MNS ENGINEERS INC

August 2016

Revised October 2016

City of San Luis Obispo

Laguna Lake Dredging and Sediment Management Project Phase I Report

PREPARED FOR:

City of San Luis Obispo

Mr. Robert Hill
Natural Resources Manager
Mr. David Athey
Supervising Civil Engineer

PREPARED BY:

MNS ENGINEERS, INC.

MNS ENGINEERS, INC.

811 El Capital Way, Suite 130
San Luis Obispo, CA
805.787.0326 Office
805.787.0437 Fax

www.mnsengineers.com

City of San Luis Obispo

Laguna Lake Dredging and Sediment Management Project Phase I Report

Capital Project Manager

Robert Hill

MNS Engineers Staff

Doug Pike, PE
Heather O'Connell, PE
Kurt Shellhause, PE
Sean Packard

Prepared by:

REGISTERED PROFESSIONAL ENGINEER
HEATHER M. O'CONNELL
C73119
Exp. 12-31-2016
8/29/16
CIVIL
STATE OF CALIFORNIA

Heather O'Connell, PE C73119
Supervising Engineer
MNS Engineers

REGISTERED PROFESSIONAL ENGINEER
KURT SHELLHAUSE
C85922
Exp. 09-30-2016
8/29/16
CIVIL
STATE OF CALIFORNIA

Kurt Shellhause, PE C85922
Project Engineer
MNS Engineers

Laguna Lake Quick Facts

- Laguna Lake is a natural lake that has been modified as part of surrounding development projects.
- An outlet culvert under Madonna Road was constructed in the 1960s. It has an invert elevation of 120.3 feet above sea level.
- At the high water level of 120.5 feet, Laguna Lake covers approximately 110 acres and holds 428.5 acre-feet of water.
- Runoff from the Prefumo Canyon, Sycamore Canyon, and Los Osos Valley watersheds drain to Laguna Lake.
- On average, one to three inches of sediment are deposited on the lakebed each year.
- Existing Lake uses include: wildlife habitat and passive recreational activities such as boating, birding, fishing, and quiet and scenic enjoyment.

Important Elevations and Descriptions

Elevation/Unit	Description	Notes
111.5	Elevation in Southeast Arm	Lowest point in lake per 2014 bathymetric survey
120.3	Outlet Culvert elevation	Maximum capacity without outflow
120.5	High water level	Elevation at which lake outflow begins

Contents

EXECUTIVE SUMMARY **7**

SECTION 1. INTRODUCTION **11**

1.1. INTRODUCTION 11
1.2. SITE LOCATION 11
1.3. PURPOSE 11
1.4. ENHANCEMENT OPPORTUNITIES 12
1.5. ADDITIONAL PROJECT COMPONENTS 13

SECTION 2. LAGUNA LAKE DESCRIPTION **17**

2.1. PHYSICAL CHARACTERISTICS 17
2.1.1. Center Lake 17
2.1.2. Prefumo Arm 17
2.1.3. Southeast Arm and Outlet Culvert 17
2.1.4. Northwest Inlets, Peninsula Inlet, and “Let It Be” Wetland Marsh 19
2.1.5. Boat Launch 19
2.2. WATER SURFACE LEVEL 19
2.3. STORAGE CAPACITY 19
2.4. HYDROLOGIC CONDITIONS 20
2.4.1. Laguna Lake Watersheds 20
2.4.2. Upstream Sediment Management 22
2.4.3. Water Quality 23
2.5. EXISTING TOPOGRAPHIC DATA 26
2.6. EXISTING BATHYMETRIC DATA 26
2.7. PREVIOUS STUDIES AND REPORTS 26

SECTION 3. HISTORY OF LAGUNA LAKE **29**

3.1. USE AND OPERATION 29
3.2. REPAIRS AND IMPROVEMENTS 29
3.2.1. 1961 Laguna Lake Master Plan 29
3.2.2. 1982 Laguna Lake Management Plan 29
3.2.3. 1993 Laguna Lake Master Plan and Beyond 29
3.3. DREDGING HISTORY 30

SECTION 4. ENVIRONMENTAL AND CULTURAL CONSIDERATIONS **31**

4.1. JURISDICTIONAL WATERS AND WETLANDS DELINEATION 31
4.2. BIOLOGICAL RESOURCES ASSESSMENT 31
4.3. CULTURAL RESOURCES ASSESSMENT 31

SECTION 5. GEOLOGY AND SOILS **33**

5.1. FIELD EXPLORATION 33
5.2. LAKE SEDIMENT CHARACTERIZATION 33
5.3. LAKE SEDIMENT CHEMISTRY 33
5.4. WATER QUALITY TESTING 34

SECTION 6. DREDGING TECHNOLOGIES **35**

6.1. DREDGING PROCESS 35
6.1.1. Mechanical Dredging 36

6.1.2. Hydraulic Dredging 36
6.1.3. Cyclonic Dredging 36
6.2. DREDGING EQUIPMENT 36
6.2.1. Mechanical Dredging Equipment 36
6.2.2. Hydraulic Dredging Equipment 36
6.2.3. Cyclonic Dredging Equipment 37
6.3. DEWATERING 37
6.3.1. Dewatering Methods 37
6.3.2. Return Water 38
6.4. DREDGED MATERIAL HAULING AND PLACEMENT 38

SECTION 7. DREDGING OPTIONS 39

7.1. PROJECT LIMITATIONS 39
7.2. DREDGING PRIORITY AREAS 39
7.3. DREDGING ALTERNATIVES 40
7.3.1. Alternative 1 – Minimum Dredging 40
7.3.2. Alternative 2 – Moderate Dredging 45
7.3.3. Alternative 3 – Maximum Dredging 50
7.3.4. Dewatering 50
7.3.5. Mechanical Dredging 54
7.4. SUMMARY 54

SECTION 8. SEDIMENT DEPOSITION 57

8.1. OPTION 1 – ON-SITE DEPOSITION ON LAGUNA LAKE NATURAL RESERVE AND LAGUNA LAKE PARK 57
8.2. OPTION 2 – OFF-SITE DEPOSITION AT COLD CANYON LANDFILL 57
8.3. OPTION 3 – PRIVATE PROPERTIES 57
8.4. SUMMARY 58

SECTION 9. RECOMMENDATIONS 61

9.1. RECOMMENDATIONS TO MINIMIZE IMPACT TO SPECIAL STATUS SPECIES 61
9.2. RECOMMENDED DREDGING ALTERNATIVE 62
9.3. RECOMMENDATIONS FOR DREDGING OPERATIONS 62
9.4. RECOMMENDATIONS FOR BANK AND SHORELINE RESTORATION 63
9.5. RECOMMENDED SEDIMENT MANAGEMENT IMPROVEMENTS 64

APPENDICES 65

TABLES

Table 1 - Laguna Lake Storage Capacity at Various Water Surface Elevations 20
Table 2 - Laguna Lake Watershed Characteristics 22
Table 3 - Laguna Lake Average Annual Sediment Rates 22
Table 4 - Water Quality Results from Previous Studies 24
Table 5 - TMDL Status of Laguna Lake Tributaries 25
Table 6 - Summary of Laguna Lake Master Plans 27
Table 7 - Summary of Laguna Lake Soil, Geologic, Water Quality, Hydrologic, and Ecological Studies 28
Table 8 - Summary of Sediment Removal from the Prefumo Arm 30
Table 9 - Performance of Dredging Processes 35
Table 10 - Alternative 1 Summary 40
Table 11 - Alternative 2 Summary 45
Table 12 - Alternative 3 Summary 50
Table 13 - Summary of Proposed Dredging Alternatives 54
Table 14 - Summary of Potentially Available Sediment Deposition Sites 58
Table 15 - Recommended Conservation Measures for Identified Special Status Species 61
Table 16 - Dredging Recommendations 62
Table 17 - Bank and Shoreline Restoration Recommendations 63

FIGURES

Figure 1 - Location Map (Google Maps) 12
Figure 2 - Existing Shoreline Erosion along Access Road 14
Figure 3 - Existing Shoreline Erosion near Boat Ramp 15
Figure 4 - Upstream, Looking Downstream Fish Passage at Los Osos Valley Road 16
Figure 5 - Lake Features 18
Figure 6 - Existing Laguna Lake Concrete Culvert Outlet under Madonna Road 19
Figure 7 - Watersheds 21
Figure 8 - Dredging Priority Areas 41
Figure 9 - Existing Lake Depths 42
Figure 10 - Alternative 1 Dredging Depths 43
Figure 11 - Alternative 1 Lake Depths 44
Figure 12 - Alternative 2-Min Dredging Depths 46
Figure 13 - Alternative 2-Min Lake Depths 47
Figure 14 - Alternative 2-Max Dredging Depths 48
Figure 15 - Alternative 2-Max Lake Depths 49
Figure 16 - Alternative 3 Dredging Depths 51
Figure 17 - Alternative 3 Lake Depths 52
Figure 18 - Dewatering Area 53
Figure 19 - Cost Trends for the Various Dredging Alternatives 55
Figure 20 - Potential Deposition Sites 59

APPENDICES

Appendix A: Additional Projects and Amenities
Appendix B: Funding and Financing Plan
Appendix C: Environmental Documents
(Biological Assessment, Jurisdictional Waters and Wetlands Delineation and Cultural Resources Study)
Appendix D: Dredge Sediment and Geotechnical Characterization Report
Appendix E: Lake Plan and Cross-section Views
Appendix F: Construction Cost Estimates
Appendix G: On-Site Deposition Analysis

This page intentionally left blank.

Executive Summary

The City of San Luis Obispo (City) owns the 344-acre Laguna Lake Natural Reserve (Reserve), which includes Laguna Lake (Lake) as well as adjacent park and open space areas. In 2015, the City adopted the Laguna Lake Natural Reserve Conservation Plan (Conservation Plan) that guides management of the Reserve. The Conservation Plan recognizes the need for ongoing dredging to mitigate the adverse effects of sedimentation, as well as the need for watershed restoration activities to minimize future sedimentation rates. Accordingly, a program to dredge certain areas of the lake over the next ten years is recommended.

In January 2016, the City retained MNS Engineers to develop phased planning and design documents to implement the Conservation Plan's dredging and sediment management elements. The first phase of this process includes development of this Preliminary Dredging Report (Report). This Report documents several key project elements and includes:

1. an overview of additional project amenities and project enhancement opportunities,
2. a review the current status of the lake, previous studies, and management documents,
3. new geotechnical and water quality testing data,
4. new biological and cultural resource assessments,
5. a review of applicable dredging technologies and approaches,
6. development of dredging alternatives,
7. recommendations for deposition and disposal of sediments,
8. a preferred alternative recommendation,
9. dredging operations recommendations,
10. recommendations for future sediment management, and
11. an analysis of project funding options.

Project Amenities and Enhancement Opportunities

Additional enhancement opportunities should to be considered when finalizing the preferred construction project or list of projects. These enhancement opportunities include potential amenities with a variety of community benefits. Potential project enhancements identified for further detailed evaluation include:

1. eroded Prefumo Creek bank restoration and stabilization,
2. lake shoreline stabilization near the park access road,
3. creation of a sediment settling basin (or basins) along Prefumo Creek,
4. fish passage improvements at Madonna and Los Osos Valley Roads,
5. flood mitigation through removal of sediments and debris at storm sewer outlets, and
6. a recycled water line extension.

Park amenity upgrades may include a Peninsula boardwalk, viewing platforms, accessible paths, and improved signage.

Funding Strategy

The benefits associated with restoring and enhancing Laguna Lake Park and Natural Reserve also provide opportunities to obtain potential funding and financing for the dredging project. A memorandum providing a detailed discussion of potential funding and financing sources has been included as Appendix B.

Geotechnical Investigation

Geotechnical investigation and sampling was conducted in the spring of 2016 for this Report. Sampling results indicate that the lakebed material consists of stratified clays of variable stiffness. Sediment testing samples detected nickel, Chromium 6 (Cr+6), and Chromium 3 (Cr+3) in the land surrounding the Lake, and at various depths in Lake sediment. Elevated levels of chromium and nickel detected in Lake sediment correlate to the naturally occurring concentrations found in the watershed lands surrounding the lake. Chromium and nickel are associated with the local metamorphic rocks. The Lake sediment concentrations are below the US EPA Numeric Action Levels[1] (NALs) for chromium and nickel, with some concentrations of chromium and nickel exceed the US EPA Region 9 Regional Screening Level[2] (RSL). The chromium and nickel present in lake sediments can become a human health risk if they become airborne and do not pose a health risk when present in a wet soil. However, since both metals exceed the RSL, dredged sediment cannot be re-used onsite.

Environmental Assessment

The environmental study area encompassed the identified, prioritized dredging areas of Laguna Lake, portions of Laguna Lake Park and the Reserve, the Prefumo Creek inlet to 300 feet upstream of Los Osos Valley Road, and Lower Prefumo Creek to approximately 150 feet downstream of Madonna Road. The entirety of the study area encompasses approximately 147.2 acres.

Jurisdictional Waters and Wetland Delineation

The site reconnaissance identified and delineated State and Federal Regulatory Agency jurisdictional areas, new and existing wetland and riparian areas, and habitat of environmentally sensitive species. The regulatory setting is outlined under the Clean Water Act, Section 1600 et seq. of the California Fish and Game Code, and the Porter-Cologne Water Quality Control Act. The delineation identified 61.49 acres of jurisdictional waters subject to Sections 404 and 401 of the Clean Water Act, including 4.72 acres of wetlands and 56.77 acres, subject to Section 1600 et seq. of the California Fish and Game Code and Porter-Cologne Water Quality Control Act.

Jurisdictional areas that cannot be avoided will require regulatory permits. Temporary impact areas are proposed to be restored at a one to one (1:1) ratio (one acre of restoration for each acre of impact) to offset temporary losses in wetland, stream, or riparian function. Permanent impacts are proposed to be offset through creation, restoration, and/or enhancement of in-kind habitats at a minimum ratio of 2:1 to mitigate unavoidable permanent impacts to jurisdictional areas.

Biological Resource Assessment

Numerous special status plant and wildlife spices were identified in the biological resource evaluation. Twenty species of special status wildlife may occur onsite based on the presence of suitable habitat, including ten birds, two mammals, two reptiles, three amphibians, one invertebrate, and one fish. Eighteen special status plant species may occur onsite based on the presence of suitable habitat; five of which were documented in the potential project area. Sensitive plant community conservation measures are identified and included in the study area Biological Assessment.

Cultural Resource Assessment

The project is not anticipated to impact any historical resources and no historic properties are affected. Although no cultural resources were identified within the current project area, mitigation measures are included in the Report to address unanticipated discoveries associated with subsurface construction activities.

[1] Numeric Action Level (NAL) are the US EPA contamination benchmarks used as thresholds for corrective action.
[2] Regional Screening Level (RSLs) are used when a site is initially investigated to determine if potentially significant levels of contamination are present to warrant further investigation. RSLs alone do not trigger the need for response actions or define “unacceptable” levels of contaminants.

Dredging Alternatives

Three dredging alternatives were developed based on Priority Areas identified by the City and the consultant team, based on sediment loading rates and existing Lake sediment volumes that have accumulated over the years.

Alternative 1: Dredging of Priority Area 1, the Prefumo Creek inlet delta, for a total dredge volume of 36,500 CY.

Alternative 2: Dredging of Priority Areas 1 and 2, the Prefumo delta plus encompassing an area further to the north and east, for a range of dredging volume estimated between 50,000 CY to 85,000 CY.

Alternative 3: Adds Priority Area 3, the Southeast Arm of the Lake, therefore dredging the three Priority Areas for a total of 167,000 CY.

For each of the three dredging alternatives, planning level costs were developed for combinations of two dredging and two dewatering methods: hydraulic dredging with dewatering basins, hydraulic dredging with mechanical dewatering, and mechanical dredging approaches. Costs for each alternative varied by approach, typically with mechanical dredging and dewatering being more expensive and hydraulic dredging with dewatering basins being less expensive. For Alternative 1, costs range between $5.3 and $6.3 million dollars. Alternative 2 costs are estimated to be between $6.7 and $14.6 million dollars. The costs associated with Alternative 3 range from $21.6 to $27.3 million dollars, based on the different dredging approaches.

Recommendation for Deposition and Disposal of Sediments

Due to the presence of detectable levels of chromium and nickel in Lake sediment samples, the decision was made that on-site sediment deposition will not be considered. The decision to not re-use the material onsite or at nearby ranch properties is related to the potential exposure of park users and neighbors to chromium and nickel should the material become airborne. Accordingly, Cold Canyon Landfill, located approximately ten miles from the site, was selected as the principal deposition site for the dredged material. Analytical testing performed on the sediment indicates that the material appears to be suitable for landfill disposal as a nonhazardous waste, meets Cold Canyon's acceptance criteria, and may be used as daily landfill cover. Cold Canyon is also already permitted to accept the range of volumes and sediment characteristics described above. Costs associated with all of the alternatives reflect assumed costs associated with hauling material to the landfill.

Recommended Dredging Alternative

To lessen overall project costs, it is recommended that a hydraulic dredging with onsite dewatering of dredged sediment be utilized. Dredging project(s) selection will be based on available funding, community benefits, and the final negotiated costs associated with offsite dredged material disposal. It is not advised that the City pursue a smaller dredging project than that presented as Alternative 1 (36,500 CY), as such a project would not adequately mitigate historic buildup of sediment in Laguna Lake and would have limited benefit relative to the planning, permitting, and mobilization costs associated with a project. **Alternative 2** is the recommended dredging project, with a dredged material volume range between 50,000 and 85,000 CY. Alternative 2 is sized within a range based on prospective funding availability and the need to be able to accommodate the uncertainty of actual competitive bidding for project implementation.

Recommendations for Dredging Operations

This Report provides a comprehensive list of recommendations for dredging Laguna Lake. Many of the recommendations are standard for dredging and earthwork projects. Key operational recommendations specific to Laguna Lake include:

1. Development of a Mitigation and Monitoring Plan encompassing the dredging project and selected amenities. Biologists selected to implement the Mitigation and Monitoring Plan should have fisheries experience.
2. Dredging should occur a minimum of 30 feet from the lake shore. This dredging setback will protect Lake bank slopes from settling. Heavy equipment should also not be placed on top of shore bank slopes.
3. The maximum slope for inside and outside faces of the containment or dewatering should not be steeper than a 2H:1V slope. The berms should be no higher than 6 to 7 feet measured vertically from the outside face.

4. Any sediments temporarily stockpiled on site should be placed in lifts not exceeding 8 inches, moisture conditioned and compacted to a minimum 90 percent maximum dry density. Soils should be kept moist and should not be allowed to fully dry during earthwork to reduce the potential for dust.

Sediment Management Recommendations

In order to reduce sedimentation rates in the Lake delta area, it is recommended that a new sediment collection and settling basin be created as a means of managing sediment from the Prefumo Canyon watershed. The basin is proposed to be located along Prefumo Creek immediately upstream of Los Osos Valley Road on the City-owned Laguna Lake golf course. It is estimated that the sediment basin would need to be about four feet deep and require an approximate two-acre footprint to capture annual average sediment loads. The basin would require periodic excavation with additional maintenance after significant flood events.

Section 1. Introduction

This following section provides a general description of Laguna Lake, introductory information, and the purpose of the Preliminary Dredging Report (Report).

1.1. Introduction

The City of San Luis Obispo (City) owns and maintains the Laguna Lake Natural Reserve (Reserve), a 344-acre land reserve and public recreation park, which includes Laguna Lake (Lake). Laguna Lake is primarily a naturally occurring lake, but was modified in the 1960s as part of the 1961 *Laguna Lake Master Plan,* which significantly altered the Lake and surrounding environment. The work included diverting Prefumo Creek into Laguna Lake on its central southern shore and dredging the southeast marsh to create the Southeast Arm of the Lake.

After Prefumo Creek was diverted to flow through the Lake, silt from the Irish Hills, located to the southwest, accumulated where the creek discharged into the Lake. Bathymetric surveys over time indicate accelerated changes in lake depth and morphology. In response, the City adopted the 2015 *Laguna Lake Natural Reserve Conservation Plan* (Conservation Plan) to improve the condition of the Reserve, and is now moving forward with the Project Design Report in support of Lake dredging and sediment management strategies.

1.2. Site Location

Laguna Lake and the Reserve are located in the southwestern portion of the City, northwest of Madonna Road and northeast of Los Osos Valley Road. Public access to the Reserve is gained through Laguna Lake Park off of Madonna Road, 0.5 miles southwest of Highway 101. The Lake is bordered by the Oceanaire neighborhood to the southwest, Laguna Lake Park to the east, the serpentine rock ridgeline and grassland meadow to the northeast, and the “Let It Be” wetland marsh to the northwest. Prefumo Creek splits the Oceanaire and Laguna Middle School neighborhoods before draining into the south central portion of the Lake. The Lake overflow outlet channel is located on the Southeast Arm and crosses under Madonna Road before connecting with San Luis Obispo Creek. Figure 1 provides the location of Laguna Lake and the surrounding communities.

1.3. Purpose

This Report includes a desktop study which outlines historic conditions and documents previous evaluations prepared for lake conditions and dredging assessments. Furthermore, this Report presents new site reconnaissance and updated dredging design and operation considerations for Laguna Lake, including:

1. an overview of additional project amenities and project enhancement opportunities,
2. a review the current status of the lake, previous studies, and management documents,
3. new geotechnical and water quality testing data,
4. new biological and cultural resource assessments,
5. a review of applicable dredging technologies and approaches,
6. development of dredging alternatives,
7. recommendations for deposition and disposal of sediments,
8. a preferred alternative recommendation,
9. dredging operations recommendations,
10. recommendations for future sediment management,
11. an analysis of project funding options.

The findings and results are intended for use by the City to support future dredging operations and modifications at Laguna Lake.

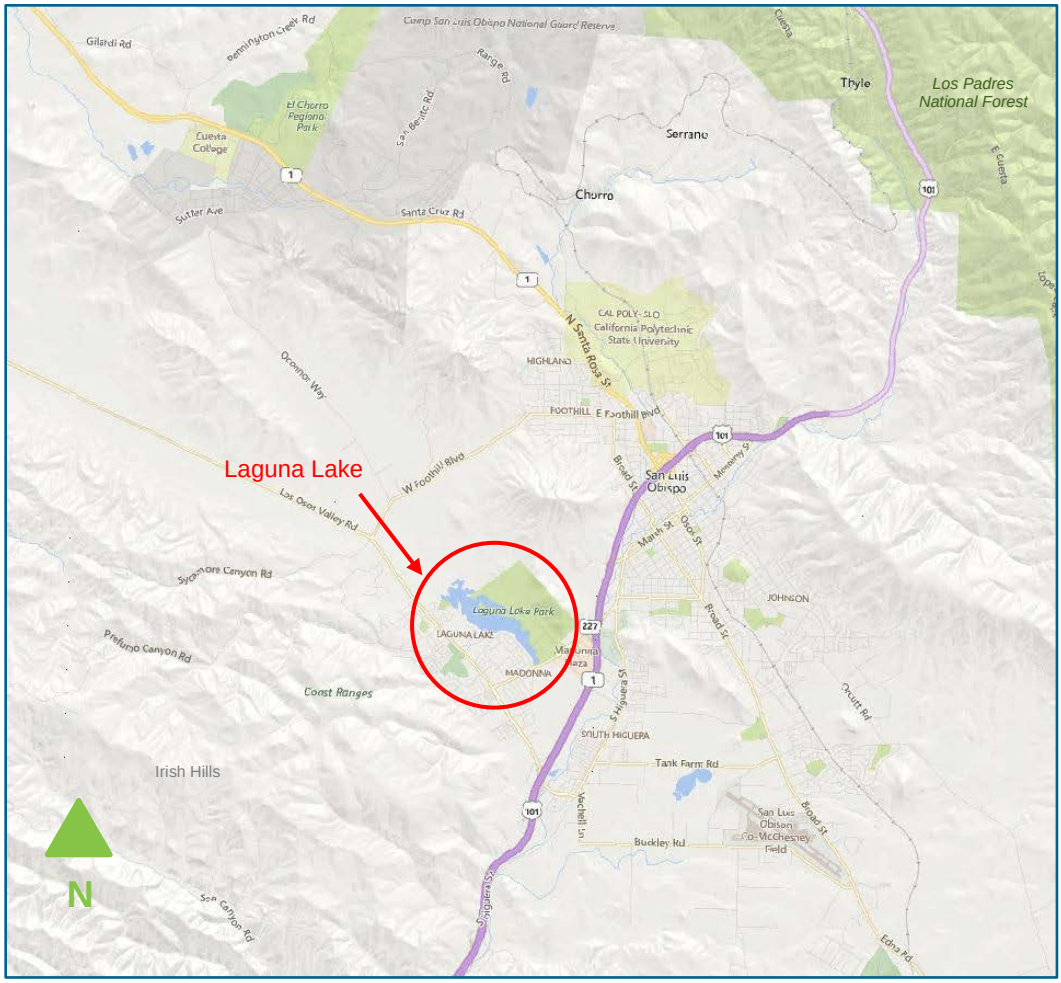


Figure 1 - Location Map (Google Maps)

1.4. Enhancement Opportunities

The City is currently studying all options for restoring and enhancing Laguna Lake Park and Natural Reserve, which may include:

1. removal of the accumulated lake sediments
2. sediment control for ongoing management of lake capacity and water quality
3. creating enhanced wildlife habitat
4. improving and enhancing public amenities
5. adding and improving recreational opportunities
6. increasing public access
7. improved educational opportunities for youth, local colleges, and wildlife enthusiasts

Benefits of increased capacity and a deeper lake include:

1. enhanced recreational opportunities: kayaking, canoeing, stand-up paddle boarding, fishing, etc.

2. increased and new wildlife habitat: critical habitat for threatened steelhead trout and local and migratory birds
3. stormwater management and flood control: reduction of severity of flooding and storm drain backups along the Prefumo Arm during frequent flood events
4. ground water management: potential for ground water recharge of the underlying basin

Facilities and amenities improvements to the Lake, Nature Preserve, and Laguna Park are described further in Section 1.5 and graphically depicted in Appendix A, but may include:

1. eroded creek bank restoration and lake shoreline stabilization
2. primary sediment basin(s) to intercept sediment before depositing in Laguna Lake
3. improved fish passage to Upper Prefumo Creek under Madonna and Los Osos Valley Roads
4. increased access for pedestrians and bikers, including a peninsula boardwalk
5. improved off-leash dog areas
6. improved boat launch and dock
7. lake and wildlife viewing platforms
8. visitor serving enhancement: kiosks, informational signage, and docent tours
9. expanded educational opportunities and partnerships: outdoor classroom area for Laguna Middle School, educational signage, K-12 programs, Cuesta College and Cal Poly programs, field labs, and restoration projects and monitoring

Community-wide benefits may include:

1. conserved asset for future generations
2. modernized amenities and facilities that reflect current and future community needs
3. flood control: Removal of sediment at the inlet of the Prefumo Arm and the establishment of regular sediment management will reduce storm drain backflow and flooding along the Prefumo Arm during frequent rainfall and localized intense rainfall events
4. ground water recharge
5. K-12 and Cuesta/Cal Poly educational programs and resources
6. improved city-wide open space system

The benefits associated with restoring and enhancing Laguna Lake Park and Natural Reserve also provide opportunities to obtain potential funding and financing for the dredging project. A memorandum providing a detailed discussion of potential funding and financing sources has been included as Appendix B.

1.5. Additional Project Components

Facility improvements mentioned above and associated with the dredging project will include shoreline restoration, creek bank stabilization, and improved fish passage, which are described in more detail below. The proposed sediment basin along Prefumo Creek is outlined in further detail in Section 9.4, Recommended Sediment Management Improvements.

Lake Shoreline Restoration

Areas of erosion and shoreline sloughing located along the northeast shore of the Lake near the boat launch/ramp area, access road and parking lot compromise site features and can impair fish habitat. The path has eroded and parts of the path and road have failed due to undermining by wave action associated with the predominant westerly winds frequently encountered at the Lake. The design recommendations that govern selection of shoreline erosion protection are described in Section 9.4 and include:

1. indirect or vegetative methods preferred over structural methods
2. protect and conserve stream bank and shoreline features with the potential to attenuate impaired runoff and
3. plan and manage activities within the water bodies adjacent to shorelines to limit erosion.

Figure 2 - Existing Shoreline Erosion along Access Road

Figure 3 - Existing Shoreline Erosion near Boat Ramp

In order to better protect the shoreline, grading to match the adjacent existing segments would provide a gentle, stabilized slope promote regular shoreline patterns. Example Cross Sections of bioengineering measures for shoreline protection are included in Appendix A, Figure A2, Shoreline Stabilization Details, as excerpted from the City's February 2003 SLO Creek Drainage Design Manual. Such measures can include, but are not limited to, live stakes and planting, vegetated geogrid, and brush layering. These examples should be evaluated in more detail with biologists to maximize habitat potential as well as meet engineering guidelines for stabilization needs.

Prefumo Creek Bank Stabilization and Restoration

Sections along Prefumo Creek have become over-steepened and present near vertical banks in areas upstream of the Prefumo Inlet. Stabilization measures should be evaluated on a case by case basis by the design engineer and biologist to insure desired outcomes. Methods to achieve creek bank stabilization and restoration include grading to lay back creek banks to a 2:1 to 2.5:1 (H:V) ratio, bank revegetation with native plant species, providing "soft" reinforcement measures including anchoring the toe of slopes with either replacement stones or willow stakes, and rip rap armoring of existing bank slopes, known as "vegetated rock slope protection" (VRSP) when steep or where water flow is very fast and turbulent. Heavily reinforced creek banks will also include soft features such as trees and other vegetation.

Example Cross Sections of bank protection measures for Prefumo Creek are included in Appendix A, Figure A3, Creek Bank Stabilization Details, as excerpted from the City's February 2003 SLO Creek Drainage Design Manual. Exact techniques vary depending on site conditions and should be evaluated in more detail and deemed acceptable by the design engineer.

Fish Passage

The existing box culverts and the existing Fish Ladder located at the culvert crossing at Los Osos Valley Road can be upgraded to provide enhanced migratory passage for anadramous fish species. The upper reach of Prefumo Creek is designated as critical habitat for south-central California coast steelhead (*Onchorynkiss mykiss*) by the National Oceanic and Atmospheric Administration (NOAA) Fisheries Division. NOAA's design criteria includes use of elements that ensure low-flow and high-flow passage for both juvenile and adult steelhead.

Figure 4 - Upstream, Looking Downstream Fish Passage at Los Osos Valley Road

Section 2. Laguna Lake Description

This section provides an overview of Laguna Lake, the Lake's physical features, and how it is managed. A graphic of the Lake and surrounding features is provided as Figure 5.

2.1. Physical Characteristics

Laguna Lake is a naturally occurring lake in the southwestern portion of the City of San Luis Obispo. The lake collects water from the Los Osos Valley watershed to the northwest and the Sycamore Canyon and Prefumo Canyon watersheds to the west. The lake is bordered by the Oceanaire neighborhood to the southwest, Laguna Lake Park to the east, the serpentine ridgeline and grassland meadow to the northeast, and the "Let It Be" wetland marsh to the northwest. Laguna Lake can be divided into several portions, described further in the following sections. They include the Center Lake, Prefumo Arm, Southeast Arm and outlet, the northwest section, and boat launch.

2.1.1. Center Lake

The section of Laguna Lake designated as Center Lake covers the largest surface area at approximately 59 acres. This section is about 1,000 feet wide and 3,000 feet long. At the normal high water level of 120.5 feet above sea level (asl), this area ranges from two to six feet deep, with isolated deeper spots. During summer months, Center Lake may only measure one foot deep or less. A 2012 bathymetric survey shows that since 1977, the Center Lake area has filled in by two to four feet, and the rest of the lake has filled in by up to two feet. The Conservation Plan states that data from the 1977 and 2012 bathymetric surveys shows the lake is filling in at a rate of one to three inches per year, which equates to 3,900 cubic yards (CY) per year. However, this volume excludes the Southeast Arm and should represent a minimum estimate.

2.1.2. Prefumo Arm

In the 1960s, Prefumo Creek was diverted from its natural route, which bypassed the Lake and fed directly into San Luis Obispo Creek, to drain into the south central side of the Lake through the corridor known as the Prefumo Arm, or Prefumo Inlet. Originally, the Prefumo Arm stretched about 1,500 feet long and was on average 150 feet wide. The total area of the arm was about six acres. It also formerly had a depth of four to six feet, but sediment from the Prefumo Canyon watershed deposited in the Prefumo Arm at an average rate of 8,000 cubic yards per year, as stated in the 1982 *Laguna Lake Management Plan* (1982 Plan). The sediment has been removed sporadically. However, the arm has now filled to an elevation above the normal high water level, and a delta has formed at the inlet due to the sedimentation, fostering a willow riparian habitat throughout the Prefumo Arm. During wet weather months, runoff from the Prefumo Canyon watershed flows through the arm to the lake, but the dry weather flow is largely intermittent subsurface flow

2.1.3. Southeast Arm and Outlet Culvert

The Southeast Arm of the lake stretches from Center Lake towards the outlet at Madonna Road. This section contains approximately 16-acres of water surface at normal high water and is about 1,800-feet long with a width that varies from 200 to 600-feet. The lake empties through three box culverts under Madonna Road and connects to San Luis Obispo Creek in a stretch now called Lower Prefumo Creek. The present three-barreled concrete culvert outlet for the lake, shown in Figure 6, permits storing water to elevation 120.3 feet asl. Water will begin out-flowing at elevation 120.5 feet. The Southeast Arm is the deepest section of the lake, ranging from six feet deep to eight feet deep at the normal high water level. Average sedimentation rates are included in Table 3, below. The south shoreline of the Southeast Arm is occupied by 30 single-family homes on Oceanaire Drive. These lots, along with the rest of the neighborhood, drain into the lake directly or through gutters and culverts.

MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 5: LAGUNA LAKE AND FEATURES

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'

Figure 6 - Existing Laguna Lake Concrete Culvert Outlet under Madonna Road

2.1.4. Northwest Inlets, Peninsula Inlet, and "Let It Be" Wetland Marsh

The northwest inlets and wetland marsh area, known as the "Let It Be" Nature Preserve, make up a flat, marshy area that receives water from the Los Osos Valley watershed and a small creek informally known as Laguna Creek. The water surface area here is greatly impacted by the Lake water surface level. This area covers about 67-acres, with only 13-acres consisting of open water. The Peninsula Inlet is located just to the north of Center Lake and covers approximately 40-acres.

2.1.5. Boat Launch

The boat launch is located on the east side of the lake at the base of the peninsula, separating Center Lake and the Southeast Arm. It was built as pursuant to the 1961 Laguna Lake Master Plan and is accessible by a driveway from Laguna Lake Park.

2.2. Water Surface Level

According to the Conservation Plan, the normal high water level, as controlled by the outlet culvert at the terminus of the Southeast Arm, is 120.5 feet above mean sea level. Older reports state the outlet elevation as 118 feet, and the difference is related to an older survey datum that was used. The lake has a surface area of approximately 110 acres when full with average water depths as follows: zero to four feet in marsh areas and inlets; two to six feet in central lake; and six to eight feet in the Southeast Arm. Lake storage capacity data is provided in Section 2.3. Flow depth at the outlet is monitored by the County of San Luis Obispo[3].

2.3. Storage Capacity

At normal high water (elevation 120.5 feet asl), Laguna Lake has an approximate capacity of 428.5 AF. Table 1 lists lake storage capacity at various water surface elevations. The Conservation Plan states that during a storm event, the lake will first rise into the marsh areas, then into the natural flood plain to the west up Laguna Creek. Because these areas are flat and cover a large portion of the watershed, an increase in the lake water level allows for up to four times the normal lake capacity.

[3] http://www.slocountywater.org/weather/alert/stream/madonna.htm

Table 1 - Laguna Lake Storage Capacity at Various Water Surface Elevations

Water Surface Elevation (MSL)	Storage Capacity (Acre-Feet)
120.5	428.5
120.0	385.6
118.0	213.9
116.0	42.2
114.0	13.4
112.0	<0.1

2.4. Hydrologic Conditions

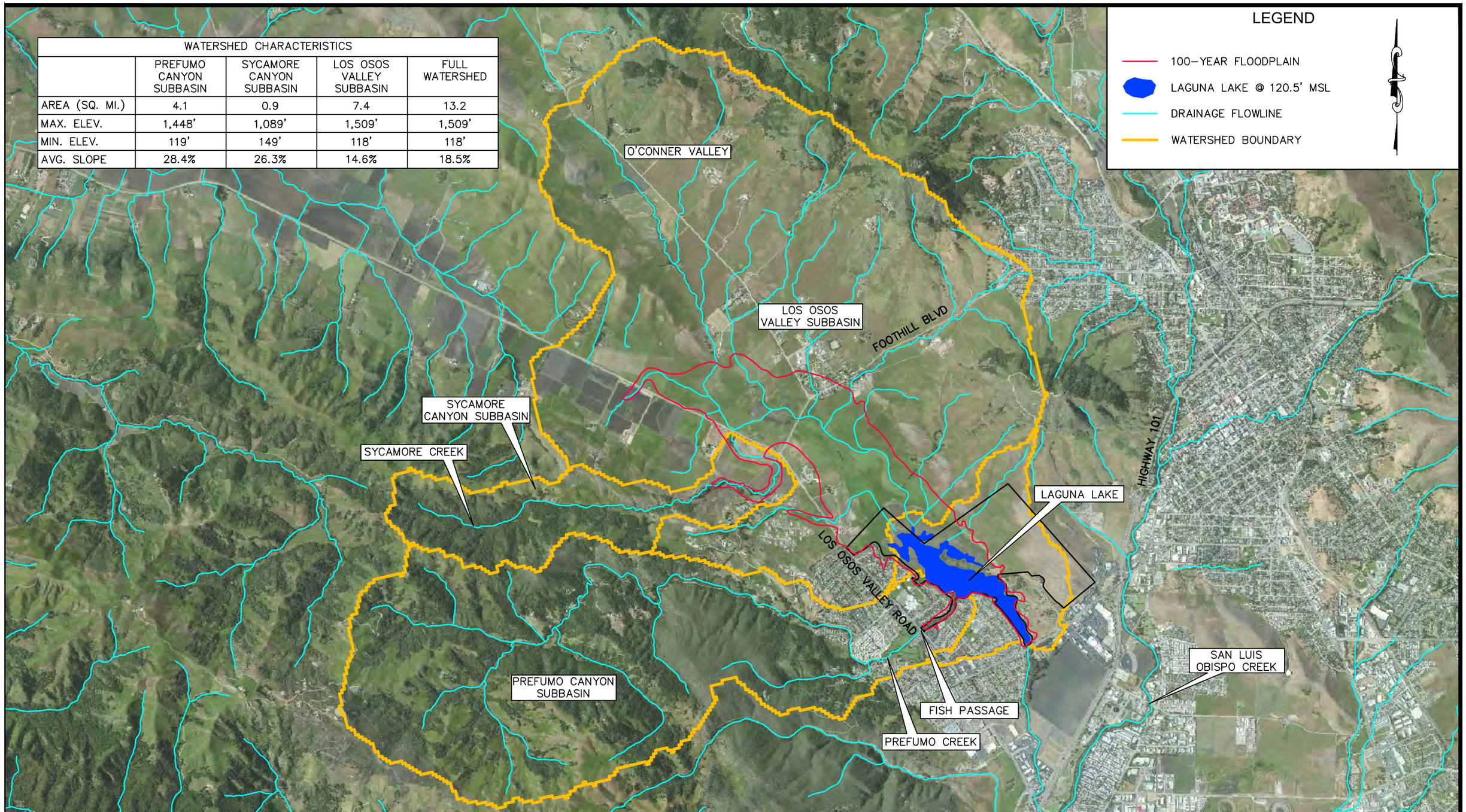
This section summarizes the general hydrology of Laguna Lake.

2.4.1. Laguna Lake Watersheds

Three main watersheds, or sub-basins, contribute to Laguna Lake: the Prefumo Canyon Sub-basin, Sycamore Canyon Sub-basin, and Los Osos Valley Sub-basin. These sub-basins are shown in Figure 7. The Prefumo Canyon Sub-basin drains the Prefumo Canyon area on the southwestern side of the lake through Prefumo Creek and the Prefumo Arm. This area consists of hills and steep slopes, resulting in significant sediment deposition to the Lake.

The Los Osos Valley Sub-basin drains the Los Osos and O'Conner Valleys and Sycamore Canyon through Laguna Creek into the northwest end of Laguna Lake. The area covers approximately 8.3 square miles and consists mostly of open space and agricultural land. Roughly 75% of the watershed drains into a mitigation wetland west of Foothill Boulevard, while the remainder of the watershed drains directly into the creek east (downstream) of Foothill Boulevard.

Several other small tributaries enter the lake directly along the northern and southern sides of the lake. In total, Laguna Lake receives water from approximately 13.2 square miles of land. Hydrologic characteristics of the Laguna Lake watershed are summarized in Table 2. Information was provided by the United States Geologic Survey (USGS) StreamStats service.



WATERSHED CHARACTERISTICS				
	PREFUMO CANYON SUBBASIN	SYCAMORE CANYON SUBBASIN	LOS OSOS VALLEY SUBBASIN	FULL WATERSHED
AREA (SQ. MI.)	4.1	0.9	7.4	13.2
MAX. ELEV.	1,448'	1,089'	1,509'	1,509'
MIN. ELEV.	119'	149'	118'	118'
AVG. SLOPE	28.4%	26.3%	14.6%	18.5%

MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 7: LAGUNA LAKE WATERSHEDS

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

3,000' 0' 3,000'
1" = 3,000'

Table 2 - Laguna Lake Watershed Characteristics

Value	Unit	Prefumo Canyon	Sycamore Canyon	Los Osos Valley	Combined
Drainage Area	sq. mi.	4.1	0.9	8.3	13.2
Max. Elevation	feet	1,448	1,089	1,509	1,509
Min. Elevation	feet	119	149	118	118
Mean Basin Slope	%	28.4	26.3	14.6	18.5
Percent Forest	%	24.7	30.2	5.07	11.1
Percent Impervious	%	3.4	0.5	1.5	2.5
Annual Precipitation	inches	22.4	21.7	21.1	21.4
Longest Flow Path	mi.	5	3	5	6

The *Waterway Management Plan* for San Luis Obispo Creek and its tributaries was developed by Questa Engineering in 2003. The report extensively details the history of the watershed, including the Laguna Lake sub-watershed comprising of the Prefumo Canyon, Sycamore Canyon, and Los Osos Valley sub-basins, and identifies the problems and needs of the watershed. It references the 1996 *San Luis Obispo Creek Watershed Hydrologic Survey*, prepared by The Land Conservancy of San Luis Obispo County. Both reports include a hydrologic model of the watershed; the 1996 *Hydrologic Survey* uses the U.S. Army Corps of Engineers' (USACE) Hydrologic Engineering Center (HEC) modeling program HEC-1, and the 2003 *Waterway Management Plan* uses the Corps' newer Hydrologic Modeling System (HEC-HMS).

2.4.2. Upstream Sediment Management

Sediment from the Sycamore Canyon and Los Osos Valley watersheds is deposited in the Center Lake area at a lower rate than sediment from the Prefumo Canyon watershed. This phenomenon is due to the flatter basin slopes of the Sycamore Canyon and Los Osos Valley watersheds. and the wetlands located on the north and northwestern portions of the Lake. The Irish Hills, located to the southwest of the Lake in the Prefumo Canyon watershed, is the main sediment production source because of steep slopes and development adjacent to the lower tributary. Hence, significant amounts of sediment have been transported into Laguna Lake since the modification and realignment of Prefumo Creek. The sediment has contributed to the delta fan formation and higher lake bed elevations throughout the entire lake. Table 3 provides a summary of sediment loading rates and their source reference.

Table 3 - Laguna Lake Average Annual Sediment Rates

Sediment Type	Lake Area(s)	Sedimentation Rate in feet and Cubic Yards (CY)	Data Source
Gravel	Prefumo Inlet	0.5 ft / Year (8,000 CY / Year)	1982 Management Plan
Silty Sand/ Sandy Silt	Center Lake	0.25 ft / Year	1982 Management Plan
Silty Clay	Center Lake	0.06-0.25 ft / Year	1982 Management Plan
Clay	Center Lake, Southeast Arm	0.06 ft / Year	1982 Management Plan
Clay	Center Lake, Peninsula Inlet, Northwest Inlet	0.02 ft / Year (3,900 CY / Year)	1982 Management Plan
General Sediment	Center Lake, Peninsula Inlet, Northwest Inlet*	0.1-0.25 ft / Year (3,900 CY / Year)	1977 and 2012 Bathymetric Surveys (Conservation Plan, Appendix E)
*Southeast Arm not included in bathymetric surveys.			

As indicated in Table 3, the Prefumo Canyon watershed is the main source of sediment in Laguna Lake. According to the 1982 *Laguna Lake Management Plan*, the Prefumo Inlet (Prefumo Arm) fills with coarse sediment (gravel and sand) at an average rate of about 0.5 feet per year. Over the length of the Prefumo Inlet, 0.5 feet equates to approximately 8,000 cubic yards (CY) per year. During years with significant flooding, up to three feet of sediment can be deposited in the Prefumo Inlet. Fine sediments (silt and clay) from the Prefumo Canyon watershed are deposited in the Center Lake portion of Laguna Lake at a rate of one to three inches (0.06 to 0.25 ft) per year, equivalent to approximately 3,900 CY of sediment per year.

These values were derived from the difference in lake bed elevation between the 1977 and 2012 bathymetric surveys, which do not include the Southeast Arm. Therefore, any sedimentation that has occurred in the Southeast Arm portion of the lake is not included in the estimated sedimentation rate of 3,900 CY per year and that sedimentation rate should be accepted as a minimum value. In addition, the estimated sedimentation rate was averaged over 35 years, so large variability in the actual year-by-year sedimentation rates is possible. Nonetheless, the average annual sediment loading rate of one to three inches per year for the Center Lake area is consistent between the 1982 *Laguna Lake Management Plan* and the Conservation Plan.

The Prefumo Inlet has been intermittently excavated to alleviate sediment build-up and maintain the conveyance capacity of the Prefumo Inlet. Material removed from the inlet consisted primarily of gravels and sands suitable for use as fill material for construction purposes. A large sediment removal operation occurred in 1979, during which between 16,000 and 20,000 CY of sediment was excavated from the inlet. No record of additional excavations was found until dredging activity resumed from 1995 to 2012, which is summarized in Table 7, Section 3.3. Since the last excavations, sediments have been building up in the Prefumo Inlet reducing the hydraulic capacity of the inlet.

Consideration of an Upstream Sedimentation Basin

To protect the Los Osos Valley Road culvert as well as Laguna Lake from future sedimentation, it is recommended that a sedimentation basin be constructed upstream of the Los Osos Valley Road culvert. It is beyond the scope of this study to perform a sediment transport analysis to design the basin; however, volumes and costs associated with the largest practical sedimentation basin size that will fit is defined and analyzed. After the detailed analysis and estimates are presented for the various dredging options, Section 9.5 addresses the scope and magnitude of this work.

2.4.3. Water Quality

Water quality data has been collected during previous studies, but there is no on-going water quality monitoring program testing at this time. The Conservation Plan recommends establishing water quality monitoring as a part of normal operation and maintenance. Two reports have been obtained that document water quality analyses of Laguna Lake. The first report was written by Leong and Brown for the 1982 Laguna Lake Management Plan. The second and more comprehensive report was written by LFR for the City as part of dredging feasibility study in 2001. Water quality test results gathered from previous studies are summarized in Table 4.

Table 4 - Water Quality Results from Previous Studies

Parameter	Range (1980)	Range (2001)	Location	Comments
Temperature, C	9 to 19	9.4 to 11.6	upper 4 feet of lake water	CiSLO (2014) Taken at inlets and center of lake,
Dissolved Oxygen, mg/l	3.5 to 11.5	N/A	Throughout lake	Varies by season, higher in late Spring (1980)
Total Dissolved Solids (TDS) mg/l	N/A	220 - 250		
Turbidity, NTU	10 to 35 NTU 40 to 64 NTU	N/A	Typical values Higher values after rain	Turbidity varies based on season and weather (1980)
pH	7.4 to 8.4	7.1-7.3	Throughout lake	Varies by season, higher in late Spring (1980)
Nitrates, mg/l	6 to 21	<0.5 mg/l	Throughout lake	Varies by season,(1980) increase late fall due to vegetation die off
Phosphorous, mg/l	0.4 to 1.6	N/A	Throughout lake	Varies by season,(1980), increase late fall due to vegetation die off
Potassium, mg/l	N/A	2.8 – 2.9		
Pollutants (TPH, VOC, SVOC, PCB , Pesticides, Metals	ND	Toluene 0.9 ug/l Barium 0.04 mg/l All other ND	Throughout lake 2001 - At cores	2 water samples in 2001

Overall, the water quality indictors have comparable values between the two data sets, with the exception of the phosphates and nitrates, which were lower in 2001 than in 1982.

During vibracoring, Leighton collected water samples to test for elutriate water quality and toxicity. The results indicate that the elutriate is not toxic to aquatic life. Additional testing will be conducted at the end of summer during low water condition and when vegetation has died off to measure Dissolved Oxygen, Temperature, pH, Turbidity, Nitrates, and Phosphates

Going forward, it will be important to establish a consistent set of meaningful water quality parameters (for both quality and regulatory requirements), sampling locations and procedures and schedule in order to develop a comprehensive picture of Laguna Lakes baseline water quality condition and patterns of variation.

The State Water Resources Control Board (SWRCB) has listed Prefumo Creek and San Luis Creek (the upstream and downstream watercourses from the Lake for certain pollutants of concern on the Clean Water Act (CWA) Statewide 303(d) List. Listing a water body as impaired is governed by the Water Quality Control Policy for developing the list pursuant to the requirements of the federal CWA. In summary, the CWA section 303(d) requires states to identify waters that do not meet, or are not expected to meet by the next listing

cycle (every 2 years), applicable water quality standards after the application of certain technology based controls and schedule such waters for development of Total Maximum Daily Loads (TMDLs). Table 5 provides a summary of the TMDLs listed for the reaches upstream and downstream of the Lake to characterize the surrounding water quality issues. Dredging Laguna Lake has potential benefits associated with reduction of the listed pollutants.

Table 5 - TMDL Status of Laguna Lake Tributaries

Reach	Pollutant	Pollutant Sources	First Year Listed	TMDL Status*	TMDL Completion Date*
Prefumo Creek	Fecal Coliform	• Agriculture • Urban Runoff • Unknown Nonpoint Source	2010	5A	2021
	Low Dissolved Oxygen	• Agriculture • Urban Runoff • Unknown Nonpoint Source	2010	5A	2021
	Nitrate	• Agriculture • Urban Runoff • Unknown Nonpoint Source	2010	5A	2021
	Turbidity	• Agriculture • Urban Runoff • Unknown Nonpoint Source	2010	5A	2021
San Luis Obispo Creek (below Osos Street)	Chloride	• Agriculture • Grazing-related Sources • Municipal Point Sources • Other Urban Runoff	2010	5A	2021
	Chlorpyrifos	• Agriculture • Grazing-related Sources • Other Urban Runoff	2010	5A	2021
	Nitrate as NO_3	• Agriculture • Grazing-related Sources • Major Municipal Point Source (dry and/or wet weather discharge) • Natural Sources • Upstream Impoundment • Urban Runoff/Storm Sewers	2006	5B	2007
	Nutrients	• Agriculture • Municipal Point Sources	1994	5B	2007
	Pathogens	• Agriculture • Grazing-related Sources • Major Municipal Point Source (dry and/or wet weather discharge) • Natural Sources • Transient Encampments • Urban Runoff/Storm Sewers	1994	5B	2004
	Sodium	• Agriculture • Grazing-related Sources • Municipal Point Sources • Other Urban Runoff	2010	5A	2021

*Category 5 criteria: A water segment where standards are not met and a TMDL is required, but not yet completed. TMDL Status A: TMDL is still required; TMDL Status B: TMDL approved by USEPA and being addressed.

2.5. Existing Topographic Data

Two versions of digital topographic data of the area surrounding Laguna Lake were obtained. The City provided topographic data in two-meter contours based on the NAD 1983 HARN State Plane California V FIPS 0405 Feet. In March 2011, the Pacific Gas and Electric Company (PG&E) performed an approximately 170,000-acre aerial Lidar[4] survey, which included the lake and surrounding area; the point cloud data is publically available and was used to create a topographic surface for base mapping.

2.6. Existing Bathymetric Data

Bathymetric survey data of Laguna Lake from 1977, 2012, and 2014 was provided by the City. The 1977 and 2012 spot elevation data were gathered mainly in the Center Lake, peninsula inlet, and northwest inlet portions of the lake. The 2014 survey was conducted to supplement the 1977 and 2012 data with spot elevations from the Southeast Arm portion of the lake. The source data from 2012 and 2014 were combined to form a single topographic 3D surface model of the lakebed in AutoCAD, based on the NAVD88[5] datum. This surface was assumed to be representative of the lakebed's current conditions and was used as the baseline for the analysis of dredging alternatives. It should be noted that the bathymetric surveys did not provide sufficient spot elevation data near the perimeter of the lake – in some areas, the closest spot elevation was taken over 100 feet from the shore. In these areas, as explained in more detail in Section 7, the actual lakebed surface is unknown; however, no dredging activity is proposed within this setback area. Additional surveying may be necessary for any lakeshore restoration projects.

2.7. Previous Studies and Reports

Previous studies and reports on Laguna Lake and the Reserve have been obtained and used for this Report. The reports include previous Laguna Lake master plans, geologic studies, hydrologic studies, water quality analyses, wildlife studies, and archaeological studies. Summaries of these studies are shown in Table 6 and Table 7.

[4] *Light Detection and Ranging - is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth.*

[5] The North American Vertical Datum of 1988 (**NAVD 88**) is the vertical control datum of orthometric height established for vertical control surveying in the United States of America.

Table 6 - Summary of Laguna Lake Master Plans

No.	Report Name	Date	Author	Notes
1	2015 Laguna Lake Natural Reserve Conservation Plan	July 2014	City of SLO	• Addresses long-term maintenance of the Reserve, including conservation, erosion and sedimentation, flood protection, and increasing access and use • Provides a brief history of Lake and the Reserve dating back to the early 20th century • Shows figures of historical photos, surveys, and master plans • Describes City Council activity leading to the decision to develop a sediment removal plan • Describes physical characteristics of the Reserve, including soils, plant and animal species, watersheds, etc. • Includes a Wildfire Preparedness Plan • Includes a 2009 Council Agenda Report (Appx D), which describes the most detailed dredging plan and environmental document to date (alternatives, costs, disposal, etc.) • Includes a Hydrology, Sedimentation, and Water Quality report (Appx E)
2	1993 Laguna Lake Master Plan	June 1993	City of SLO	• General master plan for the entire Laguna Lake Park, including work on park roads, parking, paths, restrooms, signage, picnic areas, nature preserve, etc. • Cost estimates for maintenance program, financing plan, and construction phasing plan • Includes public survey questionnaire about use/maintenance of Park
3	1982 Laguna Lake Management Plan	Jan 1982	City of SLO	• Management Plan specifically for Laguna Lake • Physical characteristics of the lake, including approximate dimensions of features, history of features and uses, sedimentation rates, soil types, etc. • Recommendations and alternatives for management: chosen plan included sedimentation maintenance in Prefumo Inlet, damming outlet culvert in summer, and weed control, but explored dredging project in depth (7 total management programs evaluated by cost, environmental consequences, procedure, effectiveness) • Includes figures on vegetation, wildlife habitat, lake depth, sedimentation rates and types, watershed • Appendices include water quality analysis (Appx B), sedimentation rate analysis (Appx E), and lake bottom soils analysis (Appx F)
4	1961 Laguna Lake Master Plan	Feb 1961	City of SLO	• Original master plan for Laguna Lake Park: development and operation of the park as a whole • Designates areas for specific uses • Describes development of roads, parking lots, paths, restrooms, utilities, landscaping, signage, and lake features (dock, boat launch, beach, etc.) • Figure of master design

Table 7 - Summary of Laguna Lake Soil, Geologic, Water Quality, Hydrologic, and Ecological Studies

No.	Report Name	Date	Author	Notes
1	Percolation Zone Study	Sep 2015	Stillwater Sciences	• Studied Santa Rosa Valley and San Luis Obispo Valley groundwater basins and catchment areas, including topography, geology, and soils.
2	Archaeological Surface Survey for the Laguna Lake Project	June 2006	Heritage Discoveries	• Studied previous archaeological investigations near Laguna Lake. • Survey of the area resulted in finding several dispersed artifacts. • Recommended further archaeological studies be performed in the area.
3	Engineering Analysis of Dredging and Disposal Alternatives at Laguna Lake	Mar 2003	LFR	• Summarized previous LFR ecological and geotechnical studies, as well as previous dredging, water, and soil studies by others. • Provided advantages and disadvantages of various dredging methods and disposal sites. • Provided six alternative projects and estimated costs.
4	Ecological Resources and Potential Impacts of Dredging Operations at Laguna Lake	Mar 2003	LFR	• Identified presence and location of sensitive species and habitat around Laguna Lake and the effects of dredging activities on the sensitive species and habitats.
5	Characterization of Sediment and Water at Laguna Lake	Mar 2001	LFR	• Sampled sediment and surface water in Laguna Lake and discussed results, specifically pollutants of concern. • Addressed potential effects of dredged material on surface water and groundwater resources and impacts to humans. • Identified potential disposal or reuse options for the dredged material.
6	Plants and Plant Community Structure in the Prefumo Creek Inlet 10 Months After Dredging	Sep 1996	Hanson	• Summarized state of plant community after dredging activity in Prefumo Arm in 1995 (follow-up report to 1995 Hanson report). • Provided photos of Prefumo Arm one year after dredging activity.
7	Plants and Plant Community Structure in the Prefumo Creek Inlet	Sep 1995	Hanson	• Documented the existing plant community in the Prefumo Arm prior to dredging activities.
8	Geotechnical Report – Laguna Lake Dredging Project	Aug 1992	Earth Systems	• Studied the geotechnical feasibility of dredging in Laguna Lake. • Recommended a 50-foot setback from shore for dredging activity. • Provided design and operation guidance for dewatering ponds and other post-construction activity.
9	Wildlife of Laguna Lake Park; Relationship to Proposed Dredging	Aug 1992	Hanson	• Summarized the environmental and ecological condition of Laguna Lake and the presence of sensitive species. • Summarized potential impacts to listed species by dredging activity. • Provides several recommendations for dredging activity to protect listed species.
10	Chromite Deposits Near San Luis Obispo	1944	Smith and Griggs	• Located and described chromite deposits around San Luis Obispo County.

Section 3. History of Laguna Lake

Laguna Lake is a naturally occurring lake and marshland habitat. Since the mid-20th century, human activity has altered the lake and surrounding environment. This section details the history of the lake, man-made changes, and the lake's dredging history.

3.1. Use and Operation

Laguna Lake has historically served primarily as a wildlife habitat. In the early 20th century, the Lake was used as a water supply for the railroad, City, and irrigation for farming. Since the development of the Oceanaire neighborhood to the southwest of the Lake in the 1960s, the Lake has been periodically modified by various management plans which altered its condition and surroundings. Under the current Conservation Plan, the Lake exists currently as a wildlife habitat, as a passive recreational activity facility, and as an adjacent residential property amenity.

3.2. Repairs and Improvements

The developments and improvements to and around Laguna Lake created a valuable resource for the City and the surrounding community. However, various maintenance challenges arose throughout the history of the Reserve. The management plans developed to address the biological needs of the Reserve's ecosystem as well as the recreational and aesthetic requests of the community are summarized in the following subsections.

3.2.1. 1961 Laguna Lake Master Plan

As the City permitted the Oceanaire neighborhood to the south of Laguna Lake in the 1960s, plans to develop the Laguna Lake Park were formed by the Laguna Lake Committee. As part of the 1961 *Laguna Lake Master Plan*, which included the park areas, the Lake was partially dredged in the Southeast Arm in conjunction with the development of the Oceanaire neighborhood and a new outlet channel connecting the lake to San Luis Obispo Creek was constructed. In 1963, Prefumo Creek (Creek) was diverted into the Lake from its natural route, which it had originally bypassed to combine with San Luis Obispo Creek to the southeast. The new inlet, called the Prefumo Arm or Prefumo Inlet, drained the Creek into the Lake's south central side. The rerouting of Prefumo Creek shortened its length across by approximately 3,500 feet. The reroute has resulted in decreased sediment deposition time along the historic Creek alignment and has thus increased the Lake sedimentation rate.

3.2.2. 1982 Laguna Lake Management Plan

The 1982 Plan was focused on Laguna Lake itself, separate from the park master plans. Of the programs discussed in the Plan, maintenance of the Prefumo Arm sedimentation and control of aquatic weeds in the Lake were adopted by the City. The 1982 Plan also introduced the possibility of using recycled water to manage lake levels, of raising the lake outlet at Madonna Road, and implementing a dredging project. In response to the 1976-1978 drought, during which the lake dried completely, the City began using a set of flashboards, installed seasonally, to raise the lake level during the summer months to retain more water in the lake. The seasonal flashboards were used thereafter for some time, but ultimately fell into disrepair and were never replaced.

3.2.3. 1993 Laguna Lake Master Plan and Beyond

The 1993 *Laguna Lake Master Plan* explored improving the natural habitat of the lake. After several years of limited funding, the City set aside $200,000 over a two-year period to complete various studies to produce an environmental report on the lake. This resulted in a long-term dredging plan over ten years at the cost of approximately $2 million, with more money dedicated for disposal. Sediment removal from the Prefumo Arm has been reported from 1995 to 2012 and is described in more detail in Section 3.3.

3.3. Dredging History

Several dredging projects have been completed in Laguna Lake since the 1961 *Master Plan*. The Southeast Arm was originally dredged to extend the lake towards Madonna Road to abut more residential property and connect the Lake to San Luis Obispo Creek. The Prefumo Arm and portions of lower Prefumo Creek have been excavated periodically to remove sediment deposited from the Creek. Table 8 summarizes the sediment removal from the Prefumo Arm since 1995, as provided by the Conservation Plan.

Table 8 - Summary of Sediment Removal from the Prefumo Arm

Year	Sediment Removed (CY)
1995	9,200
1999	8,200
2002	5,200
2006	2,900
2012	1,800
Total	27,300
Mean Annual Sediment Removal (1991-2012)	1,300
Mean Annual Sediment Removal (2002-2012)	470

The rate of sediment removal has slowed since the 1990s, and as the 2012 bathymetric survey showed, the Lake bed has raised, up to four feet since 1977 due to sedimentation, at an average rate of one to three inches per year. According to the Conservation Plan's sedimentation rate estimates, the Lake it is reasonable to expect that a "land bridge" could form in the center lake in the next 20-30 years, and that the Lake could fill entirely by the year 2100, leaving a grassland meadow environment bisected by a creek corridor.

Over the past 25 years, the City has studied many dredging methods and alternatives. The following documents have reported on Lake dredging:

- Archeological Subsurface Testing at the Laguna Lake Project Heritage Discoveries (2007)
- Archeological Surface Survey for the Laguna Lake Project; Heritage Discoveries (2006)
- Ecological Resources and Potential Impacts of Dredging Operations at Laguna Lake; LFR Inc. (2003)
- Engineering Analysis of Dredging and Disposal Alternatives at Laguna Lake; LFR Inc. (2001)
- Characterization of Sediment and Water at Laguna Lake; LFR Inc. (2001)
- Rare Plants, Vegetation, and Flora of Laguna Lake Park; Keil (1996)
- Laguna Lake Park Master Plan; City of San Luis Obispo (1993)
- Geotechnical Report Laguna Lake Dredging Project; Earth Systems Consultants (1992)
- Wildlife of Laguna Lake Park Relationship to Proposed Dredging; Michael T. Hanson (1992)
- Laguna Lake Management Program; City of San Luis Obispo (1981)
- Final EIR – Laguna Lake Management Program; City of San Luis Obispo (1981)

The most comprehensive dredging report to date was presented by City staff to the City Council at the November 17, 2009 meeting. The report proposed to remove approximately 150,000 cubic yards across most areas of the Lake, including the Center Lake and Prefumo Arm. The dredging would operate roughly 22 weeks per year during the dry season, resulting in the removal of up to 20,000 cubic yards per year over ten years. The plan was ultimately not adopted, and Council suspended dredging analyses until more funding was available. Following the economic recession that began in 2008, the City's 2011-2013 Financial Plan resulted in the Conservation Plan, which was used to inform this Report.

Section 4. Environmental and Cultural Considerations

This section summarizes the results of environmental and cultural resource assessments conducted to inform the environmental and cultural project environmental review process and to identify applicable permit requirements relative to the jurisdiction of other regulatory agencies.

4.1. Jurisdictional Waters and Wetlands Delineation

Jurisdictions of regulatory agencies were delineated by Rincon Consultants, Inc. (Rincon). The Jurisdictional Waters and Wetlands Delineation report is provided in Appendix C. The jurisdictional delineation identified 61.49 acres of jurisdictional waters subject to Sections 404 and 401 of the Clean Water Act (CWA), including 4.72 acres of wetlands and 56.77 acres (7,331 linear feet) of other waters. Additionally, the jurisdictional delineation identified 65.89 acres (7,758 linear feet) of streambed and lake below top of bank or to edge of riparian subject to Section 1600 et seq. of the California Fish and Game Code and Porter-Cologne Water Quality Control Act.

Any proposed activity in areas identified as jurisdictional waters and/or wetlands may be subject to the permit requirements of the US Army Corps of Engineers under Section 404 of the CWA, Central Coast Waterboard under Section 401 of the CWA, and under the Porter-Cologne Water Quality Control Act (Porter-Cologne), and/or California Department of Fish and Wildlife (CDFW) pursuant to Section 1600 et seq. of the California Fish and Game Code. Final jurisdictional determinations of the boundaries of waters and riparian habitats are made by each agency, typically at the time that authorizations to impact such features are requested.

4.2. Biological Resources Assessment

A biological resources assessment was performed by Rincon to identify environmentally sensitive areas within the project area and evaluate potential impacts to special status and sensitive biological resources during dredging activities in Laguna Lake. The Biological Resources Assessment (Biological Assessment) is included in Appendix C. Recommendations based on the BRA are described in Section 9.1.

Numerous special status plant and wildlife species were identified in the Biological Assessment. Twenty species of special status wildlife may occur onsite based on the presence of suitable habitat, including ten birds, two mammals, two reptiles, three amphibians, one invertebrate, and one fish. Eighteen special status plant species may occur onsite based on the presence of suitable habitat; five of which were documented in the potential project area during the biological survey. Conservations measures to be implemented for several of these special status plant and wildlife species during dredging activities were recommended by Rincon and are listed in Section 9.1, Table 15. In general, the Biological Assessment suggests avoidance of or minimization of adverse impacts to these important biological resources of the San Luis Obispo community. Final estimates of the potential impacts of dredging activities at Laguna Lake would be quantified upon completion of the project design.

4.3. Cultural Resources Assessment

A cultural resource assessment was conducted by Rincon to identify potential cultural resources that could be impacted by the project. The results of the cultural resource assessment indicate that cultural resource and heritage sites are not likely to be impacted by the work associated with this project. The Cultural Resources Study is provided in Appendix C.

This page intentionally left blank.

Section 5. Geology and Soils

A geotechnical investigation and analysis was completed in the spring of 2016 by Leighton Group, Inc., to characterize lake bed deposits, identify any contaminants present in lake sediments, determine the slope stability of the existing lake shore banks, and provide dredging recommendations based on the findings of their investigation. A geotechnical report documenting the geotechnical investigation and analysis has been provided as Appendix D.

5.1. Field Exploration

The subsurface investigation included five surface soil samples and 11 vibracore samples. Sampling locations are included in Appendix D. Surficial soil sampling was conducted on March 21, 2016, within select areas on the west side of the lake, in a primary drainage outlet adjacent to the boat ramp, and upstream within Prefumo Creek on the east side of the lake. Subsurface sampling was performed on March 30 and 31, 2016, by vibracoring to a planned depth of up to 10 feet utilizing a floating barge platform. For each core, samples were taken at discrete intervals, three per core, in order to enable detailed sediment chemistry testing.

5.2. Lake Sediment Characterization

The results of the geotechnical investigation indicated that the lakebed materials are largely silty to fat clays (CH) interlayered with lean clay (CL) and inorganic silt (MH) throughout the lake and within the principal proposed dredging areas. There is limited sand present in thin surface layers within the delta formed at the mouth of Prefumo Creek. The clays generally transition from a soft oxidized clay to a stiff clay with little to no air voids with increasing depth:

- 0 to 3 feet: Relatively loose silt and clay interlayered with silty sand near the mouth of Prefumo Creek
- 3 to 7 feet: medium soft silts and clay with shell fragments.
- 7 to 14 feet (depths explored): stiff to very stiff clay

Lake sediments have submerged unit weights ranging from 45 to 62 pounds per cubic foot (pcf) with water content ranging between 60 to 80 percent. The sediments are primarily composed of fine grained, cohesive particles. The sediments are prone to hold water, are soft and prone to creep, and low in bearing capacity.

5.3. Lake Sediment Chemistry

Sediment samples collected were analyzed for metal and nitrate and phosphate content. In addition, modified elutriate tests (MET) were performed on sediment collected from Laguna Lake.

Sediment chemistry testing detected nickel, Chromium (Cr+6) and Chromium 3 (Cr+3) in the areas surrounding the Lake as well as concentrations in the Lake sediment. The detectable levels of chromium and nickel in the soil samples are naturally occurring and the result of outcrops of serpentine rock located in the surrounding watersheds that drain to the Lake. Detected levels of nickel and Chromium (Cr+6) are below the EPA dictated Numeric Action Levels (NALs). However, at some locations, samples exceed the US EPA Region 9 Regional Screening Level (RSL) for a residential setting. A detailed discussion of the sediment sample results is provided in Appendix D.

Soil chemistry is typical of the general region, with no contamination noted from man-made sources such as Total Petroleum Hydrocarbons (TPH), Volatile or Semi-Volatile Organic Compounds (VOC or SVOC, SVOC), or Pesticides.

5.4. Water Quality Testing

During vibracoring, conducted in late March 2016, water samples were collected to test for elutriate water quality and toxicity. In April 2016, Leighton Group, Inc. completed water quality testing at various locations along the perimeter of the Lake, particularly at inlet/inflow points. A report of the water quality analysis is presented in Appendix E, Dredge Sediment and Geotechnical Characterization Report. Previous studies have indicated that water quality varies by season. The results of Elutriate Water Quality and Toxicity indicate the elutriate water is not toxic to aquatic life. Additional testing will be conducted at the end of summer during low water condition and when vegetation has died off to measure Dissolved Oxygen, Temperature, pH, Turbidity, Nitrates, and Phosphates.

Section 6. Dredging Technologies

This section summarizes the overall dredging process and available dredging methods considered for the Lake project. Dredging information was provided by various publically available resources.

6.1. Dredging Process

There are three main types of dredging associated with small inland water bodies: mechanical, hydraulic and hydropneumatic/hydrodynamic. Cyclonic dredging is a new technology that is also being considered, most closely related to hydraulic dredging. The hydropneumatic/hydrodynamic process involves disturbing sediment material to be carried by natural flow downstream and was not considered to be applicable to this project as Laguna Lake does not have the flow velocity to effectively transport sediment material and the process could create environmental and flood capacity issues downstream. The selection of mechanical, hydraulic, or cyclonic dredging process is dictated by the properties of the dredging material, operation costs associated with each dredging process and the location of the disposal area. For the purposes of this project, mechanical, hydraulic, and cyclonic dredging processes were evaluated for use. Table 9 provides a summary of different aspects of the evaluated dredging techniques.

Table 9 - Performance of Dredging Processes

Dredging Feature	Dredging Type		
	Mechanical	**Hydraulic**	**Cyclonic**
Environmental Impact (**See Note 1**)	Medium - Low Turbidity	Medium Turbidity Impact - Some Water level Impact	No Turbidity Impact Slight Water Level Impact
Works Offshore	With Barge or constructed land bridge	Yes	Yes
Excavation Rate (CY/HR) (**See Note 2**)	70-100	200-400	900 – 1000
Percent Solids%	In Situ	10%-20%	Up to 80%
Daily Maintenance (Hrs/Day)	1	2	<1
Limited Minimum Operational Depth?	None	3 feet	< 3 ft
Accuracy	Rough grading	Precise	Precise
Soil Transport Via Pipeline	None	Yes	Yes
Pipeline Transport Range	N/A	3,000 ft	> 5,000 ft
Color Key	**Poor**	**Fair**	**Good**

Note 1 - Supplemental technologies, such as silt screens, are available to manage turbidity issues associated with hydraulic dredging.

Note 2 - All technologies are expected to be limited by dewatering processes which typically achieve about 50 CY/HR.

6.1.1. Mechanical Dredging

Mechanical dredging involves the physical excavation of sediment material using conventional earth moving equipment, such as a backhoe, or specialized excavation equipment, such as a clam shell excavator or draglines. The advantages of mechanical dredging are that water is not required for dredging operations, little water is used in the dredging process and excavated soil material maintains its in-situ density. Disadvantages associated with mechanical dredging are that the excavation is not as precise as other methods and the reach distance of mechanical equipment can limit excavation extents or require additional logistics.

6.1.2. Hydraulic Dredging

Hydraulic dredging is performed by using suction to pump sediments to the shore in a slurry state. Water to solid ratios of the slurries vary with the type of equipment used and typically range from 10:1 to 3:1. The advantages of hydraulic dredging are dredging precision, flexibility of reach, and access to sediments. The chief disadvantages of hydraulic dredging are the required water use associated with making the slurry, down times to repair and maintain piping, and the drying time required for slurry dredged sediment. With cutting head attachments hydraulic dredging can also increase the turbidity of the water body being dredged. Turbidity issues associated with hydraulic dredging can be mitigated through the use of a turbidity curtain.

6.1.3. Cyclonic Dredging

Cyclonic dredging is an emerging hydraulic dredging technology that generates a vortex to transport sediments. The vortex reduces friction between transported sediments and the transmission pipe resulting in higher excavation rates, increased percent solids in slurry dredge sediment, less pipe break downs, and a longer pipe transport range. A conventional 8-inch hydraulic dredge can typically convey 200 to 400 CY per hour at 20% solids over a length of 3,000 feet without the support of a booster pump. A cyclonic dredge can transport up to 1,000 CY per hour at up to 80% solids and convey the material over 5,000 feet without the support of a booster pump. Dewatering processes would limit typical excavation rates of both conventional and cyclonic dredging operations. However, the increased percent solids of slurry material achieved by cyclonic dredging would accelerate the dewatering process which could translate to less onsite space used for dewatering and an increased dredging rate. Even with cutting head attachments cyclonic dredging does not increase the turbidity of the water body being dredged.

6.2. Dredging Equipment

Equipment needed for dredging operations varies with the selected dredging process.

6.2.1. Mechanical Dredging Equipment

In addition to the primary excavation equipment (back hoes, clamshell, or drag line), mechanical dredging typically requires support equipment to extend the access of the excavation equipment and haul dredging sediment. For wet lake equipment, this could include barges. Dump trucks would be the supporting haul equipment for dry lake conditions or if temporary access islands were created for wet lake conditions.

6.2.2. Hydraulic Dredging Equipment

Hydraulic dredging equipment typically includes a barge or boat-mounted suction head, hosing, and pump for the excavation process. Additional equipment is then used to de-water slurry dredge sediment.

Equipment Recommendations

These recommendations are based on commonly found equipment, the anticipation and/or specification of which will not create undue added costs to construction.

General hydraulic dredging equipment recommendations are as follows:

1. Dredge Barge: Shallow draft small barge for fresh-water lakes. Approximately four feet of draft for performing dredging operations
2. Barge mounted dredge pump: 8-inch, 2,000-GPM (600 CY/hour) dredge pump with cutter head for agitating consolidated clay and fat clay sediment, capable of moving 25% solids or better.
3. Hoses and Booster Pump: Contractor shall have available up to 3,000 feet of dredge hose/flexible joint piping due to the distance and elevation to which sediment can be pumped.
4. Basin Dewatering & Sediment Removal: Only practical when sufficient area is available to create a sequence of at least three settlement basins capable of holding one and half times the volume of sediment to be dredged. Basin retention time required to meet turbidity requirements identified in the permitting process is also another factor that will affect production schedule.
5. Mechanical Dewatering: When used to meet production or water quality needs, the Contractor shall have mechanical dewatering equipment capable of keeping up with the production of an 8-inch 2,000-GPM pump. Equipment typically used for this purpose is similar to sludge drying equipment used at wastewater treatment facilities.
6. Water Quality Testing: Once permitted, water quality requirements will be known, and an appropriate testing program during dredging can be established. This may be essential to the successful completion of the project.
7. Turbidity Removal: As discussed in Section 6.3.2, the Contractor may be required to remove turbidity from return water to the reservoir to acceptable turbidity levels per the Regional Water Quality Board as measured by a turbidity meter (measures how much light is scattered at 90 degrees when directed at a water sample). The units are reported in nephelometric turbidity units (NTUs).
8. Turbidity Curtain: Creates a barrier around dredging area to prevent turbid water from entering clean water.

6.2.3. Cyclonic Dredging Equipment

The equipment for cyclonic dredging is the same as for hydraulic dredging except that the barge mounted dredge pump will be replaced by a cyclonic engine system and suction head. The turbidity curtain will also not be required. Note this is a newer technology and the equipment is proprietary, but the competitive bidding process would likely assure competitive costs.

6.3. Dewatering

Dewatering is the process of extracting water from the dredged material. This allows the dredged material to be separated for reuse or disposal and the water to be returned to the lake. Regardless of the dredging method, dewatering will be required to meet turbidity requirements for return water. Saturated soil will not stockpile or compact, and the moisture level must be reduced to levels allowing grading, stable compaction, or hauling. The dewatering process will typically govern the dredging rate.

6.3.1. Dewatering Methods

Dredging sediment can be mechanically dewatered, dewatered using dewatering basins, or dewatered by a combination of the two methods.

Dewatering basins require adequate onsite space; in the case of the Laguna Lake project 6-8 acres would be necessary. A typical dewatering basin system has a sequence of at least three basins. Dredge slurry is pumped into the dewatering basin at the top of the sequence until that dewatering basin is full. The material is then allowed time to settle. Optionally, additives may be used to decrease the settling time.

Clarified water is then pumped or syphoned off the top of the dewatering basin and sent to the second and third basins in the series for additional clarification. The basin retention time required to meet turbidity requirements identified in the permitting process is also another factor that will affect production schedule.

Wet soils left at the bottom of the upper dewatering basin are then mechanically excavated and placed in eight-inch lifts to dry in an area enclosed by a berm. The soils are then regularly worked to ensure consistent drying. In the dry summer season it is expected to take three to four days to dry an eight-inch lift produced by 400 cubic yards of dredge sediment to a moisture content of 30%. The site can be configured to have multiple drying areas in different stages of drying to allow material to be hauled and placed as it achieves a necessary dryness. Locating adequate space for settlement basins will likely be challenging on City owned property on the north side of the Lake within the park due to other ongoing uses.

Mechanical dewatering allows for faster return of water used in dredging operations but is generally more expensive. However, mechanical dewatering can be accomplished with less onsite space; in this case three to four acres. Mechanical dewatering methods can include belt presses, centrifugal sludge handlers, screw presses, or heat, among others. Commercial sludge dryers of various types are commonly used due to their ability to incorporate return water treatment processes. Due to space considerations in the park and the goal of minimizing disruptions in the park, mechanical dewatering is recommended

The proposed dewatering area is delineated in Figure 18, Section 7.3.4. More details on the dewatering design are provided with the three hydraulic dredging alternatives presented in Section 7.3.

6.3.2. Return Water

The Contractor may be required to remove turbidity from return water to the reservoir to acceptable turbidity levels per the Regional Water Quality Board. It is hoped that because Laguna Lake naturally experiences high fluctuations in turbidity, the Regional Water Quality Control Board will impose a minimal turbidity requirement.

Water Quality Testing: Once permitted, water quality requirements will be known, and an appropriate testing program during dredging can be established. This may be essential to the successful completion of the project. There are a number of techniques that can be applied to facilitate more efficient achievement of water quality standards, which may include blending with clean water (dilution) or flocculation enhancers.

6.4. Dredged Material Hauling and Placement

After the dredged material has been dewatered, it must be loaded into trailers and hauled to an off-site location identified in Section 8. At the deposition site, the material will be unloaded and stockpiled in a manner and location established by the receiving site and the Contractor. Grading and other treatment of the material will be determined after further coordination.

Section 7. Dredging Options

This section proposes three alternative Lake dredging options which are based on three priority areas identified by the City and the consultant team. Dredging options were evaluated for both hydraulic and mechanical dredging approaches. As described in Section 6, hydraulic dredging refers to the dredging method to be used with the presence of water in Laguna Lake. Sufficient water levels in the lake are required for successful hydraulic dredging. Water elevations need to support the dredging barge, and sufficient water to mix with and move sediments is required. This study assumes sufficient water for hydraulic dredging if that option is selected. Mechanical dredging refers to the method to be used as an alternative to hydraulic dredging in the case that insufficient or no water is present in the Lake, but this option does not consider any operations needed to maintain a dry lakebed (pumps and continuous on-site dewatering of the Lake). Due to site soil characteristics, mechanical dredging would be very challenging to achieve to the depths and volumes outlined under any of the alternatives contemplated in this Report.

Each alternative is subject to the following design criteria:

- Dredging activity shall not occur within 30 feet of the bank, per Section 5, nor where existing bathymetry data does not provide an acceptable bank profile. Bank profiles were not considered acceptable where multiple bathymetric survey points were not present to define the slope of the bank.
- Assume dredge cuts will slump to a 4:1 slope, per Section 5.
- Dredging activity shall not exceed a water depth of 10.0 feet, per Section 4. At normal high water conditions, this corresponds to a minimum lakebed elevation of 110.5 feet.
- Alternatives shall avoid sensitive habitat and resources and incorporate mitigation measures for environmentally sensitive areas.
- Limited dredging production rate due to sediment quality and limited dewatering areas. A production rate of 50 CY/hour (400 CY/day) is assumed for hydraulic dredging.

A plan view of the existing Lake and cross sections showing proposed Dredging Alternatives 1, 2, and 3 is provided in Appendix E.

7.1. Project Limitations

During the course of site reconnaissance and sampling, as outlined in Section 5, Geology and Soils, soil samples detected heavy metals in the areas surrounding the Lake as well as in the lake sediment. Local awareness of the naturally occurring metals surrounding the Lake have been discussed in the past, although the specific knowledge of the presence of Chromium (Cr+6) and its potential to create a public health issue is new.

The detectable levels of chromium and nickel in the Laguna Lake sediment and surrounding soils originates from local geologic outcroppings classified as serpentines. Historic sampling data indicates that the local serpentine rock formations contain levels that are below the EPA dictated Numeric Action Levels (NALs), but with some exceeding the US EPA Region 9 Regional Screening Level (RSL).

Due to the chemical compounds and reactions through oxidations processes, it was determined through discussions with regulatory agencies and review of academic literature by the project team's geotechnical specialists to forego on-site deposition of the sediment material. These limitations alter the course of the original intended project in terms of viable production, processing and hauling criteria. As such, low production rates for the dredging was assumed due to the limiting disposal factor.

7.2. Dredging Priority Areas

The three dredging alternatives correlate to three Priority Areas identified for this preliminary study and are ranked in order of importance. These areas are outlined in Figure 8. Priority Area 1 encompasses the alluvial fan at the mouth of the Prefumo Inlet and across Center Lake to the middle of the peninsula, an area of approximately 16 acres. This area encounters the highest rate of sedimentation and has been identified as the most important area in the lake to dredge.

Priority Area 1 transitions into Priority Area 2 to the east of the alluvial fan and Center Lake. Priority Area 2 encounters a lower rate of sedimentation than the alluvial fan, as much of the sediment deposits in Priority Area 1. Priority Area 2 spans 15 acres, including the area abutting the peninsula and boat launch to the north and private properties along Oceanaire Drive to the south.

Priority Area 2 then transitions into Priority Area 3 at the start of the Southeast Arm. This area also encounters a low sedimentation rate, and it encompasses the deepest parts of the lake. Priority Area 3 abuts the Laguna Lake Park shoreline to the northeast the residences along Oceanaire Drive to the southwest, and runs into the lake outlet culvert at Madonna Road. The area covers 12 acres of the lake, including a moderate mound in the middle of the Southeast Arm. Priority Area 3 has been identified as the lowest priority area in the lake to dredge, but dredging in this area still has overall value for Laguna Lake.

The area encompassing the northwest inlet, peninsula inlet, and transition into Center Lake was not considered for the proposed dredging project. The northwest inlet and peninsula inlet areas have high environmental and biological significance and should not be disturbed. The area between the northwest and peninsula inlets and Center Lake experiences a low rate of sedimentation because of the ability of the marsh wetlands to capture the sediment.

7.3. Dredging Alternatives

The dredging alternatives are bracketed by a minimum dredging option targeting Priority Area 1 and a maximum dredging option which targets all three Priority Areas. A moderate dredging option range is also proposed and targets Priority Areas 1 and 2. Thus, the number of priority areas dredged are the primary differentiating element for the dredging alternatives.

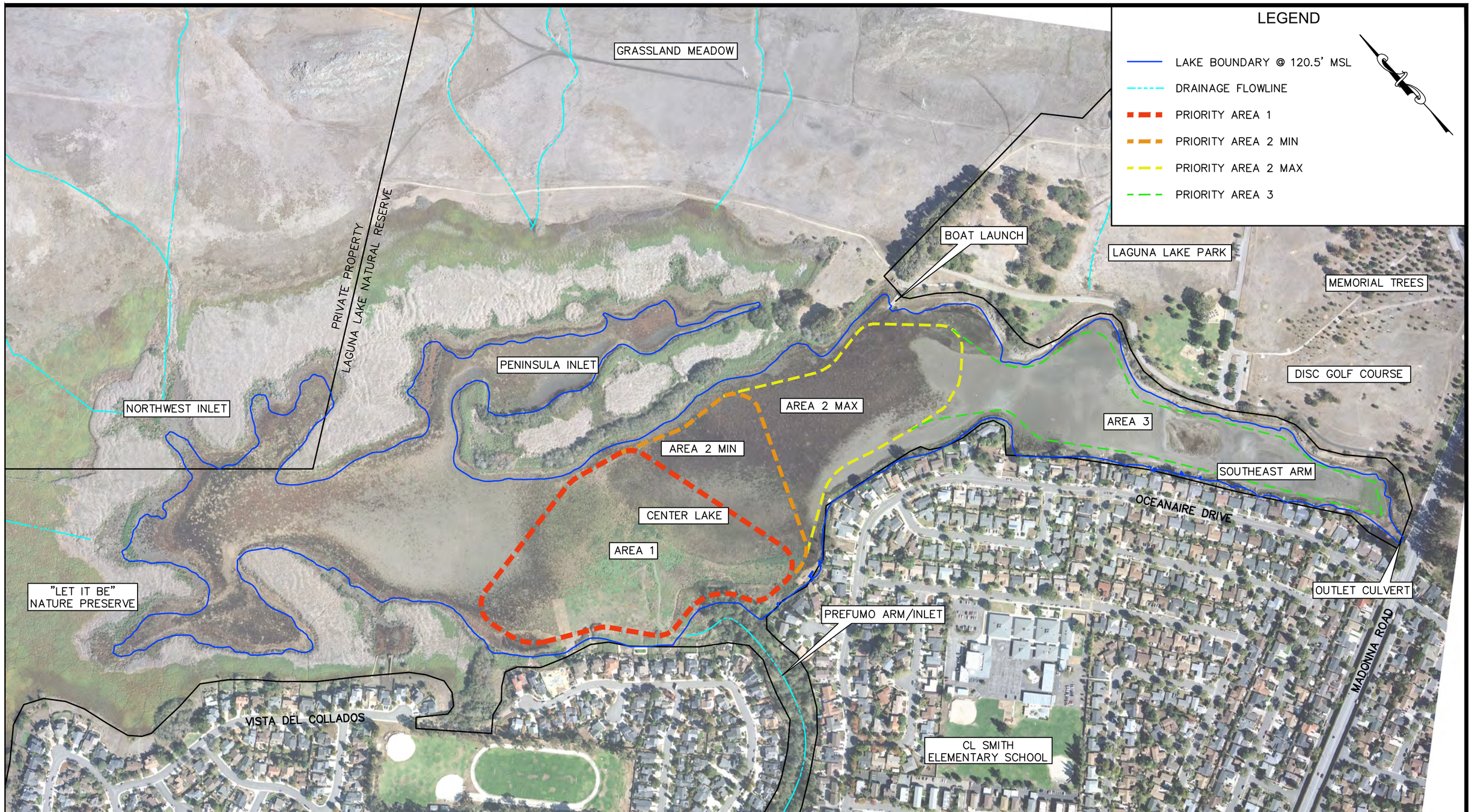
Each of the three alternatives are accompanied by two figures: one figure showing the extent and depth of the dredging activity and one figure showing the resultant lake depth after completion of the dredging activity. The figures showing the resultant lake depth for each alternative can be viewed in comparison with the existing lake depth, shown in Figure 9, to visualize the effects of the dredging activity on a lake-wide scale.

7.3.1. Alternative 1 – Minimum Dredging

Alternative 1 addresses Priority Area 1, the area identified as having the highest sedimentation rate in Laguna Lake. Dredging in this area has the greatest impact on the lake's ability to capture sediment passing through Prefumo Creek and Prefumo Arm. Alternative 1 proposes a final lakebed elevation of 114.0 feet asl in Priority Area 1. This elevation was selected to address the alluvial fan in Priority Area 1 but also to connect the northwest end of the lake to Center Lake with a smooth transition. The highest elevation within the proposed dredging area is 119.2 feet asl; at this location, the dredging depth would be 5.2 feet. In total, approximately 36,500 cubic yards (CY) of sediment would be dredged from the lake, dewatered, and deposited at an off-site location as identified in Section 8. The lake capacity would increase 22.6 AF to 451.1 AF at normal high water. The proposed dredging depths are shown in Figure 10 and the proposed final lake depths are shown in Figure 11. The total project would cost roughly $5.26 million with dewatering using onsite sedimentation ponds (Alternative 1A) or $6.34 million with mechanical dewatering (Alternative 1B). Table 10 provides a summary of Alternative 1.

Table 10 - Alternative 1 Summary

Characteristic	Value
Target Priority Area(s)	1
Dredged Volume	36,500 CY
Dredged Area	15.95 acres
Max. Existing Elevation	119.2
Finished Elevation	114.0
Max. Dredging Depth	5.2 feet
Lake Capacity Increase	22.6 AF



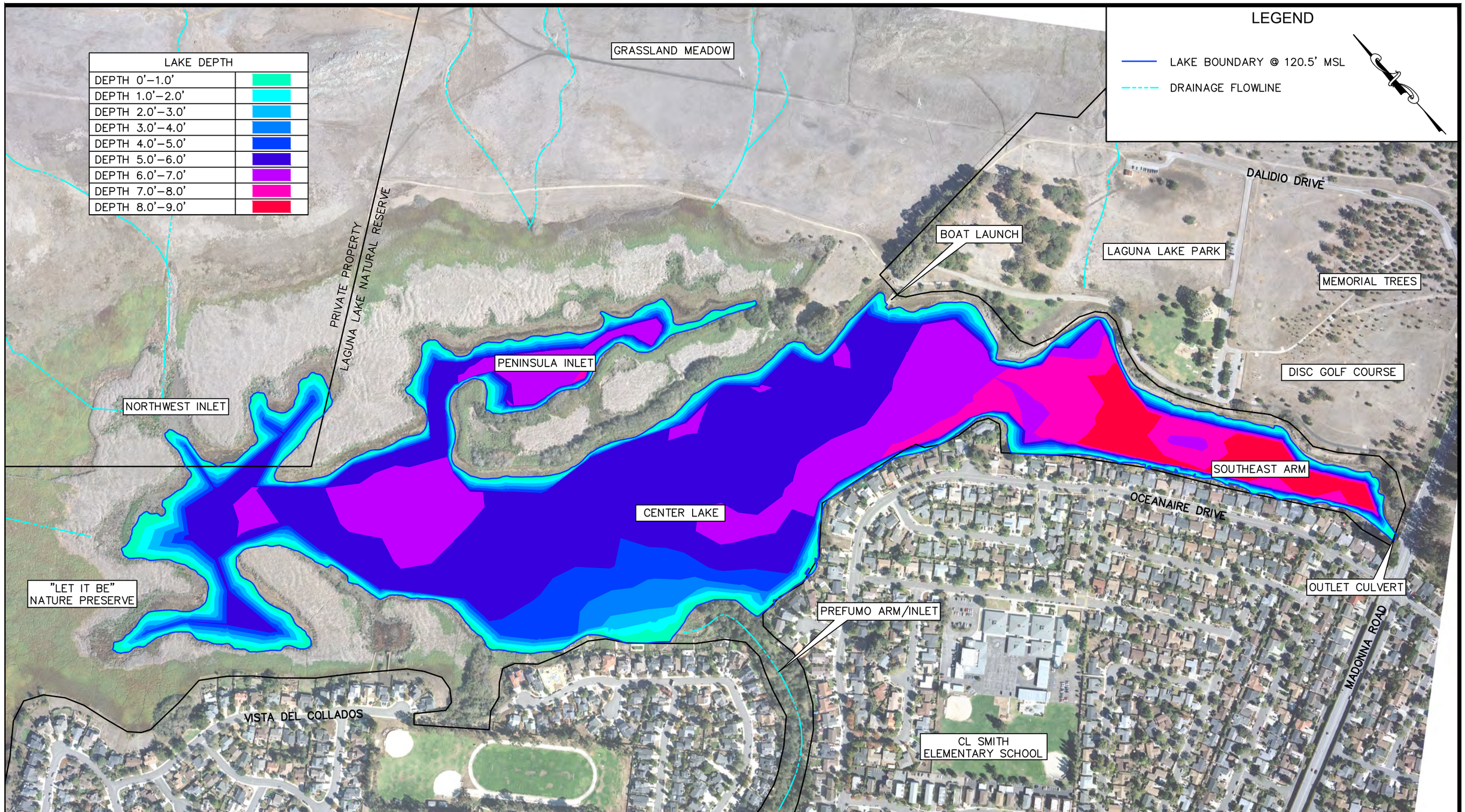
MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 8: DREDGING PRIORITY AREAS

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'



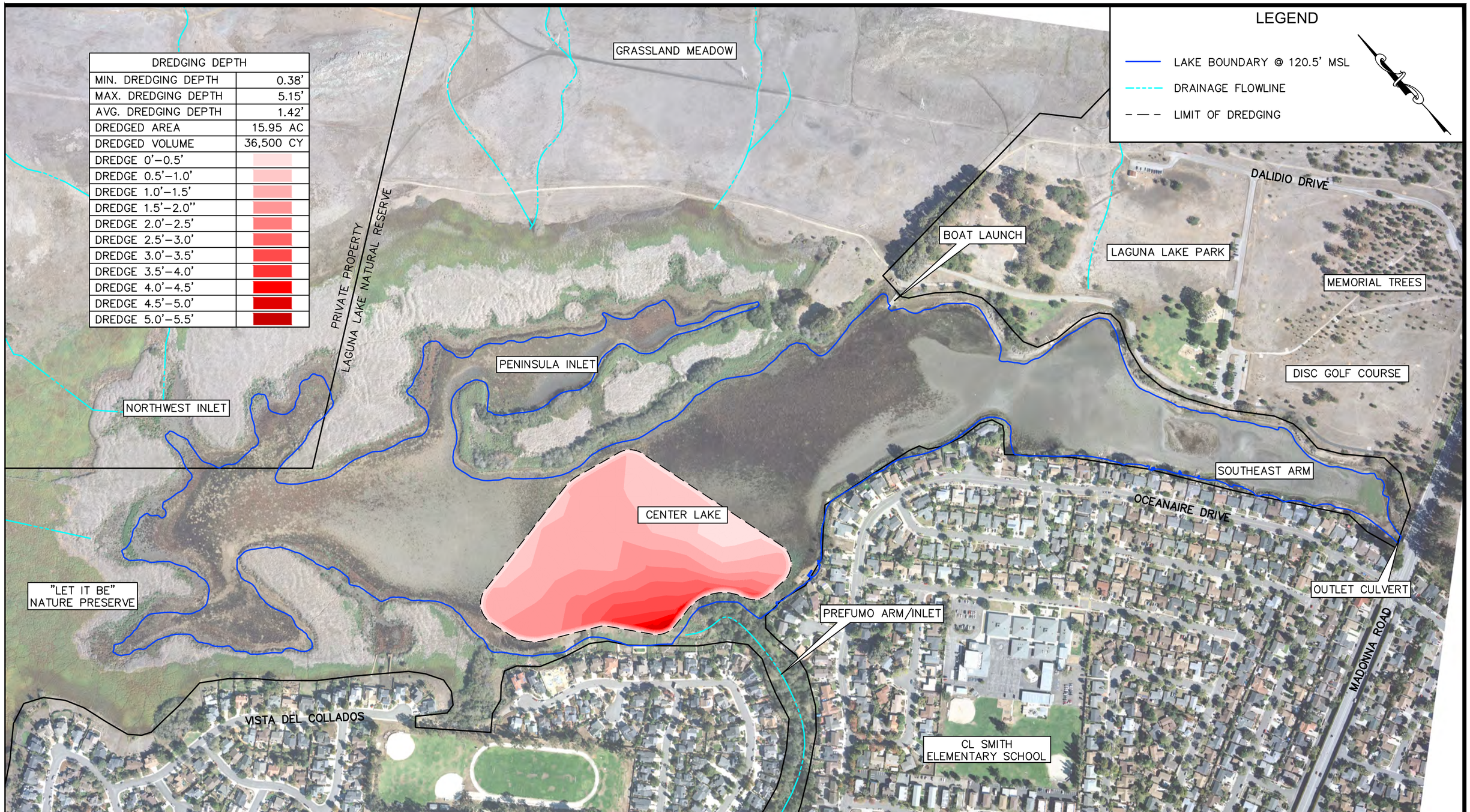
MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 9: LAGUNA LAKE EXISTING DEPTH

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'



DREDGING DEPTH	
MIN. DREDGING DEPTH	0.38'
MAX. DREDGING DEPTH	5.15'
AVG. DREDGING DEPTH	1.42'
DREDGED AREA	15.95 AC
DREDGED VOLUME	36,500 CY
DREDGE 0'–0.5'	
DREDGE 0.5'–1.0'	
DREDGE 1.0'–1.5'	
DREDGE 1.5'–2.0"	
DREDGE 2.0'–2.5'	
DREDGE 2.5'–3.0'	
DREDGE 3.0'–3.5'	
DREDGE 3.5'–4.0'	
DREDGE 4.0'–4.5'	
DREDGE 4.5'–5.0'	
DREDGE 5.0'–5.5'	

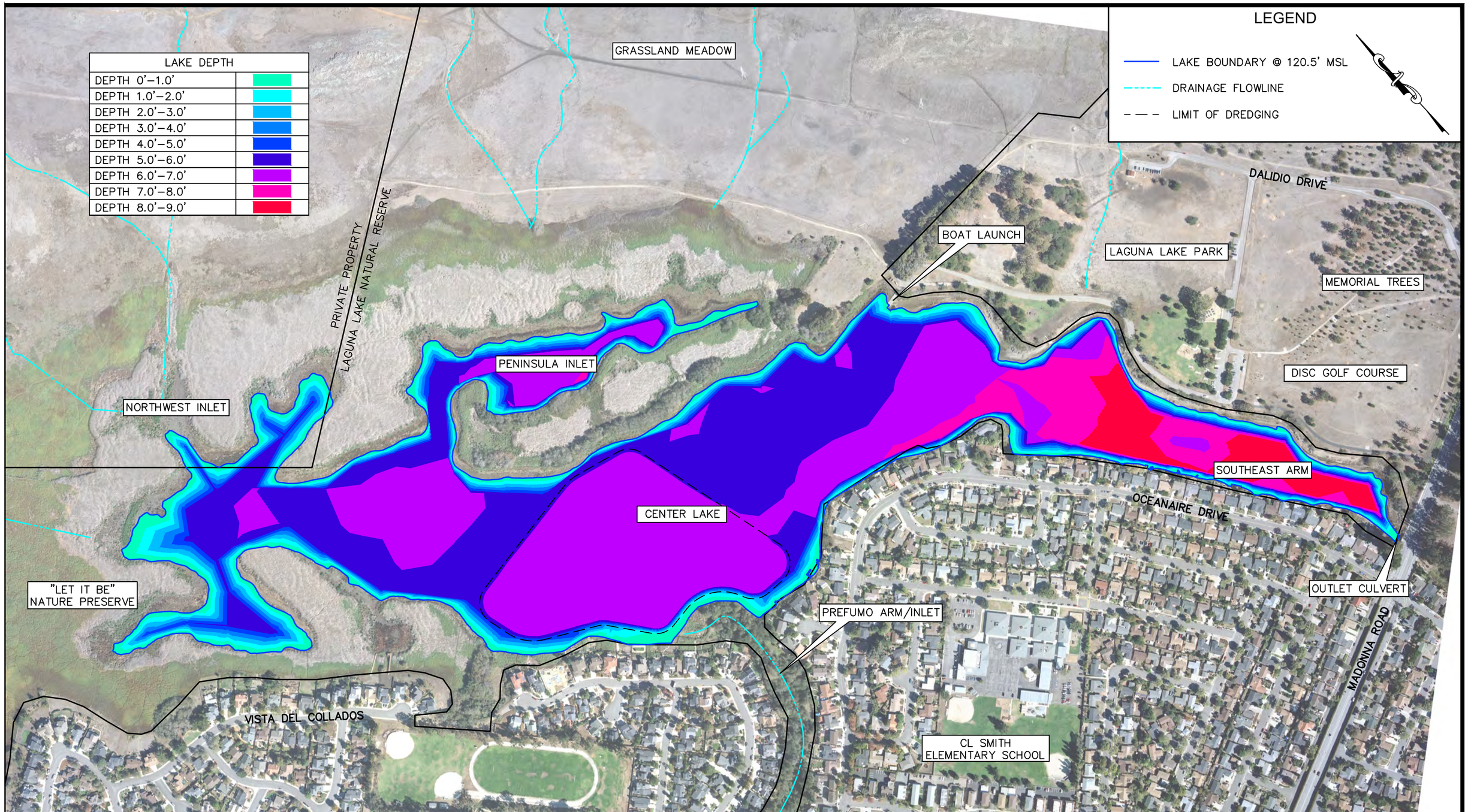
MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 10: ALTERNATIVE 1 DREDGING DEPTH

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'



MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 11: ALTERNATIVE 1 LAKE DEPTH

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'

7.3.2. Alternative 2 – Moderate Dredging

Alternative 2 is proposed as a range in which 50,000 CY to 85,000 CY of sediment is dredged from Priority Areas 1 and 2. A range was proposed for Alternative 2 in order to provide the opportunity to select a point within the range that best satisfies the goals of this dredging project with the proposed financing strategy.

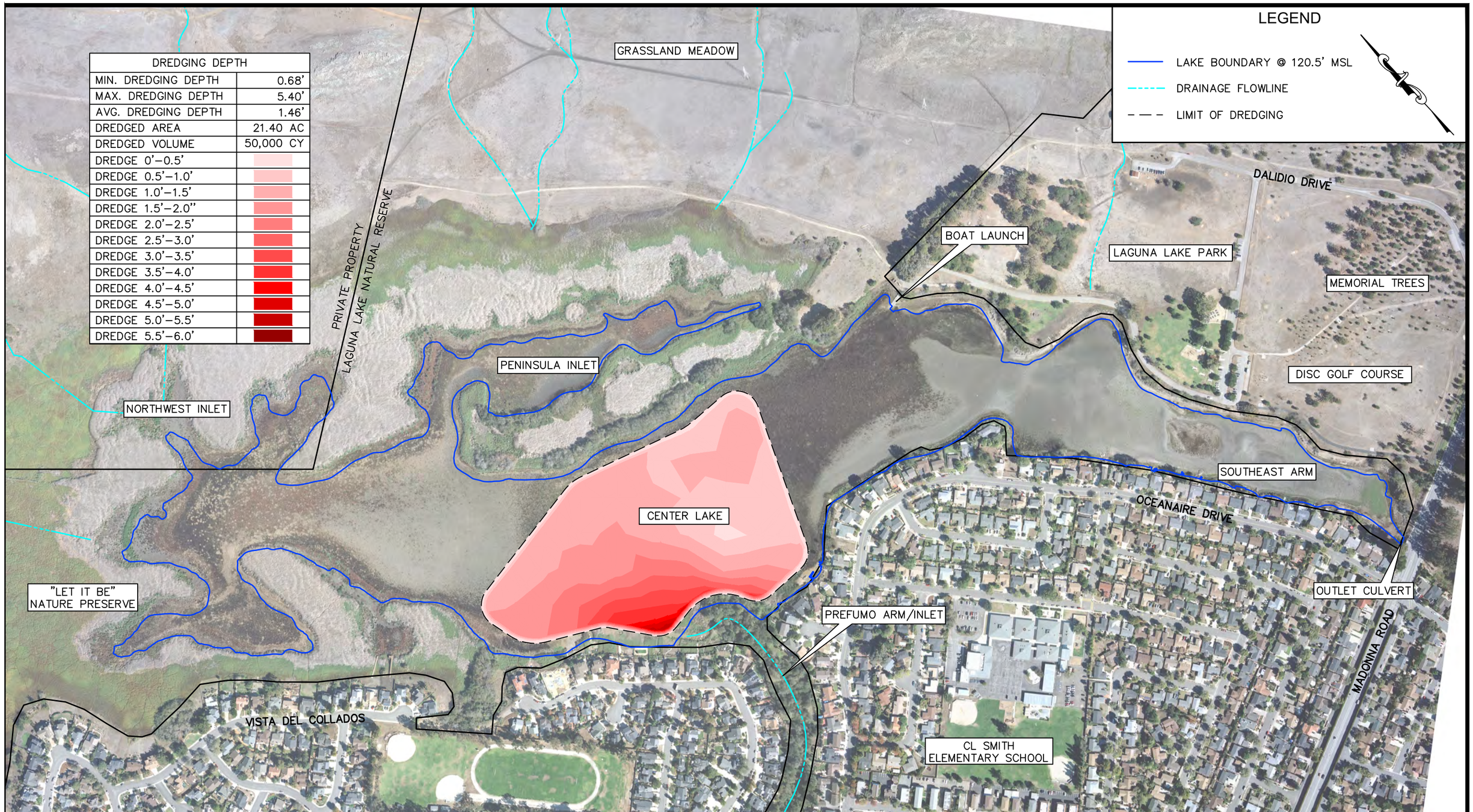
Alternative 2's range begins at minimum of 50,000 CY of dredged sediment. The proposed dredging area encompasses Priority Area 1 and a portion of Priority Area 2. The final lakebed elevation is proposed at 113.75 feet asl. Relative to the existing lakebed elevation, the dredging depth would be 5.4 feet. Alternative 2-Min would increase the lake capacity by 31.0 AF to 459.5 AF at normal high water. The sediment would be dewatered by the methods described in Section 6, then deposited offsite at the location identified in Section 8. Alternative 2-Low would cost approximately $6.95 million with dewatering basins (Alternative 2A-Low) and $8.68 million using mechanical dewatering practices (Alternative 2B-Min). Figure 12 shows the proposed dredging depths of Alternative 2-Low and Figure 13 shows the proposed lake depths. Table 11 provides a summary of Alternative 2-Low.

The maximum volume of 85,000 CY, proposed as Alternative 2-Max, originally corresponded to the maximum estimated volume that can be deposited onsite, though onsite deposition is no longer considered. This alternative proposed to dredge Priority Areas 1 and 2 to a lakebed elevation of 113.25 feet asl. The maximum dredging depth would be 5.9 feet. Alternative 2-Max would increase the lake capacity by 52.7 AF to 481.2 AF at normal high water. The sediment would be dewatered by the methods described in Section 6 and deposited at the off-site location identified in Section 8. The project would cost approximately $11.32 million with the sedimentation pond method for dewatering (Alternative 2A-Max) and $14.55 million using mechanical dewatering (Alternative 2B-Max). Figure 14 shows the proposed dredging depths, and Figure 15 shows the proposed lake depths. Table 11 provides a summary of Alternative 2-High.

Table 11 - Alternative 2 Summary

Characteristic	Value	
	Alternative 2-Max	**Alternative 2-Min**
Target Priority Area(s)	1 & 2	1 & 2
Dredged Volume	85,000 CY	50,000 CY
Dredged Area	31.00 acres	21.40 acres
Max. Existing Elevation	119.2 ft asl	119.2 ft asl
Finished Elevation	113.25 ft asl	113.75 ft asl
Max. Dredging Depth	5.9 feet	5.4 feet
Lake Capacity Increase	52.7 AF	31.0 AF

By addressing Priority Areas 1 and 2, Alternative 2 provides a greater ability to capture sediment than Alternative 1. Alternative 2 also increases the lake depth over a larger area, which provides both environmental and recreational benefits. Expanding the dredging area towards the boat launch area provides access to deeper water for kayakers, canoers, and other recreational boaters. A wider, deeper lake bed also provides aquatic wildlife with a larger habitat and overall healthier ecosystem.



DREDGING DEPTH	
MIN. DREDGING DEPTH	0.68'
MAX. DREDGING DEPTH	5.40'
AVG. DREDGING DEPTH	1.46'
DREDGED AREA	21.40 AC
DREDGED VOLUME	50,000 CY
DREDGE 0'–0.5'	
DREDGE 0.5'–1.0'	
DREDGE 1.0'–1.5'	
DREDGE 1.5'–2.0"	
DREDGE 2.0'–2.5'	
DREDGE 2.5'–3.0'	
DREDGE 3.0'–3.5'	
DREDGE 3.5'–4.0'	
DREDGE 4.0'–4.5'	
DREDGE 4.5'–5.0'	
DREDGE 5.0'–5.5'	
DREDGE 5.5'–6.0'	

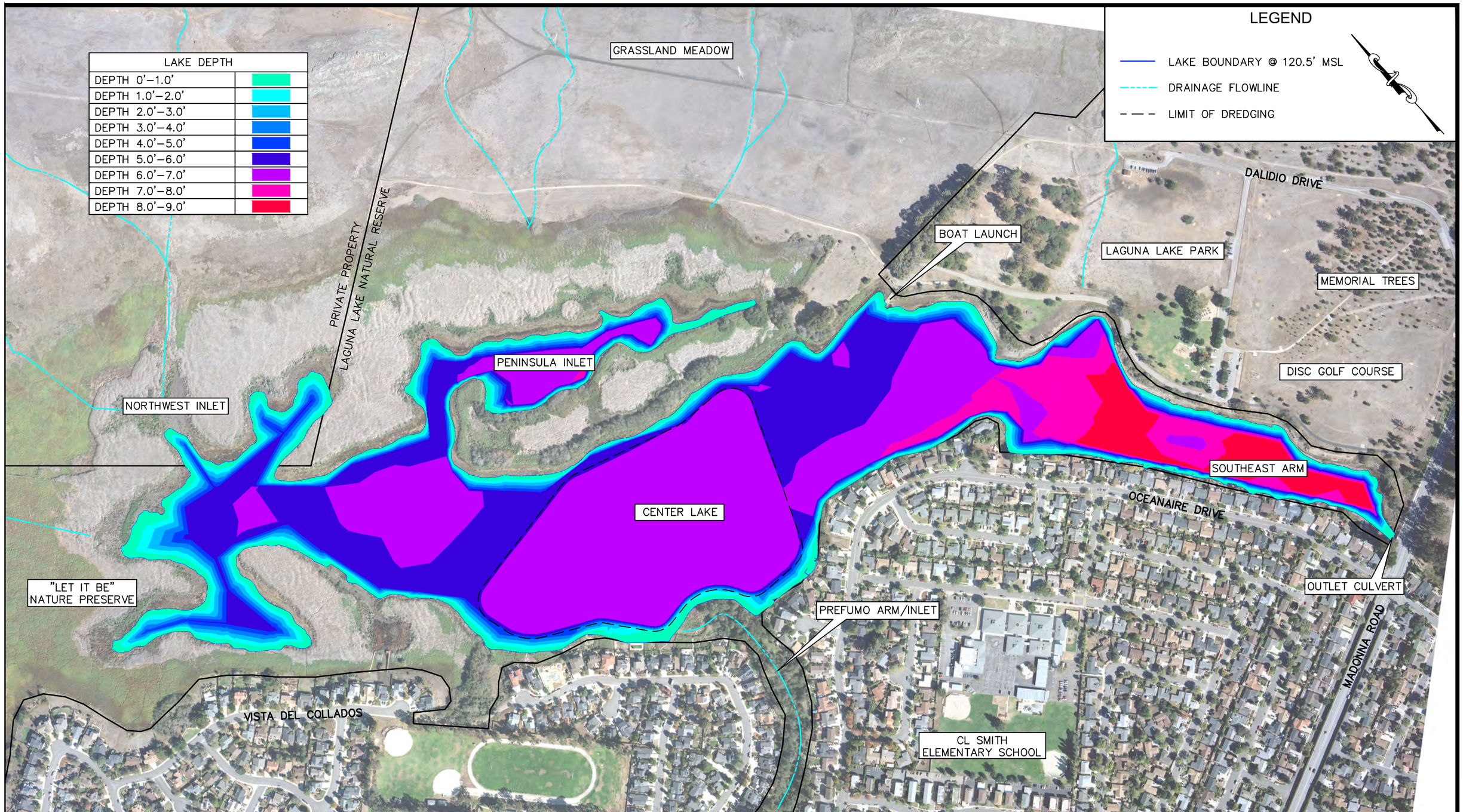
MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 12: ALTERNATIVE 2-MIN DREDGING DEPTH

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'



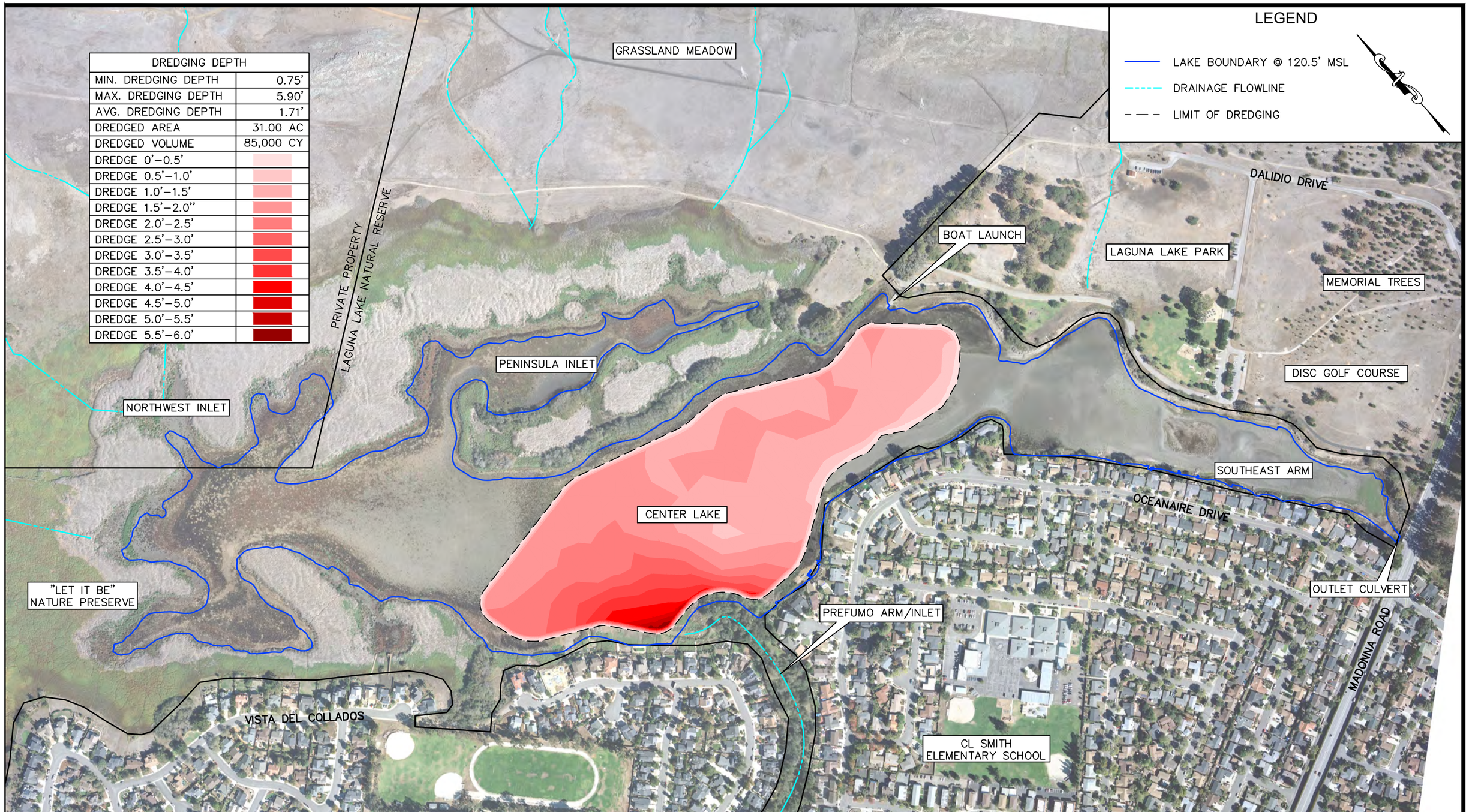
MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 13: ALTERNATIVE 2-MIN LAKE DEPTH

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'



DREDGING DEPTH	
MIN. DREDGING DEPTH	0.75'
MAX. DREDGING DEPTH	5.90'
AVG. DREDGING DEPTH	1.71'
DREDGED AREA	31.00 AC
DREDGED VOLUME	85,000 CY
DREDGE 0'–0.5'	
DREDGE 0.5'–1.0'	
DREDGE 1.0'–1.5'	
DREDGE 1.5'–2.0"	
DREDGE 2.0'–2.5'	
DREDGE 2.5'–3.0'	
DREDGE 3.0'–3.5'	
DREDGE 3.5'–4.0'	
DREDGE 4.0'–4.5'	
DREDGE 4.5'–5.0'	
DREDGE 5.0'–5.5'	
DREDGE 5.5'–6.0'	

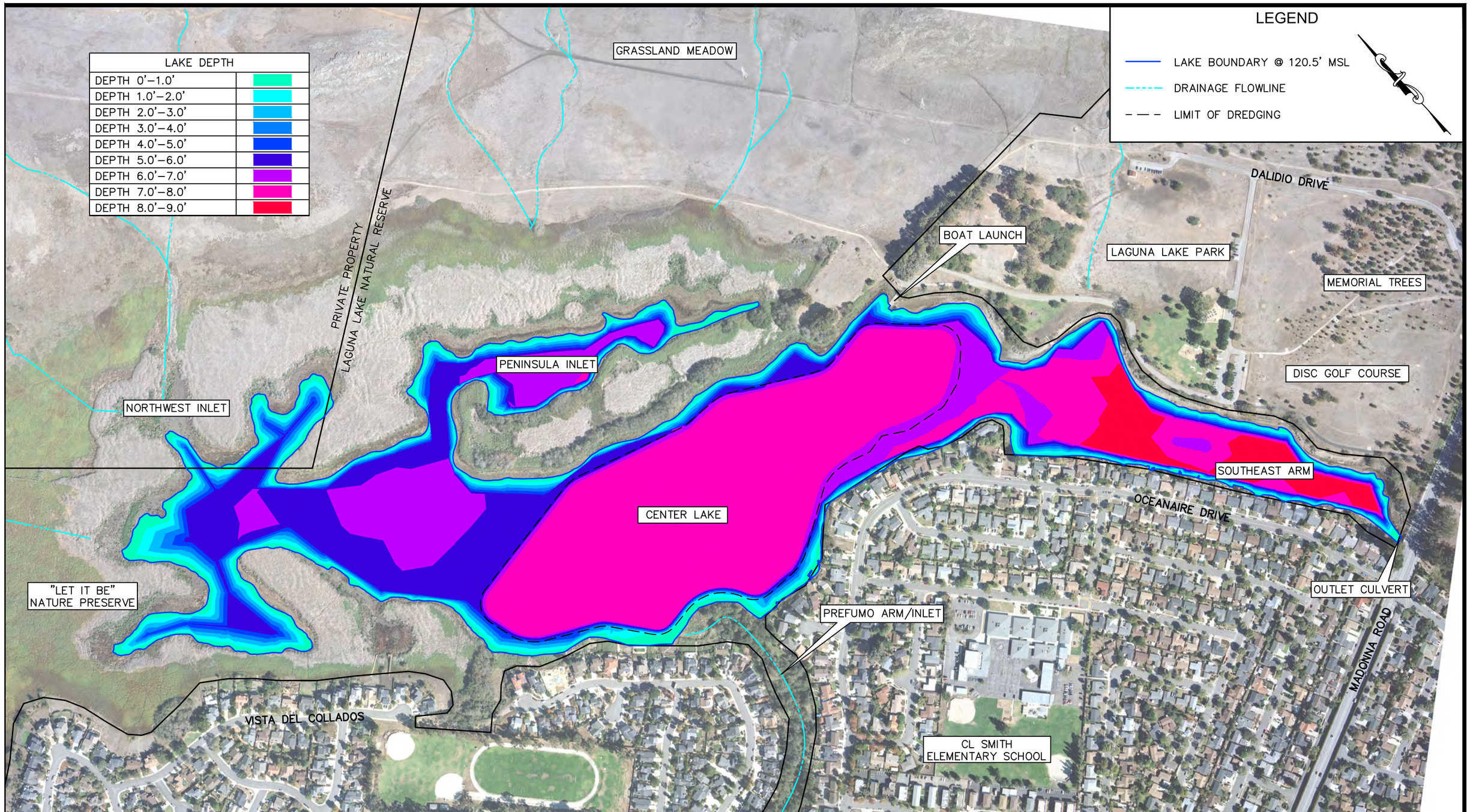
MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 14: ALTERNATIVE 2-MAX DREDGING DEPTH

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'



MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 15: ALTERNATIVE 2-MAX LAKE DEPTH

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'

7.3.3. Alternative 3 – Maximum Dredging

Alternative 3 represents the alternative in which all three priority areas are dredged. Alternative 3 targets a final lakebed elevation of 111.5 feet asl, which matches the lowest point in the lake identified in the most recent bathymetric survey. In Alternative 3, approximately 167,000 CY of sediment would be dredged from the lake, increasing the lake capacity 103.5 AF to 532.0 AF at normal high water. The dredged sediment would also be dewatered and deposited offsite. Alternative 3 would cost roughly $21.6 million with the sedimentation pond method for dewatering (Alternative 3A) and $27.3 million using mechanical dewatering (Alternative 3B). Figure 16 shows the proposed dredging depths, and Figure 17 shows the proposed lake depths. Table 12 provides a summary of Alternative 3.

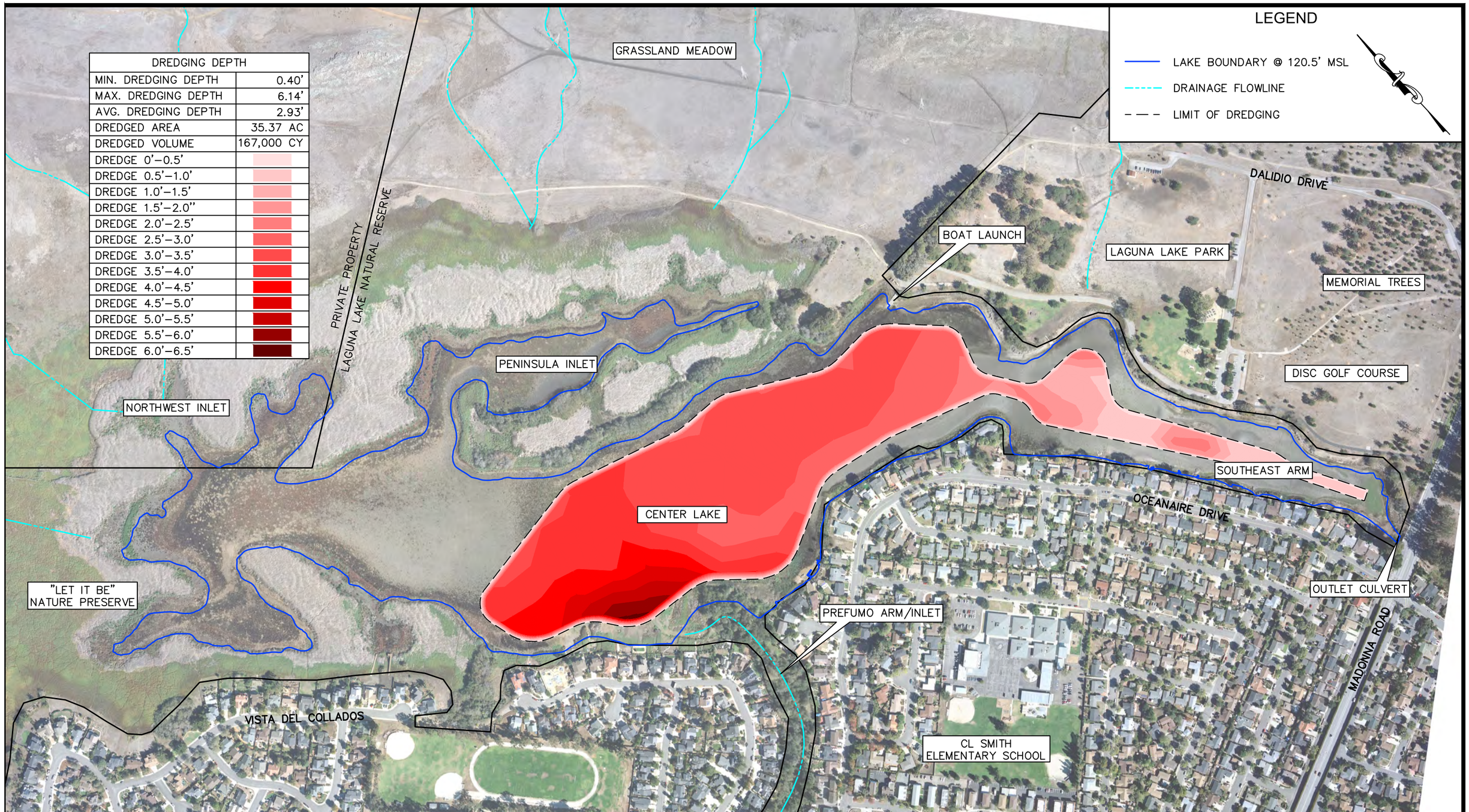
Table 12 - Alternative 3 Summary

Characteristic	Value
Target Priority Area(s)	1, 2, &3
Dredged Volume	167,000 CY
Dredged Area	35.37 acres
Max. Existing Elevation	117.6
Finished Elevation	111.5
Max. Dredging Depth	6.1 feet
Lake Capacity Increase	103.5 AF

Alternative 3 provides the greatest benefit to aquatic wildlife and recreation, albeit at the greatest cost. Expanding the lake capacity by over 100 AF across the three Priority Areas allows for the maximum recreational use of the lake. In addition, aquatic recreation would likely be possible year-round with the increased capacity of the lake, and thus recreation enthusiasts would be able to enjoy Laguna Lake year-round.

7.3.4. Dewatering

For all hydraulic dredging alternatives, dewatering processes would occur tangent to the disc golf course area of Laguna Lake Park, northeast of the lake, shown in Figure 18. The processes would impact one area of play, but that area could be re-located to a currently unused area fronting Madonna Road. Avoiding environmentally sensitive areas, described in Section 4.1, approximately three to four acres of land could be made available for construction, staging, and dewatering. This location would allow for easy access of construction and hauling equipment to the site due to its proximity to existing roads and the Lake. The amount of space available for construction staging and dewatering means that for all three alternatives, it would be best to haul material offsite as soon as it is adequately dried. If dewatering basins were used to dewater dredging sediment at a production rate of 50 CY per hour (400 CY per day) and it took an average of seven days for a single daily load of material to be settled, removed from the dewatering basin, placed in eight inch lifts and dried, approximately six to eight acres of space would be needed for the dewatering process. If mechanical dewatering equipment were used, only about three to four acres of space would be needed for dewatering.



DREDGING DEPTH	
MIN. DREDGING DEPTH	0.40'
MAX. DREDGING DEPTH	6.14'
AVG. DREDGING DEPTH	2.93'
DREDGED AREA	35.37 AC
DREDGED VOLUME	167,000 CY
DREDGE 0'–0.5'	
DREDGE 0.5'–1.0'	
DREDGE 1.0'–1.5'	
DREDGE 1.5'–2.0"	
DREDGE 2.0'–2.5'	
DREDGE 2.5'–3.0'	
DREDGE 3.0'–3.5'	
DREDGE 3.5'–4.0'	
DREDGE 4.0'–4.5'	
DREDGE 4.5'–5.0'	
DREDGE 5.0'–5.5'	
DREDGE 5.5'–6.0'	
DREDGE 6.0'–6.5'	

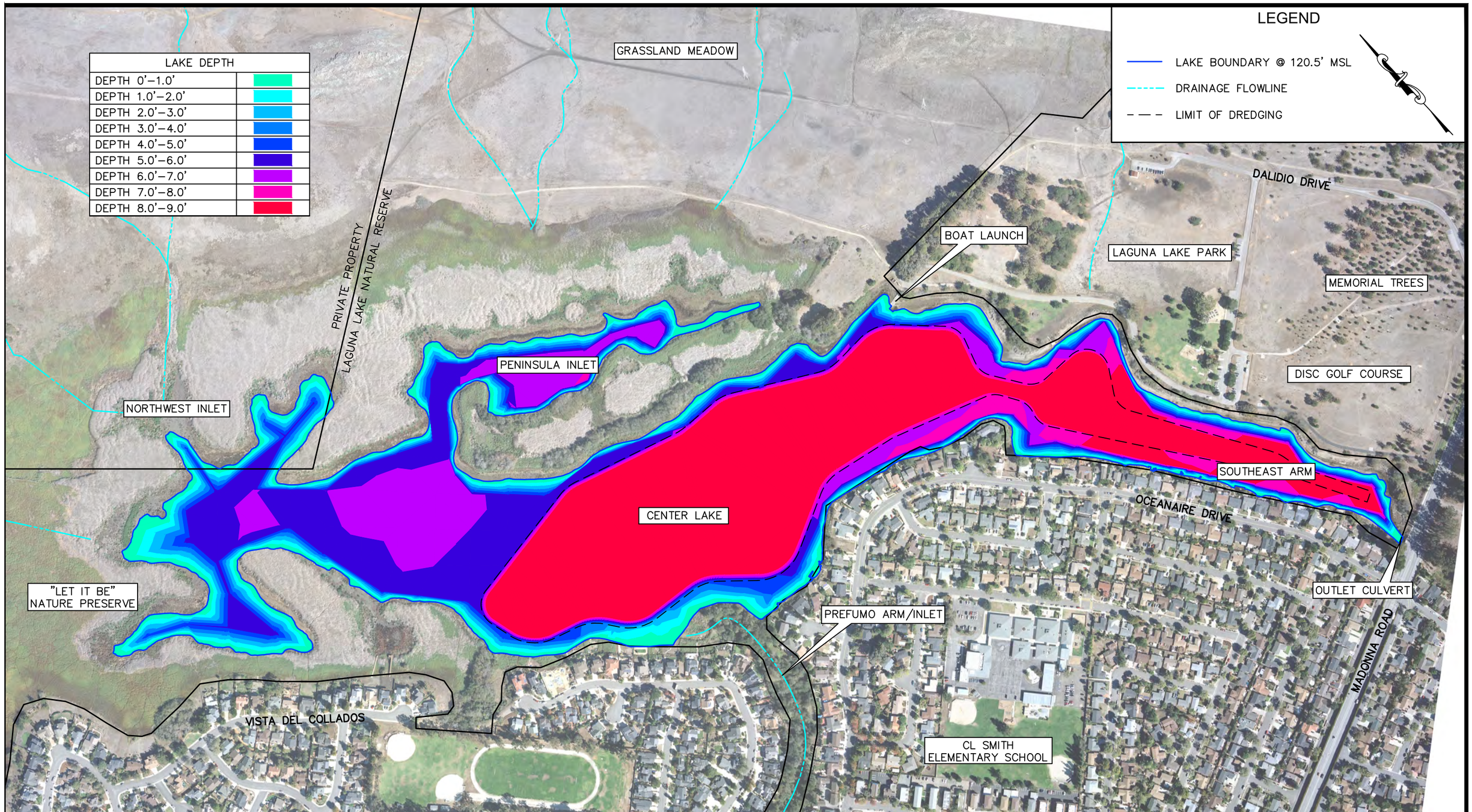
MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 16: ALTERNATIVE 3 DREDGING DEPTH

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'



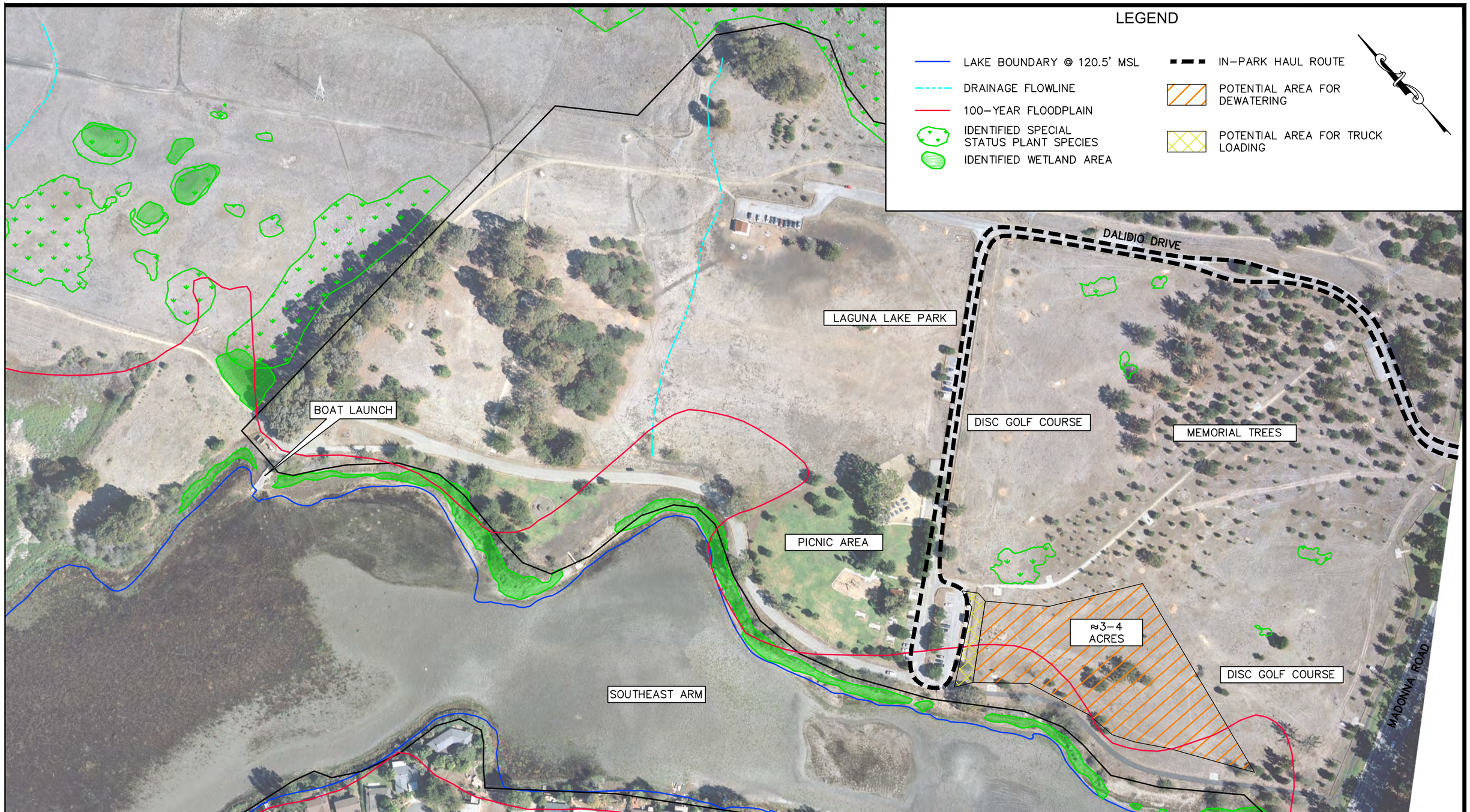
MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 17: ALTERNATIVE 3 LAKE DEPTH

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'



MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 18: POTENTIAL DEWATERING AREA

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

200' 0' 200'
1" = 200'

7.3.5. Mechanical Dredging

The Mechanical Dredging was evaluated for all three alternatives. Details on the dredging volumes, capacity increases, and benefits associated with each alternative are described in Section 6.2.1 through Section 6.2.3. Mechanical dredging would likely be applied if water levels in the Lake did not support hydraulic dredging. Costs associated with mechanical dredging do not assume a dry lake bed condition as the conditions of a dry lake bed may not support heavy excavation equipment nor last the duration of the project. Similar to Section 6.2.1 through Section 6.2.3, the dredged material would be hauled off-site to be deposited. However, dewatering operations would not be required or would be less extensive. Estimated mechanical dredging costs for each Alternative is listed in Table 13, Section 7.4.

7.4. Summary

A summary of the three proposed dredging alternatives is shown in Table 13. Figure 19 shows the estimated cost trends for the dredging alternatives. A detailed cost estimate for each alternative is provided in Appendix F.

Table 13 - Summary of Proposed Dredging Alternatives

Proposed Alternative	Priority Areas	Dredged Volume (CY)	Total Cost	Cost Per CY
Alternative 1A	1	36,500	$5.3 million	$144.1
Alternative 1B	1	36,500	$6.3 million	$173.8
Mechanical Alternative 1	1	36,500	$6.1 million	$165.7
Alternative 2A-Min	1 & 2	50,000	$6.7 million	$138.9
Alternative 2B-Min	1 & 2	50,000	$8.7 million	$173.7
Mechanical Alternative 2-Min	1 & 2	50,000	$7.4 million	$148.6
Alternative 2A-Max	1 & 2	85,000	$11.3 million	$133.2
Alternative 2B-Max	1 & 2	85,000	$14.6 million	$171.2
Mechanical Alternative 2-Max	1 & 2	85,000	$12.4 million	$145.5
Alternative 3A	1, 2, &3	167,000	$21.6 million	$129.1
Alternative 3B	1, 2, & 3	167,000	$27.3 million	$163.5
Mechanical Alternative 3	1, 2, & 3	167,000	$23.2 million	$139.1
A – Hydraulic Dredging with Dewatering Basin B – Hydraulic Dredging with Mechanical Dewatering				

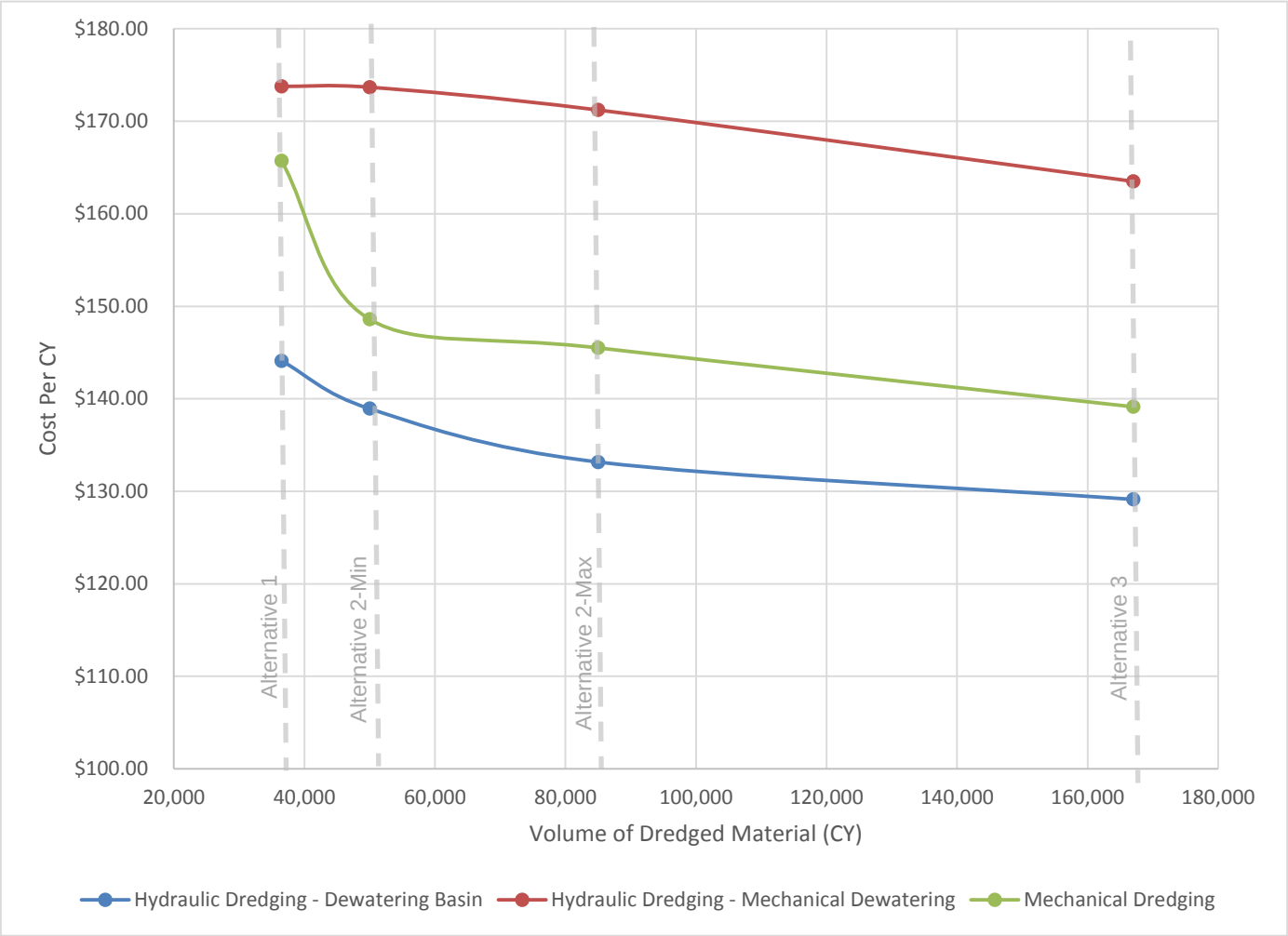


Figure 19 - Cost Trends for the Various Dredging Alternatives

This page intentionally left blank.

Section 8. Sediment Deposition

Several sites were evaluated for the deposition of dredged material. To minimize hauling costs, only sites within 10 linear miles of Laguna Lake were considered. Due to the silty, “clayey” nature of the sediment, as described in Section 5, few beneficial uses exist for the dredged material. However, all potential sites within the 10-mile radius were evaluated, including the Laguna Lake Natural Reserve and Laguna Lake Park, privately-owned property adjacent to the Reserve, Cold Canyon Landfill, the Chevron Tank Farm, and Price Canyon oil field. Locations of the potential deposition sites are shown in Figure 20.

8.1. Option 1 – On-Site Deposition on Laguna Lake Natural Reserve and Laguna Lake Park

The area directly to the east and northeast of Laguna Lake is part of the Laguna Lake Natural Reserve and the Laguna Lake Park, both City-owned properties with open land available for sediment deposition. Various areas within these properties were identified for potential sediment deposition. However, due to the geotechnical and chemical properties of the sediment in the lake and soil at the identified areas, as detailed in Section 5, on-site sediment deposition is not being considered. If on-site deposition is later considered, an analysis is provided for reference in Appendix G.

8.2. Option 2 – Off-Site Deposition at Cold Canyon Landfill

The Cold Canyon Landfill (Cold Canyon) is a Class III municipal solid waste disposal facility operated by Waste Connections, Inc. and permitted by Cal Recycle. Located seven miles to the southeast of the City along Highway 227, Cold Canyon represents the furthest site considered within the ten-mile radius from Laguna Lake at which to deposit dredged material.

A meeting was conducted on May 26, 2016, between MNS, the City, and Cold Canyon representatives to discuss several criteria regarding the disposal of dredged sediment. It was concluded that the dredged sediment could be used for municipal solid waste daily cover. Under its current permit, Cold Canyon can receive up to 1,200 tons of solid waste per day. Accounting for the Landfill’s average daily intake from municipal trash collection, Cold Canyon can receive approximately 600 tons of sediment per day. At an estimated unit weight of 125 pounds per cubic foot (lb/ft^3), 600 tons equals roughly 350 CY of sediment, which approaches the estimated daily dredging production rate. Cold Canyon plans to open a new landfill cell on its property in the coming months, and under a new permit, it could receive a total of 1,600 tons of solid waste per day. The increased capacity could allow for a higher sediment disposal rate.

For planning and cost-estimating purposes, Cold Canyon suggests a tipping fee of $20 per ton ($33.75/CY). This rate is lower than the tipping fee for private entities, but final negotiations would be made before a contract is finalized. When finalized, the contract would be active for one year. Cold Canyon also imposes a moisture content limit of 50 percent (50%) for the sediment. The quality of the sediment has been initially accepted; however, Cold Canyon requires a soil sample report for every 1,000 CY of sediment disposed of at the Landfill, but soil samples are valid for up to one year before disposal.

8.3. Option 3 – Private Properties

Various local properties have been identified as potential deposition sites for the dredged sediment. As shown in Figure 20, nearby properties include Madonna Ranch, Twisselman Ranch, San Luis Ranch, and Devaul Ranch. Haul routes to these sites may be through public roads or roads created through private property. Avila Ranch and the Chevron Tank Farm are several more miles away from Laguna Lake. The Price Canyon oil field and Santa Margarita Ranch claim the furthest haul routes of the options considered. Large portions of these sites lie within the 100-year flood plain, according to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), which limits the available area for deposition. Exact deposition sites within these properties have not been determined. Further communication and coordination with the owners of these properties is necessary to develop a more detailed analysis of logistics and costs associated with hauling and disposal.

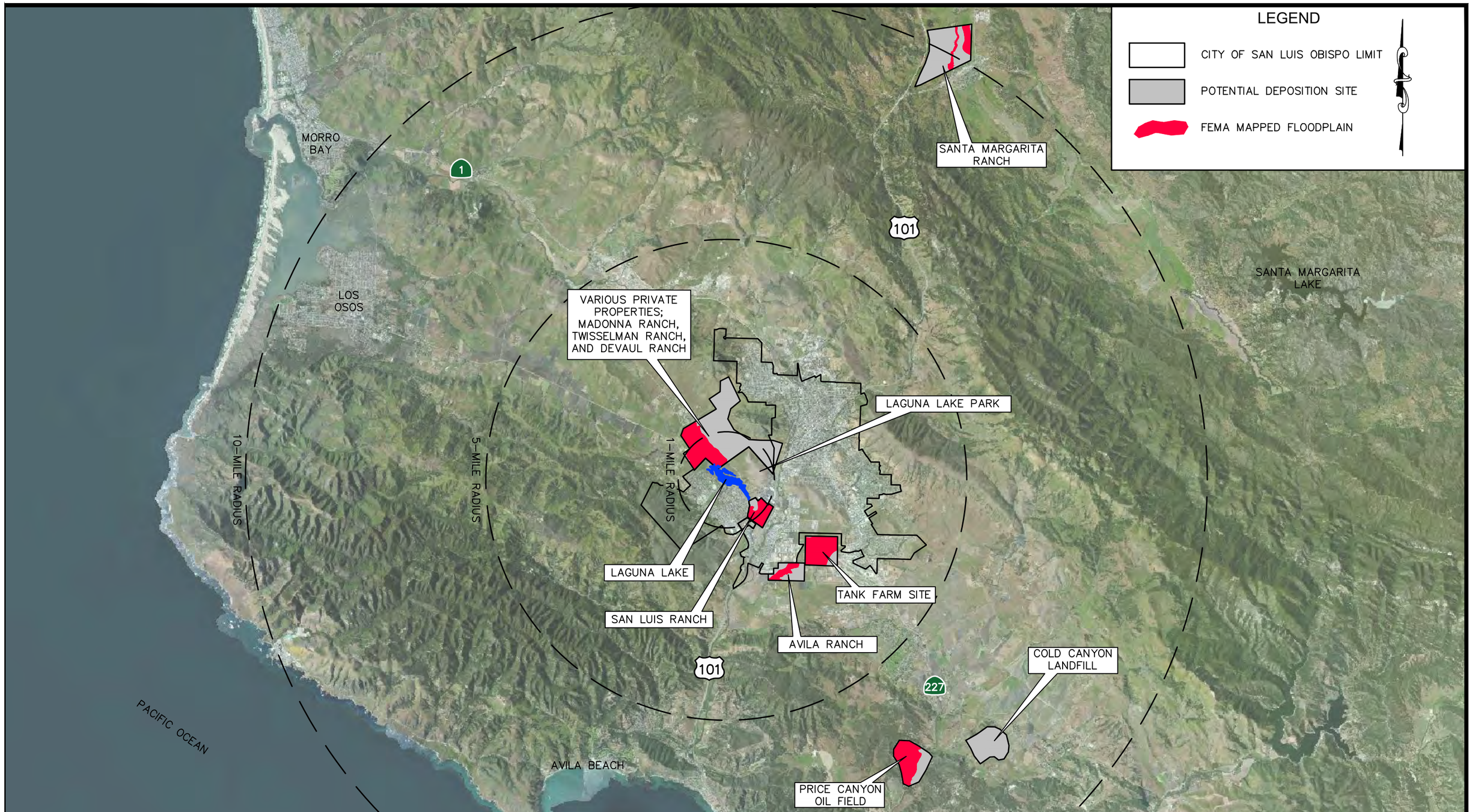
8.4. Summary

Currently, the only plausible deposition site of the dredged sediment is the Cold Canyon Landfill. However, for reference, the approximate one-way hauling distance to each of the considered deposition sites is listed in Table 14. For planning purposes, a maximum deposition rate of 600 tons per day deposited at Cold Canyon will be assumed. At an estimated unit weight of 125 lb/ft^3, 600 tons equates to approximately 350 CY of sediment deposited per day. A tipping fee of $20 per ton (approximately $33.75 per CY) is also assumed. The assumed tipping fee and deposition rate are based on a May 26, 2016 meeting with Cold Canyon staff and were provided for planning purposes. Final maximum deposition rate and tipping fee will need to be contracted with Cold Canyon in a later phase of the project.

Table 14 - Summary of Potentially Available Sediment Deposition Sites

Proposed Deposition Site	One-Way Haul Distance (mi)
On-Site	N/A
Cold Canyon Landfill	~10*
Chevron Tank Farm	4*
Twisselman Ranch	1 – 4*
Devaul Ranch	1 – 4*
San Luis Ranch	0.5 – 1*
Avila Ranch	4 – 5*
Madonna Properties	1 – 4*
Santa Margarita Ranch	13*
Price Canyon Oil Field	11*

*Exact trailer dump area within deposition site not yet determined.



MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE 20: POTENTIAL DEPOSITION SITES

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

10,000' 0' 10,000'
1"=10,000'

This page intentionally left blank.

Section 9. Recommendations

9.1. Recommendations to Minimize Impact to Special Status Species.

Table 15 provides a summary of recommendations to minimize the impact of a dredging project on special status species. These recommendations are based on the biological resource assessment described in Section 4.2. Additional details associated with these recommendations is provided in Appendix C.

Table 15 - Recommended Conservation Measures for Identified Special Status Species

Plant Species	Status	Recommended Conservation Measure
San Luis Obispo owl's clover	CRPR 1B	Avoid to maximum extent feasible; if permanent impacts occur to more than 10 percent of onsite populations, enhance existing populations through mitigation. Avoid impacts to occurrences of adobe sanicle and all special status plants listed under ESA and/or CESA.
Congdon's tarplant	CRPR 1B	
Adobe sanicle	CRPR 1B, Rare under CESA	
Saline clover	CRPR 1B	
Cambria morning glory	CRPR 4	
Terrestrial Wildlife Species	**Status**	**Recommended Conservation Measure**
White-tailed kite	Fully protected SSC	Fully avoid nest sites and roosts.
Golden eagle	Fully protected SSC	Fully avoid nest sites and roosts.
Nesting birds	SSC	Perform activities requiring vegetation disturbance outside the nesting season (Feb. 1 – Sep. 15) or perform pre-construction survey within the disturbance footprint plus a 100-foot buffer. Avoid found nests by 50-500 feet, depending on species and the work activity, until the breeding is completed.
American badger	SSC	Survey for dens within the work activity area; avoid dens by 50 feet during breeding season (Mar. 1 – Jun. 30).
Pallid bat	SSC	Inspect trees for roosting bats.
Blainville's horned lizards	SSC	Relocate healthy lizards; rehabilitate injured lizards at an approved wildlife rehabilitator.
Aquatic/Semi-aquatic Wildlife Species	**Status**	**Recommended Conservation Measure**
Vernal pool fairy shrimp	Federal threatened	Avoid impact to habitat and 250-foot radius.
Western spadefoot toad	SSC	Avoid impact to habitat; relocate healthy toads; rehabilitate injured toads at an approved wildlife rehabilitator.
California red-legged frog	Federal threatened SSC	Provide Worker Environmental Awareness Program training to construction personnel. Work activity performed between Nov. 1 and Apr. 30 should be surveyed prior to activity after rain events. Watch for frogs during all work activity.
Southern western pond turtle	SSC	Survey for turtles within work area and 100-foot buffer; relocate to outside work area.
Steelhead trout	Federal threatened	Control silt load/turbidity in lake/creeks; cease all activity if steelhead are observed.

CRPR = California Rare Plant Rank
CESA = California Endangered Species Act
SSC = California Special Species of Concern

9.2. Recommended Dredging Alternative

Alternative 2 is the recommended dredging project, with a dredged material volume range between 50,000 and 85,000 CY, sized accordingly based on the anticipated funding appropriations. The dredging alternatives presented in this document were developed to encompass the range of appropriate dredging projects. It is recommended that the actual dredging project to be implemented be selected based on available funding, community needs, and the final negotiated costs and space associated with offsite deposition of dredge sediment. Should the City choose to dredge the lake, it is not recommended that the City implement a dredging project smaller than Alternative 1 (36,500 CY) be carried out as such a project would not adequately mitigate historic buildup of sediment at the Prefumo Inlet and would have limited community benefit.

9.3. Recommendations for Dredging Operations

Table 16 provides a summary of recommendations for dredging.

Table 16 - Dredging Recommendations

Project Feature/Aspect	Category	Recommendation
Dredging Method	General Considerations	Utilize available onsite space. Dredge during the dry Season.
	Dredging Method	Hydraulic dredging methods (standard pump or cyclonic pump technology)
Dredging Operations	Dredge Cut Setbacks	Establish a minimum of 30 feet setback from shoreline.
	Dredge Cuts	No steeper than 3H:1V cut up to 10 feet deep. No placement of Heavy Equipment on top of slopes.
Dewatering Operations	General Considerations	If settling and drying times become an issue, environmentally safe soil additives or mechanical dewatering equipment may be used in combination with dewatering basins to maintain the rate of dredging in the given site space.
	Dewatering Basins	Maximum slopes for inside and outside faces of the berms should not be steeper than a 2H:1V slope. Berms should be no higher than 6 to 7 feet measured vertically from the outside face. Ponds and containment areas should have at least two feet of freeboard.
	Mechanical Dewatering	Various methods include: belt presses, centrifugal sludge handlers, screw presses, or heat, among others. Commercial sludge dryers of various types are commonly used due to their ability to incorporate return water treatment processes
	Temporary Stockpiling of Sediment	Fill should be placed in lifts not exceeding 8 inches. Soils should be kept moist during earthwork to reduce the potential for dust.
	Disposal of Dredge Sediments	Dispose of sediments at landfill, or other approved location

9.4. Recommendations for Bank and Shoreline Restoration

Recommendations for shoreline and bank restoration aspects of the project are provided in Table 17

Table 17 - Bank and Shoreline Restoration Recommendations

Project Feature/Aspect	Category	Recommendation
Bank Stabilization and Restoration	General Considerations	Minimize loads on top of stream banks. Protect and conserve stream bank features with the potential to attenuate polluted runoff. Use bioengineering and other non-structural controls over structural controls to restore damaged habitat and protect stream bank erosion. Appropriate native plant species should be used preferably collected from stock within the same watershed as the revegetated site. Stream bank stabilization projects may result in a transfer of energy from one area to another, which causes increased erosion in the adjacent or downstream area. The project team should consider the possible effects of any installed measures
	Grading and Revegetation	Where possible, the creek bank may be regraded to remove verticals and laid back to a 2H:1V to 2.5H:1V slope and revegetated with native species. Based on the soil type encountered along the creek, slope reinforcement may be required in the form of geogrid reinforcement.
	"Soft" Reinforcement	Locally the toes of eroding banks can be reinforced with either placement of heavier gravels or stones, or planted with bio roles and willow tree stakes at the toe. This has been used successfully along sections of San Luis Obispo Creek in conjunction grading and lay back of vertical banks.
	Armoring of existing creek bank slopes:	Lower portions of creek banks can be armored using either rip rap or gabions where there is not enough room to accommodate a "softer," vegetated solutions or in areas where the slope is expected to erode under design flow conditions. Rip rap may best suited where the creek bank is sloped. Gabions can be used to slow the velocity of concentrated runoff or to stabilize slopes with seepage problems and/or non-cohesive soils, and in areas where more vertical construction required than can be accommodated by rip rap.
Shoreline Protection	General Considerations	Minimize loads on top of shoreline. Protect and conserve shoreline features with the potential to attenuate polluted runoff.
	Shoreline Protection Approach	Indirect or vegetative methods are preferred over structural methods. Appropriate native plant species should be used preferably collected from stock within the same watershed as the revegetated site.
	Shoreline Protection Technologies	Breakwaters and groins are not recommended for energy dissipation due to the soft nature of the soils underneath and the potential for transferring energy to another part of the shoreline, potentially inducing erosion. A rock blanket of engineered riprap over a filter layer (fabric or soil filter) would provide armoring and still allow vegetation to be incorporated into the shoreline. Another option is installing gabions (stone-filled wire baskets) or interlocking blocks of precast concrete along eroding banks.

9.5. Recommended Sediment Management Improvements

Previous reports prepared by the city have indicated that the Prefumo Canyon watershed deposits an average annual load of 8,000 CY of coarse sediment in the Prefumo Inlet and 3,900 CY of finer sediment in the Center Lake portion of Laguna Lake. In total, an estimated 11,900 CY of sediment is carried from the Prefumo Canyon watershed and deposited in the Prefumo Inlet and Center Lake per year. These deposits are detrimental to the water quality, fish habitat, recreational use, and hydraulic capacity of Laguna Lake.

It is recommended that sediment from the Prefumo Canyon Watershed be collected and removed before they are deposited in the Lake. While dredging techniques and technologies are improving, removing sediments once they have been deposited in Laguna Lake is expensive. The sediment deposits spread out over a large area. The residential, recreational and habitat uses of the lake increase the difficulty of dredging operations. Soil deposits from the Prefumo Canyon Watershed also become more sorted and have the potential to mix with contaminants, making the material excavated from the lake less marketable for offsite placement.

Historically, sediments from the Prefumo Canyon watershed are collected and removed from the portion of the Prefumo Inlet downstream of Los Osos Valley Road before the majority of sediment could be deposited in Laguna Lake. This activity should continue.

In addition to collecting and removing sediment in the Prefumo Inlet downstream of Los Osos Valley Road, it is recommended that a new sediment collection pond be created in the area immediately upstream of Los Osos Valley Road. To capture the majority of the total average annual sediment load of 11,900 CY, a four–feet-deep pond would require about a two-acre footprint. The portion of the Prefumo Inlet located upstream of Los Osos Valley Road is part of a City-owned golf course. This means the City could easily access the site to regularly remove sediment deposits and no land acquisition or easements would be required. The area is also less environmentally sensitive than the portion of the Prefumo Inlet located downstream of Los Osos Valley Road. If such a sediment basin were constructed it would likely require excavation about once a year during the dry season and potentially after significant flood events. The annual cost of regularly removing sediment from the basin would be much less than the costs to remove the same sediment from Laguna Lake.

Appendices

A: Additional Projects and Amenities

B: Funding and Financing Plan

C: Environmental Documents (Biological Assessment, Jurisdictional Waters and Wetlands Delineation and Cultural Resources Study)

D: Dredge Sediment and Geotechnical Characterization Report

E: Lake Plan and Cross-section Views

F: Construction Cost Estimates

G: On-Site Deposition Analysis

Appendix A – Additional Projects and Amenities

POTENTIAL AMENITY PROJECTS

1. UPPER PREFUMO CREEK SEDIMENT BASIN
2. FISH PASSAGE/CULVERT RETROFIT
3. CREEK BANK EROSION RESTORATION AND STABILIZATION, SEE DETAILS A AND B, SHEET 3
4. PENINSULA BOARDWALK/VIEWING PLATFORMS
5. IMPROVED BOAT LAUNCH AND DOCK
6. SHORELINE STABILIZATION
7. VISITOR ENHANCEMENTS: KIOSKS, INFORMATIONAL SIGNAGE, ETC.
8. ACCESSIBLE PATH

LEGEND

- LAKE BOUNDARY @ 120.5' MSL
- DRAINAGE FLOWLINE
- IDENTIFIED SPECIAL STATUS PLANT SPECIES

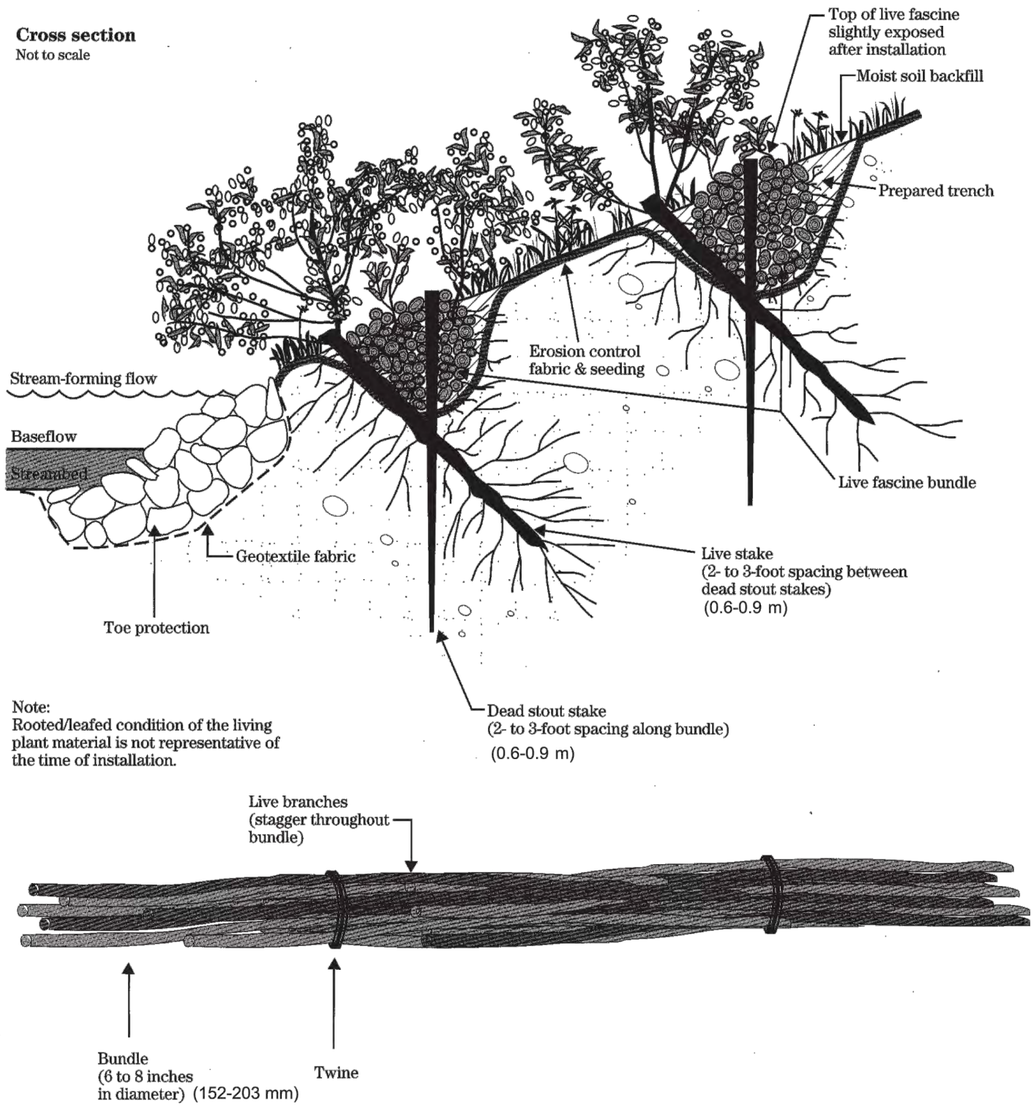
MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

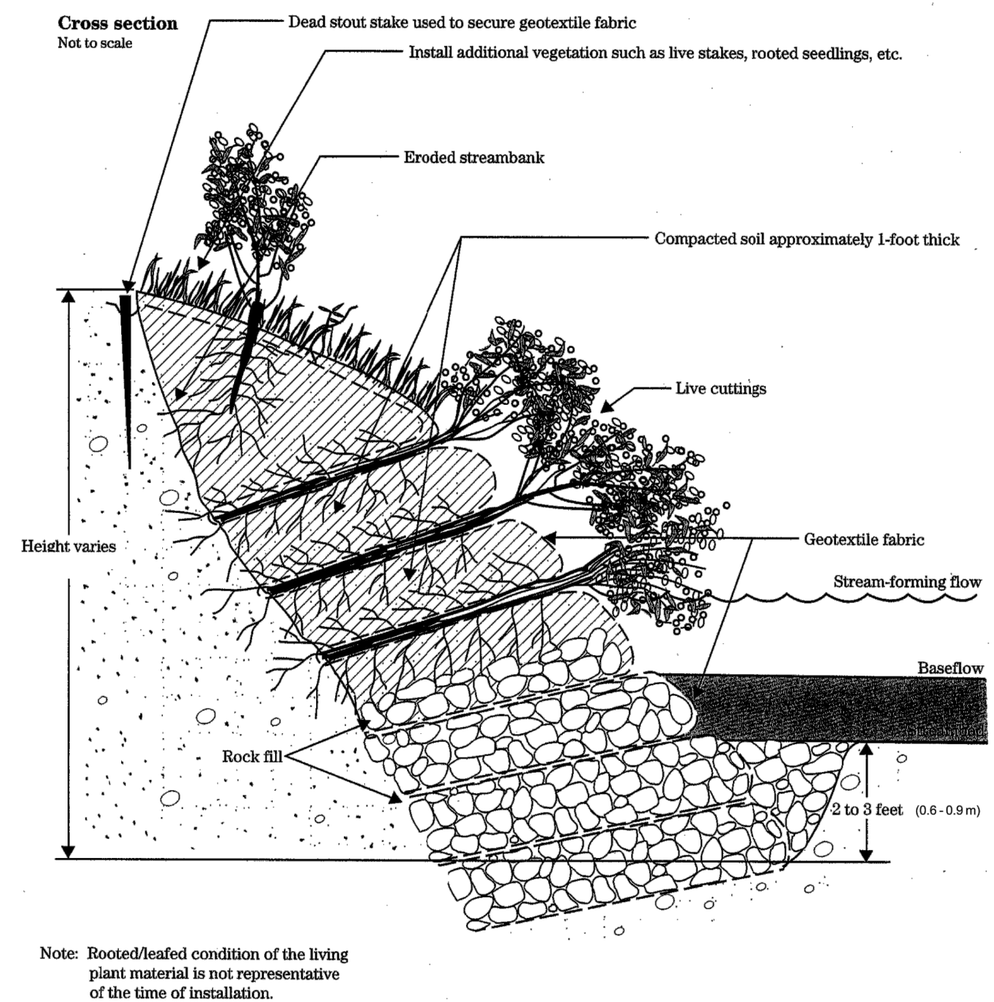
FIGURE A1: ADDITIONAL COMPONENTS AND PROSPECTIVE AMENITY PROJECTS

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

500' 0' 500'
1" = 500'



A LIVE STAKES AND WILLOW WATTLES



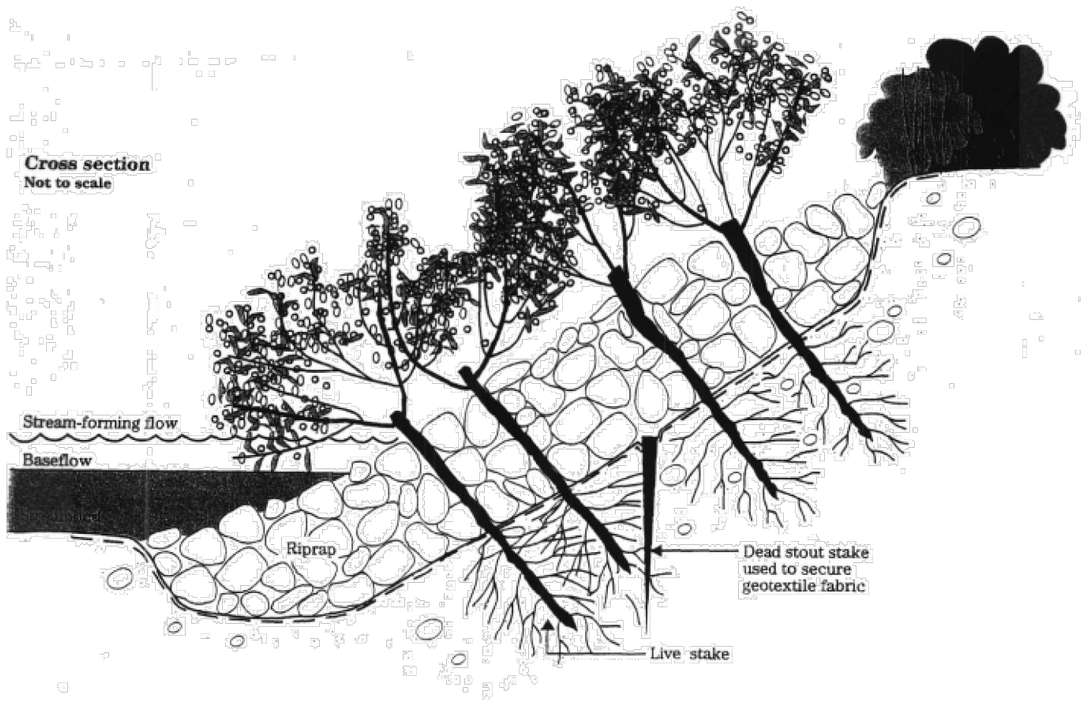
B VEGETATED GEOGRID

MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

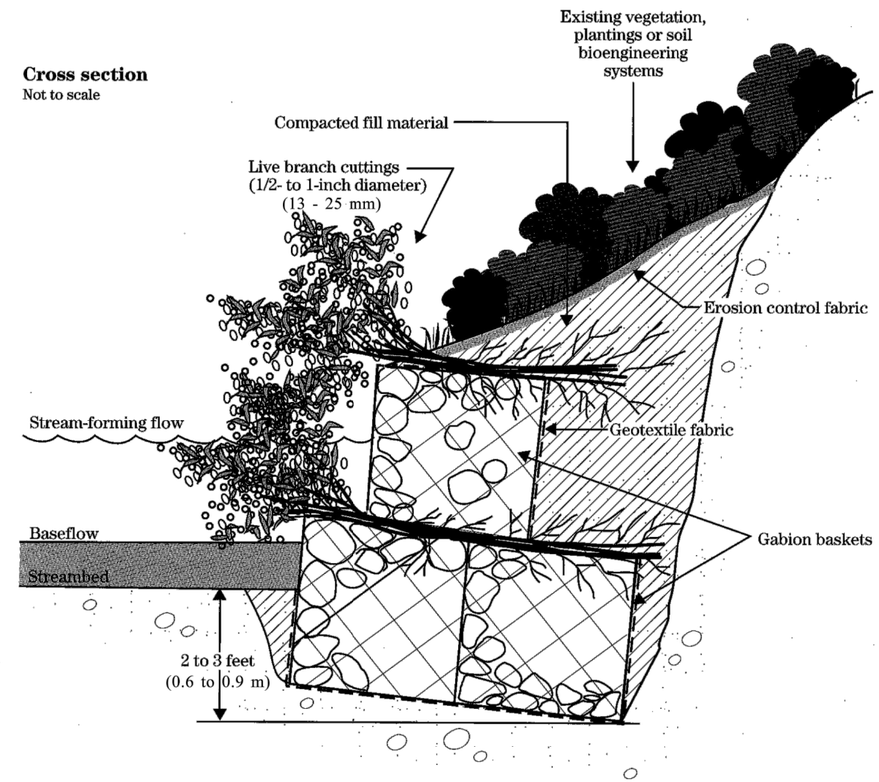
811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE A2: SHORELINE STABILIZATION DETAILS

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA



C PLANTED RIP RAP



D PLANTED GABION BASKETS

MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE A3: CREEK BANK STABILIZATION DETAILS

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

Appendix B - Funding and Financing Plan

Water Consultancy

August 5, 2016

Memorandum

To: Mr. Doug Pike, Principal Engineer
MNS Engineers, Inc.

From: Lynn M. Takaichi

Subject: Development of a Funding and Financing Plan for the Laguna Lake Dredging and Sediment Management Project
WC-030

This memorandum summarizes an evaluation of the potential funding and financing opportunities for the Laguna Lake Dredging and Sediment Management Project for the City of San Luis Obispo (City). MNS Engineers and its team were selected by the City to develop the scope of the activities to accomplish the City's objectives and provide cost estimates for the initial and ongoing costs of the recommended activities. The recommended plan provides a roadmap for the implementation of the recommended initial activities as well as the development of sustainable funding sources for related ongoing costs.

Background and Objectives

The City of San Luis Obispo owns the 344-acre Laguna Lake Natural Reserve (Reserve) that includes the lake as well as several adjacent areas. In 2014, the City adopted the Laguna Lake Natural Reserve Conservation Plan (Conservation Plan) that guides management of the Reserve. The Conservation Plan recognizes the need for ongoing dredging to mitigate the adverse effects of ongoing sedimentation as well as the need for watershed restoration activities to minimize future sedimentation rates. Accordingly, annual dredging of certain areas of the lake for the next 10 years is recommended. In January 2016, the City retained MNS Engineers to develop phased planning and design documents to implement the dredging and sediment management elements of the Conservation Plan. Included in the planning and design activities is the development of a funding and financing plan to provide the City with the financial ability to implement and sustainably maintain the recommended elements of the project. The development of this plan was subcontracted to Water Consultancy. This memorandum summarizes the development of the recommended funding and financing plan for the City. The funding and financing plan was developed based on the draft Preliminary Dredging Report (PDR) dated July 14, 2016 and in consultation with Terrain Consulting who was subcontracted to provide public opinion research on the project.

Summary of Recommended Activities to be Funded

Based on the draft PDR whose primary focus was the dredging and sediment management elements of the Conservation Plan, the recommended dredging alternative is Alternative 2 which would provide a dredged material volume of 50,000 to 85,000 cubic yards (CY) from the priority dredging areas. The estimated cost of dredging is $6.95 to $14.55 million. The

recommended approach is to utilize hydraulic dredging, onsite dewatering of dredged material, and offsite disposal at an appropriate landfill.

To minimize the future sedimentation rates, a new sediment collection and settling basin would be developed along Prefumo Creek to manage sediments from the Prefumo Canyon watershed. The basin is estimated to require semi-annual excavation.

In addition to these features, additional enhancement opportunities may be incorporated into the project. Potential projects identified for more detailed evaluation include:

1. Eroded Prefumo Creek bank restoration and stabilization
2. Lake shoreline stabilization near the park access road
3. Creation of a sediment settling basin along Prefumo Creek
4. Fish passage improvements at Los Osos Valley Road
5. Flood mitigation through removal of sediments and debris at stormsewer outlets
6. A recycled water line extension

Potential park amenity upgrades also include a Peninsula boardwalk, accessible paths, and improved signage.

The recommended funding and financing strategy for the Laguna Lake Dredging and Sediment Management Project is based on these project elements and the community benefits that they will provide.

General Funding Strategy

The recommended activities to be funded include the initial dredging and sediment management activity as well as ongoing dredging and sediment management for the subsequent 9 years. As discussed above, these activities have multiple benefits including drainage, recreation, water quality, habitat restoration, and aesthetic benefits.

Because there are numerous State and Federal grant funding programs to encourage projects such as this, it is recommended that the active pursuit of grant funding opportunities should be a key element of the funding and financing plan. Because these opportunities generally have specific objectives, the project descriptions should focus on benefits the project has on achieving these objectives. In addition, these opportunities require a local matching share which varies from program to program. Therefore, because local funding by the identified project beneficiaries normally could not be implemented in a timely way to pursue the grant funding opportunities, it is recommended that the City identify and commit the funds necessary to receive grant funds until alternative funding by the project beneficiaries can be implemented.

The project beneficiaries include the citywide residents of the City, as well as those which are proximate to the Reserve. Any benefits accrued to these parties must be allocated and the costs equitably assessed. There are several mechanisms to levy the costs of allocated benefits. These alternative are discussed in a following section

Based on these considerations, the general funding strategy consists of:

- Grant Funding and Low Interest Loans
- City Provided Funding
- Funding Provided by the Project Beneficiaries

Each of these funding elements are discussed below.

Potential Grant Funding and Low Interest Loan Opportunities

Because the recommended activities to be funded provide multiple benefits, there are several State and Federal Grant and low interest loan programs that could be utilized to provide supplemental funding for the Laguna Lake improvements. Programs whose awards are generally small are not included. The potential programs include:

Clean Water Act Section 319(h) Nonpoint Source Grant Program (NPSGP)

Program Administrator: State Water Resources Control Board (SWRCB)

Program description: This program provides funding to support projects that reduce, eliminate, or prevent water pollution resulting from polluted runoff and that enhance water quality in impaired waters. Specifically, funds are available to:

- Implement activities that contribute to the restoration of non-point source impaired waters through reduced pollutant loads as called for in an adopted or nearly adopted TMDL as identified in Nonpoint Source (NPS) Program Preferences, and are consistent with watershed plans that address the US EPA's Nine Minimum Elements to be Included in a Watershed Plan.
- Implement and/or undertake planning/assessment activities that clearly lead to implementation of an adopted or nearly adopted TMDL designated in the NPS Program Preferences, and build on existing watershed plans that address the U.S. Environmental Protection Agency's (USEPA) nine minimum watershed-based plan elements.

The maximum grant period for implementation projects is 3 years; the maximum grant period for planning projects is 2 years.

In order to be eligible, applicants must work directly with their appropriate Regional Water Quality Control Board (Regional Water Board) grant coordinator (Grant Coordinator) throughout all phases of the grant application process, including development of the project proposal.

Eligible applicants are public agencies, Indian tribes, state agencies, federal agencies, public colleges, and non-profit organizations.

Funding: Approximately $5-6 million in total funding is available each year depending on the appropriation from USEPA. Project funding for planning/assessment projects is up to $175,000, with a 25% minimum match requirement (match can be lowered for Disadvantaged Communities).

Project funding for implementation projects ranges between $250,000 and $750,000, with a 25% minimum match requirement (match can be lowered for Disadvantaged Communities).

Deadlines and Application: This program is annually funded. The application is a two-step process. In the first step, applicants submit a brief Concept Proposal. Concept proposals are generally due in September. The concept proposal is followed by a Full Proposal if selected by SWRCB. Full proposals are generally due in January.

Website: http://www.waterboards.ca.gov/water_issues/programs/grants_loans/319h/

Urban Streams Restoration Program (USRP)

Program Administrator: California Department of Water Resources

Program description: The USRP funds grants to local communities for projects to reduce flooding and erosion and associated property damages; restore, enhance, or protect the natural ecological values of streams; and promote community involvement, education, and stewardship.

Funding: The maximum award per project is $1 million.

Deadlines and Applications:
The proposal solicitation period is expected to last for 75 days upon release of final Guidelines and PSP. Proposals are generally due in January.

Website: http://www.water.ca.gov/urbanstreams/

Flood Protection Corridor Program (FPCP)

Program Administrator: California Department of Water Resources

Program description: This program provides funding for non-structural flood management projects that include wildlife habitat enhancement and/or agricultural land preservation components. In addition to demonstrating a significant reduction of peak flood flows, flood stage, flood risk or potential flood damage, projects must also include an agricultural land conservation component, wildlife habitat conservation or enhancement component, or a combination of both.

The proposed project activity must be at least 50 percent by area within, or provide substantial flood risk reduction benefits to, the 100-year floodplain.

Less than 20 percent of grant funds can go towards structural actions.

Eligible applicants are local public agencies (single or organization of more than one) and non-profit organizations.

Funding: Maximum of $5 million per project. Funds available total $18 million. Projects must include evidence of non-federal and non-state funding equal to at least 10 percent of the requested grant amount.

Applications and Deadlines: A new PSP is anticipated in FY 15-16. Application deadline is likely to be within 60 days of PSP release.

Website: http://www.water.ca.gov/grantsloans/grants/corridor.cfm

Coastal and Marine Habitat Restoration (CMHR)

Program Administrator: National Marine Fisheries Service

Program description: This program provides funding for restoration projects that use a habitat-based approach to foster species recovery and increase fish production. The funding opportunity focuses on coastal habitat restoration projects that aid in recovering listed species and rebuilding sustainable fish populations or their prey. One, two, or three year proposals will be accepted. Applications must propose work on target species with a nexus to NOAA management, namely marine and estuarine species and diadromous fish species.

Eligible applicants: Institutions of higher education, non-profit organizations, commercial organizations, U.S. territories, and state, local and Native American tribal governments.

Funding: Currently, $9 million is available. Typical awards are anticipated to range from $100,000 to $5 million. Proposals with a budget of less than $100,000 or more than $10 million will not be accepted.

Application and Deadlines: The next funding proposal is due in April 2016.

Website: http://www.habitat.noaa.gov/funding/coastalrestoration.html

Regional Conservation Partnership Program (RCPP)

Program Administrator: United States Department of Agriculture, Natural Resources Conservation Service

Program description: The Regional Conservation Partnership Program (RCPP) promotes coordination between NRCS and its partners to deliver conservation assistance to producers and landowners. NRCS provides assistance to producers through partnership agreements and through program contracts or easement agreements. Through RCPP, partners propose conservation projects to improve soil health, water quality and water use efficiency, wildlife habitat, and other related natural resources on private lands.

Funding will be provided to eligible:

- Partners for the provision of financial and technical assistance
- Producers or landowners through program contracts or easement agreements
- Entities through agreements for the purchase of ACEP agricultural land easements
- Partners through alternative funding arrangements with multistate water resource agency or authorities.

Funding under the program is divided among three funding pools: Critical Conservation Areas (CCAs), national and State. Each application must identify a single funding pool under which the application will be evaluated.

- CCA (35% funding): project proposals should address resource concern priorities listed for each CCA
- National funding pool (40% funding): projects should further conservation, restoration, and sustainable use of soil, water, wildlife, and other related resources
- State funding pool (25% funding): projects should address at least one of the national priorities or a state-identified priority.

An eligible partner must provide a significant portion of the overall cost of the project, with a goal of at least 50% leverage.

Eligible partners (applicants): Agricultural or silvicultural producer associations, farmer cooperatives or other groups of producers, state or local governments, American Indian tribes, municipal water treatment entities, water and irrigation districts, conservation-driven nongovernmental organizations and institutions of higher education.

Funding: Award ceiling is $10,000,000. Upon selection of a partnership proposal, NRCS and the partner will enter into a partnership agreement through which they will coordinate to provide assistance to producers in the project area. Partnership agreements may be for a period of up to five years.

Deadlines and Applications: Proposals are generally due in July, upon announcement of selected pre-proposals.

Website:
http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/home/?cid=stelprdb1242732

Land and Water Conservation Fund (LWCF)

Program Administrator: National Park Service

Program description: This program provides matching grants to States and local governments for the acquisition and development of public outdoor recreation areas and facilities. Priority development projects include trails, campgrounds, picnic areas, natural areas and cultural areas for recreational use. Property acquired or developed under the program must be maintained in perpetuity for public outdoor recreation use.

Eligible applicants: Cities, counties and districts authorized to acquire, develop, operate and maintain park and recreation areas.

Funding: Maximum grant amounts vary by state. LWCF monies are apportioned to the states each year according to the apportionment formula contained in the LWCF Act. There is a minimum match requirement of 50%. For California, the maximum grant request amount is $2,000,000.

Deadlines and Applications: The application deadline for California local agency applications is generally in March.

Website: http://www.parks.ca.gov/?page_id=21360

California Riparian Habitat Conservation Program (RHCP)

Program Administrator: California Wildlife Conservation Board (WCB)

Program description: This program aims at protecting, preserving, restoring, and enhancing riparian habitat throughout California.

Examples of eligible projects include:

- Bank stabilization and revegetation
- Restoration of riparian vegetation on flood-prone land
- Installation of fencing along the riparian corridor to control and/or manage livestock or wildlife.
- Removal of nonnative invasive plant species and restoration of native riparian vegetation

Eligible applicants: local agencies, nonprofit organizations, state departments and federal agencies.

Funding: There is no minimum or maximum grant request. Historically, grants under these programs have ranged from approximately $75,000 to nearly $500,000.

Deadlines and Applications: Applications are accepted on a continuous basis.

Website: https://www.wcb.ca.gov/Programs/Riparian.aspx

Habitat Enhancement and Restoration Program (HERP)

Program Administrator: California Wildlife Conservation Board

Program description: The California Wildlife Conservation Board (WCB) provides financial assistance for the restoration and enhancement of fish and wildlife resources. Eligible projects include native fisheries restoration, restoration of wetlands, in-stream restoration projects, including removal of fish barriers and other obstructions and other projects that improve the quality of native habitat throughout the state.

Eligible projects that are approved and funded must provide for the long-term maintenance of the project once completed. Projects must receive a recommendation from the California Department of Fish and Wildlife.

Eligible applicants: Cities, counties, nonprofit organizations, special districts and state entities.

Funding: Approximately $1 million is available annually.

Deadlines and Applications: Applications are accepted on a continuous basis.

Website: https://www.wcb.ca.gov/Programs/HabitatEnhancement.aspx

Infrastructure State Revolving Fund (ISRF)

Program Administrator: California Infrastructure and Economic Development Bank

Program Description: The California Infrastructure and Economic Development Bank (I-Bank) provides low interest loans for eligible projects that promote economic development, attract, create and sustain long-term employment opportunities (in addition to meeting a minimum point threshold as specified in the guidelines).

Infrastructure projects to be financed must meet the following definition: real and personal property, structures, conveyances, equipment, thoroughfares, buildings and supporting components thereof, excluding any housing, directly related to providing among the following (but not limited to):

- Drainage, Water Supply, and Flood Control including ditches, levees, pumps, pipes, as well as the acquisition, improvement, maintenance, and management of flood plain areas and all equipment used in the associated maintenance and operation
- Environmental Mitigation Measures including required construction or modification of public infrastructure, and purchase and installation of pollution control and noise abatement equipment
- Sewage Collection and Treatment including pipes, pumps, conduits that collect wastewater, the equipment, structures, and facilities used in treating wastewater to reduce or eliminate impurities or contaminants, and the facilities used in disposing of, or transporting remaining sludge, as well as equipment used in the maintenance and operation of the foregoing
- Water Treatment and Distribution including facilities in which water is purified and otherwise treated to meet residential, manufacturing, or commercial purposes and the conduits, pipes, and pumps that transport it to places of use.
- Power and communications facilities
- City streets and county highways
- Parks and recreational facilities

Applicant must demonstrate project readiness and feasibility to complete construction within 2 years after loan approval.

Eligible Applicants: Any subdivision of a local or state government, including departments, agencies, commissions, cities, counties, non-profit corporations, special districts, assessment districts, and joint powers authorities.

Funding: Financing amounts range from $50,000 to $25,000,000 per project with a maximum 30 year term. The interest rate for each loan is set at the time the loan is approved and is based on the Interest Rate Benchmark and Interest Rate Adjustments.

For loans equal or greater to $250,000, a one-time origination fee of $10,000 or 1% of the original loan amount, whichever is greater is due at closing. For loans less than $250,000 the one-time loan origination fee may be reduced or waived at the I-Bank's discretion. A servicing fee of 0.3% of the outstanding principal balance is due annually. There is no match or leverage required.

Applications: Applications are accepted on a continuous basis. The process is initiated by directly contacting the ISRF program contacts.

Website: http://www.ibank.ca.gov/infrastructure_loans.htm

Agricultural Drainage Loan Program

Program Administrator: State Water Resources Control Board (SWRCB)

Program Description: Low interest loans are provided under this program to address treatment, storage, conveyance, or disposal of agricultural drainage water that threatens waters of the State.

Eligible Applicants: Any city, county, district, joint powers authority or other political subdivision of the State involved with water management.

Funding: Funding is capped at $20 million for implementation and $100,000 for feasibility studies. Loan repayments are for a period of up to 20 years with rates of 2 – 3% (set at ½ of the State's General Obligation bond rate).

Applications: Applications are accepted on an ongoing basis.

Website:
http://www.waterboards.ca.gov/water_issues/programs/grants_loans/agdrain/agdrain_loan.shtml

Clean Water State Revolving Fund

Program Administrator: State Water Resources Control Board (SWRCB)

The Clean Water State Revolving Fund (CWSRF) program provides low interest loans for water quality projects.

Eligible projects include, but are not limited to

- Construction of publicly-owned facilities:
  - Wastewater treatment
  - Local sewers
  - Sewer interceptors
  - Stormwater treatment
  - Water reclamation facilities
- Expanded use projects, such as implementation of nonpoint source projects and programs, and development and implementation of estuary comprehensive conservation and management plans.

Eligible Applicants: Any city, town, district, or other public body created under state law; Native American tribal government or an authorized Native American tribal organization having jurisdiction over disposal of sewage, industrial wastes or other waste; any designated and approved management agency under Section 208 of the Clean Water Act; 501(c)(3)'s and National Estuary Programs.

Funding: There is no maximum financing amount.
The interest Rate is half of the most recent General Obligation (GO) Bond Rate at time of funding approval. Financing Terms are for 20 Years; up to 30 years for small disadvantaged Communities. Repayment - Begins 1 year after completion of construction. Between $200 and $300 million is disbursed to eligible projects on an annual basis.

Applications: Applications are accepted on an ongoing basis and are submitted directly via FAAST. Once the CWSRF application is submitted in FAAST, a project manager will be assigned to help the applicant complete the application process. It is recommended that the project proponent contact the Division of Financial Assistance as early as possible during the application process.

Website: www.waterboards.ca.gov/water_issues/programs/grants_loans/srf ; cleanwatersrf@waterboards.ca.gov , (916) 327-9978

In addition to the programs summarized above, there are several programs that will be funded through Proposition 1 that could be applicable to the Laguna Lake improvements. Proposition 1, approved by the voters on November 4, 2014, authorized funding for numerous existing and new programs. Most of the funding programs are administered by the Department of Water Resources, State Water Resources Control Board, and California Environmental Protection Agency. Many of these programs are still in development. However, a proposal solicitation notice was recently issued for the Proposition 1 restoration grant program and storm water grant program that could be applicable to the Laguna Lake Dredging and Sediment Management Project.

Potential City Provided Funding Opportunities

In addition to the potential grant and low interest loan opportunities, the City could contribute funds from other City revenue sources to provide local matching funds for specific project benefits such as citywide recreational benefits, water supply and groundwater recharge, or stormwater retention and treatment. Potential City revenue sources include:

Sales Tax Revenues

In November 2014, City voters approved Measure G which authorized the City to continue to collect a sales tax of 0.5 percent for 8 years. Measure G was an extension of Measure Y which authorized the tax in 2006. Among the services and facilities authorized by the Measure is "open space preservation …, flood protection …and other vital services and capital improvement projects". The tax provides approximately $5.2 million per year.

Community Development Block Grant Funds

The Community Development Block Grant (CDBG) Program is a flexible program providing the City with resources to address a wide range of unique community development needs. The United States Department of Housing and Urban Development allocates funds to San Luis Obispo County which allocates funds to the City. In recent years the allocation has been declining. The City budget anticipates that $405,500 will be available in FY 15-16 and 365,000 will be available in FY 16-17. To the extent that the Project provides community development benefits, CDBG funds could be utilized.

Water Enterprise Transfer

The City maintains a water enterprise fund which receives revenues for services provided for water system related activities. Projected revenues are $19.2 million in FY 15-16 and $19.3 in FY 16-17. The Water Fund has a significant capital improvement program (CIP) to maintain the City's water infrastructure. The City's CIP budget for the Water Fund is $2.8 million in FY 15-16

and $8.0 million for FY 16-17. To the extent that the Project provides groundwater recharge benefits, costs could be allocated to the Water Fund.

Formation of a Stormwater Utility

The City does not currently allocate the costs associated with stormwater management into a separate enterprise fund. Expenditures for this activity are generally funded by the City's general fund. In the event that the City creates a stormwater enterprise fund, Project costs related to stormwater management benefits could be allocated to the new fund.

Potential Funding Alternatives by Project Beneficiaries

The Laguna Lake improvements can be funded through a variety of assessment procedures which would allocate costs to the beneficiaries of the project and could be administered by the City. Among the procedures that could be applicable to this project include:

- Community Facility Districts (CFDs)
- Service-Related Assessment Districts
- Maintenance Districts

The application of these alternative approaches to funding the improvements on a sustainable basis is summarized below:

Community Facility Districts

The Mello-Roos Community Facilities Act of 1982 authorized the formation of a Community Facilities District (CFD) to finance public improvements and services.

Formation: A CFD can be formed by specified local government agencies such as the City. The CFD should include all of the properties that will benefit from the improvements to be constructed or the services to be provided. A CFD cannot be formed without a two-thirds majority vote of the residents living within the proposed boundaries. If there are fewer than 12 residents, a vote of the current landowners is conducted. When a CFD is approved, a special tax lien is placed against each property and property owners must pay the special tax each year. Municipal bonds may be issued to finance capital projects.

Basis for the Special Tax: Due to the requirements of Proposition 13, the special tax cannot be based be directly based on the value of the property. Instead, the special tax is based on a formula that considers the property characteristics and the benefits received. The formula is determined at the time of CFD formation and includes the maximum special tax amount and a maximum percentage annual tax increase.

Duration of the Special Tax: If bonds were issued to finance the improvements, the special tax will continue until the bonds are retired. However, the CFD may continue a tax to maintain the constructed improvements.

Assessment Districts

The formation of assessment districts by local government agencies, such as the City, is primarily authorized by the Improvement Act of 1911 and Municipal Improvement Act of 2015. These legal authorities are generally used together with the Improvement Bond Act of 2015 to finance the capital improvements.

Formation: An assessment district is generally formed by the local sponsoring agency after receipt of petition signed by property owners. The assessment district should include all of the properties that will benefit from the improvements to be constructed or the services to be provided. Prior to formation, a public hearing is held to provide an opportunity for property owners to protest the district formation. After approval, property owners have the option to prepay the assessment prior to bond issuance. A special assessment lien is recorded against each property with an unpaid assessment. Property owners pay annual installments on their property tax bills and have the right to prepay the remaining balance at any time.

Basis for the Assessment: Prior to creating a new assessment, the sponsoring agency must develop a professional engineer's report that outlines the proposed boundaries of the assessment district, estimated project costs, annual costs to each property, and benefit formula used to determine each property's share of the cost. To increase the assessment, written notice to the property owners is required, a public hearing must be held, and a majority vote must be received.

Duration of the Assessment: If bonds were issued to finance the improvements, the assessments will continue until the bonds are retired.

1982 Act Benefit Assessment Districts

The Benefit Assessment Act of 1982 authorizes the formation of a benefit assessment district to finance maintenance and operation of public facilities.

Formation: To initiate the formation of a 1982 Act Benefit Assessment District, the sponsoring agency must prepare a written report which proposes the formation of the district and specifies the annual assessment. Property owners are notified and a public hearing is held. The assessment district should include all of the properties that will benefit from the services to be provided. A majority vote of the property owners is required to form the district. When approved, the assessments are included on the property tax bills each year.

Basis for the Assessment: Assessments are based on a formula which bases the assessment on the benefit received by each parcel.

Duration of the Assessment: Assessment will continue as long as the services are provided.

Maintenance Districts

There are several types of maintenance districts that are available for cities and counties to utilize to finance the costs of maintaining open spaces, parks, playgrounds and other public areas. The formation of maintenance districts is authorized by the Open Space Maintenance Act, Park and Playground Act, and Tree Planting Act of 1931. Maintenance districts formed under the Tree Planting Act of 1931 are not relevant to this evaluation.

Formation: An open space maintenance district is in initiated by a petition of property owners having more than 25 percent of the assessed value of the land within the proposed district. This type of district may charge an ad valorem special assessment to pay the costs of conservation planning, maintenance, improvements related to open space conservation, and activities to reduce fire, erosion and flooding hazards. The sponsoring agency prepares an ordinance of intention that specifies the district boundaries, proposed projects, annual assessment, maximum assessment, and time for a protest hearing. When approved, a special annual assessment based on the assessed value of the property will be levied on the county property tax bill.

A park and playground district follows the formation process described in the Improvement Act of 1911, Municipal Improvement Act of 1913, and Improvement Act of 1915 and summarized above. A park and playground district may be used to finance public park, urban open space land, playground, and library facilities.

Basis for the Assessment: The assessments authorized by an open space maintenance district is based on the assessed value of the property. The assessments authorized by a park and playground district are based on the assessment process described above for assessment districts.

Duration of the Assessment: Assessment will continue as long as the services are provided.

Recommendations

The recommended project is comprised of a diverse combination of activities that would provide numerous community-wide, as well as localized, benefits. However, the initial and ongoing cost of accomplishing the project is significant. Accordingly, a broad funding strategy is necessary. To provide the necessary funding to implement the project elements, the following recommendations are presented for consideration:

1. **Monitor potential State and Federal grant programs on an ongoing basis.** As each potential project element is developed and approved, review the applicable programs for the feasibility of a successful application, level of potential funding, and funding schedule of the program. Because of the level of funding required and the broad range of benefits provided, the highest priority should be given to grant programs that focus on water quality, habitat restoration, non-point source management, and recreational development.

2. **Create one or more benefit assessment districts.** Formation of these districts would provide a vehicle for capital and ongoing funding and providing the matching share of the potential grant programs. Multiple districts or zones may be necessary to separate the community-wide benefits from the enhanced neighborhood benefits. Although the allocation between these types of benefits cannot be determined until the project benefits are quantified, they will be addressed in the Engineer's Report which will support district formation. However, based on the 2015 San Luis Obispo Open Space Survey prepared for the City by Riggs et al., approximately 12 percent of the City's visitors to the City's major open spaces arrived by walking, which implies a neighborhood benefit, versus the visitors that arrived by driving, biking or other transportation means.

3. **Prepare the necessary Engineer's Report to support district formation.** Use of a benefit assessment district requires the preparation of an Engineer's Report. This report would describe the boundaries of the district and zones, the activities to be funded, the basis for allocating costs, and the cost to each parcel.

4. **Evaluate potential financial contributions from other City sources.** Although these potential funding sources are expected to be relatively small, the wide range of benefits provided by the project result in specific benefits to other City activities, including its enterprise funds. When these benefits have been quantified, the City should determine if other City financial resources should be utilized to support the project.

Appendix C - Environmental Documents

City of San Luis Obispo

Laguna Lake Dredging and Sediment Management Project

Jurisdictional Waters and Wetlands Delineation

rincon

May 2016

Environmental Scientists Planners Engineers

JURISDICTIONAL WATERS AND WETLANDS DELINEATION

Laguna Lake Dredging and Sediment Management Project

City of San Luis Obispo
San Luis Obispo County, California

Prepared for:
City of San Luis Obispo
990 Palm Street
San Luis Obispo, CA 93401
Contact: Robert Hill, Natural Resources Manager
805-781-7211

Prepared by:
Rincon Consultants, Inc.
1530 Monterey Street, Ste. D
San Luis Obispo, California 93401
805-547-0900

May 2016

TABLE OF CONTENTS

Executive Summary 1
1.0 Introduction 2
1.1 Project Location 2
1.2 Project Description 6
2.0 Methodology 6
2.1 Regulatory Overview 6
2.2 Literature Review 7
2.2 Field Survey 8
3.0 Delineation Results 9
3.1 Environmental Setting 9
3.1.1 Vegetation /Land Cover Types 10
3.1.2 Hydrology 13
3.1.3 Soils 14
3.2 Sample Points 17
4.0 Assessment of Jurisdictional Waters and Wetlands 23
4.1 USACE and RWQCB Jurisdiction 23
4.1.1 Significant Nexus Evaluation 26
4.2 CDFW and Porter-Cologne Act (Top of Bank/Edge of Riparian) Jurisdiction 27
5.0 Limitations, Assumptions and User Reliance 27
6.0 References 29

Tables

Table 1: Summary of Vegetation, Soils, and Hydrology Wetlands Indicator Status at Wetland Determination Data Points 19
Table 2: Summary of OHWM Indicators by Data Point 22
Table 3 - Summary of Potentially Jurisdictional Wetlands, Waters and Riparian Habitats 23

Figures

Figure 1 – Regional Location 3
Figure 2 – Study Area 4
Figure 3 – Study Area depicted over USGS Topographic Quadrangle 5

Figure 4 – USDA Soil Map Units 16
Figure 5 – Jurisdictional Delineation 24
Figure 6 – Connectivity to Downstream Traditional Navigable Waters 25

Appendices

Appendix A – Regulatory Overview and Definitions
Appendix B – Wetland Determination Data Forms and OHWM Data Forms
Appendix C – Site Photographs
Appendix D – Potential Jurisdictional Features – Table of Dimensions and Characteristics

EXECUTIVE SUMMARY

Rincon Consultants, Inc. (Rincon) conducted a jurisdictional waters and wetlands delineation for the Laguna Lake Dredging and Sediment Management Project, located in the City of San Luis Obispo, San Luis Obispo County, California.

The Laguna Lake Dredging and Sediment Management Project (the Project) is generally located in and near Laguna Lake in the eastern Los Osos Valley, within the City of San Luis Obispo, San Luis Obispo County, California. The project site is north-northeast of the intersection of Madonna Road and Los Osos Valley Road. The Study Area encompasses a section of Laguna Lake, a portion of the Laguna Lake Park and the Laguna Lake Natural Reserve (LLNR), the Prefumo Creek inlet and upstream reach from approximately 300 feet upstream of Los Osos Valley Road to its inlet into the lake, and the Prefumo Creek outlet from Laguna Lake to a point approximately 150 feet downstream of the south edge of Madonna Road. Laguna Lake is a naturally-occurring lake situated near the Irish Hills to the southwest on the floor of eastern Los Osos Valley.

The Project consists of a range of actions proposed to manage sediment that is filling the lake, influencing water quality, diminishing the capacity of the downstream connection to lower Prefumo Creek, decreasing overall depth of the lake, promoting increased water temperatures, reducing recreation opportunities in the lake, and reducing capacity to attenuate flooding. Overall, the sediment deposition and accumulation is lowering ecological functions and values of the lake. The proposed project actions include a range of dredging depths, a range of disposal options for removed sediment, and alternatives for controlling and ultimately reducing sediment loads coming into the lake. The project also includes an option to stabilize the eroding bank on the east shore of the lake where slumping banks are failing. Additionally, the project includes possible improvements to the inlet at Los Osos Valley Road and the outlet at Madonna Road, including possible improvements to the existing fish passage at Los Osos Valley Road.

The jurisdictional delineation identified 61.49 acres of jurisdictional waters subject to Sections 404 and 401 of the Clean Water Act, including 4.72 acres of wetlands and 56.77 acres (7,331 linear feet) of other waters. Additionally, the jurisdictional delineation identified 65.89 acres (7,758 linear feet) of streambed and lake below top of bank or to edge of riparian subject to Section 1600 et seq. of the California Fish and Game Code and Porter-Cologne Water Quality Control Act. Note the final jurisdictional determinations of the boundaries of wetlands, waters, and riparian habitat are made by each agency, typically at the time that authorizations to impact such features are requested.

1.0 INTRODUCTION

Rincon Consultants, Inc. (Rincon) conducted a jurisdictional waters and wetlands delineation for the Laguna Lake Dredging and Sediment Management Project, located in the City of San Luis Obispo, San Luis Obispo County, California. The delineation was conducted to determine the location and extent of waters and wetlands within the project site that are potentially subject to the jurisdictions of the United States Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and California Department of Fish and Wildlife (CDFW).

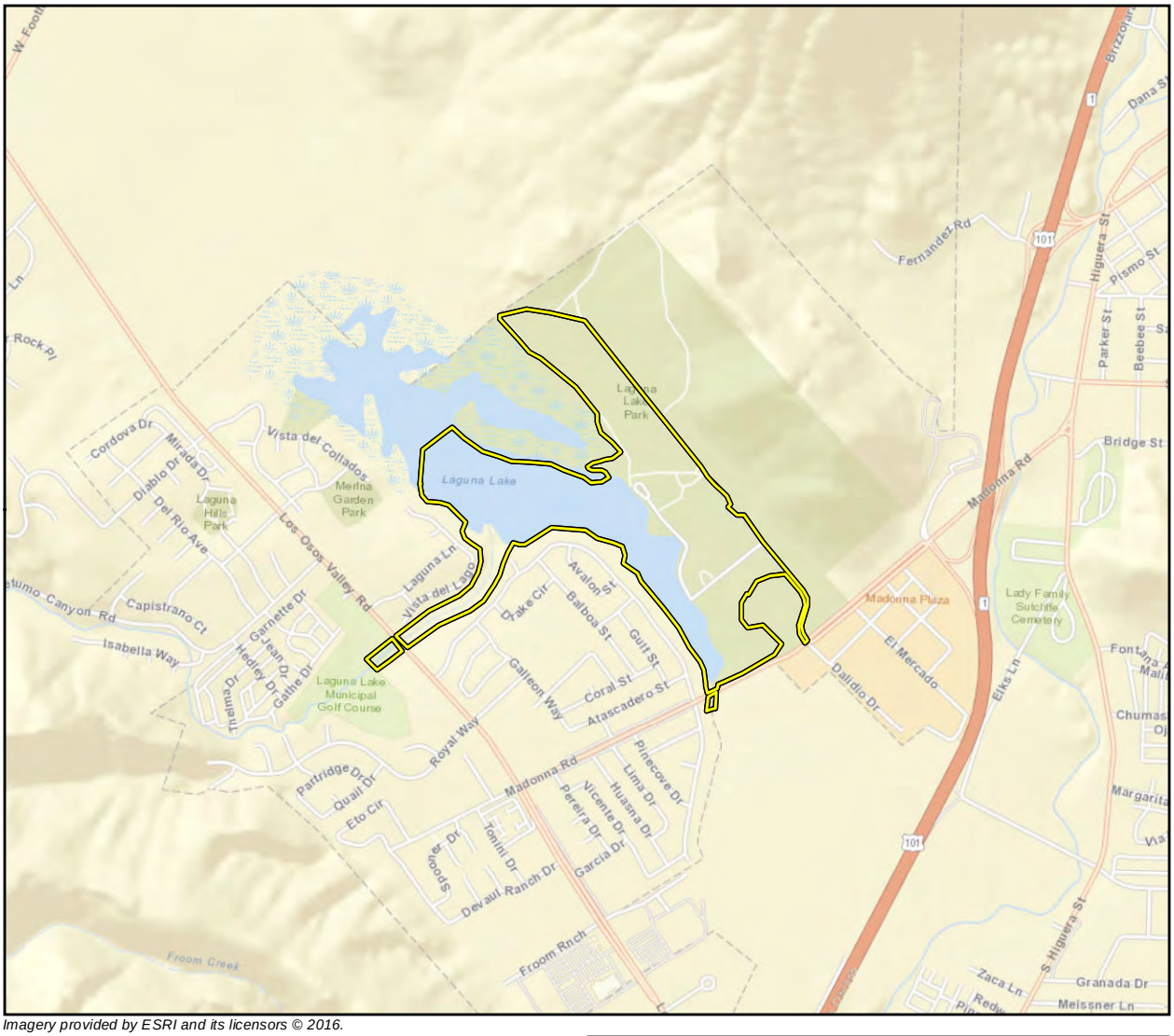
Any proposed activity in areas identified as jurisdictional waters and/or wetlands may be subject to the permit requirements of the USACE under Section 404 of the Clean Water Act (CWA), RWQCB under Section 401 of the CWA and under the Porter-Cologne Water Quality Control Act (Porter-Cologne), and/or CDFW pursuant to Section 1600 et seq. of the California Fish and Game Code. Final jurisdictional determinations of the boundaries of waters and riparian habitats are made by each agency, typically at the time that authorizations to impact such features are requested.

1.1 PROJECT LOCATION

The Laguna Lake Dredging and Sediment Management Project (the Project) is generally located in and near Laguna Lake in the eastern Los Osos Valley, within the City of San Luis Obispo, San Luis Obispo County, California. The project site is north-northeast of the intersection of Madonna Road and Los Osos Valley Road, approximately 11 miles due east of the Pacific Ocean, as shown in Figure 1. A jurisdictional delineation study area, hereinafter referred to as the "Study Area," was defined for the Project that is extensive enough to include all anticipated project options, access points, staging areas, and permanent and temporary disturbance sites. Note that final project design is not yet complete and an array of alternatives are under consideration; final impact calculations will be completed when the preferred project alternative has been selected.

The Study Area encompasses a section of Laguna Lake, a portion of the Laguna Lake Park and the Laguna Lake Natural Reserve (LLNR), the Prefumo Creek inlet and upstream reach from approximately 300 feet upstream of Los Osos Valley Road to its inlet into the lake, and the Prefumo Creek outlet from Laguna Lake to a point approximately 150 feet downstream of the south edge of Madonna Road. Laguna Lake is a naturally-occurring lake situated near the Irish Hills to the southwest on the floor of eastern Los Osos Valley. The Study Area is illustrated on Figure 2.

The approximately 174.16-acre Study Area is also depicted on the *San Luis Obispo, California* United States Geological Survey (USGS) 7.5-minute topographic quadrangle within the Laguna Grant, (Townships 30 and 31 South, Range 12 East; land grant not sectioned - Mount Diablo Meridian) on Figure 3. The approximate center of the Study Area is at 35.264657 degrees North and 120.685381 West (WGS 84).



Imagery provided by ESRI and its licensors © 2016.

Project Location

N

0 1,250 2,500
Feet

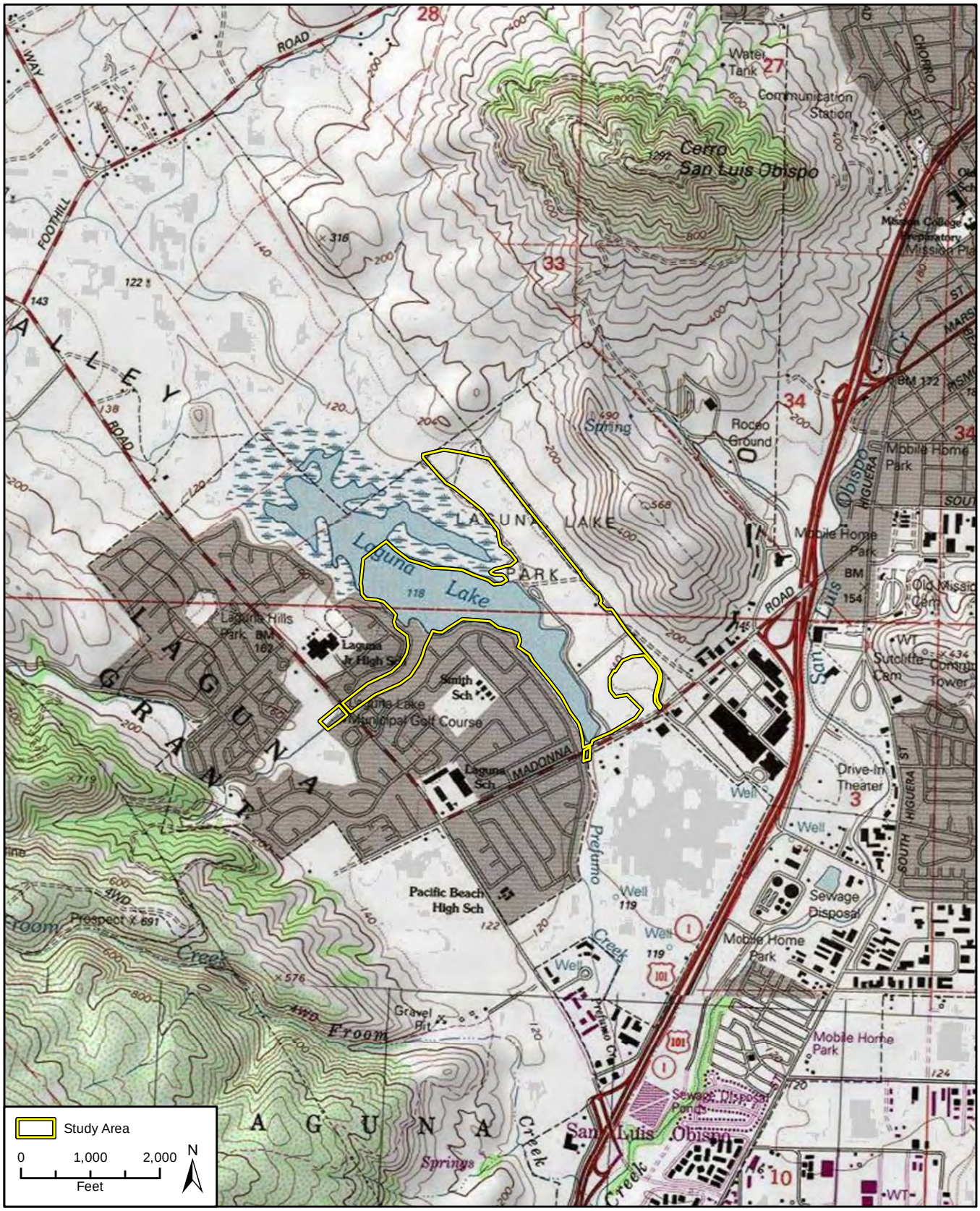
Regional Location

Figure 1

Imagery provided by Google and its licensors © 2016.

Jurisdictional Delineation Study Area

Figure 2



Imagery provided by National Geographic Society, ESRI and its licensors © 2016.
The topographic representation depicted in this map may not Portray all of the features currently found in the vicinity today and/or features depicted in this map may have changed since the original Topographic map was assembled.

Topographic Map

Figure 3

1.2 PROJECT DESCRIPTION

The Project consists of a range of actions proposed to manage sediment that is filling the lake, influencing water quality, diminishing the capacity of the downstream connection to lower Prefumo Creek, decreasing overall depth of the lake, promoting increased water temperatures, and reducing recreation opportunities in the lake. Problems with sedimentation and potential risk associated with decreased capacity have been known for several years, and the City of San Luis Obispo has previously studied the issue in detail. Previous studies were reviewed during preparation of this report, including a recent report prepared by Central Coast Salmon Enhancement (CCSE) that reviews information on the hydrology of Laguna Lake (2014). As documented in the CCSE report, Flood Insurance Rate Maps (FIRM) provided by the Federal Emergency Management Agency (FEMA), depict Laguna Lake as a special flood hazard area subject to inundation by the one percent (1%) annual chance flood, also known as the base flood (FEMA 2012 as cited in CCSE 2014). The Oceanaire neighborhood near Laguna Lake would begin to flood even at water surface elevations an estimated lower than elevation anticipated during a 100-year flood. Over time sedimentation has and will continue to decrease the storage capacity in Laguna Lake (CCSE, 2014), and flood risks are exacerbated by decreased lake capacity.

The proposed project actions include a range of dredging depths, a range of disposal options for removed sediment, and alternatives for controlling and ultimately reducing sediment loads coming into the lake. The project also includes an option to stabilize the eroding bank on the east shore of the lake where slumping banks are failing. The failing banks are causing erosion that compromises park access roads and park facilities. Bank stabilization would include options to improve fish habitat through inclusion of root wads and downed logs. Additionally, the project includes possible improvements to the inlet at Los Osos Valley Road and the outlet at Madonna Road, including possible improvements to the existing fish passage at Los Osos Valley Road.

As previously noted, a range of alternatives for total volume of dredge, disposal, and other project features that bracket the smallest and largest practical project options are under consideration. Evaluation of impacts to natural resources will be a component of the impact assessment and selection of a preferred alternative. When a preferred alternative is selected, impacts to jurisdictional features can be calculated based on the areas delineated in this report and included with permit applications.

2.0 METHODOLOGY

2.1 REGULATORY OVERVIEW

Within the limits of the project site, waters of the United States (U.S.), including wetlands, potentially subject to USACE jurisdiction were delineated in accordance with the following:

- *Wetlands Delineation Manual* (Environmental Laboratory 1987);

- *Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest* (United States Army Corps of Engineers 2001);
- *Regulatory Guidance Letter No. 05-05: Ordinary High Water Mark Identification* (United States Army Corps of Engineers 2005);
- *Distribution of Ordinary High Water Mark (OHWM) Indicators and Their Reliability in Identifying the Limits of "Waters of the United States" in Arid Southwestern Channels* (United States Army Corps of Engineers 2006);
- *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (United States Army Corps of Engineers 2008a);
- *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (United States Army Corps of Engineers 2008b);
- *Updated Datasheet for the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (United States Army Corps of Engineers 2010); and
- Code of Federal Regulations sections that pertain to factors constituting the OHWM for non-wetland waters ("other waters") (33 CFR 328.3 and 33 CFR 328.4).

RWQCB jurisdiction was determined in accordance with the previously listed methodologies to identify waters of the U.S. and thus, mirrors the jurisdictional limits of federal jurisdiction pursuant to Section 401 of the CWA; based on federal and state law and regulations, the Central Coast RWQCB's jurisdiction should be delineated at the OHWM. However, based on discussions with Central Coast RWQCB staff there may be differing interpretations of the RWQCB's jurisdictional reach under Section 401 of the CWA and the Porter-Cologne Water Quality Control Act (i.e. Waters of the State) and the RWQCB's jurisdictional limits extend to the top of bank or edge of riparian area, if present. CDFW jurisdiction was delineated in accordance with Section 1602(a) of the California Fish and Game Code. Appendix A presents a discussion of pertinent regulations and definitions pertaining to jurisdictional wetlands, other waters and riparian habitats.

2.2 LITERATURE REVIEW

Rincon reviewed aerial imagery depicting the proposed project area (Google Earth 2016), the 1965, 1995 and 2015 editions of the *San Luis Obispo, California* USGS 7.5-minute topographic quadrangle (USGS), the *Soil Survey of San Luis Obispo County, California, Coastal Part* (United States Department of Agriculture, Soil Conservation Service 1984), the Soil Survey Geographic Database (SSURGO) and Web Soil Survey (United States Department of Agriculture, Natural Resources Conservation Service 2016), the National Hydrography Dataset (NHD; USGS 2016), and other available background information to better characterize the nature and extent of jurisdictional wetlands, other waters and riparian habitats potentially occurring on the subject site.

Furthermore, the *National Wetlands Inventory* (NWI) (United States Department of the Interior, Fish and Wildlife Service 2016) was reviewed to determine if any wetland and/or other waters

had been previously documented and mapped on or in the vicinity of the proposed project site. The *National Hydric Soils List* (United States Department of Agriculture, Natural Resources Conservation Service, 2015) was also reviewed to determine if any soil map unit types mapped on or in the vicinity of the proposed project site were classified as having hydric components.

Additionally, Rincon wetland specialists reviewed previous studies completed in and near the Study Area to evaluate previous boundaries of potential jurisdictional features, including the, the Laguna Lake Park Master Plan (Fred L. Hector, 1961), the Laguna Lake Management Plan (EDW et al., 1982), the 1993 revised Laguna Lake Park Master Plan (Sedes et al., 1993), the 2003 analysis of Potential Impacts of Dredging Operations at Laguna Lake (LFR Levine Fricke), and the 2009 Laguna Lake Dredging Environmental Document (City of San Luis Obispo). Rincon also reviewed the Laguna Lake Natural Reserve Conservation Plan (City of San Luis Obispo, 2014) and searched the USACE database for previous jurisdictional determinations made in the same watershed.

2.2 FIELD SURVEY

Rincon Senior Biologist/Botanist Meg Perry and Biologist Noel Fie conducted the jurisdictional delineation over the course of two days, April 21 and May 6, 2016. The entire site was inspected for presence of potential jurisdictional features. All potentially jurisdictional features within the site were then evaluated to record existing conditions and determine limits of jurisdiction.

Dominance of hydrophytic vegetation (i.e., wetland plants) was determined by creating a species list for those plants occurring within an appropriate radius around each data point (wetland and upland data points only). Radius of the sample plot was determined based on life form – for herbaceous plots, a minimum 5-foot radius was used; for shrubs, a 15-foot radius, and for trees, a 30-foot radius was used. After creating the species list, Rincon wetland specialists estimated absolute percent cover for each species by stratum, assigning an indicator status category to each species using the current National Wetland Plant List, version 3.3 (Lichvar et al., 2016; USACE, 2016), and determining whether wetland plants dominated the subject area using the dominance and/or prevalence tests (United States Army Corps of Engineers, 2008a). Taxonomic nomenclature for plant species is in accordance with *The Jepson Manual* (Baldwin et al., 2012); where conflicts exist with the National Wetlands Plant List, both names are provided. The 2016 National Wetland Plant List went into effect on May 1, 2016 and thus was utilized for this delineation effort.

To establish whether hydric soils were present, a soil pit approximately 18 inches deep was dug to determine the presence or absence of positive field indicators for hydric soils as described in *Field Indicators of Hydric Soils in the United States, version 7* (United States Department of Agriculture, Natural Resources Conservation Service, 2010) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (United States Army Corps of Engineers, 2008a). Soil color was determined using a Munsell® (2000) Soil Color Chart. In some instances, wetland scientists assumed hydric soils were present when they observed direct observation of saturated or inundated soil more than 18 days after the last significant (more than 0.05 inch) precipitation event; at these sample locations soil profiles were not fully described.

Wetland hydrology was determined by the presence or absence of primary and secondary indicators, such as surface water and drainage patterns, respectively. A data point was considered to be potentially within a jurisdictional wetland if the area met the criteria for all three factors.

The lateral limits of USACE jurisdiction (i.e., width) for non-wetland waters or "other waters" were determined by the presence of physical characteristics indicative of the OHWM. The OHWM was identified in accordance with the methodologies presented in the aforementioned federal regulations, guidance letter, and technical publications.

CDFW and RWQCB jurisdictional limits were delineated at the top-of-bank or to the outer drip-line of associated riparian vegetation, when present.

All wetlands, other waters and riparian habitats were mapped using a Trimble® 7X Global Positioning System (GPS) unit, with the exception of some dense areas of vegetation and when sufficient GPS signals were unavailable, and where thick mud in the lake bed precluded direct survey. In those instances, a range finder and measure tapes were used to assist in collecting measurements, and other waters and riparian habitats were hand drawn onto aerial imagery depicting the sites. ArcGIS was then used to digitize and calculate the approximate acreages and/or linear feet of jurisdictional wetlands, other waters and riparian habitats. Data for potential jurisdictional areas were entered on standardized datasheets, which are presented in Appendix B.

3.0 DELINEATION RESULTS

A description of the major vegetation units observed, soil types encountered, and a discussion of local hydrology in the survey area are presented below. Nine wetland determination sampling points were assessed and four OHWM data points were collected within drainage features in the Study Area. The results of collected data are summarized in Tables 1 and 2, Section 3.2. Data from these sample points were entered on standardized Wetland Determination Data Forms for wetland determination points, and on Ordinary High Water Mark Data Forms for other waters. Data sheets are presented in Appendix B.

3.1 ENVIRONMENTAL SETTING

The Study Area is focused around Laguna Lake and its inlet and outlet along Prefumo Creek. As noted in Section 1, the Study Area also consists of portions of Laguna Lake Park, including the LLNR. Topography is gentle, though steeper hills are present on both sides of the Study Area. Elevations range from approximately 120 feet above mean sea level (msl) at the lower edge of the Prefumo Creek outlet reach, to approximately 150 feet above msl on upper slopes.

Surrounding hillsides are predominantly serpentine-influenced, and serpentine outcrops are present in the LLNR outside but close to the Study Area. Seeps are prominent on benches and slopes in the LLNR outside the Study Area, draining through ephemeral drainages toward the lake. These drainages do not have continuous bed and bank, but rather consist of segments of

defined channel, hydrologically connected by sheet flow in areas without a well-defined bed and bank. Hillsides west of the Study Area in the Irish Hills also include serpentine outcrops, and serpentine chemistry and weathering influences soil conditions in the Study Area.

A large portion of the Study Area is actively managed for recreational use. Existing roads, trails, parking areas, picnic areas, play structures, restrooms, and landscaping are present. Groves of planted trees are common, and range in age from trees planted within the last five years, to well-established mature trees several decades old. A disc golf course is present in semi-natural grasslands that are mowed periodically but still contain some native vegetation. A portion of the LLNR, which is managed for native vegetation, including several rare plants and wetlands, is also present. Laguna Lake itself is used recreationally by fishermen, boaters, and birdwatchers. Note that the Study Area includes only a portion of the lake and associated wetlands; open water and extensive emergent wetlands are present north and west of the Study Area reviewed for this report.

The San Luis Obispo region has a Mediterranean climate, with mild, wet winters and warm, dry summers. The USDA WETS table (30-year climate summary for wetland delineations; USDA, 2016) reports typical summertime highs in the 80s with wintertime temperatures generally in the low 40s. Average annual precipitation is reported in the City of San Luis Obispo at Cal Poly, the nearest climate station, as approximately 17.79 inches, most of which falls between November and April. Total precipitation for the current year was near average at the time of the field survey, though the previous three years were well below average.

3.1.1 Vegetation /Land Cover Types

Vegetation classifications are based on the classification systems provided in *A Manual of California Vegetation, Second Edition* (Sawyer et al., 2009) and *Preliminary Descriptions of the Terrestrial Communities of California* (Holland, 1986); but have been modified to reflect the existing site conditions. Aquatic habitats, particularly open water in the lake, and sparsely vegetated areas of the seasonal stream, are also included in the land cover description. Eight vegetation communities and habitat types were observed within the Study Area during the field surveys:

- Non-native annual grasslands
- Needlegrass grassland
- Developed and landscaped areas
- Planted tree groves
- Freshwater wetlands
- Willow and mixed riparian
- Open water (lake) habitat
- Seasonal stream beds

The eastern portion of the Study Area is primarily upland vegetation, consisting of annual grasslands, needlegrass grasslands, developed and landscaped areas, and planted tree groves. The western portion of the Study Area is predominantly occupied by open water of Laguna Lake, its adjacent wetland fringe, and riparian vegetation associated with Prefumo Creek.

Non-Native Annual Grasslands

Non-native annual grasslands are common in upland portions of the Study Area. Composition and condition varies across the Study Area. Within the LLNR, although non-native grasses such as ryegrass (*Festuca perennis*) and oats (*Avena fatua; A. barbata*) are dominant, native herbs are also common and several native wildflowers are commonly observed in annual grassland, and occasional meadow barley (*Hordeum brachyantherum*), purple needlegrass (*Stipa pulchra*), and California oat grass (*Danthonia californica*) are present at very low cover. Some rare plants, including San Luis Obispo owl's clover (*Castilleja densiflora* ssp. *obispoensis*), Cambria morning glory (*Calystegia subacaulis* ssp. *episcopalis*), and Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*) occur in annual grasslands in the LLNR.

In other areas, the abundance and diversity of native herbs and grasses is lower, especially in grasslands south of the Study Area. These include recreational areas such as the dog park, disc golf course, and inter-canopy spaces between planted tree groves, and many of these areas are mowed periodically. Oats, ryegrass, ripgut brome (*Bromus diandrus*), and hare barley (*Hordeum murinum*) are dominant in these areas. Cambria morning glory also occurs in small patches within non-native annual grasslands.

These grasslands most closely resemble element #42200 Non-native grassland in the Holland system (Holland, 1986), and include areas consistent with the Annual Brome Grasslands, Perennial Rye Grass Grasslands, and Wild Oats Grasslands Semi-Natural Stands in the Manual of California Vegetation, Second Edition system (Sawyer et al., 2009).

Ephemeral drainages are present within annual grasslands in the eastern portion of the Study Area, in the LLNR. These features are fed by seeps and spring upslope of the Study Area. As noted previously, these drainage features are discontinuous, hydrologically connected by swales that lack a defined bed and bank, and by overland flow toward the lower-lying lake, during storm events. Vegetation in these features was not notably distinct from annual grasslands other than having lower density and total cover. Only those portions with discernible bed, bank, and OHWM indicators were mapped as drainages, following agency guidance on delineation of waterways.

Needlegrass Grasslands

Intermixed with non-native annual grassland communities are areas with native perennial bunchgrass, primarily purple needlegrass, consistently forming at least 10 percent cover. With the exception of purple needlegrass, the species composition of this vegetation community is similar to what was observed within the non-native annual grassland stands. Mapping of this habitat type was based on the presence of intact and readily visible purple needlegrass inflorescences and basal bunches over continuous areas summing to at least a quarter acre across one acre of land, compared with native grass species occurring at very low percentages in small areas as described with non-native annual grasslands. Current understanding of grassland types as summarized in the Manual of California Vegetation, Second Edition, defines purple needlegrass grassland as stands that have at least 10 percent relative cover of this species within the herbaceous vegetation layer (Sawyer et al., 2009). This habitat type most closely corresponds to Valley Needlegrass Grassland and Serpentine Bunchgrass Grassland in the

Holland (1986) classification system; current classification systems do not differentiate types based on substrate. These areas are Purple Needlegrass Grassland Alliance in the Manual of California Vegetation, Second Edition (Sawyer et al., 2009). This habitat type is recognized as a sensitive natural community by the CDFW (2010).

Developed and Landscaped Areas

Developed and landscaped areas include existing trails, roads, lawns, restroom facilities, parking areas, and maintained landscaping where a natural vegetation understory does not persist. Some habitat for nesting birds and other small- to medium-sized terrestrial wildlife persists in these areas, but habitat for native plants is limited to non-existent. This land cover type does not include areas where substantial naturalized vegetation persists.

Planted Groves

Planted groves range from recently planted saplings to mature, well established trees, and include a range of species, both native and introduced. These areas are differentiated from areas mapped as landscaped and developed by their relatively dense canopy spacing and differences in potential habitat provided for wildlife. Individual planted trees are also present in the Study Area but are generally not mapped separately from the habitat type in which they are planted. Planted trees include natives such as coast live oak (*Quercus agrifolia*), coast redwood (*Sequoia sempervirens*), and Monterey cypress (*Hesperocyparis macrocarpa*) as well as naturalized species including eucalyptus trees (*Eucalyptus* spp.) and horticultural selections such as Strawberry tree (*Arbutus* 'Marina'), pines (*Pinus* spp.), plum (*Prunus* sp.), and grevillea (*Grevillea* sp.). Planted tree groves are not typically classified in the Manual of California Vegetation, Second Edition (Sawyer et al., 2009). However, eucalyptus trees have become naturalized in California since eucalyptus trees were first introduced to the state in the mid to late 1800's, and stands dominated by these trees most closely correspond to Eucalyptus Groves, Semi-Natural Woodland Stands (Sawyer et al., 2009). Stands of eucalyptus habitat in a windrow configuration are present in the Study Area; these areas are dominated by mature eucalyptus trees and generally lack understory species. The remaining tree groves observed within the properties do not correspond to any of the recognized elements in the Holland (1986) classification system or the Manual of California Vegetation Second Edition (Sawyer et al., 2009).

Freshwater Wetlands

Freshwater wetlands in the Study Area include a wetland fringe in the shallows along the edge of Laguna Lake, wetlands in the bed of Prefumo Creek where wetland vegetation has recruited, and wetlands in depressions adjacent to Laguna Lake Park. Dominant vegetation varies by location and ranges from short annual and perennial herbs to tall tule and smartweed stands. Along the edges of Laguna Lake, California bulrush (*Schoenoplectus californicus*) is dominant in many areas. Smart weed (*Persicaria amphibia, P. lapathifolia)* is dominant in a depression adjacent to the lake and in some areas along the lake shore. Some additional wetland depressions support Mediterranean barley (*Hordeum marinum*), spikerush (*Eleocharis macrostachya*), rabbitsfoot grass (*Polypogon monspeliensis*), and Mexican rush (*Juncus mexicanus*). Mexican rush and spikerush are also dominant in some areas immediately adjacent to the lake. Within the bed of Prefumo Creek upstream of the lake, Mexican rush, spikerush, and umbrella sedge (*Cyperus eragrostis*) are dominant in some low gradient areas of the channel. Horsetail (*Equisetum hyemale*) and small-headed rush (*Scirpus microcarpus*) are also present where wetlands form a fringe along the channel edge. Within the freshwater wetlands category are vegetation units consistent

with California bulrush marsh, Smartweed/Cocklebur patches, Pale spikerush marshes, and Mexican Rush marsh herbaceous alliances in the Manual of California Vegetation, Second Edition (Sawyer et al., 2009). These alliances are consistent with Coastal and valley freshwater marsh, in the Holland classification (Holland, 1986).

Willow Riparian
Willow-dominated riparian scrub and riparian woodlands are present as patches along the margins of Laguna Lake, and as more extensive stands in the upper Prefumo Creek above the inlet to Laguna Lake. Arroyo willow (*Salix lasiolepis*) is predominant as a large shrub to small tree. Fremont cottonwood (*Populus fremontii*) trees are also present occasionally. Non-native weeping willow (*Salix babylonica*) trees are also present in riparian vegetation along Laguna Lake near its outlet. Understory vegetation varies with location; in some areas, the understory consists of freshwater wetland species, including spikerush, Mexican rush, and smartweed. In other locations farther from water, understory vegetation consists of upland annual grasses and weeds. Willow riparian vegetation units are consistent with Arroyo Willow Thickets Alliance in the Manual of California Vegetation, Second Edition (Sawyer et al., 2009) and Central Coast arroyo willow riparian forest in the Holland classification (Holland, 1986).

Open water (lake) habitat
Laguna Lake within the Study Area is primarily open water, forming shallow warm lake aquatic habitat. Vegetation around the margins is mapped with freshwater wetlands and riparian types. Laguna Lake occasionally dries up during periods of severe drought, as it did in 2015, but in most years, the lake contains water year-round. Laguna Lake provides suitable habitat for rare aquatic and semi-aquatic wildlife, including California red-legged frog (*Rana draytonii*), southwestern western pond turtle (*Actinemys pallida*), two-striped garter snake (*Thamnophis hammondii*), as well as other more common amphibians and reptiles. The lake is also suitable for some fish species, and connects upper and lower reaches of Prefumo Creek, which is designated as critical habitat for steelhead (*Oncorhynchus mykiss;* South Central DPS). Open water is not classified in the Manual of California Vegetation, Second Edition (Sawyer et al., 2009) or the Holland classification (Holland, 1986).

Seasonal stream beds
Some portions of Prefumo Creek are sparsely vegetated. Overhanging canopy from adjacent banks is present in some areas but the streambed lacks vegetation. The majority of these areas have sandy or gravelly substrates, and are typically below the ordinary high water mark of the channel. Sparsely vegetated streambeds are not classified in the Manual of California Vegetation, Second Edition (Sawyer et al., 2009) or the Holland classification (Holland, 1986).

3.1.2 Hydrology

Hydrology of the Study Area and vicinity was evaluated through review of topographic maps, aerial photos, the National Hydrography Dataset (USGS, 2016a), the USGS StreamStats tool, as well as a recent report prepared by CCSE that summarizes information on the hydrology of Laguna Lake. Several years of aerial imagery were evaluated, particularly dry season photos to investigate patterns of saturation and inundation.

The Study Area is in the northwestern portion of the Lower San Luis Obispo Creek Watershed (Hydrologic Unit Code 180600060702; USGS 2016). Surface waters within the Study Area, including Laguna Lake, are fed by streams and sheet flow. Two major creeks flow into Laguna Lake: Prefumo Creek flows through the Study Area into the lake from the west, and an unnamed creek with several tributary forks drains eastern Los Osos and O'Conner Valleys west of the study area, and several small unnamed ephemeral drainages flow toward the northeast side of Laguna Lake from the adjacent hills (Figure 3).

The unnamed creek that flows into Laguna Lake from further west collects water from several tributaries that drain the south slopes of Cerro Romauldo and Bishops Peak before flowing into the west end of Laguna Lake, outside the Study Area. Extensive herbaceous wetlands and some riparian scrub are present in the Los Osos Valley floor west of the Study Area.

Prefumo Creek drains the Irish Hills and enters Laguna Lake near the south shore. Prefumo Creek is intermittent with some perennial pools within the Study Area. A review of historic maps indicates that Prefumo Creek was rerouted several decades ago; prior to this modification, Prefumo Creek did not flow into Laguna Lake; rather, it entered San Luis Obispo Creek directly, downslope of Laguna Lake, and the outlet of Laguna Lake contributed additional water. Prefumo Creek is now routed through Laguna Lake through a culvert under Los Osos Valley Road, exiting the lake at a culvert under Madonna Road. Prefumo Creek joins San Luis Obispo Creek approximately 1.15 miles downstream of the Madonna Road culvert. San Luis Obispo Creek flows into the Pacific Ocean approximately 7.25 miles downstream of its confluence with Prefumo Creek.

Additionally, several small ephemeral, unnamed drainages flow through the hills that form the foothills to Cerro San Luis Obispo, north of the Study Area. These features ultimately contribute water to Laguna Lake through small channels, in grassy swales, and through sheet flow. As previously noted, many of these drainages have a well-defined bed and bank in the hills where topography is steep, but do not have continuous bed and bank throughout, dissipating as they reach the gentler topography adjacent to the lake. Segments of defined channel are interspersed with flat areas and grassy swales that are hydrologically connected by sheet flow in areas without a well-defined bed and bank.

Additionally, seeps supporting wetland vegetation are prominent on benches and slopes in the LLNR outside the Study Area, and water from these features also collects in drainages or sheet flows into the Study Area and ultimately to Laguna Lake. The USGS StreamStat tool estimates that the watershed draining through the Study Area is approximately 13.2 square miles in size (approximately 8,500 acres), calculated using the StreamStats tool for the outlet point in the Study Area, specifically the culvert at Madonna Road (USGS, 2016b).

3.1.3 Soils

Based on the *Soil Survey of San Luis Obispo County, California, Coastal Part* (United States Department of Agriculture, Soil Conservation Service, 1984), Soils Geographic Database and Web Soil Survey (USDA, 2016), the Study Area contains six soil map units: Concepcion loam, 5 to 9 percent slopes; Cropley clay, 0 to 2 percent slopes; Cropley Clay, 2 to 9 percent slopes;

Diablo clay, 5 to 9 percent slopes; Salinas silty clay loam, 0 to 2 percent slopes; and Water (United States Department of Agriculture, Natural Resources Conservation Service, 2016). These soil map units are depicted on Figure 4.

Concepcion loam, 5 to 9 percent slopes

Concepcion loam soils are moderately well drained, clay soils originating from alluvium derived from mixed rock sources with 5 to 9 percent slopes. Concepcion loam soils are typically used for grazing, production of dry farm grain or hay and for urban areas. A typical soil profile contains a very dark grayish brown (moist) sandy loam to a depth of 4 inches, very dark grayish brown sandy loam (moist) to a depth of 20 inches, dark gray (moist) sandy loam to a depth of 22 inches, dark grayish brown (moist) clay to a depth of 36 inches, grayish brown (moist) sandy clay loam to a depth of 51 inches, and light gray (moist) sandy loam to a depth of 64 inches. This soil map unit is not included on the *National Hydric Soils List* (United States Department of Agriculture, Natural Resources Conservation Service, 2015).

Cropley clay, 0 to 2 percent slopes

Cropley clay soils are moderately well drained, clay soils originating from alluvium derived from sedimentary rock with 0 to 2 percent slopes. Cropley soils are typically used for irrigated row and truck crops, irrigated and dry pasture, apricots, prunes and for urban development. Vegetation in uncultivated or undeveloped areas is annual grasses and forbs with some scattered live oak. A typical soil profile of Cropley clay contains a very dark gray (moist) clay to 2 inches deep, very dark gray (moist) to a depth of 32 inches, very dark grayish brown clay (moist) to a depth of 51 inches, with brown clay below to a depth of 66 inches. This soil map unit is not included on the *National Hydric Soils List* (United States Department of Agriculture, Natural Resources Conservation Service, 2015).

Cropley clay, 2 to 9 percent slopes

Cropley clay soils are moderately well drained, clay soils originating from alluvium derived from sedimentary rock with 2 to 9 percent slopes. Cropley soils are typically used for irrigated row and truck crops, irrigated and dry pasture, apricots, prunes and for urban development. Vegetation in uncultivated or undeveloped areas is annual grasses and forbs with some scattered live oak. A typical soil profile of Cropley clay contains a very dark gray (moist) clay to 2 inches deep, very dark gray (moist) to a depth of 32 inches, very dark grayish brown clay (moist) to a depth of 51 inches, with brown clay below to a depth of 66 inches. This soil map unit is not included on the *National Hydric Soils List* (United States Department of Agriculture, Natural Resources Conservation Service, 2015).

Imagery provided by ESRI and its licensors © 2016.
Additional data provided by SSURGO 2014.

USDA Soil Map Units

Figure 4

Diablo clay, 5 to 9 percent slopes

Diablo clay soils are well drained soils that formed in material weathered from calcareous sandstone and shale. Diablo clay soils are used mainly for grazing and for production of dry farmed grain, mainly barley. A typical soil profile contains dark gray clay (moist) to a depth of five inches, with very dark gray clay to a depth of 36 inches, and light olive brown clay to a depth of 50 inches, and pale yellow calcareous soft weathered sandstone to a depth of at least 50 inches. This soil map unit is not included on the *National Hydric Soils List* (United States Department of Agriculture, Natural Resources Conservation Service, 2015).

Salinas silty clay loam, 0 to 2 percent slopes

Salinas silty clay loam soils are well drained soils that formed in alluvium weathered from sandstone and shale. Salinas silty clay loam soils are used mainly for growing irrigated truck, field, and forage crops. A typical soil profile contains a black (moist) clay loam to a depth of 5 inches, very dark gray clay loam (moist or dry) to a depth of 13 inches, very dark gray clay loam (moist or dry) to a depth of 23 inches, dark grayish brown (moist) loam to a depth of 33 inches, very dark grayish brown (moist) sandy loam to a depth of 40 inches, olive brown (moist) sandy loam to a depth of 49 inches, and light olive brown (moist) sandy loam to a depth of 75 inches. This soil map unit is included on the *National Hydric Soils List*; an unnamed component occupying an estimated one percent of the soil map unit is listed as hydric (United States Department of Agriculture, Natural Resources Conservation Service, 2015).

Water

The soil survey identifies areas of open water including Laguna Lake, a large portion of the Study Area. Water levels can fluctuate over the course of a season and from year to year.

Site-Specific Observations

These soil units are from the USDA NRCS Soil Survey of San Luis Obispo County, California, Coastal Part, which was conducted on a broader scale than this study and did not necessarily include onsite observations within the jurisdictional delineation Study Area. The physical characteristics of each soil unit, as described above, are general and not necessarily indicative of characteristics actually present on the property. During our field work, we noted that the majority of native soils in the eastern Study Area had a very dark, heavy clay surface horizon. Soils in the bed of Prefumo Creek, in contrast, had layers of sand and gravel, and the clay texture was not predominant. On the banks of Prefumo Creek, some sandy areas were evident. Recently deposited gravel and sand were also noted in Prefumo Creek; these deposits are typically minimally developed.

3.2 SAMPLE POINTS

Wetland determination data were collected at several representative locations in a variety of vegetation types with at least some hydrophytic component. A comparison upland site was also evaluated. At several locations, direct observation of current inundation or saturation of soil at

shallow depths supported our assumption of hydric soils, and in these locations soils were not fully described. Areas known to support rare plants were not sampled excessively to minimize soil disturbance. Mapping of wetland boundaries was extrapolated from findings in representative sample sites. A summary of wetland determination data points is provided in Table 1.

Additionally, where hydrophytic vegetation was absent but indicators of surface hydrology were observed, features were evaluated to determine if other waters were present. Representative OHWM data sheets were filled out and results are summarized in Table 2.

Table 1: Summary of Vegetation, Soils, and Hydrology Wetlands Indicator Status at Wetland Determination Data Points

Sampling Point ID	Vegetation Characteristics	Soils Indicators	Hydrology Indicators	Determination	Comments
WD1	**Hydrophytic vegetation – Dominance Test is >50%.** <u>Herb Stratum</u> *Persicaria amphibia* (OBL) – 20% Cover *Persicaria lapathifolia* (FACW) – 40% Cover *Schoenoplectus californicus* (OBL) – *10% Cover*	**Hydric Soil (F6 and more)** 10YR 2/1 matrix to 20+"depth 2- 5% Redox concentrations starting within 5 inches of surface – 7.5YR 4/3 Clay soil	**Wetland Hydrology** C3 B10 C9 D5	Wetland	Adjacent to Laguna Lake, a relatively permanent water
WD2	**Upland vegetation** <u>Herb Stratum</u> *Foeniculum vulgare* (UPL) – 5% *Bromus diandrus* (UPL) – 20% *Brassica nigra* (UPL) – 5% *Hordeum murinum* (FACU) - 35% *Rumex crispus* (FAC) – 5% *Lolium perenne* (FAC) – 15% *Hordeum brachyantherum* (FACW) – 15% cover	**None.** 10 YR 3/1 clay (0-3") 7.5 YR 2.5/1 clay 7.5 YR 2.5/1 gravelly clay No redox features.	**None.**	Upland	Comparison pit – nearby and adjacent to site WD-1. Representative conditions of typical upland herbaceous vegetation in naturally vegetated portions of the Study Area
WD3	**Hydrophytic vegetation – Dominance Test is >50%.** <u>Herb Stratum</u> *Persicaria lapathifolia* (FACW) – 60% Cover *Schoenoplectus californicus* (OBL) – 2% Cover *Juncus mexicanus* (FACW) – 10% Cover *Potentilla anserina* (OBL) – 3 % Cover	**Hydric Soil (F6)** 10YR 3/2 matrix in upper 8 inches 5% Redox concentrations starting within 5 inches of surface – 7.5YR 4/6 Clay loam soil with gravel	**Wetland Hydrology** A3 B10 C9	Wetland	Riparian canopy partly shades wetland area. Wetland is at low point along edge of lake.

Sampling Point ID	Vegetation Characteristics	Soils Indicators	Hydrology Indicators	Determination	Comments
WD4	**Hydrophytic vegetation – Dominance Test is >50%.** <u>Herb Stratum</u> *Persicaria lapathifolia* (FACW) – 10% Cover *Schoenoplectus californicus* (OBL) – 25% Cover *Polypogon interruptus* (FACW) – 5% Cover *Cyperus eragrostis* (FACW) – 10 % Cover	**Hydric Soil** Assumed – direct observation of saturation more than 14 days of a measurable storm. Redox concentrations and reduced matrix also noted to surface.	**Wetland Hydrology** A3 B10 C9	Wetland	Just above culvert under Madonna Road. Wetland vegetation is likely scoured away during high water events, but drought in recent years has allowed vegetation to establish in areas that are likely scoured during normal precipitation years.
WD5	**Hydrophytic vegetation – Dominance Test is >50%.** <u>Herb Stratum</u> *Persicaria lapathifolia* (FACW) – 20% Cover *Schoenoplectus californicus* (OBL) – 40% Cover	**Problematic Soils** This sample point is in a location that is maintained for sediment and vegetation. Substrates are gravel and sand deposits and lack well developed soil features. Due to presence of hydrophytic vegetation and wetland hydrology, hydric soils were assumed at this location.	**Wetland Hydrology** Low areas within channel bed: B1 B2	Wetland	Other areas of the streambed lack hydrophytic vegetation and instead support Bermuda grass, bromes, and other weedy species
WD6	**Hydrophytic vegetation – Dominance Test is >50%.** <u>Herb Stratum</u> *Persicaria lapathifolia* (FACW) – 45% Cover *Schoenoplectus californicus* (OBL) – 5% Cover *Cyperus eragrostis* (FACW) – 5% Cover	**Problematic Soils** This sample point is in a location that is maintained for sediment and vegetation. Substrates are gravel and sand deposits and lack well developed soil features. Due to presence of hydrophytic vegetation and wetland hydrology, hydric soils were assumed at this location.	**Wetland Hydrology** Low areas within channel bed: B1 B2	Wetland	Other areas of the streambed lack hydrophytic vegetation and instead support Bermuda grass, bromes, and other weedy species

Sampling Point ID	Vegetation Characteristics	Soils Indicators	Hydrology Indicators	Determination	Comments
WD7	**Hydrophytic vegetation – Dominance Test is >50%.** <u>Tree Stratum</u> *Salix lasiolepis* (FACW) – 10% Cover <u>Herb Stratum</u> *Juncus patens* (FACW) – 5% Cover *Juncus phaeocephalus* (FACW) – 15% Cover *Cyperus eragrostis* (FACW) – 10% Cover *Eleocharis palustris [=E. macrostachya]* (OBL) – 15% Cover *Lolium perenne* (FAC) – 5 percent cover	**Hydric Soil** Assumed – direct observation of saturation near surface more than 14 days of a measurable storm.	**Wetland Hydrology** A3 B9 B1, B2	Wetland	Large quantities of organic matter intermixed into top layer of soil, not well decomposed but water stained. Soil feels "Spongy".
WD8	**Unvegetated**	**Hydric Soil** Assumed – direct observation of saturation near surface more than 14 days of a measurable storm.	**Wetland Hydrology** A3 B9 B1, B2	Other Waters	In channel bed; no wetland vegetation immediately adjacent to areas at similar landscape position with that currently support wetland vegetation.
WD9	**Hydrophytic vegetation – Dominance Test is >50%.** <u>Herb Stratum</u> *Juncus phaeocephalus* (FACW) – 15% Cover *Cyperus eragrostis* (FACW) – 10% Cover *Eleocharis palustris [=E. macrostachya]* (OBL) – 15% Cover *Juncus mexicanus* (FACW) – 10% Cover *Potentilla anserina* (OBL) – 3 % Cover	**Hydric Soil** Assumed – direct observation of saturation near surface more than 14 days of a measurable storm.	**Wetland Hydrology** A3 B1, B2 C9	Wetland	Abutting Laguna Lake.

Table 2: Summary of OHWM Indicators by Data Point

Sampling Point ID	OHWM Width	Description of Features	Determination	Comments
OHWM 1	45 ft.	Maintained channel with recent gravel and sand deposits, just downstream of the triple box culvert under Madonna Road	Waters of the U.S and State. Top of Bank also mapped	Two patches of wetland vegetation were observed and evaluated within the OHWM.
OHWM 2	40 ft.	The channel bed well defined and soils are saturated to near the surface. Bank edges are cut and well defined. Downstream of this point, wetland vegetation is dominant in bed of channel; upstream vegetation is absent.	Waters of the U.S and State. Edge of Riparian/ Top of Bank also mapped	Data points OHWM 2, 3, and 4 are in upper Prefumo Creek and represent typical variation in the dimensions and characteristics of this reach of the creek.
OHWM 3	20 ft.	This point is representative of narrower but deeper areas of the reach. Willow canopy is present on banks, and a well defined OHWM is present	Waters of the U.S and State. Edge of Riparian/ Top of Bank also mapped	
OHWM 4	18 ft.	At this point, wetland vegetation is not present downstream. Standing water was observed in small pools. Cut banks and well defined channel bed are present.	Waters of the U.S and State. Edge of Riparian/ Top of Bank also mapped	
OHWM 5	5 ft.	Cut banks and much reduced vegetation cover are present in this ephemeral feature. Shelving and sediment deposits were noted. This feature is well defined upstream but has less defined bed and banks downstream; connection to Laguna Lake is through swales and sheet flow where the defined channel is interrupted.	Waters of the U.S and State. Top of Bank also mapped	This channel is discontinuous downstream of the mapped segment, but is hydrologically connected by sheet flow and through grassy swales. Similar features were mapped following the same process

4.0 ASSESSMENT OF JURISDICTIONAL WATERS AND WETLANDS

Based upon the analysis of Rincon's jurisdictional delineation, there are wetlands and other waters of the U.S. considered to be subject to USACE and RWQCB jurisdictions in the Study Area. In addition, streambeds and riparian habitats subject to CDFW and RWQCB jurisdiction were also identified. Note the final jurisdictional determinations of the boundaries of wetlands, waters, and riparian habitat are made by each agency, typically at the time that authorizations to impact such features are requested. Table 3, below, summarizes the total acreage of jurisdictional waters, wetlands, streambeds, lakes, and riparian areas onsite per regulation. Figure 5 depicts the location and extent of USACE, RWQCB, and CDFW jurisdiction within the Study Area, and Figure 6 illustrates downstream connection to the Pacific Ocean, a Traditional Navigable Water.

Table 3 - Summary of Potentially Jurisdictional Wetlands, Waters and Riparian Habitats

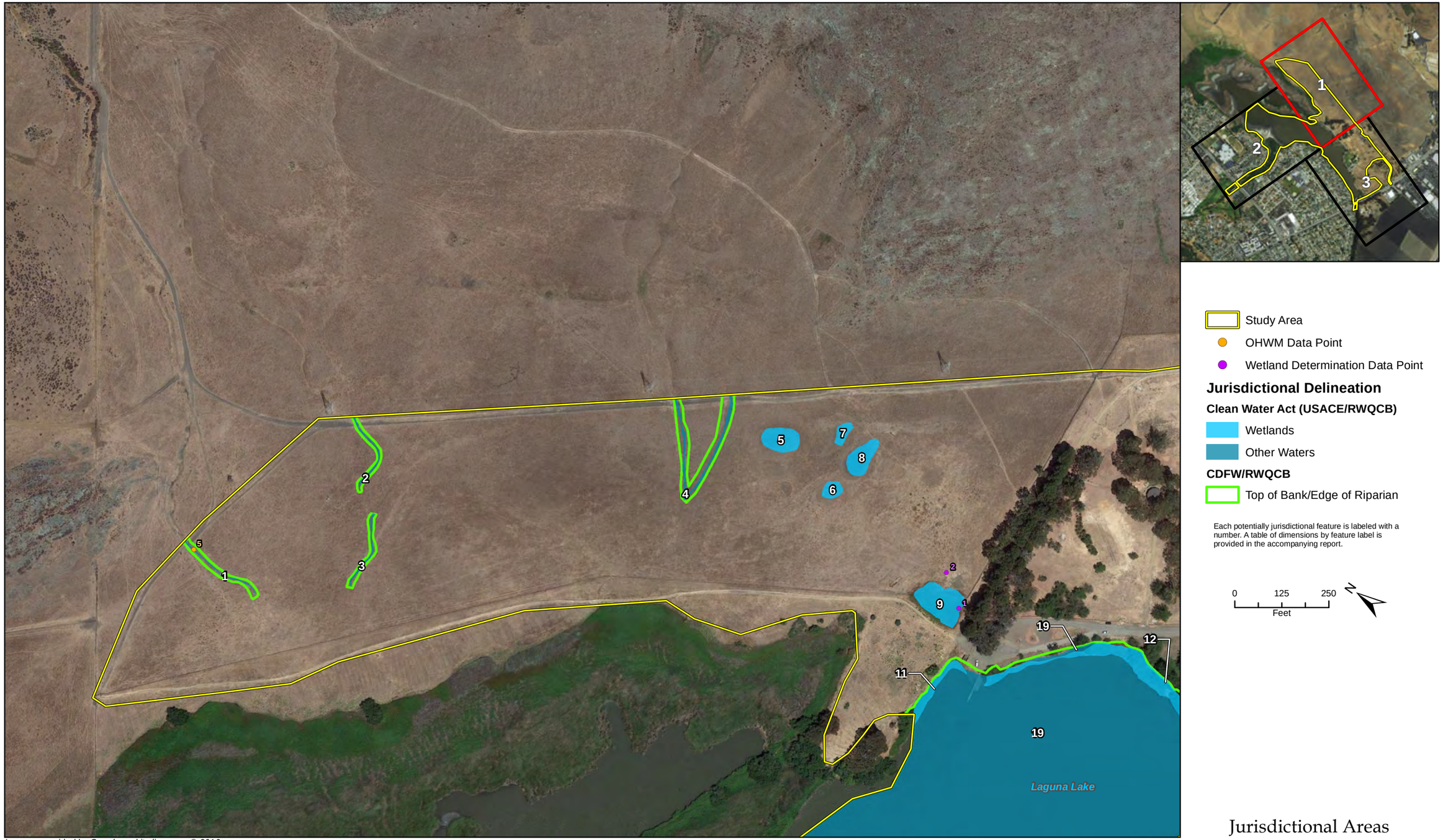
Jurisdictional Type	Jurisdictional Area
Clean Water Act Section 404/401 Jurisdiction	
Other Waters below OHWM	56.77 acres 7,331 linear feet
Wetlands to edge of wetland (linear feet provided for wetland waters only; no length measurement for adjacent wetlands)	4.72 acres 427 linear feet
Total	61.49 acres 7,758 linear feet
CDFW 1602 and RWQCB Porter-Cologne Jurisdiction[1]	
Streambeds/Lakes below top of bank or to edge of riparian	65.89 Acres 7,758 linear feet
Total	65.89 Acres 7,758 linear feet

[1] No isolated wetlands or waters are present, thus CDFW 1602 and RWQCB Porter-Cologne jurisdictions are the same for this project, according to recent RWQCB guidance for the Central Coast Region.

A table of dimensions for each feature mapped as potential jurisdictional under Clean Water Act Section 404 and 401 is presented as Appendix D. This table identifies each mapped feature, dimensions, and other pertinent characteristics.

4.1 USACE AND RWQCB JURISDICTION

Prefumo Creek, Laguna Lake, and the unnamed ephemeral stream channels within the Study Area are considered waters of the U.S. under Clean Water Act Sections 404 and 401, and are subject to USACE and RWQCB jurisdictions. Portions of these features contain wetland vegetation, hydric soils, and wetland hydrology, and other areas are considered other waters. OHWM physical characteristics or indicators documented include a break in bank slope, benches, surface relief, change in vegetation cover, and the presence of bed and bank. Prefumo



Imagery provided by Google and its licensors © 2016.

Jurisdictional Areas

Figure 5a

Imagery provided by Google and its licensors © 2016.

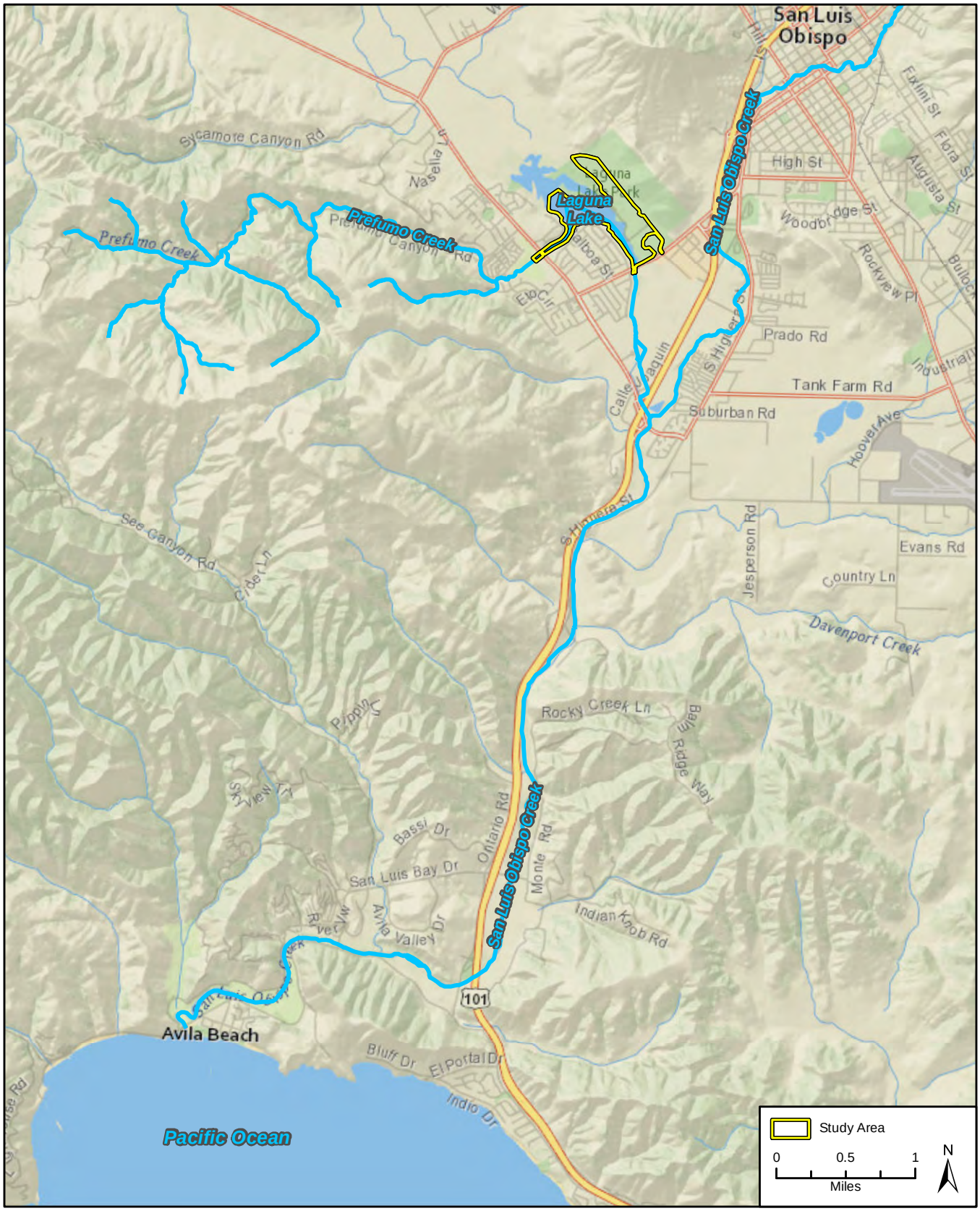
Jurisdictional Areas

Figure 5b

Imagery provided by Google and its licensors © 2016.

Jurisdictional Areas

Figure 5c



Imagery provided by ESRI and its licensors © 2016.

Downstream Connection to
Traditional Navigable Waters

Figure 6

Creek is intermittent, with perennial pools in most years, and Laguna Lake is perennial except during extreme drought, and thus these features are considered Relatively Permanent Waters (RPWs). Wetlands in the channel and lake edge below OHWM, and wetlands adjacent to Laguna Lake are likely under jurisdiction of the USACE.

Ephemeral drainages were also mapped in the Study Area and these ephemeral drainages likely only flow during and immediately after rain events. The ephemeral drainages and wetland depressions are hydrologically connected by sheet flow and through grassy swales, ultimately contributing water into Laguna Lake a few hundred feet away. As previously noted, Prefumo Creek flows into San Luis Obispo Creek which has direct connectivity to the Pacific Ocean, a Traditional Navigable Water (TNW) under the jurisdiction of the USACE/RWQCB. Therefore, these ephemeral features are mostly likely to be determined to be jurisdictional by the USACE/RWQCB through the significant nexus analysis discussed below.

4.1.1 Significant Nexus Evaluation

A significant nexus evaluation of the ephemeral drainages in the northeastern study area was performed to determine USACE jurisdiction (see Appendix A for further discussion) of these non-RPWs. The significant nexus evaluation considered hydrological and ecological factors associated with the drainages.

Hydrological Factors

The unnamed ephemeral drainages (Features 1, 2, 3, 4 and 10 on Figure 5) convey surface flows during and following storm events, and also hold small pools of standing water periodically during the rainy season. The drainages contain physical characteristics of flow, including channel incision, scouring, and changes in vegetation density. Sediment deposition and shelving along banks was evident in some portions of the drainages, indicating that surface flows are conveyed at certain times of the year. These ephemeral drainages contribute water to Laguna Lake and Prefumo Creek approximately 300 feet downstream.

Ecological Factors

The LLNR, through which these ephemeral drainages flow, supports a number of special status plants, including federally listed Chorro Creek bog thistle (*Cirsium fontinale* ssp. *obispoensis*), state-listed adobe sanicle (*Sanicula maritima*), and California Rare Plant Ranked (CRPR) Congdon's tarplant, all of which occur in wet habitats in serpentine-influenced soils, as well as several additional CRPR plant species such as Cambria morning glory, San Luis Obispo owls' clover, Brewer's spineflower (*Chorizanthe breweri*), San Luis Obispo star tulip (*Calochortus obispoensis*), and others.

Prefumo Creek, including the segment through Laguna Lake, is designated as critical habitat for steelhead, South-Central California Coast DPS. High quality cold water is a key component of steelhead habitat.

The State Water Resources Control Board has listed Prefumo Creek, including the segment flowing through Laguna Lake, as an impaired waterbody under section 303 (d) of the Clean Water Act. This segment is listed for fecal coliform, nitrates, turbidity, and low dissolved oxygen, as Category 5 (a water segment where standards are not met and a TMDL is required, but not yet completed, for at least one of the pollutants being listed for this segment). The USGS StreamStat tool and a topographic analysis of contributing watersheds above the features draining directly to Laguna Lake estimates over 250 acres of contributing upstream watershed. Water from the hillsides in the LLNR and upstream areas flows directly into designated critical habitat for steelhead, and there is potential for these drainages to transport sediment and pollutants downstream. Water from this subwatershed also helps support wetlands and riparian areas adjacent to and abutting Laguna Lake's north east side. Wetlands provide habitat for common and rare wildlife and native plants within the Study Area and perform important filtering and nutrient cycling functions.

Significant Nexus Determination

The unnamed ephemeral drainages have physical evidence of flow that is likely significant during storm events, have the capacity to transport pollutants and sediment, and contribute water that supports wetlands and stands of riparian vegetation downslope adjacent to Laguna Lake. These features also have the potential to transport sediment and pollutants into Laguna Lake and Prefumo Creek, potentially influencing water quality in designated critical habitat for steelhead. Given these factors it is reasonable to conclude that these drainages have a significant nexus with a TNW, and are thereby jurisdictional.

Note that the USACE and U.S. Environmental Protection Agency (USEPA) make the final significant nexus determination.

4.2 CDFW AND PORTER-COLOGNE ACT (TOP OF BANK/EDGE OF RIPARIAN) JURISDICTION

Laguna Lake, Prefumo Creek, and the adjacent ephemeral drainages contain approximately 65.89 acres of lake and streambed (below top of bank) and associated riparian habitat, subject to the jurisdiction of CDFW. The RWQCB has recently indicated that under Porter-Cologne, they also consider these areas above OHWM to be under state jurisdiction. Within ephemeral drainages average width of bank to bank is approximately 10 to 15 feet. Within Prefumo Creek above Laguna Lake, width of riparian habitat ranges from approximately 75 to 150 feet wide. Below Laguna Lake, bank to bank width of Prefumo Creek is approximately 65 feet. The width of Laguna Lake varies with location, varying between approximately 250 and 900 feet within the Study Area portion.

5.0 LIMITATIONS, ASSUMPTIONS AND USER RELIANCE

We note that based on discussions with Central Coast RWQCB staff there may be differing interpretations of the RWQCB's jurisdictional reach under Section 401 of the CWA and Porter-Cologne. Based on federal and state law and regulations, the Central Coast RWQCB's jurisdiction should be delineated at the OHWM. However, it has been clearly conveyed to us

that the Central Coast RWQCB's interpretation of Porter-Cologne (i.e., Waters of the State) is that the RWQCB's jurisdictional limits extend to the top of bank or edge of riparian area, if present. This is, in our experience, inconsistent with previous policy. The *Preliminary Draft Water Quality Control Policy for Wetland Area Protection and Dredged or Fill Permitting* (State Water Resources Control Board, 2013) does not contain any language specific to the limits of jurisdiction extending to the top of bank or edge of riparian area. We understand that in connection with this project, these differing approaches would not change the permit fees, required mitigation, or the overall analysis.

6.0 REFERENCES

Baldwin B. G., Goldman, D. H., Keil D. J., Patterson R., Rosatti T. J. (editors). 2012. *The Jepson Manual: Vascular Plants of California, Second Edition, Thoroughly Revised and Expanded*. University of California Press. Berkeley, California.

California Department of Fish and Wildlife. 2010. *List of Vegetation Alliances and Associations.* Vegetation Classification and Mapping Program, Sacramento, CA. September 2010.

California, State of. As Amended. *Fish and Game Code*. http://www.leginfo.ca.gov/calaw.html

Central Coast Salmon Enhancement. 2014. A Review of Hydrology, Sedimentation, and Water Quality Issues for Laguna Lake, San Luis Obispo. Appendix F of the Laguna Lake Natural Reserve Conservation Plan.

City of San Luis Obispo. 2015. Laguna Lake Natural Reserve Conservation Plan. Final Approved Plan.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. U.S. Army Engineers Waterways Experiment Station. Vicksburg, Mississippi.

Google Earth. 2014. Available at: http://earth.google.com/

Holland, R.F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. California Department of Fish and Wildlife. Sacramento, California.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. The National Wetland Plant List: 2016 wetland ratings. Phytoneuron 2016-30: 1–17. Published 28 April 2016.

Munsell® Color. 2000. *Munsell® Soil Color Charts*. New York.

Sawyer, J., Keeler-Wolf, T., and J. Evens. 2009. *A Manual of California Vegetation*, 2nd Edition. California Native Plant Society Press. Sacramento, California

State Water Resources Control Board. 2013. Preliminary Draft Water Quality Control Policy for Wetland Area Protection and Dredged or Fill Permitting. Available online at http://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/wrapp/policy_draft.pdf

United States Army Corps of Engineers. 2001. *Final Summary Report: Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest*. U.S. Army Corps of Engineers. San Francisco, California.

United States Army Corps of Engineers. 2004. *Review of Ordinary High Water Mark Indicators for Delineating Arid Streams in the Southwest United States*. Technical Report ERDC TR-04-1.

U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory. Hanover, New Hampshire.

United States Army Corps of Engineers. 2005. *Regulatory Guidance Letter No. 05-05: Ordinary High Water Mark Identification*. U.S. Army Corps of Engineers. Washington, D.C.

United States Army Corps of Engineers. 2006. *Distribution of Ordinary High Water Mark (OHWM) Indicators and Their Reliability in Identifying the Limits of "Waters of the United States" in Arid Southwest Channels*. Technical Report ERDC/CRREL TR-06-5. U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory. Hanover, New Hampshire.

United States Army Corps of Engineers. 2008a. Regional *Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0).* Technical Report ERDC/EL TR-08-28. U.S. Army Engineer Research and Development Center. Vicksburg, Mississippi.

United States Army Corps of Engineers. 2008b. A *Field Guide to the Identification of the Ordinary High Water mark (OHWM) in the Arid West Region of the Western United States.* Technical Report ERDC/CRREL TR-08-12. U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory. Hanover, New Hampshire.

United States Army Corps of Engineers. 2010. *Updated Datasheet for the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States*. Technical Report ERDC/CRREL TN-10-1. U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory. Hanover, New Hampshire.

United States Army Corps of Engineers. 2016. National Wetland Plant List. Website. Available at: http://rsgisias.crrel.usace.army.mil/NWPL/

United States Department of Agricultural, Natural Resources Conservation Service. 2016a. Web Soil Survey: San Luis Obispo County, California, Coastal Part Soil Survey Area. Available at: http://websoilsurvey.nrcs.usda.gov/app/. Accessed April 14, 2016.

United States Department of Agricultural, Natural Resources Conservation Service. 2016b. WETS Table: San Luis Obispo. Accessed April 14, 2016. San Luis Obispo County.

United States Department of Agriculture, Natural Resources Conservation Service. 2015. National Hydric Soils List. National Cooperative Soil Survey, U.S. Department of Agriculture. Available online at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/. December.

United States Department of Agriculture, Soil Conservation Service. 1984. Soil Survey of San Luis Obispo County, California, Coastal Part.

United States Fish and Wildlife Service. 2016b. *National Wetland Inventory.* Available at: http://www.fws.gov/wetlands/Data/Mapper.html.

United States Geological Survey. 2016a. National Hydrography Dataset. Accessed through the National Map at http://viewer.nationalmap.gov/viewer/

United States Geological Survey. 2016b. StreamStats Tool for California. http://water.usgs.gov/osw/streamstats/.

Appendix A

Regulatory Overview and Definitions

USACE JURISDICTION

The USACE, under provisions of Section 404 of the Clean Water Act and USACE implementing regulations, has jurisdiction over the "waters of the United States." "Waters" include all waters subject to the ebb and flow of the tide, all interstate waters, all other waters (intrastate lakes, rivers, streams, mudflats, sandflats, playa lakes, natural ponds, seasonal drainage channels, etc.), all impoundments of waters otherwise defined as waters of the U.S., tributaries of waters otherwise defined as waters of the U.S., territorial seas, and wetlands adjacent to waters of the U.S. USACE jurisdictional limits are typically identified by the presence of an Ordinary High Water Mark (OHWM). The OHWM is the line on the shore or banks of a water course established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area. The USACE defines wetlands as containing three parameters: hydrophytic vegetation, hydric soils, and wetland hydrology.

Areas not considered to be jurisdictional waters include non-tidal drainage and irrigation ditches excavated on dry land, artificially-irrigated areas, artificial lakes or ponds excavated on dry land used for irrigation or stock watering, small artificial water bodies such as swimming pools, and water filled depressions (51 Fed. Reg. 41, 217 1986). In addition, a Supreme Court ruling (Solid Waste Agency of Northern Cook Counties [SWANCC] vs. USACE, January 9, 2001) determined that the USACE exceeded its statutory authority by asserting Clean Water Act jurisdiction over "an abandoned sand and gravel pit in northern Illinois, which provides habitat for migratory birds." Based solely on the use of such waters by migratory birds, the Supreme Court's holding was strictly limited to waters that are "non-navigable, isolated, and intrastate."

The Supreme Court further addressed the extent of the USACE jurisdiction in Rapanos v. U.S. (June 19, 2006). There, a sharply divided Court issued multiple opinions, none of which garnered the support of a majority of Justices. This created substantial uncertainty as to which jurisdictional test should be used. The Ninth Circuit Court of Appeal, which encompasses California, answered this in Northern California River Watch v. City of Healdsburg (August 11, 2006). There, the Court held that Justice Kennedy's opinion in Rapanos provides the controlling rule of law. Under that rule, wetlands or other waters which are not navigable in fact are subject to USACE jurisdiction if they have a "significant nexus" to a navigable-in-fact waterway. As Justice Kennedy explained, whether a significant nexus exists in any given situation will have to be decided on a case-by-case basis, depending on site-specific circumstances.

USACE Headquarters in Washington, D.C. issued substantive guidance on June 5, 2007, to its District Offices as to how to apply these rulings. Based on this guidance, additional quantitative, qualitative, and other physical data is required for the USACE to make a determination of jurisdictional authority. This determination is reviewed by the United States Environmental Protection Agency (USEPA).

In accordance with the Rapanos guidance, the USACE will assert jurisdiction over traditional navigable waters (TNWs), non-navigable tributaries of TNWs that are relatively permanent waters (RPWs), and wetlands that directly abut such tributaries. TNWs include all of the

"navigable waters of the U.S.," defined in 33 CFR Part 329 and by pertinent federal court decisions. RPWs convey water flow seasonally, typically for at least 3 months. In addition, non-navigable tributaries that are not relatively permanent (non-RPWs), wetlands adjacent to non-RPWs, and wetlands adjacent to but that do not directly abut a TNW will be found jurisdictional based on a fact-specific analysis that they have a significant nexus with a TNW. The significant nexus evaluation considers the volume, duration, and frequency of water flow in the tributary and the proximity of the tributary to a TNW, as well as the hydrologic, ecologic, and other functions performed by the tributary and all of its adjacent wetlands.

WETLANDS

The USACE defines wetlands as containing three parameters: hydrophytic vegetation, hydric soils, and wetland hydrology. The following is a discussion of each of these parameters.

HYDROPHYTIC VEGETATION

Hydrophytic vegetation dominates areas where frequency and duration of inundation or soil saturation exerts a controlling influence on the plant species present. Plant species are assigned wetland indicator status according to the probability of their occurring in wetlands. More than fifty percent of the dominant plant species must have a wetland indicator status to meet the hydrophytic vegetation criterion. The USACE maintains the National Wetland Plant List and associated website (Lichvar, 2016; USACE; 2016), which separates vascular plants into the following five basic categories based on plant species frequency of occurrence in wetlands:

- Obligate Wetland (OBL). Occur almost always under natural conditions in wetlands.
- Facultative Wetland (FACW). Usually occur in wetlands but occasionally found in non-wetlands.
- Facultative (FAC). Equally likely to occur in wetlands or non-wetlands.
- Facultative Upland (FACU). Usually occur in non-wetlands but occasionally found in wetlands.
- Obligate Upland (UPL). May occur in wetlands in another region, but almost never occur in wetlands under natural conditions in the region specified.

The USACE considers OBL, FACW and FAC species to be indicators of wetlands. An area is considered to have hydrophytic vegetation when greater than 50 percent of the dominant species in each vegetative stratum (tree, shrub, and herb) fall within these categories. Any species not appearing on the USFWS list is assumed to be an upland species, almost never occurring in wetlands. In addition, an area needs to contain at least 5% vegetative cover to be considered as a vegetated wetland.

HYDRIC SOILS

Hydric soils are saturated or inundated for a sufficient duration during the growing season to develop anaerobic or reducing conditions that favor the growth and regeneration of hydrophytic vegetation. Field indicators of wetland soils include observations of ponding, inundation, or saturation, dark (low chroma) soil colors, bright mottles (concentrations of

oxidized minerals such as iron), gleying, which indicates reducing conditions by a blue-grey color, or accumulation of organic material. Additional supporting information includes documentation of soil as hydric or reference to wet conditions in the local soils survey, both of which must be verified in the field.

WETLAND HYDROLOGY

Wetland hydrology is inundation or soil saturation with a frequency and duration long enough to cause the development of hydric soils and plant communities dominated by hydrophytic vegetation. If direct observation of wetland hydrology is not possible (as in seasonal wetlands), or records of wetland hydrology are not available (such as stream gauges), assessment of wetland hydrology is frequently supported by field indicators, such as water marks, drift lines, sediment deposits, or drainage patterns in wetlands.

RWQCB JURISDICTION

The State Water Resources Control Board (SWRCB) and local RWQCB have jurisdiction over "waters of the State," which are defined as any surface water or groundwater, including saline waters, within the boundaries of the state. The SWRCB has issued general Waste Discharge Requirements (WDRs) regarding discharges to "isolated" waters of the State (Water Quality Order No. 2004-0004-DWQ, Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the USACE to be Outside of Federal Jurisdiction). The local RWQCB enforces actions under this general order, and is also responsible for Clean Water Act Section 401 certification determinations over USACE defined jurisdictional waters.

The Porter-Cologne Act provides the State with very broad authority to regulate "waters of the State" (which are defined as any surface water or groundwater, including saline waters). The Porter-Cologne Act has become an important tool in the post-SWANCC and Rapanos era with respect to the State's authority over isolated waters. Generally, any person proposing to discharge waste into a water body that could affect its water quality must file a "Report of Waste Discharge" (ROWD) when there is no federal nexus, such as under Section 401of the CWA. Although "waste" is partially defined as any waste substance associated with human habitation, the RWQCB interprets this to include fill discharge into water bodies.

It should be noted that the RWQCB shares USACE jurisdiction unless isolated conditions are present. If isolated waters conditions are present, the RWQCB takes jurisdiction using the USACE's definition of the OHWM and/or the three-parameter wetlands methodology pursuant to the 1987 Wetlands Manual. The CDFW's jurisdiction is defined as the top of the bank to the top of the bank of the stream, channel, or basin or to the outer limit of riparian vegetation located within or immediately adjacent to the river, stream, creek, pond, or lake or other impoundment, whichever is greater. However, as noted in the body of this report, RWQCB has recently stated that they consider top of bank and edge of riparian above OHWM to be within their jurisdiction on features that are under USACE jurisdiction, in addition to areas below OHWM.

CDFW JURISDICTION

The CDFW has regulatory authority over any work within rivers, streams, and lakes of the State of California (California Fish and Game Code Section 1600 et seq.) on public, private, and agricultural lands. Water features that are regulated by CDFW include all rivers, streams, or lakes, including man-made watercourses with or without wetlands, if they contain a definable bed and bank and support a fish or wildlife resource.

Appendix B

Wetland Determination Data Forms & OHWM Forms

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Laguna Lake Park City/County: San Luis Obispo Sampling Date: 5/6/2016

Applicant/Owner: City of San Luis Obispo State: CA Sampling Point: WD1

Investigator(s): Meg Perry; Noel Fie Section, Township, Range: _____

Landform (hillslope, terrace, etc.): swale & depression Local relief (concave, convex, none): Concave Slope (%): _____

Subregion (LRR): _____ Lat: see map Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** **Yes ✓ No _____**
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Persicaria amphibia	20	y	OBL
2. Persicaria lapathifolia	40	y	FACW
3. Schoenoplectus californicus	10	n	OBL
4.			
5.			
6.			
7.			
8.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ✓ No _____**

Remarks:

depression area fed by a grassy swale. a culvert conducts overflow from this area under the trail.

SOIL

Sampling Point: WD1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR2/1	100					clay	
5-13	10YR2/1	97	7.5YR 4/3	3	C	M/PL	clay	
13-18+	10YR2/1	95	7.5YR 5/4	5	C	M/PL	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** _____

Remarks:

very dark clay, may be masking redox. moist to surface.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ✓ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ✓ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? **Yes** ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

moist but not wet. visibly wetter on many years of summer aerial photos.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Laguna Lake Park City/County: San Luis Obispo Sampling Date: 5/6/2016

Applicant/Owner: City of San Luis Obispo State: CA Sampling Point: WD2

Investigator(s): Meg Perry, Noel Fie Section, Township, Range: _____

Landform (hillslope, terrace, etc.): toeslope Local relief (concave, convex, none): Convex Slope (%): _____

Subregion (LRR): _____ Lat: see map Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5x5')			
1. Bromus diandus	20	y	UPL
2. Brassica nigra	5	n	UPL
3. Foeniculum vulgare	5	n	UPL
4. Hordeum brachyantherum	15	n	FACW
5. Hordeum murinum	35	y	FACU
6. Lolium perenne	15	n	FAC
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	15	x 2 = 30
FAC species	15	x 3 = 45
FACU species	35	x 4 = 140
UPL species	30	x 5 = 150
Column Totals:	100 (A)	365 (B)

Prevalence Index = B/A = 3.65

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** _____ **No** ✓

Remarks:

site is on low slope near wetland depression and is primarily vegetated with upland weeds

SOIL

Sampling Point: WD2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/1		none				clay	roots
3-8	7.5YR 2.5/1		none				clay	10% rocks
8-14+	7.5YR 2.5/1		none				gr Clay	gravelly

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Laguna Lake Park City/County: San Luis Obispo Sampling Date: 5/6/2016

Applicant/Owner: City of San Luis Obispo State: CA Sampling Point: WD3

Investigator(s): Meg Perry Section, Township, Range: _____

Landform (hillslope, terrace, etc.): low area near edge of lake Local relief (concave, convex, none): Concave Slope (%): _____

Subregion (LRR): _____ Lat: see map Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** **Yes ✓ No _____**
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Persicaria lapathifolia	60	Y	FACW
2. Schoenoplectus californicus	2	n	OBL
3. Juncus mexicanus	10	n	FACW
4. Potentilla anserina	3	n	OBL
5.			
6.			
7.			
8.			
	75 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 25 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ✓ No _____**

Remarks:

riparian canopy partly shades wetland area. Wetland is at low point along edge of lake.

SOIL

Sampling Point: WD3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	95	7.5YR 4/6	5	c	m, pl	clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
✓ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✓ **No** ___

Remarks:

redox to surface. saturated at 6"

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
✓ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
✓ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
✓ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 10

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 6

Wetland Hydrology Present? **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Laguna Lake Park City/County: San Luis Obispo Sampling Date: 5/6/2016

Applicant/Owner: City of San Luis Obispo State: CA Sampling Point: WD4

Investigator(s): Meg Perry Section, Township, Range: _____

Landform (hillslope, terrace, etc.): edge of lake Local relief (concave, convex, none): Concave Slope (%): _____

Subregion (LRR): _____ Lat: see map Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** _____
Hydric Soil Present?	Yes _____	No _____	
Wetland Hydrology Present?	Yes _____	No _____	

Remarks:

just above culvert under Madonna Road

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 10x10')			
1. Persicaria lapathifolia	10	n	FACW
2. Schoenoplectus californicus	25	y	OBL
3. Polypogon interruptus	5	n	FACW
4. Cyperus eragrostis	10	n	FACW
5.			
6.			
7.			
8.			
	50 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** _____

Remarks:

Wetland vegetation is likely scoured away during high water events, but drought in recent years has allowed vegetation to establish in areas that are likely scoured during normal precipitation years.

SOIL

Sampling Point: WD4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** _____

Remarks:

Assumed – direct observation of saturation more than 14 days of a measurable storm. Redox concentrations and reduced matrix also noted to surface.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
✓ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
✓ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
✓ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No _____ Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Laguna Lake Park City/County: San Luis Obispo Sampling Date: 5/6/2016

Applicant/Owner: City of San Luis Obispo State: CA Sampling Point: WD5

Investigator(s): Meg Perry Section, Township, Range: _____

Landform (hillslope, terrace, etc.): streambed Local relief (concave, convex, none): Concave Slope (%): _____

Subregion (LRR): _____ Lat: see map Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** **Yes ✓ No _____**
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

This sample point is in a location that is maintained for sediment and vegetation.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Persicaria lapathifolia	20	n	FACW
2. Schoenoplectus californicus	40	y	OBL
3.			
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ✓ No _____**

Remarks:

This sample point is in a location that is maintained for sediment and vegetation periodically, downstream of outlet from Laguna Lake in Prefumo Creek.

SOIL

Sampling Point: WD5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12+							gravels	gravel and sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
✓ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✓ **No** ___

Remarks:

This sample point is in a location that is maintained for sediment and vegetation. Substrates are gravel and sand deposits and lack well developed soil features. Due to presence of hydrophytic vegetation and wetland hydrology, hydric soils were assumed at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

✓ Water Marks (B1) (**Riverine**)
✓ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): _____

Water Table Present? Yes ___ No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): _____

Wetland Hydrology Present? **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Other areas of the streambed lack hydrophytic vegetation and instead support Bermuda grass, bromes, and other weedy species, and were not classed as wetlands.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Laguna Lake Park City/County: San Luis Obispo Sampling Date: 5/6/2016

Applicant/Owner: City of San Luis Obispo State: CA Sampling Point: WD6

Investigator(s): Meg Perry Section, Township, Range: _____

Landform (hillslope, terrace, etc.): streambed Local relief (concave, convex, none): Concave Slope (%): _____

Subregion (LRR): _____ Lat: see map Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** **Yes ✓ No _____**
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

This sample point is in a location that is maintained for sediment and vegetation.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Persicaria lapathifolia	45	y	FACW
2. Schoenoplectus californicus	5	n	OBL
3. Cyperus eragrostis	5	n	FACW
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ✓ No _____**

Remarks:

This sample point is in a location that is maintained for sediment and vegetation periodically, downstream of outlet from Laguna Lake in Prefumo Creek near sample point WD5.

SOIL

Sampling Point: WD6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-14+							gravels	gravel and sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
✓ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✓ **No** ___

Remarks:

This sample point is in a location that is maintained for sediment and vegetation. Substrates are gravel and sand deposits and lack well developed soil features. Due to presence of hydrophytic vegetation and wetland hydrology, hydric soils were assumed at this location.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

✓ Water Marks (B1) (**Riverine**)
✓ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): _____

Water Table Present? Yes ___ No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): _____

Wetland Hydrology Present? **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Other areas of the streambed lack hydrophytic vegetation and instead support Bermuda grass, bromes, and other weedy species, and were not classed as wetlands.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Laguna Lake Park City/County: San Luis Obispo Sampling Date: 5/6/2016

Applicant/Owner: City of San Luis Obispo State: CA Sampling Point: WD7

Investigator(s): Meg Perry Section, Township, Range: _____

Landform (hillslope, terrace, etc.): streambed Local relief (concave, convex, none): Concave Slope (%): _____

Subregion (LRR): _____ Lat: see map Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** **Yes ✓ No _____**
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

in stream channel of Prefumo Creek above Laguna Lake.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30x30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix lasiolepis	10	y	FACW
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Juncus patens	5	n	FACW
2. Juncus phaeocephalus	15	y	FACW
3. Cyperus eragrostis	10	n	FACW
4. Eleocharis palustris [=E macrostachya]	15	y	OBL
5. Lolium perenne	5	n	FAC
6.			
7.			
8.			
	50 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ✓ No _____**

Remarks:

leaf litter and partially decomposed organic matter in upper soil layer

SOIL

Sampling Point: WD7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ✓ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✓ **No** ___

Remarks:

Assumed – direct observation of saturation near surface more than 14 days after a measurable storm.
Large quantities of organic matter intermixed into top layer of soil, not well decomposed yet, but clearly water stained. Soil feels "Spongy".

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ✓ Water Marks (B1) (**Riverine**)
- ✓ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ✓ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 4

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0

Wetland Hydrology Present? **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

standing water nearby.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Laguna Lake Park City/County: San Luis Obispo Sampling Date: 5/14/2016

Applicant/Owner: City of San Luis Obispo State: CA Sampling Point: WD8

Investigator(s): Meg Perry Section, Township, Range: _____

Landform (hillslope, terrace, etc.): streambed Local relief (concave, convex, none): Concave Slope (%): _____

Subregion (LRR): _____ Lat: see map Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** ✓
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** _____ **No** ✓

Remarks:

unvegetated area. appears to have recently dried at the surface (inundated recently)

SOIL

Sampling Point: WD8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ✓ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✓ **No** ___

Remarks:

direct observation of saturation near surface more than 14 days of a measurable storm.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ✓ Water Marks (B1) (**Riverine**)
- ✓ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 2

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0

Wetland Hydrology Present? **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

In channel bed; no wetland vegetation immediately adjacent to areas at similar landscape position with that currently support wetland vegetation.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Laguna Lake Park City/County: San Luis Obispo Sampling Date: 5/6/2016

Applicant/Owner: City of San Luis Obispo State: CA Sampling Point: WD9

Investigator(s): Meg Perry Section, Township, Range: _____

Landform (hillslope, terrace, etc.): edge of Laguna Lake Local relief (concave, convex, none): Concave Slope (%): _____

Subregion (LRR): _____ Lat: see map Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** **Yes ✓ No _____**
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Juncus phaeocephalus	15	Y	FACW
2. Cyperus eragrostis	10	n	FACW
3. Eleocharis palustris	15	y	OBL
4. Juncus mexicanus	10	n	FACW
5. Potentilla anserina	3	n	OBL
6.			
7.			
8.			
	53 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ✓ No _____**

Remarks:

SOIL

Sampling Point: WD9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ✓ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✓ **No** ___

Remarks:

Hydric Soil Assumed – direct observation of saturation near surface more than 14 days of a measurable storm.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ✓ Water Marks (B1) (**Nonriverine**)
- ✓ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ✓ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 1

Water Table Present? Yes ✓ No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): _____

Wetland Hydrology Present? **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

margin of lake - plot partially inundated.

Arid West Ephemeral and Intermittent Streams OHWM Datasheet – Prefumo Creek.

Project: Laguna Lake Dredging and Sediment Management **Project Number:** **Stream:** Prefumo Creek – below Madonna Road **Investigator(s):** M. Perry	**Date:** 5/6/2016 **Town:** San Luis Obispo **Photo begin file#:**	**Time:** 16:30 **State:** CA **Photo end file#:**
Y☒ / N☐ Do normal circumstances exist on the site? Y☒ / N☐ Is the site significantly disturbed?	**Location Details:** Site is in Prefumo Creek, below Madonna Road, downstream of Laguna Lake **Projection:** (Geographic) **Datum:** WGS 84 **Coordinates:**	

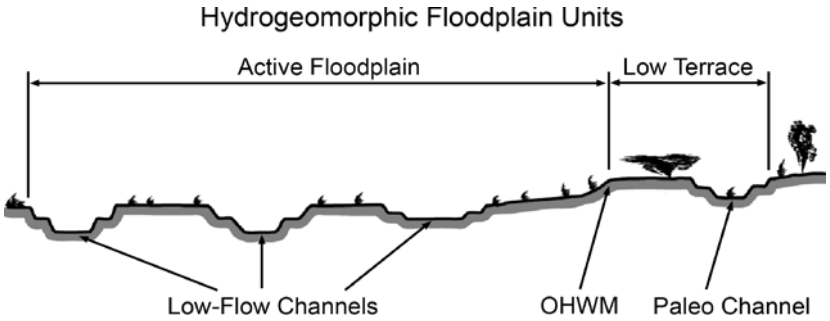
Potential anthropogenic influences on the channel system:
An existing triple-box culvert is present under Madonna Road. A concrete apron and concrete sidewalls extend downstream of the road. The channel bed is actively maintained for sediment and vegetation on a regular basis.

Brief site description:
This location is in Prefumo Creek below the outlet from Laguna Lake. At this location, the channel is regularly maintained. Vegetation consists of herbaceous annuals and perennials. Small patches of wetland vegetation dominated by Persicaria sp., Schoenoplectus californicus, and Cyperus eragrostis are present. Upland vegetation includes Cynodon dactylon, Avena spp., Festuca spp., Genista monspeliensis, and Helminthotheca echioides. Homes and yards present above west bank.

Checklist of resources (if available):

☒ Aerial photography
Dates: multiple years
☒ Topographic maps
☒ Geologic maps
☒ Vegetation maps
☒ Soils maps
☒ Rainfall/precipitation maps
Existing delineation(s) for site
☒ Global positioning system (GPS)
☐ Other studies

☐ Stream gage data
Gage number:
Period of record:
☐ History of recent effective discharges
☐ Results of flood frequency analysis
☐ Most recent shift-adjusted rating
☐ Gage heights for 2-, 5-, 10-, and 25-year events and the ☐ most recent event exceeding a 5-year event



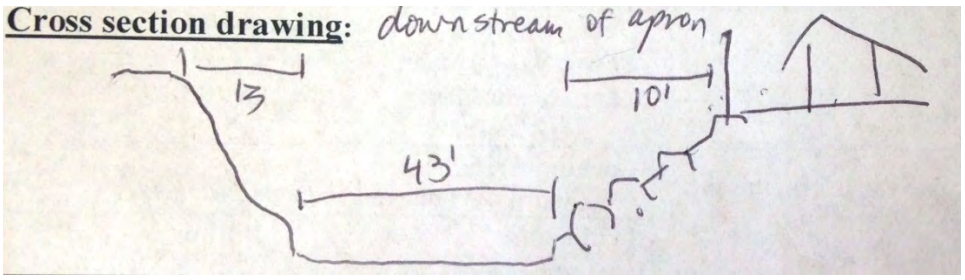
Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:

☒ Mapping on aerial photograph ☒ GPS
☒ Digitized on computer ☐ Other:

Project ID:	**Cross section ID: OHWM1**	**Date: 5/6/2016**	**Time: 16:30**
Laguna Lake Dredging Project	**Prefumo Creek, Reach 1**		

Cross section drawing: downstream of apron



OHWM

GPS point: _____OHWM1_____

Indicators:

☒ Change in average sediment texture
☒ Change in vegetation species
☒ Change in vegetation cover
☒ Break in bank slope
☐ Other: _____
☐ Other: _____

Comments: Obvious differences in moisture, status of vegetation (surrounding uplands annual vegetation is dry; in channel annual vegetation is still living)

Floodplain unit: Low-Flow Channel X Active Floodplain Low Terrace

GPS point: __(same location)_____

Characteristics of the floodplain unit:

Average sediment texture: _____gravel; medium sand_____

Total veg cover: __90___ % Tree: __0___% Shrub: __0___% Herb: __90___%

Community successional stage:

☐ NA
☒ Early (herbaceous & seedlings)
☐ Mid (herbaceous, shrubs, saplings)
☐ Late (herbaceous, shrubs, mature trees)

Indicators:

☐ Mudcracks
☐ Ripples
☐ Drift and/or debris
☒ Presence of bed and bank
☒ Benches
☐ Soil development
☒ Surface relief
☐ Other: _____
☐ Other: _____
☐ Other: _____

Comments: Floodplain within OHWM. This system is not very complex in this reach. Channel bed is actively managed by the City for sediment and vegetation at this location. OHWM about 45′ wide.

Arid West Ephemeral and Intermittent Streams OHWM Datasheet – Prefumo Creek Reach 2

Project: Laguna Lake Dredging and Sediment Management	**Date:** 5/6/2016	**Time:** 14:30
Project Number:	**Town:** San Luis Obispo	**State:** CA
Stream: Prefumo Creek – below Los Osos Valley Road	**Photo begin file#:**	**Photo end file#:**
Investigator(s): M. Perry		

Y☒ / N☐ Do normal circumstances exist on the site?	**Location Details:** Site is in Prefumo Creek, below Los Osos Valley Road, upstream of Laguna Lake
Y☒ / N☐ Is the site significantly disturbed?	**Projection:** (Geographic) **Datum:** WGS 84 **Coordinates:**

Potential anthropogenic influences on the channel system:
An existing culvert and fish passage are present under Los Osos Valley Road. Previous sediment management has been conducted in this reach. Prefumo Creek was rerouted several decades ago; it didn't previously flow through Laguna Lake.

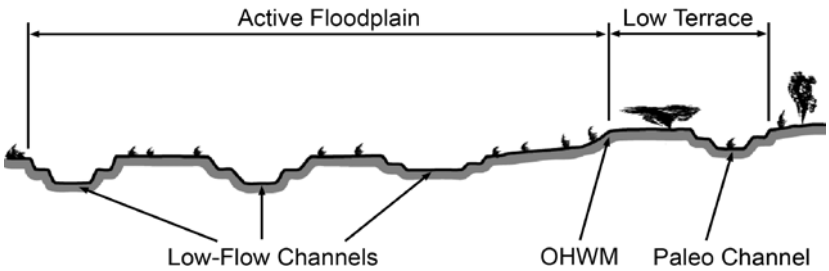
Brief site description:
This location is in Prefumo Creek above its inlet to from Laguna Lake. Data points at a vegetation transition where wetland vegetation becomes dominant in the bed, a nd to represent variation lower in reach. Multi and single-family residential are present above both banks. Los Osos Valley Road crosses the stream upstream. Well-developed riparian canopy is present.

Checklist of resources (if available):

☒ Aerial photography
Dates: multiple years
☒ Topographic maps
☒ Geologic maps
☒ Vegetation maps
☒ Soils maps
☒ Rainfall/precipitation maps
Existing delineation(s) for site
☒ Global positioning system (GPS)
☐ Other studies

☐ Stream gage data
Gage number:
Period of record:
☐ History of recent effective discharges
☐ Results of flood frequency analysis
☐ Most recent shift-adjusted rating
☐ Gage heights for 2-, 5-, 10-, and 25-year events and the ☐ most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



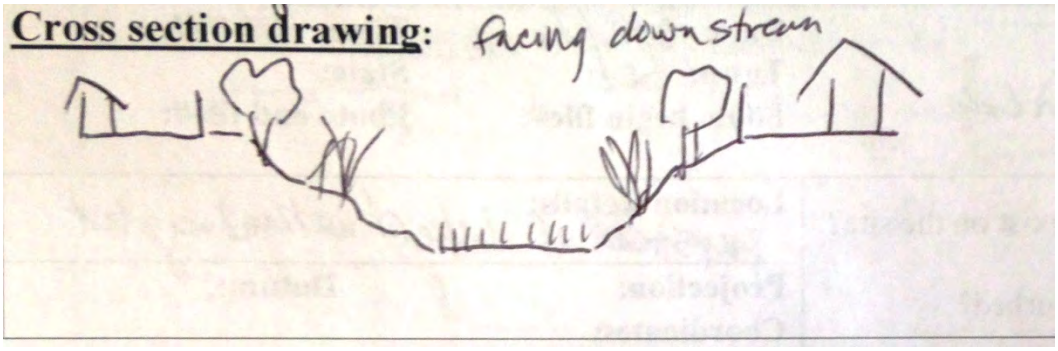
Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

6. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
7. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
8. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
9. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
10. Identify the OHWM and record the indicators. Record the OHWM position via:

☒ Mapping on aerial photograph ☒ GPS
☒ Digitized on computer ☐ Other:

Project ID: **Cross section ID: OHWM2** **Date: 5/6/2016** **Time: 14:30**
Laguna Lake Dredging Project

Cross section drawing: facing downstream



OHWM

GPS point: OHWM2

Indicators:

- ☒ Change in average sediment texture
- ☒ Change in vegetation species
- ☒ Change in vegetation cover
- ☒ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments: Obvious differences in moisture of the channel bed, vegetation composition and density, topography, and soil.

Floodplain unit: Low-Flow Channel X Active Floodplain Low Terrace

GPS point: (same location as OHWM 2)

Characteristics of the floodplain unit:

Average sediment texture: gravel; medium sand

Total veg cover: 90 % Tree: 50 % Shrub: 10 % Herb: 60 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☒ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☒ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☒ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments: Floodplain within OHWM. This system is not very complex in this reach. Channel bed is fairly uniform. Willow canopy is present on banks, overhanging the streambed. Wetland vegetation is present in some areas of this reach.

Project ID: **Cross section ID: OHWM3** **Date: 5/6/2016** **Time: 15:00**
Laguna Lake Dredging Project

OHWM

GPS point: _____OHWM3_____

Indicators:

☒ Change in average sediment texture
☒ Change in vegetation species
☒ Change in vegetation cover
☒ Break in bank slope
☐ Other: _____
☐ Other: _____

Comments: Obvious differences in moisture, status of vegetation (surrounding uplands annual vegetation is dry; in channel annual vegetation is still living)

Floodplain unit: Low-Flow Channel X Active Floodplain Low Terrace

GPS point: __(same location)_____

Characteristics of the floodplain unit:

Average sediment texture: _____gravel; medium sand_____
Total veg cover: __80___ % Tree: __60___% Shrub: __3___% Herb: __30___%
Community successional stage:

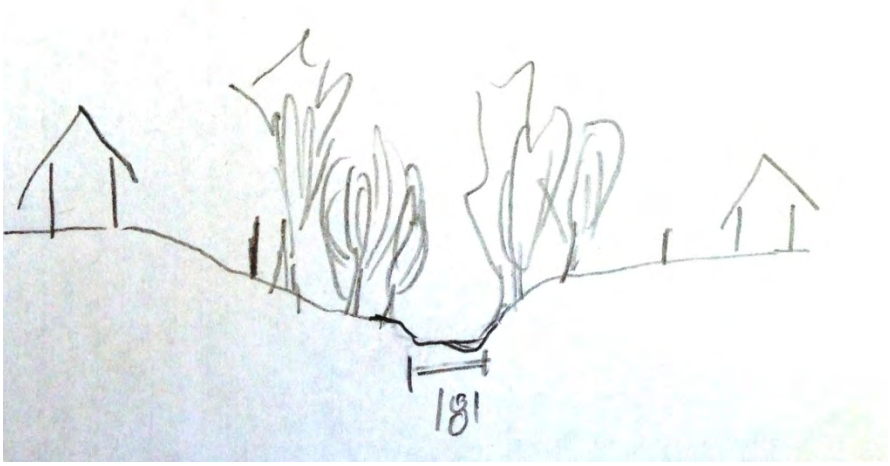
☐ NA
☐ Early (herbaceous & seedlings)
☐ Mid (herbaceous, shrubs, saplings)
☒ Late (herbaceous, shrubs, mature trees)

Indicators:

☐ Mudcracks
☐ Ripples
☒ Drift and/or debris
☒ Presence of bed and bank
☐ Benches
☐ Soil development
☒ Surface relief
☐ Other: _____
☐ Other: _____
☐ Other: _____

Comments: Floodplain within OHWM. This system is not very complex in this reach. Riparian canopy on both banks.

Project ID: **Cross section ID: OHWM4** **Date: 5/6/2016** **Time: 15:15**
Laguna Lake Dredging Project



OHWM

GPS point: _____OHWM4_____

Indicators:

☒ Change in average sediment texture
☒ Change in vegetation species
☒ Change in vegetation cover
☒ Break in bank slope
☐ Other: _____
☐ Other: _____

Comments: Obvious differences in moisture, status of vegetation (surrounding uplands annual vegetation is dry; in channel annual vegetation is still living)

Floodplain unit: Low-Flow Channel X Active Floodplain Low Terrace

GPS point: __(same location)_____

Characteristics of the floodplain unit:

Average sediment texture: _____gravel; medium sand_____
Total veg cover: __80___ % Tree: __80___% Shrub: __0___% Herb: _15___%
Community successional stage:

☐ NA
☒ Early (herbaceous & seedlings)
☐ Mid (herbaceous, shrubs, saplings)
☒ Late (herbaceous, shrubs, mature trees)

Indicators:

☐ Mudcracks
☐ Ripples
☒ Drift and/or debris
☒ Presence of bed and bank
☒ Benches
☐ Soil development
☒ Surface relief
☐ Other: _____
☐ Other: _____
☐ Other: _____

Comments: Floodplain within OHWM. This system is not very complex in this reach.

Arid West Ephemeral and Intermittent Streams OHWM Datasheet: Unnamed Drainage Reach

Project: Laguna Lake Dredging and Sediment Management	**Date:** 5/6/2016	**Time:** 18:30
Project Number:	**Town:** San Luis Obispo	**State:** CA
Stream: un-named tributary to Laguna Lake	**Photo begin file#:**	**Photo end file#:**
Investigator(s): M. Perry		

Y☒ / N☐ Do normal circumstances exist on the site?	**Location Details:** Site is in Prefumo Creek, below Madonna Road, downstream of Laguna Lake
Y☒ / N☐ Is the site significantly disturbed?	**Projection:** (Geographic) **Datum:** WGS 84 **Coordinates:**

Potential anthropogenic influences on the channel system:
Existing ranch roads; past land use history

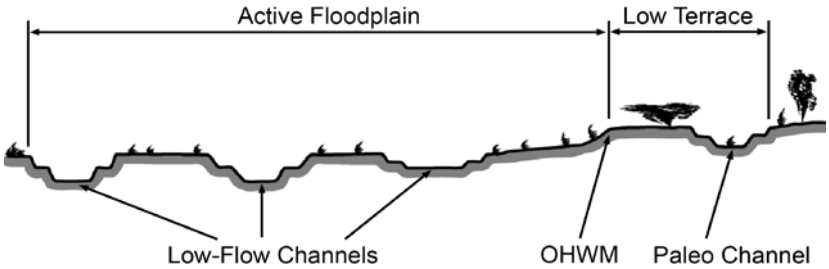
Brief site description:
This location is the Laguna Lake Natural Reserve. Upstream this channel is well defined. Downstream, the channel is intermittent. Swales connect defined segments of channel to the lake. Some areas are hydrologically connected by sheet flow only..

Checklist of resources (if available):

☒ Aerial photography
Dates: multiple years
☒ Topographic maps
☒ Geologic maps
☒ Vegetation maps
☒ Soils maps
☒ Rainfall/precipitation maps
Existing delineation(s) for site
☒ Global positioning system (GPS)
☐ Other studies

☐ Stream gage data
Gage number:
Period of record:
☐ History of recent effective discharges
☐ Results of flood frequency analysis
☐ Most recent shift-adjusted rating
☐ Gage heights for 2-, 5-, 10-, and 25-year events and the ☐ most recent event exceeding a 5-year event

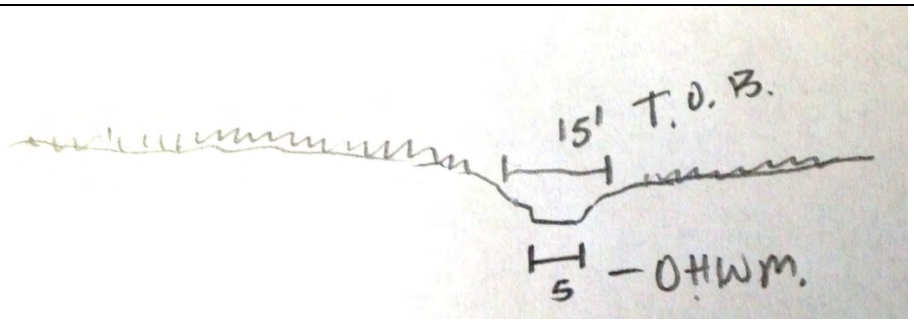
Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

11. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
12. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
13. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
    a) Record the floodplain unit and GPS position.
    b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
    c) Identify any indicators present at the location.
14. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
15. Identify the OHWM and record the indicators. Record the OHWM position via: ☒ Mapping on aerial photograph ☒ GPS ☒ Digitized on computer ☐ Other:

Project ID: **Cross section ID: OHWM5** **Date: 5/6/2016** **Time: 16:30**
Laguna Lake Dredging Project



OHWM

GPS point: OHWM5

Indicators:

- ☒ Change in average sediment texture
- ☒ Change in vegetation species
- ☒ Change in vegetation cover
- ☒ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments: sediment with more gravel in bed. Less vegetation in bed than bank though composition is similar.

Floodplain unit: Low-Flow Channel X Active Floodplain Low Terrace

GPS point: (same location)

Characteristics of the floodplain unit:

Average sediment texture: gravel; medium sand

Total veg cover: 70 % Tree: 0 % Shrub: 0 % Herb: 70 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☒ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments: Floodplain within OHWM. This system is not very complex.

Appendix C

Site Photographs

Photo 1. Wetland Depression on April 21, 2016.

Photo 2. Wetland abutting Laguna Lake on May 6, 2016.

Photo 3. Wetland vegetation at Laguna Lake outlet on May 6, 2016.

Photo 4. Redox in upper soil horizon near Laguna Lake outlet, May 6, 2016.

Photo 5. Wetland fringe around Laguna Lake on April 21, 2016.

Photo 6. Open water of Laguna Lake, May 6, 2016.

Photo 7. Hydric soil in adjacent wetland in depression area on May 6, 2016.

Photo 8. Accumulated partially decomposed and waterstained leaves in sample from upper soil layer in Prefumo Creek, May 6, 2016.

Photo 9. Wetland vegetation in streambed with adjacent riparian canopy in upper Prefumo Creek, May 6, 2016.

Appendix D

Potential Jurisdictional Features: Table of Dimensions and Characteristics

Table D-1: Potential CWA Jurisdictional Features: Dimensions and Characteristics

Map Label	Feature Type	CWA Jurisdiction		Comments
		Acres	Linear Feet (when Relevant)	
1	Other Waters	0.02	243	Ephemeral drainage in LNRR
2	Other Waters	0.02	238	Ephemeral drainage in LNRR
3	Other Waters	0.02	212	Ephemeral drainage in LNRR
4	Other Waters	0.09	582	Ephemeral drainage in LNRR
5	Adjacent Wetland	0.13	--	Wetland depression adjacent to Laguna Lake
6	Adjacent Wetland	0.05	--	Wetland depression adjacent to Laguna Lake
7	Adjacent Wetland	0.04	--	Wetland depression adjacent to Laguna Lake
8	Adjacent Wetland	0.12	--	Wetland depression adjacent to Laguna Lake
9	Adjacent Wetland	0.23	--	Wetland depression adjacent to Laguna Lake
10	Other Waters	0.01	113	Ephemeral drainage in LNRR
11	Adjacent Wetland	0.09	--	wetland abutting Laguna Lake
12	Adjacent Wetland	0.46	--	wetland abutting Laguna Lake
13	Adjacent Wetland	0.52	--	wetland fringe along margins of Laguna Lake
14	Adjacent Wetland	0.01	--	wetland fringe along margins of Laguna Lake
15	Adjacent Wetland	0.14	--	wetland fringe along margins of Laguna Lake
16	Adjacent Wetland	<0.01	--	wetland fringe along margins of Laguna Lake
17	Adjacent Wetland	<0.01	--	wetland fringe along margins of Laguna Lake
18	Adjacent Wetland & Wetland Waters	0.31	--	wetland fringe along margins of Laguna Lake
19	Other Waters	55.45	3906	Laguna Lake to OHWM; "linear feet" measure is estimated length of connection between reaches of Prefumo Creek.
20	Other Waters	0.09	110	Prefumo Creek below Madonna Road
21	Wetland Waters	0.01	--	small wetland in bed of Prefumo Creek below Lake outlet (30 ft long, parallel to another wetland and other waters, distances not double-counted)
22	Wetland Waters	<0.01	--	small wetland in bed of Prefumo Creek below Lake outlet (20 ft long, parallel to another wetland and other waters, distances not double-counted)
23	Adjacent Wetland & Wetland Waters	1.79	--	Wetland abutting Prefumo Creek at lake inlet, below OHWM of Laguna Lake
24	Adjacent Wetland & Wetland Waters	0.31	--	Wetland abutting Prefumo Creek at lake inlet, below OHWM of Laguna Lake
25	Other Waters	0.73	1395	Prefumo Creek above Laguna Lake
26	Adjacent Wetland	0.05	--	wetland fringe along marigins of Prefumo Creek
27	Adjacent Wetland	0.07	--	wetland fringe along marigins of Prefumo Creek
28	Wetland Waters	0.37	427	Upper reach of Prefumo Creek. Hydrophytic vegetation dominant in this section
29	Other Waters	0.16	200	Upper reach of Prefumo Creek. No hydrophytic vegetation in chanel bed.
30	Other Waters	0.18	332	Upper reach of Prefumo Creek. No hydrophytic vegetation in chanel bed.
Totals		61.49	7,758	

City of San Luis Obispo

Laguna Lake Dredging and Sediment Management Project

Cultural Resources Study

U.S.G.S. *San Luis Obispo, CA* quadrangle

Prepared for:
City of San Luis Obispo
990 Palm Street
San Luis Obispo, CA 93401

Prepared by:
Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, CA 93401

Authors:
Ashlee M. Bailey, M.A., RPA
and Christopher Duran, M.A., RPA

May 2016

Keywords: San Luis Obispo County; Intensive pedestrian survey; Section 106; NEPA; Negative; no historic properties affected; no impact

Environmental Scientists Planners Engineers

Bailey, A., and C. Duran
2016 *Cultural Resources Study for the Laguna Lake Dredging and Sediment Management Project, San Luis Obispo, San Luis Obispo County, California*. Rincon Consultants Project No. 15-01939.

Laguna Lake Dredging and Sediment Management Project

Table of Contents

Page

Executive Summary 1
1.0 Introduction 3
1.1 Area of Potential Effects 3
1.2 Project Description 3
1.3 Personnel 6
2.0 Regulatory Setting 6
2.1 California Environmental Quality Act 7
2.2 Section 106 of the National Historic Preservation Act 7
3.0 Setting 8
3.1 Prehistory 9
3.1.1 Paleo-Indian Period (ca. 10,000 – 6,000 B.C.) 9
3.1.2 Millingstone Period (8,000–3,000 B.C.) 10
3.1.3 Early Period and Early-Middle Transition Period (3,500 B.C. – 600 B.C.) 11
3.1.4 Middle Period (600 B.C.–A.D. 1000) 11
3.1.5 Middle-Late Transition Period (A.D. 1000-1250) 12
3.1.6 Late Period (A.D. 1250–Historic Contact) 12
3.2 Ethnographic Overview 13
3.3 Historical Overview 14
3.3.1 Spanish Period (1769–1822) 14
3.3.2 Mexican Period (1822–1848) 14
3.3.3 American Period (1848–Present) 15
4.0 Background Research 15
4.1 Native American Heritage Commission 16
4.2 California Historical Resources Information System 16
4.2.1 Previous Studies 16
4.2.2 Previously Recorded Resources 18
4.3 Historical Group Consultation 19
5.0 Survey Methods 19
6.0 Results and Discussion 19
7.0 Conclusions and Recommendations 20

7.1 Unanticipated Discovery of Cultural Resources 20
7.2 Unanticipated Discovery of Human Remains 21
8.0 References 22

Figures

Figure 1. Project Location Map. 4
Figure 2. APE Map. 5

Tables

Table 1. Previous Studies Conducted Within the APE. 17
Table 2. Previous Studies Within a 0.5-Mile Radius of the APE. 17
Table 3. Previously Records Resources Within a 0.5-Mile Radius of the APE. 18

Appendices

Appendix A Native American and Local interested Parties Correspondence
Appendix B CHRIS CCIC Records Search Results

EXECUTIVE SUMMARY

Rincon Consultants, Inc. was retained by MNS Engineers on behalf of the City of San Luis Obispo to conduct a Phase I cultural resources study for the Laguna Lake Dredging and Sediment Management Project. Laguna Lake Natural Reserve is located in the City of San Luis Obispo, San Luis Obispo County, California (Figure 1). The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The project will require a Section 404 Permit in accordance with the Clean Water Act, and will therefore be considered a federal undertaking under the jurisdiction of the United States Army Corps of Engineers and subject to Section 106 of the National Historic Preservation Act.

Although Laguna Lake is primarily a naturally occurring lake, alteration and manipulation of its watersheds have increased sediment deposition in the lake. This has changed the lake depth and morphology, resulting in decreased water quality and aquatic habitat functions. The Laguna Lake Dredging Project seeks to address these impacts by developing conservation recommendations for near-term dredging and long-term sediment management. The project will require use of the land surrounding the lakeshore for project access, equipment mobilization and staging, dredging, and sediment transport. A final project design is not complete; therefore, the report discusses possible impacts to cultural resources that may occur from implementation of the proposed project, permitting pathways, where applicable, and suggests avoidance, minimization, and/or other conservation measures that could avoid or minimize adverse impacts to cultural resources. Impacts would be fully enumerated upon completion of project alternative review and selection of a final project option.

The project will require a Section 404 Permit in accordance with the Clean Water Act, and will therefore be considered a federal undertaking under the jurisdiction of the United States Army Corps of Engineers and subject to Section 106. The City will conduct environmental reviews of the project in accordance with the California Environmental Quality Act and Section 106. Therefore, this study address impacts to cultural resources under both State and Federal regulations.

Native American scoping and historic group consultation efforts did not identify any specific resources important to the consulted groups within the Area of Potential Effects. No cultural resources were identified during the background research of the Area of Potential Effects. Intensive pedestrian survey of the Area of Potential Effects did not identify any previously unidentified cultural resources. Based on the results of the records search, Native American scoping, historical group consultation, and field survey, Rincon recommends a finding of ***no historic properties affected*** for the current undertaking under the National Historic Preservation Act and a finding of ***no impact to historical resources*** under the California Environmental Quality Act. Therefore, Rincon recommends no further cultural resources work for the current proposed undertaking. Although no cultural resources were identified within the current Area of Potential Effects, the following measures are recommended in the case of unanticipated discoveries associated with subsurface construction activities.

UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES

If cultural resources are encountered during ground-disturbing activities, work in the immediate area should be halted and an archaeologist meeting the Secretary of the Interior's *Professional Qualifications Standards* for archaeology (National Park Service 1983) should be contacted immediately to evaluate the find. If necessary, the evaluation may require preparation of a treatment plan and archaeological testing for National Register of Historic Places eligibility. If the discovery proves to be significant under the National Historic Preservation Act and cannot be avoided by the project, additional work such as data recovery excavation may be warranted to mitigate any adverse effects to historic properties.

UNANTICIPATED DISCOVERY OF HUMAN REMAINS

The discovery of human remains is always a possibility during ground disturbing activities; if human remains are found, State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the Monterey County Sherriff-Coroner must be notified immediately. If the human remains are determined to be prehistoric, the coroner will notify the Native American Heritage Commission, which will determine and notify a most likely descendant (MLD). The MLD shall complete the inspection of the site within 48 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.

1.0 INTRODUCTION

Rincon Consultants, Inc. (Rincon) was retained by the City of San Luis Obispo (City) to conduct a Phase I cultural resources study for the Laguna Lake Dredging and Sediment Management Project (project). Laguna Lake Natural Reserve is located in the City of San Luis Obispo, San Luis Obispo County, California (Figure 1). The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The project will require a Section 404 Permit in accordance with the Clean Water Act, and will therefore be considered a federal undertaking under the jurisdiction of the United States Army Corps of Engineers (USACE) and subject to Section 106 (Section 106) of the National Historic Preservation Act (NHPA).

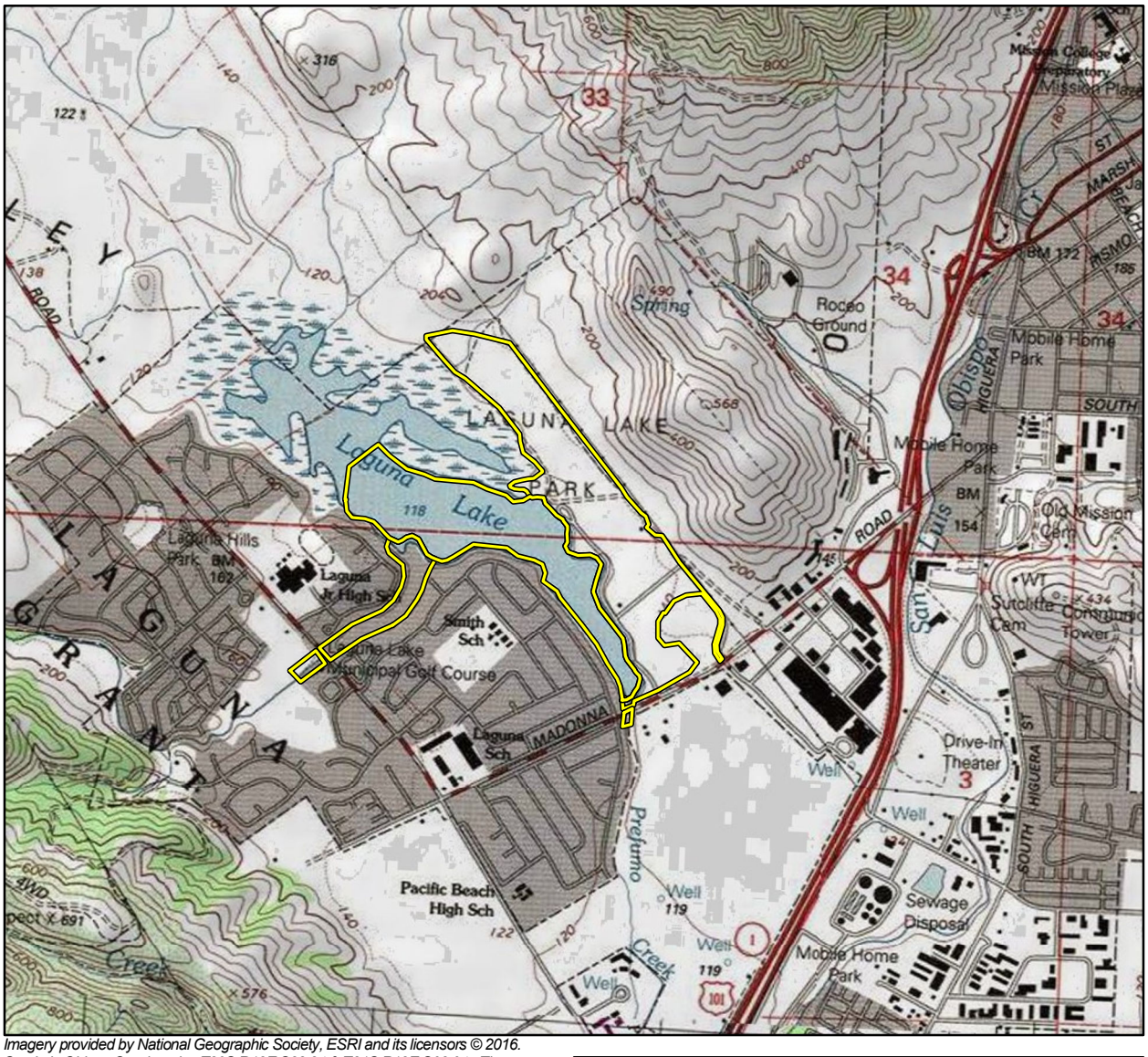
The City will conduct environmental reviews of the project in accordance with the California Environmental Quality Act (CEQA) and Section 106. The study has been prepared in support of an Initial Study (IS) in anticipation of a Mitigated Negative Declaration (MND). This cultural resources study includes an overview of the regulatory setting for the project; background environmental and cultural context of the APE; Native American scoping, including a review of the Sacred Lands File (SLF) maintained by the Native American Heritage Commission (NAHC); the results of background research, including a review of cultural resource records at the California Historical Resources Information System (CHRIS) Central Coast Information Center (CCIC); local historical group scoping for information regarding any historic resources or other cultural resources within or near the APE; a description of the methods employed in this study, the results of the intensive pedestrian survey of the APE, and preparation of this report.

1.1 AREA OF POTENTIAL EFFECTS

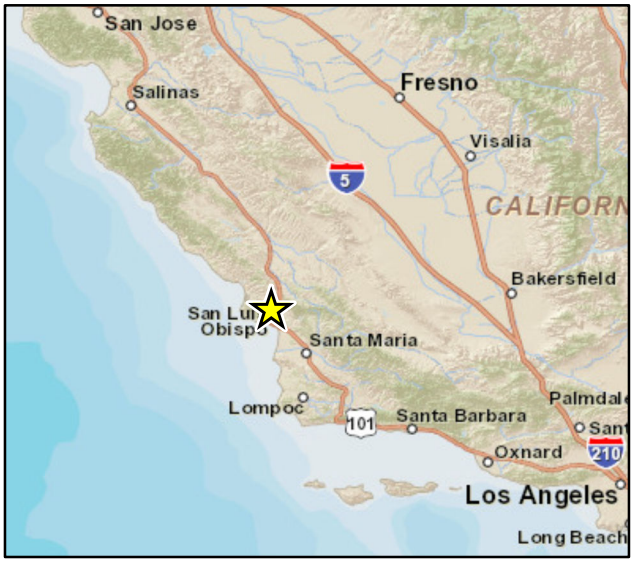
36 CFR 800.16(d) of Section 106 defines the Area of Potential Effects (APE) of an undertaking as the "geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist." Laguna Lake is situated on the eastern end of Los Osos Valley, surrounded by the City of San Luis Obispo, San Luis Obispo County, California. The City developed the Laguna Lake Park Master Plan in 1993, acquiring the current extent of the Laguna Lake Natural Reserve (Reserve). The Reserve encompasses 344 acres of water and open space around the lake. For the purposes of this study, however, the APE includes the areas of project ground disturbance on the Reserve property. The project does not intend to construct buildings or alter any visual components of the Reserve; therefore, the APE is not considered to extend beyond the Reserve property or the access areas along Prefumo Creek (Figure 2). The APE is located on an unsectioned portion of the U.S. Geological Survey *San Luis Obispo, CA* 7.5-minute topographic quadrangle.

1.2 PROJECT DESCRIPTION

Although Laguna Lake is primarily a naturally occurring lake, alteration and manipulation of its watersheds have increased sediment deposition in the lake. This has changed the lake depth and morphology, resulting in decreased water quality and aquatic habitat functions. The Laguna Lake Dredging Project seeks to address these impacts by developing conservation recommendations for near-term dredging and long-term sediment management. The project



Imagery provided by National Geographic Society, ESRI and its licensors © 2016. San Luis Obispo Quadrangle. T30S R12E S33,34 & T31S R12E S03,04. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may have changed since the original topographic map was assembled.



Project Site

0 1,000 2,000
Feet

1:24,000

N

Project Location Map

Figure 1

Imagery provided by Google and its licensors, 2016. Other baselayer data from SanGIS/SANDAG Data Warehouse, April 2016.

Area of Potential Effects Map

Figure 2

will require use of the land surrounding the lakeshore for project access, equipment mobilization and staging, dredging, and sediment transport.

The project consists of a range of actions proposed to manage sediment that is filling the lake, influencing water quality, diminishing the capacity of the downstream connection to lower Prefumo Creek, decreasing overall depth of the lake, promoting increased water temperatures, and reducing recreation opportunities in the lake. Problems with sedimentation and potential risk associated with decreased capacity have been known for several years, and the City has previously studied the issue in detail. The Oceanaire neighborhood near Laguna Lake would begin to flood even at water surface elevations lower than the estimated elevation anticipated during a 100-year flood. Over time sedimentation has and will continue to decrease the storage capacity in Laguna Lake, and flood risks are exacerbated by decreased lake capacity. Overall, the sediment deposition and accumulation is lowering ecological functions and values of the lake.

The proposed project actions include a range of dredging depths, a range of disposal options for removed sediment, alternatives for controlling and ultimately reducing sediment loads coming into the lake. The project also includes an option to stabilize the eroding bank on the east shore of the lake where slumping banks are failing. The failing banks are causing erosion that compromises park access roads and park facilities. Bank stabilization would include options to improve fish habitat through inclusion of root wads and downed logs. Additionally, the project includes possible improvements to the inlet at Los Osos Valley Road and the outlet at Madonna Road, including possible improvements to the existing fish passage at Los Osos Valley Road. Dredged materials may be temporarily stored onsite but permanent disposition will be offsite.

1.3 PERSONNEL

Cultural Resources Principal Investigator Christopher Duran, M.A., Registered Professional Archaeologist (RPA), served as the archaeological principal investigator for the study. Mr. Duran meets the Secretary of the Interior's Professional Qualification Standards for prehistoric and historic archaeology (National Park Service 1983). Rincon Archaeologist Ashlee Bailey, M.A., RPA, managed the study, served as the primary author of this report, assisted with Native American consultation, and conducted the pedestrian survey. Rincon Archaeologist Kyle Brudvik, M.A., RPA, co-authored the report.

Rincon Assistant Architectural Historian Barbara Burkhart conducted the records search at the California Historical Resources Inventory System (CHRIS) Central Coast Information Center (CCIC). Rincon GIS Analyst Allysen Valencia produced the figures in this report. Rincon Principal and Senior Ecologist Colby J. Boggs reviewed this report for quality control.

2.0 REGULATORY SETTING

This section includes a discussion of the applicable federal and state laws governing cultural resources, which must be adhered to before and during implementation of the proposed project. The project will require a Section 404 Permit in accordance with the Clean Water Act. The project, therefore, is considered a federal undertaking under the jurisdiction of the USACE and subject to Section 106 of the NHPA and NEPA. The project will also support analysis of impacts

and development of avoidance, minimization, and mitigation measures in accordance with the CEQA.

2.1 CALIFORNIA ENVIRONMENTAL QUALITY ACT

CEQA requires a lead agency to determine whether a project may have a significant effect on historical resources (Public Resources Code [PRC], Section 21084.1). A *historical resource* is a resource listed, or determined to be eligible for listing, in the California Register of Historical Resources (CRHR); a resource included in a local register of historical resources; or any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant (State CEQA Guidelines, Section 15064.5[a][1-3]).

A resource shall be considered historically significant if it meets any of the following criteria:

1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2) Is associated with the lives of persons important in our past;
3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
4) Has yielded, or may be likely to yield, information important in prehistory or history.

In addition, if a project can be demonstrated to cause damage to a unique archaeological resource, the lead agency may require reasonable efforts to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that resources cannot be left undisturbed, mitigation measures are required (PRC, Section 21083.2[a], [b], and [c]).

PRC, Section 21083.2(g) defines a *unique archaeological resource* as an artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;
2) Has a special and particular quality such as being the oldest of its type or the best available example of its type; or
3) Is directly associated with a scientifically recognized important prehistoric or historic event or person.

The City will conduct environmental reviews of the project in accordance with the CEQA.

2.2 SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

The definition of a federal undertaking in 36 Code of Federal Regulations (CFR) 800.16(y) includes projects requiring a Federal permit, license or approval and/or projects receiving Federal funding. Cultural resources are considered during federal undertakings chiefly under Section 106 of the NHPA of 1966 (as amended) through one of its implementing regulations, 36

CFR 800 (Protection of Historic Properties), as well as NEPA. Properties of traditional religious and cultural importance to Native Americans are considered under Section 101(d)(6)(A) of the NHPA, and Section 106 36 CFR 800.3–800.10. Other federal laws include the Archaeological Data Preservation Act of 1974, the American Indian Religious Freedom Act (AIRFA) of 1978, the Archaeological Resources Protection Act (ARPA) of 1979, and the Native American Graves Protection and Repatriation Act (NAGPRA) of 1989, among others.

Section 106 of the NHPA (16 United States Code [USC] 470f) requires federal agencies to take into account the effects of their undertakings on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings (36 CFR 800.1). Under Section 106, the significance of any adversely affected historic property is assessed and mitigation measures are proposed to reduce any impacts to an acceptable level. Historic properties are those significant cultural resources that are listed in or are eligible for listing in the NRHP per the criteria listed below (36 CFR 60.4; Advisory Council on Historic Preservation 2000).

> *The quality of significance in American, state, and local history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and that:*
>
> *(a) Are associated with events that have made a significant contribution to the broad patterns of our history; or*
> *(b) Are associated with the lives of persons significant in our past; or*
> *(c) Embody the distinctive characteristics of a type, period, or method of installation, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*
> *(d) Have yielded, or may be likely to yield, information important in prehistory or history.*

The project requires a Section 404 Permit in accordance with the Clean Water Act and is, therefore, considered a federal undertaking subject to Section 106 and NEPA. This cultural resources study has been prepared to provide documentation for an IS-MND.

3.0 SETTING

The APE is located in unincorporated San Luis Obispo County, completely surrounded by the corporate boundary of San Luis Obispo at an approximate elevation of 36-42 meters (118-138 feet) above mean sea level. The project encompasses most of Laguna Lake and Laguna Park to the east, and is located north of Madonna Road and east of Los Osos Valley Road. Laguna Lake Park includes three major areas, including a preserved natural wetland fringe bounded by two dirt walking trails, a developed area, and grasslands with a disc golf course and fitness area. Vegetation in the natural wetland fringe in the shallows along the edge of Laguna Lake consists of annual grassland, including primarily annual and perennial herbs, tall tule, and smartweed stands. Vegetation in the developed area consists of an area of annual grassland, which includes non-native grasses, such as ryegrass and oats, and native herbs and wildflowers, as well as a large, landscaped lawn and groves of eucalyptus trees. The eastern portion of the APE consists

of annual and needlegrass grasslands. The APE along Prefumo Creek consists of a willow riparian habitat with thick vegetation.

3.1 PREHISTORY

The project lies in the Central Coast archaeological region (Jones et al. 2007). The Central Coast has been defined as extending from south of San Francisco Bay to the northern edge of the California Bight (Jones et al. 2007:125). Following Jones et al. (2007:137), the prehistoric cultural chronology for the Central Coast can be generally divided into six periods: Paleo-Indian (ca. 10,000–8,000 B.C.), Millingstone/Early Archaic (8,000-3,500 B.C.), Early (3,500-600 B.C.), Middle (600 B.C.- A.D. 1000), Middle-Late Transition (A.D. 1000-A.D. 1250), and Late (A.D. 1250-contact [ca. A.D. 1769]).

Several chronological sequences have been devised to understand cultural changes along the Central Coast from the Millingstone Period to contact. Jones (1993) and Jones and Waugh (1995) presented a Central Coast sequence that integrated data from archaeological studies conducted since the 1980s. Three periods, including the Early, Middle, and Late periods, are presented in their prehistoric sequence subsequent to the Millingstone Period. More recently, Jones and Ferneau (2002:213) updated the sequence following the Millingstone Period as follows: Early, Early-Middle Transition, Middle, Middle-Late Transition, and Late periods. The archaeology of the Central Coast subsequent to the Millingstone Period is distinct from that of the Bay Area and Central Valley. The region has more in common with the Santa Barbara Channel area during the Middle and Middle-Late Transition periods, but few similarities during the Late period (Jones and Ferneau 2002:213).

3.1.1 Paleo-Indian Period (ca. 10,000 – 6,000 B.C.)

When Wallace (1955, 1978) developed the Early Man horizon in the 1950s (referred to herein as the Paleo-Indian Period), little evidence of human presence was known for the southern California coast prior to 6,000 B.C. Archaeological work in the intervening years has identified a number of sites older than this date, including coastal and Channel Islands sites (e.g., Erlandson 1991; Johnson et al. 2002; Moratto 1984).

Only a few archaeological sites along the Central Coast are documented prior to 8,000 years ago. It is likely that most earlier coastal sites are presently under water because it is estimated that 10,000 years ago sea levels were 15–20 meters lower than today (Bickel 1978:7). Estimates place the shore in central and southern California during this period at approximately 10 kilometers farther west than today's coastline (Breschini and Haversat 1991:126).
In San Luis Obispo County, archaeological sites CA-SLO-1764 (Lebow et al. 2001), Cross Creek (CA-SLO-1797; Fitzgerald 2000), and CA-SLO-832 (Jones et al. 2001) yielded radiocarbon dates from approximately 9,000 years ago (Jones and Ferneau 2002).

Recent data from Paleo-Indian sites in southern California indicate that the economy was a diverse mixture of hunting and gathering, with a major emphasis on aquatic resources in many coastal areas (e.g., Jones and Ferneau 2002) and on Pleistocene lake shores in eastern California (Moratto 1984:90–92). Although few Clovis-like or Folsom-like fluted projectile points have been found in southern California (e.g., Erlandson et al. 1987), it is generally considered that the

emphasis on hunting may have been greater during the Paleo-Indian period than during later periods. A fluted projectile point was recently found in Nipomo, San Luis Obispo County (Mills et al. 2005; Jones and Klar 2007).

Large side-notched projectile points of the Central Coast Stemmed series in this area date to as early as 8,000 years ago (Justice 2002). Points of this type have been recovered along the Central Coast from sites such as Diablo Canyon (CA-SLO-2; Greenwood 1972), Cross Creek (CA-SLO-1797; Fitzgerald 2000), Little Pico Creek (CA-SLO-175; Jones and Waugh 1995), and the Honda Beach site (CA-SBA-530; Glassow 1997), among others.

3.1.2 Millingstone Period (8,000–3,000 B.C.)

The Millingstone Period, as defined by Wallace (1955, 1978) and recognized on the Central Coast by Greenwood (1972), is characterized by an ecological adaptation to collecting suggested by the appearance and abundance of well-made milling implements. Millingstones occur in large numbers for the first time in the region's archaeological record, and are even more numerous near the end of this period. Aside from millingstones, typical artifacts during this period include crude core and cobble-core tools, flake tools, large side-notched projectile points, and pitted stones (Jones et al. 2007).

As testified by their toolkits and shell middens in coastal sites, people during this period practiced a mixed food procurement strategy. Subsistence patterns varied somewhat as groups became better adapted to their regional or local environments. Faunal remains identified at Millingstone sites point to broad-spectrum hunting and gathering of shellfish, fish, birds, and mammals, though large faunal assemblages are uncommon.

The Millingstone Period somewhat corresponds with King's (1981, 1990) Early Period of the Santa Barbara Channel area, although King's Early period starts later and lasts longer (5500 – 1350 B.C.). The Cross Creek site (CA-SLO-1797) is a Millingstone occupation site in San Luis Obispo County that returned radiocarbon dates ranging between 9,500 – 4,700 years ago This site represents one of the oldest expressions of the pattern (Jones et al. 2007; Jones et al. 2002; Fitzgerald 2000:58).

Along the Central Coast, Millingstone Period sites are most common on terraces and knolls, typically set back from the current coastline (Glassow et al. 1988:68, Erlandson 1994:46). However, no less than 42 sites have been identified in various settings, including rocky coasts, estuaries, and nearshore interior valleys (Jones et al. 2007). The larger sites usually contain extensive midden deposits, possible subterranean house pits, and cemeteries. Most of these sites probably reflect intermittent use over many years of local cultural habitation and resource exploitation. Erlandson (1994:47) has noted that the typical Millingstone tools are not common on contemporaneous Channel Island sites, possibly reflecting an alternate insular resource exploitation pattern.

3.1.3 Early Period and Early-Middle Transition Period (3,500 B.C. – 600 B.C.)

Although Jones and Ferneau (2002:213) have distinguished an Early-Middle Transition Period, it is not well defined and is difficult to observe. Thus, the transition phase is included in the following discussion of the sites and characteristics recognized for the Early Period in the Central Coast region.

A high frequency of shoreline midden deposits has been identified in the Central Coast region dating to the Early Period. This suggests that population numbers increased from the Milling Stone Horizon to the Early Period along the Central Coast (Jones 1995; Jones and Waugh 1995, 1997). Archaeological sites dating to the Early Period include CA-SLO-165 in Estero Bay, and CA-MNT-73, CA-MNT-108, and CA-MNT-1228 in Monterey Bay.

The material culture recovered from Early Period sites within the Central Coast region provides evidence for continued exploitation of inland plant and coastal marine resources. Artifacts include milling slabs and handstones, as well as mortars and pestles, which were used for processing a variety of plant resources. Bipointed bone gorge hooks were used for fishing. Assemblages also include a suite of *Olivella* beads, bone tools, and pendants made from talc schist. Square abalone shell (*Haliotis* spp.) beads have been found in Monterey Bay (Jones and Waugh 1997:122).

Shell beads and obsidian are hallmarks of the trade and exchange networks of the central and southern California coasts. The archaeological record indicates that there was a substantial increase in the abundance of obsidian at Early Period sites in the Monterey Bay and San Luis Obispo areas (Jones and Waugh 1997:124–126). Obsidian trade continued to increase during the following Middle period. Flaked stone artifact assemblages from Early Period sites include Central Coast Stemmed Series and side-notched projectile points. Square-stemmed and side-notched points were recovered from deposits at Willow Creek (CA-MNT-282) in Big Sur and Little Pico II (CA-SLO-175) on the San Luis Obispo coast (Jones and Ferneau 2002). This projectile point style trend, first identified by David Banks Rogers in 1929, was confirmed by Greenwood (1972) at Diablo Canyon. The projectile point trend has become apparent at numerous sites throughout the Central Coast. In many cases, manifestations of this trend are associated with the establishment of new settlements (Jones et al. 2007).

3.1.4 Middle Period (600 B.C.–A.D. 1000)

A pronounced trend toward greater adaptation to regional or local resources occurred during the Middle Period. The remains of fish, land mammals, and sea mammals are increasingly abundant and diverse in archaeological deposits along the coast. Flaked stone tools used for hunting and processing—such as large side-notched, stemmed, lanceolate or leaf-shaped projectile points, large knives, edge modified flakes, and drill-like implements—occurred in archaeological deposits in higher frequencies and are more morphologically diversified during the Middle Period. Bone tools, including awls, are more numerous than in the preceding period, and the use of asphaltum adhesive became common. Shell fishhooks also became part of the toolkit during this period.

Complex maritime technology, such as circular fish hooks, compound bone fish hooks, and the tule reed or balsa raft, also proliferated during this period. Notable technological introductions include circular shell fishhooks that date from between 1000 and 500 B.C. (Jones and Klar 2005:466). Compound bone fishhooks appear in deposits dating between A.D. 300 and 900 (Arnold 1995; Jones and Klar 2005:466; Kennett 1998:357; King 1990:87–88). Populations continued to follow a seasonal settlement pattern until the end of the Middle Period. Large, permanently occupied settlements, particularly in coastal areas, appear to have been the norm by the end of the Middle Period (Kennett 1998).

3.1.5 Middle-Late Transition Period (A.D. 1000-1250)

The Middle-Late Transition Period is marked by relative instability and change, with major changes in diet, settlement patterns, and interregional exchange. The relatively ubiquitous Middle Period shell midden sites found along the Central Coast were abandoned by the end of the Middle-Late Transition Period (Jones and Ferneau 2002:213, 219). Site CA-SLO-239 has been tentatively dated to the Middle-Late Transition Period, and contains the only residential feature, a circular house floor, dating to this time (Jones et al. 2007; Mikkelsen et al. 2000).

During the Middle to Late Transition Period, projectile points diagnostic of both the Middle and Late periods are found within the Central Coast region (Jones and Ferneau 2002:217). These projectile points include large, contracting-stemmed types typical of the Middle Period, as well as small, leaf-shaped Late Period projectile points, which likely reflect the introduction of the bow and arrow.

3.1.6 Late Period (A.D. 1250–Historic Contact)

Late Period sites are distinguished by small, finely-worked projectile points and temporally diagnostic shell beads. Although shell beads were typical of coastal sites, trade brought many of these maritime artifacts to inland locations, especially during the latter part of the Late Period. Small, finely-worked projectile points are typically associated with bow and arrow technology, which is believed to have been introduced to the area by the Takic migration from the deserts into southern California.

Common artifacts identified at Late Period sites include bifacial bead drills, bedrock mortars, hopper mortars, lipped and cupped *Olivella* shell beads, and steatite disk beads. The presence of beads and bead drills suggest that low-level bead production was widespread throughout the Central Coast region (Jones et al. 2007).

Unlike the large Middle Period shell middens, Late Period sites are more frequently single-component deposits. There are also more inland sites, with fewer and less visible sites along the Pacific shore during the Late Period. One Late Period shell midden has been identified on the coast, in Morro Bay (CA-SLO-23). The settlement pattern and dietary reconstructions indicate a lesser reliance on marine resources than observed for the Middle and Middle-Late Transition periods, as well as an increased preference for deer and rabbit (Jones 1995). An increase in the number of sites with bedrock mortar features that date to the Late Period suggests that nuts and seeds began to take on a more significant dietary role in Late Period populations (Jones et al. 2007).

3.2 ETHNOGRAPHIC OVERVIEW

The APE was historically occupied by the Obispeño Chumash, so called after their historic period association with Mission San Luis Obispo de Tolosa (Gibson 1983; Kroeber 1925). The precise location of the boundary between the Chumashan-speaking Obispeño Chumash and their northern neighbors, the Hokan-speaking Salinan, is debatable (Milliken and Johnson 2005); however, Jones and Waugh (1995:8) note that "those boundaries may well have fluctuated through time in response to possible shifts in economic strategies and population movement."

The Chumash spoke six closely related Chumashan languages, which have been divided into two broad groups—Northern Chumash (consisting only of Obispeño) and Southern Chumash (Purisimeño, Ineseño, Barbareño, Ventureño, and Island Chumash) (Mithun 2004:389). The Chumashan language currently is considered an isolate stock with a long history in the Santa Barbara region (Mithun 2004:304). Groups neighboring the Chumash included the Salinan to the north, the Southern Valley Yokuts and Tataviam to the east, and the Gabrielino (Tongva) to the south. Chumash place names in the project vicinity include Pismu (Pismo Beach), Tematatimi (along Los Berros Creek), and Tilhini (near San Luis Obispo) (Greenwood 1978:520).

Only a general outline of the lifeways of the Obispeño Chumash is known based on the little ethnographic information available (Greenwood 1978). Although their language was closer to Southern Chumash groups, the material culture and lifeways of the Northern Chumash appear to have been more similar to their northern neighbors, the Salinan. Accordingly, their populations in this area are thought to have been substantially lower than in the Santa Barbara Channel area, their villages smaller, and their livelihood less based on intensive use of marine fisheries (Glassow et al. 1988; Greenwood 1978).

Permanent Chumash villages included hemispherical dwellings arranged in close groups, with the chief having the largest for social obligations (Brown 2001). Each Chumash village had a formal cemetery marked by tall painted poles and often with a defined entrance area (Gamble et al. 2001:191). Archaeological studies have identified separate sections for elite and commoner families within the cemetery grounds (King 1969).

The acorn was a dietary staple for the mainland Chumash, though its dominance varied by coastal or inland location. Chumash diet also included cattail roots, fruits and pads from cactus, and bulbs and tubers of plants such as amole (Miller 1988:89). On the coast, the wooden plank canoe (*tomol*) was employed in the pursuit of marine mammals and fish. The *tomol* not only facilitated marine resource procurement but also facilitated an active trade network maintained by frequent crossings between the mainland and the Channel Islands.

Chumash populations were decimated by the effects of European colonization and missionization (Johnson 1987). Traditional lifeways largely gave way to laborer jobs on ranches and farms in the Mexican and early American periods. Today, the Santa Ynez Band of Chumash Indians is the only federally recognized Chumash tribe, though many people of Chumash descent continue to live throughout their traditional territory.

3.3 HISTORICAL OVERVIEW

Post-European contact history for California is generally divided into three periods: the Spanish Period (1769–1822), the Mexican Period (1822–1848), and the American Period (1848–present). The Spanish Period brought the establishment of the California mission system, while the Mexican Period is largely known for the division of the land of California into private land holdings. Following the Mexican-American war, the United States purchased California from Mexico and population in the state subsequently increased, particularly during the Gold Rush.

3.3.1 Spanish Period (1769–1822)

Initial European entry into the San Luis Obispo region began with the Juan Rodrigues Cabrillo Expedition in 1542. Cabrillo sailed along the coast, possibly landing in Morro Bay, and then continued as far north as San Francisco Bay (Chesnut 1993). In 1587, Pedro de Unamuno landed in what was most likely Morro Bay, but suffered casualties during an attack by Native Americans and left (Bean 1968). Sebastian Rodriguez Cermeño entered the San Luis Obispo region in 1595 as part of his exploration of the Alta California coast (Jones et al. 1994). The earliest detailed descriptions of the area come from members of Gaspar de Portolá's land expedition, which passed through the region in 1769 (Squibb 1984). Early travelers in the Central Coast region reported seeing no large Native American villages like those noted in the Santa Barbara Channel area.

Gaspar de Portolá and Franciscan Father Junípero Serra established the first Spanish settlement in Alta California at Mission San Diego de Alcalá in 1769. This was the first of 21 missions erected by the Spanish between 1769 and 1823. Portolá continued north, passing through the project vicinity and reaching San Francisco Bay in 1769. Mission San Luis Obispo de Tolosa was founded in 1772, the fifth of 21 missions established by the Spanish in Alta California (Rolle 2003).

3.3.2 Mexican Period (1822–1848)

The Mexican Period commenced when news of the success of the Mexican Revolution (1810-1821) against the Spanish crown reached California in 1822. This period saw the federalization of mission lands in California with the passage of the Secularization Act of 1833. This Act enabled Mexican governors in California to distribute former mission lands to individuals in the form of land grants. Successive Mexican governors made more than 700 land grants between 1833 and 1846, putting most of the state's lands into private ownership for the first time (Shumway 2007).

The secularization of the missions during the Mexican period resulted in approximately 500,000 acres of former mission lands being granted to Mexican citizens in San Luis Obispo County (San Luis Obispo 2006). The land around Laguna Lake was originally part of a rancho associated with the Mission San Luis Obispo de Tolosa. In 1844 Governor Manuel Micheltorena granted the Church one square league or approximately 4,157 acres of land in the place called Laguna (Bertrando 1999). In 1845 Governor Pio Pico sold the remaining mission lands and buildings to Captain John Wilson and his partners Scott and McKinley $500 (Angel 1994).

3.3.3 American Period (1848–Present)

The American Period began with the signing of the Treaty of Guadalupe Hidalgo in 1848, which marked the end of the United States' war with Mexico. The United States agreed to pay Mexico $15 million for the conquered territory, including California, Nevada, Utah, and parts of Colorado, Arizona, New Mexico, and Wyoming. The existing Mexican land grants were expected to be recognized, but over time, as settlement increased throughout the state, disputes arose between rancheros and settlers. Rancho owners expended much money and effort attempting to defend their land holdings. The California territory officially became a state in 1850 and the County of San Luis Obispo was established as one of the state's original 27 counties. That same year, William Hutton was authorized to survey and lay out the town of San Luis Obispo (Angel 1994). The region suffered a severe drought between the years of 1862 and 1864 which decimated the cattle herds (Angel 1994). Rancheros struggled with this loss of income, debt, and costs incurred from legally defending their land under the new American law. As a result, many of the rancho lands were sold or lost. Most were subdivided into agricultural parcels or towns. .

Bishop Joseph Alemany petitioned the U.S. government to return a portion of the mission lands back to the Church. In the mid-1850s, approximately 53 acres of the former mission lands were returned to the Church as well as the 4,157 acre Laguna Rancho (Angel 1994; Morrison et al. 1917). Bishop Alemany sold the Laguna property to Captain John Wilson in late 1859 (Angel 1994). In the early 1860s, W.W. Stow, an attorney and politician from San Francisco, purchased the Laguna Rancho from Wilson. The rancho was subdivided in 1868 when it was surveyed by James Stratton along with Rancho Cañada de los Osos (Bertrando 1999).

By April 1887, an estimated 3,000 to 4,000 people inhabited the region, and land prices increased dramatically. In 1894, the Southern Pacific Railroad completed a line from San Jose to San Luis Obispo encouraging trade and further settlement of the region. As the population increased in the town, Laguna Lake became a popular area for duck hunting and black bass were stocked in the lake. By 1896 farmers around the lake, growing mostly barley at that time, posted "No Hunting Allowed" signs throughout the area, as the popularity of the lake became troublesome to the surrounding landowners (Tognazzini 1996).

In the early twentieth century Port Harford was renamed Port San Luis, and oil from the Santa Maria and Taft-Coalinga fields was shipped beginning in 1907 and 1913, respectively. The California Polytechnic School was established in 1901 as a high school and eventually became California Polytechnic State University. The county's agriculture and ranching production supplied U.S troops during World War I and helped its residents weather the Great Depression of the 1930s. At the start of World War II, the U.S. War Department transferred nearly 100,000 military personnel to bases at Morro Bay, Camp San Luis Obispo, Camp Roberts, and Cambria.

4.0 BACKGROUND RESEARCH

Background research for the current study encompassed both the APE and a 0.5-mile radius surrounding the APE. Background research was conducted to identify any previous studies within proximity to the project and to identify and characterize any previously recorded resources in and around the APE. The background research conducted for this study includes a

review of the SLF maintained by the NAHC; Native American scoping for information regarding any Native American cultural resources within or near the project site; a review of cultural resource records at the CHRIS CCIC; local historical group scoping for information regarding any historic resources or other cultural resources within or near the APE; and a review of all available historical USGS 7.5- and 15-minute quadrangle and aerial maps.

4.1 NATIVE AMERICAN HERITAGE COMMISSION

Rincon Archaeologist Ashlee Bailey, M.A., RPA, contacted the NAHC to request a review of the SLF on April 20, 2016 and to initiate communication with local Native American groups and individuals who may have knowledge of cultural resources that may exist within or near the project area. As part of this effort, Ms. Bailey mailed anticipatory letters to Native American tribal organizations or individuals who may have knowledge of cultural resources within the APE using a contact list provided for a nearby project on April 20, 2016. The NAHC responded by email on April 21, 2016. The response provided a list of Native American groups and individuals with whom to communicate regarding the project (Appendix A). Additional letters were sent to three Native American not included in the anticipatory mailing. As of May 18, 2016, Rincon has received no responses from Native American contacts.

4.2 CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

On April 20, 2016, Rincon requested a search of the cultural resource records housed at the California Historical Resources Information System (CHRIS), Central Coast Information Center (CCIC) located at University of California, Santa Barbara. The search was conducted to identify all previous cultural resources work and previously recorded cultural resources within a 0.5-mile radius of the project site. The CHRIS search included a review of the NRHP, the CRHR, the California Points of Historical Interest list, the California Historical Landmarks list, the Archaeological Determinations of Eligibility list, and the California State Historic Resources Inventory list. The records search also included a review of all available historic USGS 7.5- and 15-minute quadrangle maps.

The cultural resource records search of the CCIC inventory identified eight reports that overlapped the APE, and 20 resulting from projects conducted within a 0.5-mile radius of the APE. No cultural resources have been recorded within the project site, but six resources have been recorded within a 0.5-mile radius of the project site (Appendix B).

4.2.1 Previous Studies

The cultural resource records search of the CCIC inventory identified eight reports that overlapped the APE, and 20 reports resulting from projects conducted within a 0.5-mile radius of the APE. Table 1 summarizes the report for the projects conducted that overlap the APE. Table 2 summarizes the reports for projects conducted within a 0.5-mile radius of the APE.

Table 1. Previous Studies Conducted Within the APE.

Study No.	Author	Year	Title
S-00087	Dills, C.	N.D.	*Archaeological Potential of the Curci Property around Laguna Junior High, S.L.O.*
S-00152	Hoover, R.	1980	*Archaeological Evaluation of the Los Osos Valley Road Widening*
S-00226	Dills, C.	1977	*Sunset Terrace, South Bay*
S-00967	Singer, C. and J. Atwood	1989	*Cultural Resources Survey and Impact Assessment for the Proposed Widening of Los Osos Valley Road from the San Luis Obispo City Limit Westward to the Los Osos Creek Bridge, SLO County, CA*
S-02922	Farris, G., P. Hines, M. Rhoades, and B. Rivers	1995	*Coastal Branch, Phase II State Water Project Cultural Resources Survey Reaches 5B and 6 San Luis Obispo and Santa Barbara Counties*
S-05439	Parker, J.	2005	*Cultural Resource Investigation of The Rittger Parcel, 1821 Donna Ave., Los Osos APN 074-136-028*
S-06458	Linder, Megan M. and Marc D. Linder	2009	*Archaeological Survey Report Prefumo Creek Pedestrian/Bike Path Project City of San Luis Obispo, San Luis Obispo County, California*
S-06459	Price, Barry	2009	*Historic Property Survey Report Prefumo Creek Pedestrian/Bike Path Project City of San Luis Obispo, San Luis Obispo County California*

Source: Central Coast Information Center, April 2016.

Table 2. Previous Studies Within a 0.5-Mile Radius of the APE.

Study No.	Author	Year	Study
S-00091	Dills, C.	1977	*San Luis Mall, Archaeological Potential*
S-00093	Dills, C.	1977	*Val Vista Estates tract on Los Osos Road, north of Laguna Junior High. A statement of archaeological potential*
S-00135	Dills, C.	1976	*Archaeological Potential of Fire Station and Swimming Pool Areas, Proposed for San Luis Obispo*
S-00136	Dills, C.	1977	*Laguna Lake, Cuesta Highlands Tracts 603 and 608, San Luis Obispo City Draft EIR Report*
S-00138	Dills, C.	1975	*Information to aid in Interpretive Planning Map for San Luis Obispo (city) and Environs*
S-00139	Dills, C.	N.D.	*Dutch Barn*
S-00315	Dills, C.	N.D.	*Recorded Sites in the Irish Hills near Prefumo Canyon*
S-00437	Smith, C.	1981	*Archaeological Survey Along Highway 101, From Marsh Road. South to Approximately .5 miles South of Madonna Road*
S-00719	Brock, J. and R. Wall	1986	*A Cultural Resources Assessment of Selected Study Areas within the City of San Luis Obispo*

Table 2. Previous Studies Within a 0.5-Mile Radius of the APE.

S-02363	Gibson, Robert O.	1993	*Inventory of Cultural Resources for the Water Reclamation Project, City of San Luis Obispo, CA*
S-03711	Bertrando, Betsy	1999	*Historical Resources Inventory and Evaluation for the San Luis Marketplace Annexation: The Dalidio Property, San Luis Obispo, California*
S-03804	Bertrando, Betsy	1999	*Historical Evaluation for the Existing Structures on the Proposed San Luis Obispo Marketplace Annexation*
S-03962	Parker, J.	2000	*Cultural Resource Resurvey of the Proposed Alignments of the MFS Globenet/Worldcom Fiber Optic Project*
S-04053	Nettles, Wendy	2000	*Phase-1 Archaeological Survey of the Proposed Prado Road/Highway 101 Interchange, San Luis Obispo County, CA*
S-04378	Gibson, Robert O.	1997	*Results of Phase One Archaeological Surface Survey of the Devaul Ranch Property, Los Osos Valley Road, San Luis Obispo, CA*
S-06133	Conway, Thor	2007	*Archaeological Surface Survey for the Prefumo Creek Commons Project, Los Osos Valley Road & Froom Rancy Way, San Luis Obispo, San Luis Obispo County, California*
S-06388	Bonner, Wayne H.	2008	*Cultural Resources Records Search and Site Visit Results for AT&T Mobility, LLC Candidate VN0181-01 (Laguna Lake Golf Course), 11175 Los Osos Valley Road, San Luis Obispo, San luis Obispo County, California*
S-06431	Billat, Lorna	2009	*New Tower, Project Name: Congregational Church, Project Number: SF-90220B*
S-06759	Not available	N.D.	*Not available*
S-06761	Not available	N.D.	*Not available*

Source: Central Coast Information Center, April 2016.

4.2.2 Previously Recorded Resources

The CCIC records search identified six previously recorded cultural resources within a 0.5-mile radius of the project APE (Table 3). No previously recorded resources have been found within the project APE.

Table 3. Previously Records Resources Within a 0.5-Mile Radius of the APE.

Resource No.	Description	NRHP/CRHR Eligibility Status	Recorded By and Year	Relationship to APE
P-40-000097	Lithic scatter, rock shelter, habitation debris	Not NRHP/CRHR recognized, eligibility unknown	P.M. Jones (1900); A.R. Pilling (1955); L. Spanne (1977); T. Hannahs (2007); J. Dietler and L. Laurie (2012)	Outside
P-40-000400	Bedrock mortar site	Not NRHP/CRHR recognized, eligibility unknown	C.E. Dills (1970)	Outside
P-40-000605	Bedrock mortar site	Not NRHP/CRHR recognized, eligibility unknown	W. Deane (1971)	Outside

Table 3. Previously Records Resources Within a 0.5-Mile Radius of the APE.

Resource No.	Description	NRHP/CRHR Eligibility Status	Recorded By and Year	Relationship to APE
P-40-001406	Shell midden	Not NRHP/CRHR recognized, eligibility unknown	G. Fleshman (1974)	Outside
P-40-002281	Rock wall feature	Not NRHP/CRHR recognized, eligibility unknown	R.O. Gibson (1996)	Outside
P-40-002282	Lithic scatter	Not NRHP/CRHR recognized, eligibility unknown	R.O. Gibson (1996)	Outside

Source: Central Coast Information Center, April 2016.

4.3 HISTORICAL GROUP CONSULTATION

On April 20, 2016, Rincon Senior Architectural Historian Shannon Carmack, B.A., mailed letters to the City of San Luis Obispo Cultural Heritage Committee, the History Center of San Luis Obispo County, and the San Luis Obispo County Genealogical Society, Inc. asking for any knowledge those groups might have regarding cultural resources that may exist within or near the project area. On May 16, 2016, Ms. Carmack spoke with Eva Ulz, Curator and Director of the History Center of San Luis Obispo County. Ms. Ulz stated that she had no knowledge of potential or known historic or other cultural resources in the project area or vicinity. As of May 18, 2016, Rincon has received no further responses from local historical groups.

5.0 SURVEY METHODS

Rincon Archaeologist Ashlee M. Bailey, M.A., RPA, conducted an intensive pedestrian survey of the APE on April 21, 2016. Ms. Bailey examined the ground using transects spaced no greater than 15 meters apart and oriented northeast to southwest for the entire APE. Ms. Bailey examined all exposed ground surface for artifacts (e.g. flaked stone tools, tool-making debris, stone milling tools, ceramics, fire-affected rock [FAR]), ecofacts (marine shell and bone), soil discoloration that might indicate the presence of a cultural midden, soil depressions, and features indicative of the former presence of structures or buildings (e.g. standing exterior walls, postholes, foundations) or historic debris (e.g. metal, glass, ceramics). Ground disturbances, such as animal burrows and drainages, were visually inspected as these disturbances can expose subsurface deposits.

6.0 RESULTS AND DISCUSSION

The pedestrian survey did not identify any previously unrecorded built environment or archaeological resources within the APE. The APE includes the Laguna Lake Park as well as access to Laguna Lake via Prefumo Creek, bounded on both sides by developed residential areas. Laguna Lake Park includes three major areas, including a preserved natural wetland fringe bounded by two dirt walking trails, a developed area, and a grassland with a disc golf course and fitness area.

Approximately 35 percent of the APE is a natural wetland fringe in the shallows along the edge of Laguna Lake, bounded on the north by the Allen K. Settle Trail and on the south, east, and

west by the Lake Side Trail. Vegetation in this area consists of annual grassland, including primarily annual and perennial herbs, tall tule, and smartweed stands. Ground visibility was low, with vegetation cover estimated at approximately 90 to 100 percent. Modern trash and piles of discarded rocks were noted throughout this area.

Approximately 30 percent of the APE is developed with paved access roads and parking areas, paved pedestrian walkways, the Laguna Lake Dog Park, a gazebo with picnic benches, restroom facilities, a portion of the disc golf course, benches and picnic tables near a playground, an area of annual grassland, and a large, landscaped lawn with planted trees. Vegetation in this area includes a grove of eucalyptus trees, landscaped lawn, and dirt pathways with groundcover bark and duff from the eucalyptus grove. Non-native grasses, such as ryegrass and oats, are dominant in the areas of unkempt grass. Native herbs and several native wildflowers were also observed in the annual grassland. Ground visibility was low, with vegetation cover estimated at approximately 95 to 100 percent. Development has impacted the majority of this portion of the APE.

Approximately 20 percent of the eastern portion of the APE consists of annual and needlegrass grasslands with a disc golf course and a fitness area. The disc golf course includes concrete disc golf throwing platforms; unpaved, mowed pathways; and disc golf baskets. Ground visibility was low, with vegetation cover estimated at approximately 95 to 100 percent.

The APE along Prefumo Creek consists of a willow riparian habitat. Vegetation includes willow and cottonwood trees as well as grass, smartweed, and annual poppies. Ground visibility was low, with vegetation cover estimated at approximately 95 to 100 percent.

7.0 CONCLUSIONS AND RECOMMENDATIONS

No cultural resources were identified within the APE as a result of the SLF search, Native American scoping, the CHRIS records search, historic group consultation, or the pedestrian survey. Based on these results, Rincon recommends a finding of ***no historic properties affected*** under the NHPA and a finding of ***no impact to historical resources*** under the CEQA for the current undertaking. No further cultural resources work is recommended for the proposed project. To maintain the findings of no historic properties affected under the NHPA and no impact to historical resources under the CEQA, Rincon recommends that measures be in place for the unanticipated discovery of cultural resources and human remains. These recommendations are discussed in greater detail below.

7.1 UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES

In the event that archaeological resources are unearthed during Project construction, all earth disturbing work within the vicinity of the find shall be temporarily suspended or redirected until an archaeologist has evaluated the nature and significance of the find. Evaluation of significance for the find may include the determination of whether or not the find qualifies as an archaeological site. Isolated finds do not qualify as a historic property under the NHPA or as historical resources under CEQA and require no management consideration under either regulation. Should the resource(s) be determined to qualify as an archaeological site, an evaluation of eligibility for the NRHP and CRHR may be required through the development of

a treatment plan including a research design plan and subsurface testing through the excavation of test units and shovel test pits. After effects to the find have been appropriately mitigated, work in the area may resume. Mitigation of effects to the find may include a damage assessment of the find, archival research, and/or data recovery to remove any identified archaeological deposits, as determined by a qualified archaeologist.

7.2 UNANTICIPATED DISCOVERY OF HUMAN REMAINS

The discovery of human remains is always a possibility during ground disturbing activities. If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the county coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner must be notified immediately. If the human remains are determined to be prehistoric, the coroner will notify the NAHC, which will determine and notify a most likely descendant (MLD). The MLD shall complete the inspection of the site within 48 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.

8.0 REFERENCES

Angel, Myron
1994 [1883] History of San Luis Obispo County, California, With Illustrations and Biographical Sketches of Its Prominent Men and Pioneers. Friends of the Adobes, San Miguel, California. Originally published 1883, Thompson and West, Oakland, California.

Arnold, Jeanne E.
1995 Transportation Innovation and Social Complexity among Maritime Hunter-Gathere Societies. *American Anthropologist* 97: 733-747.

Bean, Walton
1968 *California: An Interpretive History*. McGraw-Hill Book Company.

Bertrando, Betsy
1999 Historical Evaluation for the Existing Structures on the Proposed San Luis Obispo Marketplace Annexation. Report on file, California Historical Resources Information System, Central Coast Information Center, University of California Santa Barbara.

Bickel, P. McW.
1978 Changing Sea Levels along the California Coast: Anthropological Implications. *Journal of California Anthropology* 5:6-20.

Breschini, Gary S., and Trudy Haversat
1991 Early Holocene Occupation of the Central California Coast. In *Hunter-Gatherers of Early Holocene Coastal California*, edited by Jon M. Erlandson and Roger H. Colten, pp.125-132. Perspectives in California Archaeology, Vol. 1. Institute of Archaeology, University of California, Los Angeles.

Brown, Alan K. (editor)
2001 *A Description of Distant Roads: Original Journals of the First Expedition into California, 1769-1770*, by Juan Crespi. Translated by Alan K. Brown. San Diego State University Press, San Diego.

Chesnut, Merlyn
1993 The Gaviota Land: A Glimpse Into California History. Fithian Press, Santa Barbara, California.

Erlandson, Jon M.
1991 Early Maritime Adaptations on the Northern Channel Islands. In *Hunter-Gatherers of Early Holocene Coastal California,* edited by J. M. Erlandson and R. Colten. Perspectives in California Archaeology, Vol. 1. Institute of Archaeology, University of California, Los Angeles.

1994 *Early Hunter-Gatherers of the California Coast*. Plenum Press, New York.

Erlandson, Jon M., Theodore Cooley, and Richard Carrico
1987 A Fluted Projectile Point Fragment from the Southern California Coast: Chronology and Context at CA-SBA-1951. *Journal of California and Great Basin Anthropology* 9:120–128.

Fitzgerald, Richard T.
2000 Cross Creek: An Early Holocene/Millingstone Site. *California State Water Project, Coastal Branch Series Paper Number 12*. San Luis Obispo County Archaeological Society, San Luis Obispo, California.

Gamble, Lynn. H., Philip. L. Walker, and Glenn S. Russell
2001 Integrative Approach to Mortuary Analysis: Social and Symbolic Dimensions of Chumash Burial Practices. *American Antiquity* 66:185–212.

Gibson, R. O.
1983 Ethnography of the Salinan People: A Systems Approach. Master's Thesis, California State University, Hayward.

Glassow, Michael A.
1997 Middle Holocene Cultural Development in the Central Santa Barbara Channel Region. In *Archaeology of the California Coast during the Middle Holocene*, edited by Jon M. Erlandson and Michael A. Glassow, pp.73–90. Perspectives in California Archaeology, Vol. 4. Institute of Archaeology, University of California, Los Angeles.

Glassow, Michael A, L. Wilcoxen, and J. M. Erlandson
1988 Cultural and Environmental Change during the Early Period of Santa Barbara Channel Prehistory. In *The Archaeology of Prehistoric Coastlines*, edited by G. Bailey and J. Parkington pp. 64–77. Cambridge University Press, Cambridge, England.

Greenwood, Roberta S.
1972 9000 Years of Prehistory at Diablo Canyon, San Luis Obispo County, California. *San Luis Obispo Historical Society Occasional Paper No. 7*.

1978 Obispeño and Purisimeño Chumash. In *California*, edited by Robert F. Heizer, pp. 520–523. Handbook of North American Indians, Vol. 8, William G. Sturtevant, general editor, Smithsonian Institution, Washington D.C.

Johnson, John R.
1987 Chumash Social Organization: An Ethnohistoric Perspective. Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Santa Barbara.

Johnson, J. R., T. W. Stafford, Jr., H. O. Ajie, and D. P. Morris
2002 Arlington Springs Revisited. In *Proceedings of the Fifth California Islands Symposium*, edited by D. Browne, K. Mitchell, and H. Chaney, pp. 541–545. USDI Minerals Management Service and the Santa Barbara Museum of Natural History, Santa Barbara, California.

Jones, D.A., C. Young, and William R. Hildebrandt
2001 Phase II Archaeological Test Excavation at CA-SLO-832 and CA-SLO-1420, for the James Way/Price Street Road Improvement Project, San Luis Obispo County, California. Far Western Anthropological Research Group, Davis California. Submitted to California Department of Transportation, San Luis Obispo.

Jones, Terry L.
1993 Big Sur: A Keystone in Central California Cultural History. *Pacific Coast Archaeological Society Quarterly* 29(1):1–78.

1995 Transitions in Prehistoric Diet, Mobility, Exchange, and Social Organization along California's Big Sur Coast. Unpublished Ph.D. dissertation, University of California, Davis.

Jones, Terry L. and Georgie Waugh

1995 Central California Prehistory: A View from Little Pico Creek. *Perspectives in California Archaeology 3*. Institute of Archaeology, University of California, Los Angeles.

1997 Climatic Consequences of Population Pragmatism? A Middle Holocene Prehistory of the Central Coast. In Archaeology of the California Coast During the Middle Holocene, edited by Jon M. Erlandson and Michael A. Glassow, pp. 111–128. Perspectives in California Archaeology 4. Institute of Archaeology, University of California, Los Angeles.

Jones, Terry L., and Jennifer A. Ferneau

2002 Deintensification along the Central California Coast. In *Catalysts to Complexity, Late Holocene Societies of the California Coast*, edited by Jon M. Erlandson and Terry L. Jones, pp. 205-232. Perspectives in California Archaeology Vol. 6. Costen Institute of Archaeology, University of California, Los Angeles.

Jones, Terry L. and Kathryn A. Klar

2005 Diffusionism Reconsidered: Linguistic and Archaeological Evidence for Prehistoric Polynesian Contact with Southern California. *American Antiquity* 70(3):457–484.

2007 California Prehistory: Colonization, Culture, and Complexity. AltaMira Press, Lanham, Maryland.

Jones, Terry L., K. Davis, G. Farris, S.D. Grantham, T.W. Fung, and B. Rivers

1994 *Toward a Prehistory of Morro Bay: Phase II Archaeological Investigations for the Highway 41 Widening Project, San Luis Obispo County, California*. Report prepared for Caltrans District 5, San Luis Obispo, California.

Jones, Terry L., Nathan E. Stevens, Deborah A. Jones, Richard T. Fitzgerald, and Mark G. Hylkema

2007 The Central Coast: A Midlatitude Milieu. In *California Prehistory: Colonization, Culture, and Complexity,* edited by Terry L. Jones and Kathryn A. Klar, pp. 125–146. AltaMira Press, Lanham, Maryland.

Jones, Terry L., Richard T. Fitzgerald, Douglas J. Kennett, Charles Miksicek, John L. Fagan, John Sharp, and Jon M. Erlandson

2002 The Cross Creek Site and Its Implications for New World Colonization. *American Antiquity* 67:213–230.

Justice, Noel D.

2002 *Stone Age Spear and Arrow Points of California and the Great Basin*. Indiana University Press, Bloomington, Indiana.

Kennett, Douglas J.

1998 Behavioral Ecology and the Evolution of Hunter-Gatherer Societies on the Northern Channel Islands, California. Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Santa Barbara.

King, Chester D.

1969 Approximate 1769 Chumash Village Locations and Populations. *Annual Reports of the University of California Archaeological Survey* 11:3. Los Angeles, California.

1981 The Evolution of Chumash Society: A Comparative Study of Artifacts Used in Social System Maintenance in the Santa Barbara Channel Region Before A.D. 1804. Ph.D. dissertation, University of California, Davis.

1990 Evolution of Chumash Society: A Comparative Study of Artifacts Used in Social System Maintenance in the Santa Barbara Channel Region Before A.D. 1804. Revised Ph.D. dissertation with a new preface and updated bibliography. In *The Evolution of North American Indians*, edited by David Hurst Thomas. Garland Publishing, New York.

Kroeber, Alfred J.

1925 *Handbook of the Indians of California*. Bulletin 78, Bureau of American Ethnology, Smithsonian Institution. Government Printing Office, Washington, D.C. Reprinted 1976 by Dover Publications, Inc., New York.

Lebow , C., M.C. Baloian, D.R. Harro, R.L. Mckim, C. Denardo, J. Onken, E. Romanski, and B.A. Price

2001 Final Report of Archaeological Investigations for Reaches 5B and 6 Coastal Branch Aqueduct, Phase II. Applied EarthWorks Inc., Fresno, California. Submitted to Central Coast Water Authority, Buellton, California.

Mikkelsen, P., W.R. Hildebrandt, and D. A. Jones

2000 Prehistoric Adaptations on the Shores of Morro Bay Estuary: Excavations at Site CA-SLO-165, Morro Bay, California. *San Luis Obispo County Archaeological Society Occasional Papers* no. 14.

Miller, Bruce W.

1988 *Chumash: A Picture of Their World*. Sand River Press, Los Osos, California.

Milliken, R. T. and J. R. Johnson

2005 An Ethnography of Salinan and Northern Chumash-1769 to 1810. Report prepared for Caltrans District 5. Far Western Anthropological Research Group, Davis. Copies available from California Department of Transportation, San Luis Obispo.

Mills, Wayne, Michael F. Rondeau, and Terry L. Jones

2005 A Fluted Point from Nipomo, San Luis Obispo County, California. *Journal of California and Great Basin Archaeology* 25(2): 68-74.

Mithun, Marianne

2004 *The Languages of Native North America*. Cambridge University Press, Cambridge, Massachusetts. Originally published 1999.

Moratto, Michael

1984 *California Archaeology*. Academic Press, New York.

Morrison, Annie L., and John H. Haydon

1917 *History of San Luis Obispo County and Environs With Biographical Sketches of the Leading Men and Women of the County and Environs Who Have Been Identified with the Growth and Development of the Section From The Early Days to the Present*. Historic Record Company, Los Angeles.

National Park Service
1983 *Secretary of Interior Standards and Guidelines for Archaeology and Historic Preservation*. https://www.nps.gov/history/local-law/arch_stnds_0.htm. Accessed 5/20/2016.

Rolle, Andrew
2003 *California: A History*. Revised and expanded sixth edition. Harlan Davidson, Inc., Wheeling, Illinois.

San Luis Obispo, City of
2006 A Brief History. Electronic document, www.ci.san-luis-obispo.ca.us/briefhistory.asp., accessed May 10, 2006.

Shumway, Burgess McK.
2007 California Ranchos. Second Edition. The Borgo Press.

Squibb, Paul
1984 *Captain Portola in San Luis Obispo County in 1769*. Tabula Rasa Press, Morro Bay, California.

Tognazzini, W.N.
1996 *100 Years Ago, 1896: Excerpts from the San Luis Obispo Morning Tribune and Breeze*. W. N. Tognazzini, San Luis Obispo, California.

Wallace, William
1955 Suggested Chronology for Southern California Coastal Archaeology. *Southwestern Journal of Anthropology* 11:214–230.

1978 Post-Pleistocene Archaeology, 9000 to 2000 B.C. In *California*, edited by R. F. Heizer, pp. 25–36. Handbook of North American Indians, Vol. 8, W. C. Sturtevant, general editor, Smithsonian Institution, Washington D.C.

Appendix A

Native American and Historic Group Correspondence

NATIVE AMERICAN HERITAGE COMMISSION
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
(916) 373-3710
Fax (916) 373-5471

April 21, 2016

Ashlee Bailey
Rincon Consultants, Inc.

Sent by Email: abailey@rinconconsultants.com
Number of Pages: 3

RE: Proposed Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo USGS Quadrangle, San Luis Obispo County, California

Dear Ms. Bailey:

A record search of the Native American Heritage Commission (NAHC) *Sacred Lands File* was completed for the area of potential project effect (APE) referenced above with negative results. Please note that the absence of specific site information in the *Sacred Lands File* does not indicate the absence of Native American cultural resources in any APE.

I suggest you contact all of the listed Tribes. If they cannot supply information, they might recommend others with specific knowledge. The list should provide a starting place to locate areas of potential adverse impact within the APE. By contacting all those on the list, your organization will be better able to respond to claims of failure to consult. If a response has not been received within two weeks of notification, the NAHC requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any of these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact via email: gayle.totton@nahc.ca.gov.

Sincerely,

Gayle Totton

Gayle Totton, M.A., PhD.
Associate Governmental Program Analyst

Native American Contact List
San Luis Obispo County
April 21, 2016

Santa Ynez Band of Mission Indians
Vincent Armenta, Chairperson
P.O. Box 517 Chumash
Santa Ynez , CA 93460
varmenta@santaynezchumash.org
(805) 688-7997
(805) 686-9578 Fax

Xolon-Salinan Tribe
Karen White, Council Chairperson
PO Box 7045 Salinan
Spreckels , CA 93962
blukat41@yahoo.com
831-238-1488

Barbareno/Ventureno Band of Mission Indians
Julie Lynn Tumamait-Stennslie, Chair
365 North Poli Ave Chumash
Ojai , CA 93023
jtumamait@hotmail.com
(805) 646-6214

Salinan Nation Cultural Preservation Association
Cultural Resources Coordinator
P.O.Box 56 Salinan
Lockwood , CA 93932

San Luis Obispo County Chumash Council
Chief Mark Steven Vigil
1030 Ritchie Road Chumash
Grover Beach , CA 93433
(805) 481-2461

(805) 474-4729 Fax

Salinan Nation Cultural Preservation Association
Robert Duckworth, Environmental Coordinator
4777 Driver Rd. Salinan
Valley Springs , CA 95252
dirobduck@thegrid.net
(831) 578-1852

Salinan Tribe of Monterey, San Luis Obispo Counties
Patti Dunton, Tribal Administrator
7070 Morro Road, Suite A Salinan
Atascadero , CA 93422 Chumash
salinantribe@aol.com
(805) 464-2650
(805) 235-2730 Cell
(805) 460-9204

Coastal Band of the Chumash Nation
Mia Lopez, Chairperson
, Chumash
cbcn.nahc.sb@gmail.com
(805) 324-0135

Santa Ynez Tribal Elders Council
AntoniaFlores, Chairperson
P.O. Box 365 Chumash
Santa Ynez , CA 93460
elders@santaynezchumash.org
(805) 688-7997

(805) 693-1768 Fax

yak tityu tityu - Northern Chumash Tribe
Mona Olivas Tucker, Chairwoman
660 Camino Del Rey Chumash
Arroyo Grande , CA 93420
olivas.mona@gmail.com
(805) 489-1052 Home
(805) 748-2121 Cell

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo Counties, California.

Native American Contact List
San Luis Obispo County
April 21, 2016

Santa Ynez Band of Mission Indians
Tribal Admin/Counsel Sam Cohen
P.O. Box 517 Chumash
Santa Ynez , CA 93460
info@santaynezchumash.org
(805) 688-7997

(805) 686-9578 Fax

Barbareno/Ventureno Band of Mission Indians
Raudel Joe Banuelos, Jr.
331 Mira Flores Court Chumash
Camarillo , CA 93012
(805) 987-5314

Salinan Nation Cultural Preservation Association
Gregg Castro, Administrator
5225 Roeder Road Salinan
San Jose , CA 95111
glcastro@pacbell.net
(408) 219-2754

Coastal Band of the Chumash Nation
Gino Altarmirano
, Chumash
cbcn.nahc.slo@gmail.com
(510) 862-7615

Salinan-Chumash Nation
Xielolixii
3901 Q Street, Suite 31B Salinan
Bakersfield , CA 93301 Chumash
(408) 966-8807 Cell

Coastal Band of the Chumash Nation
Isabel Ayala
, Chumash
cbcn.nahc.ventura@gmail.com
(661) 340-6997

Northern Chumash Tribal Council
Fred Collins, Spokesperson
67 South Street Chumash
San Luis Obispo , CA 93401
fcollins@northernchumash.org
(805) 801-0347 (Cell)

Salinan Tribe of Monterey, San Luis Obispo Counties
Fred Segobia
46451 Little Creek Court Salinan
King City , CA 93930 Chumash
831-385-1490

Barbareno/Ventureno Band of Mission Indians
Kathleen Pappo
2762 Vista Mesa Drive Chumash
Rancho Pales Verdes , CA 90275
(310) 831-5295

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo Counties, California.

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 29, 2016

Gregg Castro
5225 Roeder Road
San Jose, CA 95111

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Administrator Gregg Castro:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in the project area. The NAHC responded via email on April 21, 2016 with negative results. The NAHC recommended that we consult with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. We are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 29, 2016

Cultural Resources Coordinator
P.O. Box 56
Lockwood, CA 93932

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Cultural Resources Coordinator:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in the project area. The NAHC responded via email on April 21, 2016 with negative results. The NAHC recommended that we consult with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. We are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 29, 2016

Robert Duckworth
4777 Driver Rd.
Valley Springs, CA 95252

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Environmental Coordinator Robert Duckworth:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in the project area. The NAHC responded via email on April 21, 2016 with negative results. The NAHC recommended that we consult with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. We are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Julie Lynn Tumamait-Stenslie
365 North Poli Ave
Ojai, CA 93023

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Chairperson Julie Lynn Tumamait-Stenslie:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Fred Collins
67 South Street
San Luis Obispo, CA 93401

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Spokesperson Fred Collins:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Xielolixii
3901 Q Street, Suite 31B
Bakersfield, CA 93301

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Xielolixii:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Patti Dunton
7070 Morro Road, Suite A
Atascadero, CA 93422

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Tribal Administrator Patti Dunton:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Fred Segobia
46451 Little Creek Court
King City, CA 93930

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Chairperson Fred Segobia:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Kathleen Pappo
2762 Mesa Drive
Rancho Palos Verdes, CA 90275

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Kathleen Pappo:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Raudel Joe Banuelos, Jr.
331 Mira Flores Court
Camarillo, CA 93012

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Raudel Joe Banuelos, Jr.:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Karen White
PO Box 7045
Spreckels, CA 93962

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Council Chairperson Karen White:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Chief Mark Steven Vigil
1030 Ritchie Road
Grover Beach, CA 93433

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Chief Mark Steven Vigil:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Mona Olivas Tucker
660 Camino Del Rey
Arroyo Grande, CA 93420

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Chairwoman Mona Olivas Tucker:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Vincent Armenta
PO Box 517
Santa Ynez, CA 93460

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Chairperson Vincent Armenta:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Sam Cohen
PO Box 517
Santa Ynez, CA 93460

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Tribal Admin/Counsel Sam Cohen:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Antonio Flores
PO Box 365
Santa Ynez, CA 93460

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Chairperson Antonio Flores:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

805 547 0900
FAX 547 0901

info@rinconconsultants.com
www.rinconconsultants.com

April 20, 2016

Freddie Romero
PO Box 365
Santa Ynez, CA 93460

RE: Cultural Resources Study for the Laguna Lake Dredging Project, City of San Luis Obispo, San Luis Obispo County, California

Dear Cultural Resources Coordinator Freddie Romero:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the Laguna Lake Dredging Project in the City of San Luis Obispo, San Luis Obispo County, California. The project entails sediment dredging to remove sediment that has changed the depth and morphology of the lake, resulting in decreased water quality and aquatic habitat functions. The APE is located on an unsectioned portion of the U.S. Geological Survey San Luis Obispo, CA 7.5-minute topographic quadrangle. The Records Search Map includes a 0.5-mile buffer.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near a nearby project area. As of the date of this letter, we have not yet received a response from the NAHC, but we are contacting you directly because, based on a previous project, we are aware that the present project site is within your area of concern. Rincon is consulting with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project. Rincon understands that this letter may be redundant to consultation initiated by the City of San Luis Obispo. If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or abailey@rinconconsultants.com, or by telephone at (805) 547-0900, extension 120. Thank you for your assistance.

Sincerely,

Ashlee M. Bailey

Ashlee Bailey
Archaeologist

Enclosure: Project Location Map

Appendix B

CHRIS CCIC Records Search Results

CHRIS Information Center Records Search Data Sheet

Project Name: Laguna Lake Dredging Project

Project Number: 15-01939 Date: 4/20/2016

Information Center: CCIC

Search Radius: Half Mile: X One Mile: _____ Other:

USGS Quadrangle: San Luis Obispo

Public Land Survey System (PLSS): Township: Range: N/A Section: Unsectioned

County: San Luis Obispo

Previously Recorded Sites: 400, 2281, 1605, 2282, 9714, E-127 2 isolates, see 1406

Previous Studies: 6459, 6458, E-6759, 6388, 6761, 6431, E-6133, E-5439, E-138, E-3804, E 437

National Register of Historic Places:	Copies:	Y	N
California Register of Historical Resources:	Copies:	Y	N
California Points of Historical Interest:	Copies:	Y	N
California Historical Landmarks List:	Copies:	Y	N
Archaeological Determinations of Eligibility:	Copies:	Y	N
California Historical Resources Inventory:	Copies:	Y	N

Historic Maps:

Notes:

Report List

Laguna Lake Dredging Project

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
SL-00087			Dills, C.	Archaeological Potential of the Curci Property around Laguna Junior High, S.L.O.		
SL-00091		1977	Dills, C.	San Luis Mall, Archaeological Potential		
SL-00093		1977	Dills, C.	Val Vista Estates tract on Los Osos Road, north of Laguna Junior High. A statement of archaeological potential.		
SL-00135		1976	Dills, C.	Archaeological Potential of Fire Station and Swimming Pool Areas, Proposed for San Luis Obispo		
SL-00136		1977	Dills, C.	Laguna Lake, Cuesta Highlands Tracts 603 and 608, San Luis Obispo City Draft EIR Report		
SL-00138		1975	Dills, C.	Information to aid in Interpretive Planning Map for San Luis Obispo (city) and Environs		
SL-00139			Dills, C.	Dutch Barn		40-000971
SL-00152			Hoover, R.	Archaeological Evaluation of the Los Osos Valley Road Widening		40-000004, 40-000011, 40-000025, 40-000462
SL-00226		1977	Dills, C.	Sunset Terrace, South Bay		
SL-00315			Dills, C.	Recorded Sites in the Irish Hills near Perfumo Canyon		40-000971
SL-00437		1981	Smith, C.	Archaeological Survey Along Highway 101, From Marsh Road. South to Approximately .5 miles South of Madonna Road.		
SL-00719		1986	Brock, J. and Wall, R.	A Cultural Resources Assessment of Selected Study Areas within the City of San Luis Obispo		40-000064, 40-000124, 40-000914
SL-00967		1989	Singer, C. and Atwood, J.	Cultural Resources Survey and Impact Assessment for the Porposed Widening of Los Osos Valley Road from the San Luis Obispo City Limit Westward to the Los Osos Creek Bridge, SLO County, CA		40-000025
SL-02363		1993	Gibson, Robert O.	Inventory of Cultural Resources for the Water Reclamation Project, City of San Luis Obispo, CA.		40-000030, 40-000044, 40-000064, 40-000124, 40-000400, 40-000785, 40-000891, 40-000914, 40-001262, 40-001406, 40-001419, 40-001427, 40-001449, 40-001493

Report List

Laguna Lake Dredging Project

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
SL-02922		1995	Farris, G., Hines, P., Rhoades, M., and Rivers, B.	Coastal Branch, Phase II State Water Project Cultural Resources Survey Reaches 5B and 6 San Luis Obispo and Santa Barbara Counties - FILED UNDER 1877 (SANTA BARABARA)		40-000806, 40-001139, 40-001313, 40-001320, 40-001672, 40-001673, 40-001675, 40-001699, 40-001700, 40-001701, 40-001702, 40-001725, 40-001726, 40-001729, 40-001734
SL-03711		1999	Besty Bertrando	Historical Resources Inventory and Evaluation for the San Luis Marketplace Annexation: The Dalidio Property, San Luis Obispo, California		
SL-03804		1999	Bertrando, Betsy	Historical Evaluation for the Existing Structures on the Proposed San Luis Obispo Marketplace Annexation		40-041000
SL-03962		2000	Parker, J.	Cultural Resource Resurvey of the Proposed Alignments of the MFS Globenet/Worldcom Fiber Optic Project		40-002014, 40-002015, 40-002016, 40-002017
SL-04053		2000	Nettles, Wendy.	Phase-1 Archaeological Survey of the Proposed Prado Road/Highway 101 Interchange, San Luis Obispo County, CA	Applied Earth Works, Inc	
SL-04378		1997	Gibson, Robert O.	Results of Phase One Archaeological Surface Survey of the Devaul Ranch Property, Los Osos Valley Road, San Luis Obispo, CA		40-002145
SL-05439		2005	Parker, John	Cultural Resource Investigation of The Rittger Parcel, 1821 Donna Ave., Los Osos APN 074-136-028.		
SL-06133		2007	Conway, Thor.	Archaeological Surface Survey for the Prefumo Creek Commons Project, Los Osos Valley Road & Froom Rancy Way, San Luis Obispo, San Luis Obispo County, California		40-000205, 40-001002, 40-001195, 40-001365, 40-001780
SL-06388		2008	Bonner, Wayne H.	Cultural Resources Records Search and Site Visit Results for AT&T Mobility, LLC Candidate VN0181-01 (Laguna Lake Golf Course), 11175 Los Osos Velley Road, San Luis Obispo, San luis Obispo County, California.		
SL-06431		2009	Billat, Lorna	New Tower, Project Name: Congregational Church, Project Number: SF-90220B		
SL-06458		2009	Megan M. Linder, Marc D. Linder, and Applied Earthworks	Archaeological Survey Report Prefumo Creek Pedestrian/Bike Path Project City of San Luis Obispo, San Luis Obispo County, California		

Report List

Laguna Lake Dredging Project

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
SL-06459		2009	Barry Price, Applied Earthworks, and Department of Transportation	Historic Property Survey Report Prefumo Creek Pedestrian/Bike Path Project City of San Luis Obispo, San Luis Obispo County, California		
SL-06759						
SL-06761						

Resource List

Laguna Lake Dredging Project

Primary No.	Trinomial	Other IDs	Type	Age	Attribute codes	Recorded by	Reports
P-40-000097	CA-SLO-000097	National Register -	Site	Prehistoric	AP02 (Lithic scatter); AP14 (Rock shelter/cave); AP15 (Habitation debris)	1900 (P. M. Jones); 1955 (A.R. Pilling written from memory March 1956); 1977 (L. Spanne/ Recorded earlier by C. Dills); 2011 (Todd Hannahs, CRMS, 829 Paso Robles St. Paso Robles, CA 93446); 2012 (John Dietler and Leroy Laurie, SWCA Environmental Consultants 1422 Monterey St. Suite C200 San Luis Obispo, CA 93401)	SL-00036, SL-06039, SL-06743, SL-06877
P-40-000400	CA-SLO-000400		Site				SL-02363
P-40-000605	CA-SLO-000605		Site				SL-00294
P-40-001406	CA-SLO-001406		Site				SL-02363, SL-06406
P-40-002281	CA-SLO-002281	Other -	Site	Prehistoric, Unknown	AP08 (Cairns/rock features)	1996 (Gibson, RO, Gibson's Archaeological Consulting)	SL-05934
P-40-002282	CA-SLO-002282	Other - Red Point Site	Site	Prehistoric	AP02 (Lithic scatter)	1996 (Gibson, RO, Gibson's Archaeological Consulting)	SL-05934

City of San Luis Obispo

Laguna Lake Dredging and Sediment Management Project,

San Luis Obispo County, California

Biological Resources Assessment

May 2016

Environmental Scientists Planners Engineers

BIOLOGICAL RESOURCES ASSESSMENT

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT, SAN LUIS OBISPO COUNTY, CALIFORNIA

Prepared for:

City of San Luis Obispo
990 Palm Street
San Luis Obispo, California 93401
Contact: Robert Hill, Natural Resources Manager
805-781-7211

Prepared by:

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401
805-547-0900

May 2016

This report was produced on 50% recycled paper with 50% post-consumer content.

Table of Contents

Page

Executive Summary 1
Section 1 – Introduction 3
1.1 Project Location 3
1.2 Project Description 3
Section 2 – Methodology 7
2.1 Regulatory Overview 7
2.2 Literature Review 7
2.3 Field Surveys 8
Section 3 – Existing Conditions 10
3.1 Summary of Previous Environmental Study and Management Plans 10
3.1.1 1961 Master Plan 10
3.1.2 1982 Laguna Lake Management Program and Associated EIR 10
3.1.3 1996 Rare Plants, Vegetation, and Flora of Laguna Lake Park 11
3.1.4 LFR Levine Fricke 2003 11
3.1.5 2009 City Council Agenda Report 12
3.1.5 2014 Laguna Lake Natural Reserve Conservation Plan 12
3.2 Physical Characteristics 13
3.2.1 Hydrology and Watershed 13
3.2.2 Climate 14
3.2.3 Geology and Soils 15
3.3 Vegetation Communities/Habitats 17
3.3.1 Non-native Annual Grasslands 19
3.3.2 Needlegrass Grasslands 19
3.3.3 Developed and Landscaped Areas 20
3.3.4 Planted Groves 20
3.3.5 Freshwater Wetlands 20
3.3.6 Willow Riparian 21
3.3.7 Open water (lake) habitat 21
3.3.8 Seasonal stream beds 22
3.4 General Wildlife 22
Section 4 – Sensitive Biological Resources 23

4.1 Special Status Species 25
4.1.1 Special Status Plant Species 25
4.1.2 Special Status Wildlife Species 27
4.2 Sensitive Plant Communities 32
4.3 Jurisdictional Areas 32
4.4 Wildlife Movement 34
4.5 Resources Protected by Local Policies 35
Section 5 – Resource Evaluation and Recommended Conservation Measures 35
5.1 Special Status Species 35
5.1.1 Special Status Plant Species 35
5.2.1 Special Status Wildlife 36
5.2 Sensitive Plant Communities 41
5.3 Jurisdictional Areas 42
5.4 Wildlife Movement 43
5.5 Local policies and ordinances 43
5.6 Adopted or Approved Plans 43
Section 6 – Limitations, Assumptions, and User Reliance 44
Section 7 - References 45
Section 8 – List of Preparers 50

FIGURES

Figure 1 – Regional Location 4
Figure 2 – Laguna Lake Study Area 5
Figure 3 – Natural Communities – Laguna Lake Study Area 18
Figure 4 – Sensitive Elements Reported by the California Natural Diversity Database and Federally Designated Critical Habitat 24
Figure 5 – Special Status Species in Study Area 26
Figure 6 – Jurisdictional Delineation 33

TABLES

Table 1 - Vegetation Communities 17
Table 2 - Vegetation Communities 27
Table 3 – Summary of Potentially Jurisdictional Wetlands, Waters and Riparian Habitats 32

APPENDICES

Appendix A: Regulatory Setting
Appendix B: Site Photographs
Appendix C: Floral and Fauna Compendia
Appendix D: Special Status Species Evaluation Tables

EXECUTIVE SUMMARY

Rincon Consultants, Inc. has prepared this biological resources assessment to document existing conditions, summarize previous biological resource reports and studies, and provide a basis for evaluation of potential impacts to special status and sensitive biological resources during development and implementation of sediment dredging and management actions located at Laguna Lake in the City of San Luis Obispo, San Luis Obispo County, California. The Laguna Lake Dredging and Sediment Management Project (Project) is generally located in and near Laguna Lake in the eastern Los Osos Valley, within the City of San Luis Obispo, San Luis Obispo County, California.

The Project consists of a range of actions proposed to manage sediment that is filling the lake, influencing water quality, diminishing the capacity of the downstream connection to lower Prefumo Creek, decreasing overall depth of the lake, promoting increased water temperatures, and reducing recreation opportunities in the lake. Problems with sedimentation and potential risk associated with decreased capacity have been known for several years, and the City of San Luis Obispo has previously studied the issue in detail. The Oceanaire neighborhood near Laguna Lake would begin to flood even at water surface elevations lower than the estimated elevation anticipated during a 100-year flood. Over time sedimentation has and will continue to decrease the storage capacity in Laguna Lake, and flood risks are exacerbated by decreased lake capacity. Overall, the sediment deposition and accumulation is lowering ecological functions and values of the lake.

The proposed project actions include a range of dredging depths, a range of disposal options for removed sediment, alternatives for controlling and ultimately reducing sediment loads coming into the lake. The project also includes an option to stabilize the eroding bank on the east shore of the lake where slumping banks are failing. The failing banks are causing erosion that compromises park access roads and park facilities. Bank stabilization would include options to improve fish habitat through inclusion of root wads and downed logs. Additionally, the project includes possible improvements to the inlet at Los Osos Valley Road and the outlet at Madonna Road, including possible improvements to the existing fish passage at Los Osos Valley Road. Onsite disposal was considered during project development, but has been eliminated from consideration as a permanent option due to numerous constraints including sensitive biological resources in the approximately 147.2-acre Study Area, and the quality of soils onsite. Dredged materials may be temporarily stored onsite but permanent disposition will be offsite.

Eight vegetation communities and habitat types were observed within the study area during the biological field surveys; non-native annual grassland, needlegrass grassland, developed and landscaped areas, planted tree groves, freshwater wetlands, willow riparian, open water (lake) habitat, and seasonal stream beds. Laguna Lake, Prefumo Creek, and the adjacent ephemeral drainages contain approximately 65.89 acres of lake and streambed (below top of bank) and associated riparian habitat, subject to the jurisdiction of the California Department of Fish and Wildlife. Approximately 4.72 acres of wetlands and 56.77 acres of other waters potentially under the U.S. Army Corps of Engineers and Regional Water Quality Control Board jurisdictions (Clean Water Act Sections 404 and 401, respectively) are present in the Study Area.

Eighteen special status plant species may occur onsite based on the presence of suitable habitat; five of which, Cambria morning-glory (*Calystegia subacaulis* ssp. *episcopalis*), San Luis Obispo owl's-clover (*Castilleja densiflora* ssp. *obispoensis*), Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*), adobe sanicle (*Sanicula maritima)* and saline clover (*Trifolium hydrophilum*), were documented in the Study Area. Of the numerous wildlife species reported from the vicinity of the Study Area, nineteen species may occur onsite based on the presence of suitable habitat, including golden eagle, white-tailed kite , tricolored blackbird, burrowing owl, purple martin, Cooper's hawk, grasshopper sparrow, California horned lark, merlin, prairie falcon, American badger, pallid bat, Blainville's horned lizard, California red-legged frog, Coast Range newt , spadefoot toad, Southern western pond turtle, vernal pool fairy shrimp, and steelhead – South Central California Distinct Population Segment. A white-tailed kite was observed during field surveys.

A final project design is not complete; therefore, the report discusses possible impacts to biological resources that may occur from implementation of the proposed project, permitting pathways, where applicable, and suggests avoidance, minimization, and/or other conservation measures that could avoid or minimize adverse impacts to biological resources. Impacts would be fully quantified upon completion of project alternative review and selection of a final project option.

SECTION 1 – INTRODUCTION

Rincon Consultants, Inc. (Rincon) has prepared this biological resources assessment to document existing conditions, summarize previous biological resource reports and studies, and provide a basis for evaluation of potential impacts to special status and sensitive biological resources during development and implementation of the Laguna Lake Dredging and Sediment Management Project (Project) located in the City of San Luis Obispo (City), San Luis Obispo County, California. This document summarizes previous studies regarding biological resources in the vicinity of the proposed project, provides updated information on biological resources in the Study Area, and will support permit applications when a preferred project alternative is selected.

1.1 PROJECT LOCATION

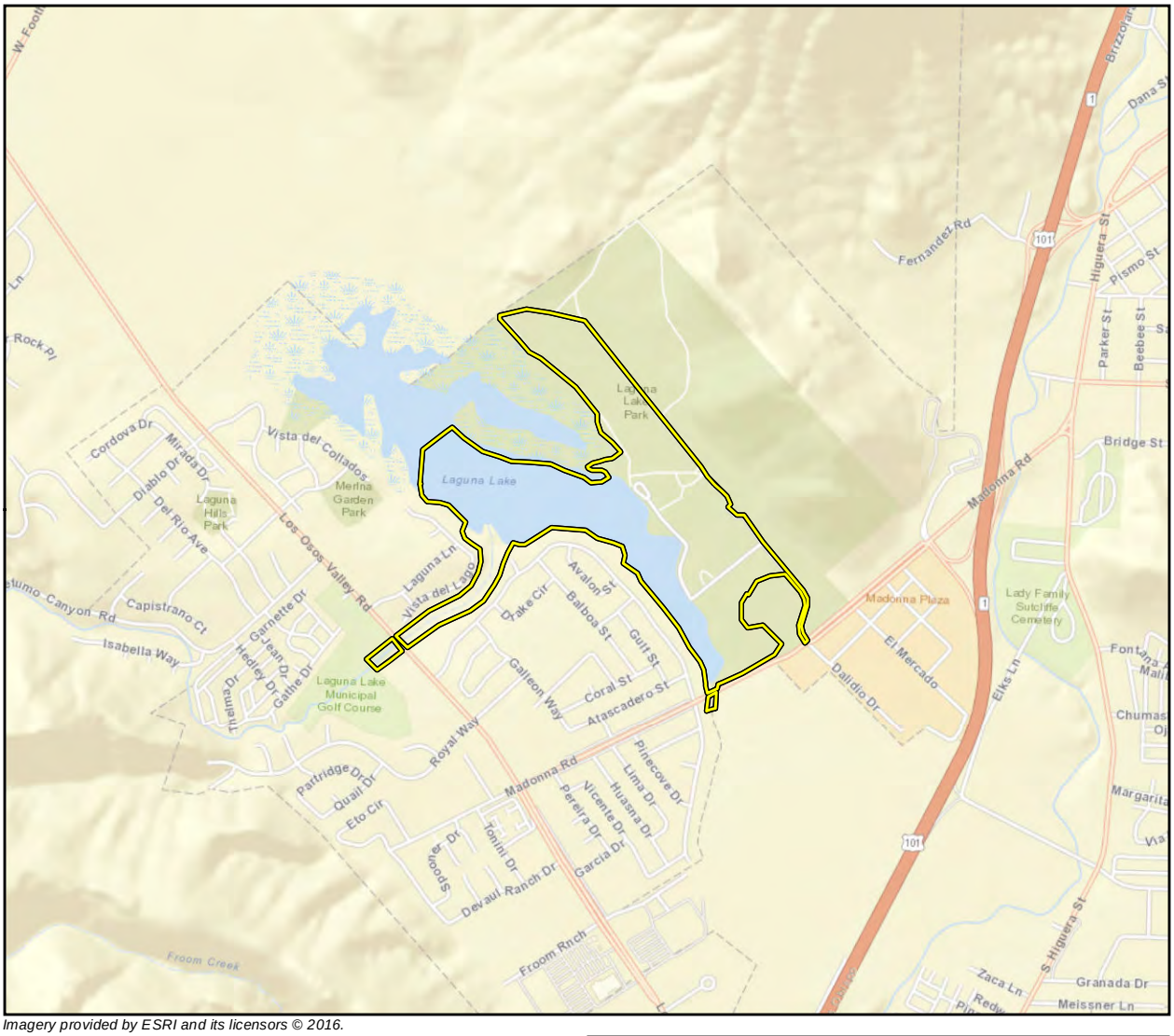
The Project is generally located in and near Laguna Lake in the eastern Los Osos Valley, within the City, San Luis Obispo County, California. The project site is generally located north-northeast of the intersection of Madonna Road and Los Osos Valley Road, approximately 11 miles due east of the Pacific Ocean, as shown in Figure 1. A Biological Resource Assessment study area, hereinafter referred to as the "Study Area", was defined for the Project that is extensive enough to include all anticipated project options, access points, staging areas, and permanent and temporary disturbance sites. Note that final project design is not yet complete and an array of alternatives are under consideration; final impact calculations will be completed when the preferred project alternative has been selected.

The Study Area encompasses a section of Laguna Lake, a portion of the Laguna Lake Park and the Laguna Lake Natural Reserve (LLNR), the Prefumo Creek inlet and upstream reach from approximately 300 feet upstream of Los Osos Valley Road to its inlet into the lake, and the Prefumo Creek outlet from Laguna Lake to a point approximately 150 feet downstream of the south edge of Madonna Road. Laguna Lake is a naturally occurring lake situated near the Irish Hills to the southwest on the floor of eastern Los Osos Valley. The Study Area is illustrated on Figure 2.

The approximately 147.2-acre Study Area is depicted on the *San Luis Obispo, California* United States Geological Survey (USGS) 7.5-minute topographic quadrangle within the Laguna Grant, (Townships 30 and 31 South, Range 12 East; land grant not sectioned - Mount Diablo Meridian). The approximate center of the Study Area is at 35.264657 degrees north and 120.685381 degrees west (WGS 84).

1.2 PROJECT DESCRIPTION

The Project consists of a range of actions proposed to manage sediment that is filling the lake, influencing water quality, diminishing the capacity of the downstream connection to lower Prefumo Creek, decreasing overall depth of the lake, promoting increased water temperatures, and reducing recreation opportunities in the lake. Problems with sedimentation and potential risk associated with decreased capacity have been known for several years, and the City has previously studied the issue in detail.



Imagery provided by ESRI and its licensors © 2016.

Project Location

N

0 1,250 2,500

Feet

Regional Location

Figure 1

Imagery provided by Google and its licensors © 2016.

Biological Study Area

Figure 2

Previous studies were reviewed during preparation of this report, including a recent report prepared by Central Coast Salmon Enhancement (CCSE) that reviews information on the hydrology of Laguna Lake. As documented in the CCSE report, Flood Insurance Rate Maps (FIRM) provided by the Federal Emergency Management Agency (FEMA), depict Laguna Lake as a special flood hazard area subject to inundation by the one percent (1%) annual chance flood, also known as the base flood (FEMA, 2012). The Oceanaire neighborhood near Laguna Lake would begin to flood even at water surface elevations lower than estimated elevations anticipated during a 100-year flood. Over time sedimentation has and will continue to decrease the storage capacity in Laguna Lake (CCSE, 2014), and flood risks are exacerbated by decreased lake capacity.

The proposed project actions include a range of dredging depths, a range of disposal options for removed sediment, and alternatives for controlling and ultimately reducing sediment loads coming into the lake. The project also includes an option to stabilize the eroding bank on the east shore of the lake where slumping banks are failing. The failing banks are causing erosion that compromises park access roads and park facilities. Bank stabilization would include options to improve fish habitat through inclusion of root wads and downed logs. Additionally, the project includes possible improvements to the inlet at Los Osos Valley Road and the outlet at Madonna Road, including possible improvements to the existing fish passage at Los Osos Valley Road. Onsite disposal was considered during project development, but has been eliminated from consideration as a permanent option due to numerous constraints including sensitive biological resources in the Study Area, and the quality of soils onsite. Dredged materials may be temporarily stored onsite but permanent disposition will be offsite.

The range of possible project alternatives for total volume of dredge, disposal, and other project features will bracket the smallest and largest practical project options under consideration. A final project alternative will be selected after evaluating cost, impacts, and practicality. Evaluation of impacts to natural resources will be a component of the impact assessment and selection of a preferred alternative. When a preferred alternative is selected, impacts to jurisdictional features and special status and sensitive biological resources can be quantified and included with permit applications. Recommendations for avoiding and minimizing effects to biological resources are included in Section 5 of this report.

SECTION 2 – METHODOLOGY

2.1 REGULATORY OVERVIEW

Regulated or sensitive resources studied and analyzed herein include special status plant and wildlife species, raptors and other nesting birds, sensitive plant communities, wetlands, wildlife movement, and locally protected resources, such as protected trees. For the purpose of this report, the need to evaluate potential impacts to biological resources based on the following statutes was considered:

- California Environmental Quality Act (CEQA)
- Federal Endangered Species Act (ESA)
- California Endangered Species Act (CESA)
- Federal Clean Water Act (CWA)
- California Fish and Game Code (CFGC)
- Migratory Bird Treaty Act (MBTA)
- The Bald and Golden Eagle Protection Act
- Porter-Cologne Water Quality Control Act (Porter-Cologne)
- City Tree Protection Policies

A discussion of resources regulated within this framework is provided in Section 5. Final quantification of impacts and mitigation measures will depend on final project design.

2.2 LITERATURE REVIEW

Rincon reviewed literature for baseline information on biological resources known to occur and potentially occurring at the project site and in the surrounding area. The literature review included information available in peer reviewed journals and standard reference materials (e.g., Bowers et al., 2004; Burt and Grossenheider, 1980; Holland, 1986; Baldwin et al., 2012; Sawyer et al., 2009; Stebbins, 2003; American Ornithologists Union, 2015; United States Army Corps of Engineers, 2008a and 2008b).

The literature review also included careful review of information from the City's *Laguna Lake Natural Reserve Conservation Plan* (adopted 2015) and *Laguna Lake Management Plan (*1993), a previous biological resource evaluation for lake dredging prepared by LFR Levine Fricke (2003), and the CCSE's report, *A Review of Hydrology, Sedimentation, and Water Quality Issues for Laguna Lake, San Luis Obispo* which summarizes conditions pertinent to aquatic habitat, hydrology, sediment sources, and management of sediment in the Laguna Lake watershed. The CEQA document prepared for Laguna Lake dredging (City of San Luis Obispo, 2009) and other CEQA documents for nearby projects were also reviewed.

Rincon also conducted queries of relevant databases of sensitive resource occurrences from the California Department of Fish and Wildlife (CDFW) California Natural Diversity Data Base (CNDDB) (California Department of Fish and Wildlife, 2016a) and Biogeographic Information and Observation System (BIOS) (California Department of Fish and Wildlife, 2016b); the California Native Plant Society Online Inventory of Rare Plants (California Native Plant Society

Rare Plant Program, 2016); and the U.S. Fish and Wildlife Service (USFWS) Critical Habitat Portal (United States Fish and Wildlife Service, 2016). The search area for CNDDB and CNPS queries evaluated records within the *San Luis Obispo* USGS 7.5-minute topographic quadrangle and the surrounding eight quadrangles (*Morro Bay South, Port San Luis, Pismo Beach, Arroyo Grande NE, Lopez Mountain, Santa Margarita, Atascadero, and Morro Bay North*). A list of all potentially occurring special status plant and animal species as well as sensitive natural communities is presented in Appendix D.

Rincon also conducted a review of the National Wetlands Inventory Wetlands Mapper (United States Fish and Wildlife Service, 2016b) and the United States Department of Agriculture, Natural Resource Conservation Service Web Soil Survey (United States Department of Agricultural, Natural Resources Conservation Service, 2016a). Other sources of information about the site included aerial photographs, topographic maps, geologic maps, and climatic data.

2.3 FIELD SURVEYS

Rincon Senior Biologist/Botanist Meg Perry and Biologist Noël Fie conducted field reconnaissance surveys and a jurisdictional delineation on April 14, April 21, and May 6, 2016. Surveys were conducted to review and update previously prepared resource maps, update vegetation classification and mapping, update jurisdictional boundaries, and assess and photograph current conditions. Ms. Perry and Ms. Fie recorded observations of wildlife and plant species, photographed the site, updated vegetation classification and mapping to current standards, and performed a jurisdictional delineation. During field surveys, an inventory of all plant and animal species observed was compiled (Appendix C).

Plant species nomenclature and taxonomy followed *The Jepson Manual: Vascular Plants of California*, Second Edition (Baldwin et al., 2012). Results of previously conducted botanical surveys were reviewed prior to site work. Methodology for the reconnaissance field visit and botanical surveys consisted of meandering transects such that visual inspection of the full site was achieved. During reconnaissance surveys, previously unreported occurrences of three special status plants were found and mapped. To search for other previously unmapped resources, Ms. Perry and Ms. Fie walked transects through the entirety of the terrestrial habitats in the Study Area. All plant species encountered were noted and identified to the lowest possible taxonomic level. Updated botanical field surveys were generally conducted in accordance with *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFW, 2009) and *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants* (USFWS, 2000) except that full season surveys were not completed. The large body of existing knowledge regarding botanical resources and ongoing active management strategy for resources on the site were also referenced in preparation of this report and will be considered during development of the final project and evaluation of impacts.

During the April 21, 2016 and May 6, 2016 site visits, a jurisdictional delineation was performed to identify jurisdictional wetlands and other waters of the United States (U.S.) in accordance with the following:

- *Wetlands Delineation Manual* (Environmental Laboratory, 1987);

- *Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest* (United States Army Corps of Engineers, 2001);
- *Regulatory Guidance Letter No. 05-05: Ordinary High Water Mark Identification* (United States Army Corps of Engineers, 2005);
- *Distribution of Ordinary High Water Mark (OHWM) Indicators and Their Reliability in Identifying the Limits of "Waters of the United States" in Arid Southwestern Channels* (United States Army Corps of Engineers, 2006);
- *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (United States Army Corps of Engineers, 2008a);
- *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (United States Army Corps of Engineers, 2008b)
- *Updated Datasheet for the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (United States Army Corps of Engineers, 2010); and
- Code of Federal Regulations sections that pertain to factors constituting the OHWM for non-wetland waters ("other waters") (33 CFR 328.3 and 33 CFR 328.4).

Data were collected on vegetation, soils, and hydrology at representative locations in potential wetlands and compared with conditions in adjacent upland areas. Data were recorded on the Arid West Wetland Determination forms, appended to the Laguna Lake Dredging and Sediment Management Project, Jurisdictional Waters and Wetlands Delineation report (Rincon Consultants, Inc. 2016; under separate cover). Shallow soil pits were excavated to a minimum of 20 inches deep or to a soil horizon layer deeper than root zone to record soil texture, color, and any redoximorphic field indicators of hydric soils. To meet the wetland vegetation criteria an area needs to support greater than 50 percent cover of dominant plant species designated as obligate wetland (OBL), facultative wetland (FACW), and/or facultative wetland (FAC) plants. Field indicators of wetland hydrology were recorded if evident. Plant species wetland indicator status was based on the current U.S. Army Corps of Engineers (USACE) National Wetland Plant List (Lichvar, 2016; USACE, 2016).

Regional Water Quality Control Board (RWQCB) jurisdiction was determined in accordance with the previously listed methodologies to identify waters of the U.S. and thus, includes the jurisdictional limits of federal jurisdiction pursuant to Section 401 of the CWA and based on federal and state law and regulations, the Central Coast RWQCB's jurisdiction should be delineated at the OHWM. However, based on discussions with Central Coast RWQCB staff there may be differing interpretations of the RWQCB's jurisdictional reach under Section 401 of the CWA and Porter-Cologne (i.e., Waters of the State) and the RWQCB's jurisdictional limits extend to the top of bank or edge of riparian area, if present. CDFW jurisdiction was delineated in accordance with Section 1602(a) of the CFGC. Final jurisdictional determinations of the boundaries of waters and riparian habitats are made by each agency, typically at the time that authorizations to impact such features are requested.

SECTION 3 – EXISTING CONDITIONS

This section provides a discussion of the existing conditions observed within the Study Area. Results reported here were prepared with consideration for previously reported resources, updated to reflect current site conditions and current regulatory guidance. A summary of previous studies and data is also provided. Site photographs are provided in Appendix B, and compendia of plant species and wildlife observed during site surveys are provided in Appendix C.

3.1 SUMMARY OF PREVIOUS ENVIRONMENTAL STUDY AND MANAGEMENT PLANS

The Study Area has been the subject of numerous previous studies and management plans. In this section, we briefly summarize previous management plans and supporting studies as they relate to biological resources in the Study Area.

3.1.1 1961 Master Plan

In 1961, Fred L. Hector prepared a *Master Plan, Laguna Lake Park* for the development and operation of the Laguna Lake Park on 300 acres of city-owned land. This document identified a plan to create a lake from "Laguna Marsh" and proposed that the lake would include conversion of both public and privately owned land. The document described homes currently under construction along the lake shore. The primary focus of this document was on aesthetics and recreational uses of open water at the lake, including fishing, boating. Tree plantings as wind breaks and for shade were also prescribed. The plan briefly described habitats on the hillsides as unusual and alpine-like.

3.1.2 1982 Laguna Lake Management Program and Associated EIR

In 1982, the Laguna Lake Study Committee, City of San Luis Obispo, MDW Associates and Envicom Corporation finalized a management program for Laguna Lake. The program recommended actions to restore and preserve natural qualities of the lake. Development of the program was prompted in part by severe drought in 1976 through 1978, during which time the lake evaporated almost completely. An Environmental Impact Report (EIR) was also prepared evaluating the Program.

Management goals were identified as wildlife preservation, recreation enhancement, shoreline home protection, and agricultural preservation. The document summarized baseline resource conditions, and mapped willow thicket, marsh, transitional marsh, and emergent vegetation around the lake. Warm water fish in the lake are noted, and the report also indicated a trout stocking program by the California Department of Fish and Game (now CDFW) was underway. [CDFW ended stocking of trout in Laguna Lake in 1991 (Cleveland, 1995)]. A water quality analysis was completed as well. Riparian vegetation was identified along Prefumo Creek. Steelhead trout were reported moving through Prefumo Creek to sites further upstream, and the document hypothesized that sedimentation at the lake inlet could create a barrier to trout migration without intervention.

This document identified the Prefumo inlet as a man-made feature connecting Prefumo Creek to Laguna Lake, and estimated sedimentation rates at 8,000 cubic yards per year. The Management Program identified a recommended balance between recreational uses, proposed for the southeast arm, and wildlife and natural habitat areas along the shorelines and northeast inlets. Additionally, sediment control in Prefumo Creek inlet and from Prefumo Creek was recommended - Prefumo Creek watershed was considered the major sediment source filling the lake.

The EIR prepared for the Program concluded that excavation of sediment at the Prefumo Creek inlet and dredging the center of the lake would not significantly impact water quality, would have a net long-term benefit on nutrient balance, and would potentially improve steelhead movement into Prefumo Creek above the lake. Short-term negative impacts due to increased turbidity were identified. Restocking was proposed as a mitigation measure.

An accompanying wildlife report noted that the project could potentially impact sensitive wildlife, and noted that western pond turtle and burrowing owl could be impacted by dredging and placement of fill.

3.1.3 1996 Rare Plants, Vegetation, and Flora of Laguna Lake Park

A flora prepared by Dr. David J. Keil, a botany professor at Cal Poly, provided a species inventory from five years of study in all seasons. Within this document, occurrences of both common and sensitive plant species were described, and regulatory status at the time of publication was included. Reports of special status plants have been incorporated into the CNDDB.

3.1.4 LFR Levine Fricke 2003

In 2003, LFR Levine Frick prepared a report titled "Ecological Resources and Potential Impacts of Dredging Operations at Laguna Lake". This report analyzed potential effects of a large-scale dredging effort on biological resources and provided avoidance and minimization measures to offset measures of the project proposed at that time. The project proposed dredging to increase depth by as much as 1.5 meters. Deposition was proposed to occur onsite.

Biological resources were evaluated in 2001. No additional special status plants beyond those identified in Keil's flora were reported. Vegetation along the lake was described as wetlands with a mixture of smartweed and tules. Wetland pools and wet grasslands were described near the lake. Grasslands in the proposed deposition site were described as predominantly rye (*Festuca perennis [=Lolium multiflorum*]).

The LFR report identified two federally listed wildlife species with potential to occur in the lake, steelhead (*Oncorhynchus mykiss*) and California red-legged frog (*Rana draytonii*), but stated that at the time of the report neither species was believed to occupy the lake or surrounding areas. The report also identified potential for pond turtles to occur in the lake, and reported previous sightings of burrowing owls from 1990. Protocol surveys for California red-legged frog were negative in 2001. No confirmed sightings of pond turtle were reported in 2001. Burrowing owls

were not found in 2001. The report also includes a discussion of barriers to steelhead passage that existed at the time of the report, including the culvert on Prefumo Creek where it passes under Highway 101 into San Luis Obispo Creek, which was described as a total barrier, in addition to partial barriers at Calle Joaquin Road, Garcia Road, and unspecified barriers upstream of the lake in Prefumo Creek.

The impact analysis in the 2003 report identified potential impacts to botanical resources due to changes in water level, temporary impacts to water quality due to increased turbidity, noise disturbances to waterfowl, potential impacts to pond turtles, and potential disturbances to terrestrial wildlife at the onsite disposal area. Additionally, potential impacts were identified to special status plants in the deposition locations.

Mitigation measures included restrictions on location by avoiding dredging very close to the shore, maintaining water level during dredging operations (no sudden draw-down), timing the operation to avoid winter season when turtles could be burrowing into bottom sediments, and winter migrant birds would be present on the lake. Measures also included restriction of onsite deposition to areas not containing sensitive wildlife or plants to the extent feasible, use of existing roads and trails for access, completion of restoration plantings, and weed control.

3.1.5 2009 City Council Agenda Report

A City Council Agenda Report from 2009 summarizes planning actions regarding dredging of Laguna Lake after the 2003 LFR reports. An environmental study of the project was authorized in 2005. An Initial Study – Mitigated Negative Declaration (IS-MND) was prepared. The project description for that study used an assumption of continuous dredging 22 weeks a year annually for ten years to remove 150,400 cubic yards of sediment, and increasing lake depth by approximately 1.5 feet for an average depth of 9.0 feet. The project description identified a combination of onsite placement of dredged materials and offsite disposal.

Mitigation measures for impacts to biological resources included a minimum 23-meter avoidance buffer from nesting birds; completion of disturbance in uplands outside the nesting season; final design in consultation with the City Biologist to minimize impacts to upland resources; a biological awareness training program; delineation of work areas; preconstruction wildlife surveys and relocation of non-listed wildlife; biological monitoring; exclusion fencing; identification of avoidance areas; and habitat replacement.

The IS-MND was approved in December 2009.

3.1.5 2014 Laguna Lake Natural Reserve Conservation Plan

The City, assisted by technical experts, prepared the Laguna Lake Natural Reserve Conservation Plan (Plan) for the LLNR in 2014. As previously noted, a portion of the LLNR is within the Study Area. This document provides a summary of the history of the site, including Laguna Lake, and the natural resources present in the LLNR. Management considerations outlined are conservation, erosion and sedimentation management, flood protection, recreational access and use of the lake. Goals and policies are identified to balance conservation, flood protection, and recreational uses. These include conservation of natural plant and wildlife

communities, protection of sensitive plants and wildlife, conservation of biodiversity, protection of wetlands, streams, and seeps. Active management of sedimentation is identified as a priority for the LLNR and for upstream areas.

Chapter 2 of the Plan provides an overview of natural resources in the LLNR. This section identifies several special status plants and wildlife known or expected to occur in the LLNR, including white-tailed kite, south-central steelhead, pond turtle, and San Luis Obispo Owl's clover, and provides a summary of habitat types present. An Appendix of the Plan prepared by CCSE, as previously referenced in Section 2, is *A Review of Hydrology, Sedimentation, and Water Quality Issues for Laguna Lake*. This document includes a brief discussion of fish habitat, designated critical habitat, and steelhead habitat requirements, and questions whether water quality in Laguna Lake is well suited to residence by steelhead due to warm temperatures and relatively high nutrient levels in the available reports.

3.2 PHYSICAL CHARACTERISTICS

The Study Area is focused around Laguna Lake and its inlet and outlet along Prefumo Creek. As noted in Section 1, the Study Area also consists of portions of Laguna Lake Park, including part of the LLNR. Topography is gentle, though steeper hills are present on both sides of the Study Area. Elevations range from approximately 120 feet above mean sea level (msl) at the lower edge of the Prefumo Creek outlet reach, to approximately 150 feet above msl on upper slopes.

A large portion of the Study Area is actively managed for recreational use. Existing roads, trails, parking areas, picnic areas, play structures, restrooms, and landscaping are present. Groves of planted trees are common, and range in age from trees planted within the last five years, to well-established mature trees several decades old. A disc golf course is present in semi-natural grasslands that are mowed periodically but still contain some native vegetation. A portion of the LLNR, which is managed for native vegetation, including several rare plants and wetlands, is also present. Laguna Lake itself is used recreationally by fishermen, boaters, and birdwatchers. Note that the Study Area includes only a portion of the lake and associated wetlands; open water and extensive emergent wetlands are present north and west of the Study Area reviewed for this report. The Laguna Lake Watershed is dominated by open space and agricultural lands. The southern perimeter of the lake is surrounded by urban development. Residential structures exist adjacent to Prefumo Creek above and below the lake. Properties in the vicinity of the study area to the north and east include open space/ranch properties mixed with public and recreational trails.

3.2.1 Hydrology and Watershed

Hydrology of the Study Area and vicinity was evaluated through review of topographic maps, aerial photos, the National Hydrography Dataset (USGS, 2016a), the USGS StreamStats tool (USGS, 2016b), as well as a recent report prepared by CCSE that summarizes information on the hydrology of Laguna Lake. Several years of aerial imagery were evaluated, particularly dry-season photos to investigate patterns of saturation and inundation.

The Study Area is in the northwestern portion of the Lower San Luis Obispo Creek Watershed (Hydrologic Unit Code 180600060702; USGS, 2016a). Surface waters within the Study Area, including Laguna Lake, are fed by streams and sheet flow. Two major creeks flow into Laguna Lake: Prefumo Creek flows through the Study Area into the lake from the west, and an unnamed creek with several tributary forks drains eastern Los Osos and O'Conner Valleys west of the study area, and several small unnamed ephemeral drainages flow toward the northeast side of Laguna Lake from the adjacent hills. The unnamed creek that flows into Laguna Lake from further west collects water from several tributaries that drain the south slopes of Cerro Romauldo and Bishops Peak before flowing into the west end of Laguna Lake, outside the Study Area. Extensive herbaceous wetlands and some riparian scrub are present in the Los Osos Valley floor west of the Study Area.

Prefumo Creek drains the Irish Hills and enters Laguna Lake near the south shore. Prefumo Creek is intermittent with some perennial pools within the Study Area. A review of historic maps indicates that Prefumo Creek was rerouted several decades ago in the 1960s; prior to this modification, Prefumo Creek did not flow into Laguna Lake; rather, it entered San Luis Obispo Creek directly, downslope of Laguna Lake, and the outlet of Laguna Lake contributed additional water. At that time the southeast arm of the lake was also excavated (City of San Luis Obispo, 2015). Prefumo Creek is now routed through Laguna Lake through a culvert under Los Osos Valley Road, exiting the lake at a culvert under Madonna Road. Prefumo Creek joins San Luis Obispo Creek approximately 1.15 miles downstream of the Madonna Road culvert. San Luis Obispo Creek flows into the Pacific Ocean approximately 7.25 miles downstream of its confluence with Prefumo Creek.

Additionally, several small ephemeral, unnamed drainages flow through the hills that form the foot hills to Cerro San Luis Obispo, north of the Study Area. These features ultimately contribute water to Laguna Lake through small channels, in grassy swales, and through sheet flow. As previously noted, many of these drainages have a well-defined bed and bank in the hills where topography is steep, but do not have continuous bed and bank throughout, dissipating as they reach the gentler topography adjacent to the lake. Segments of defined channel are interspersed with flat areas and grassy swales that are hydrologically connected by sheet flow in areas without a well-defined bed and bank.

Seeps supporting wetland vegetation are prominent on benches and slopes in LLNR outside the Study Area, and water from these features also collects in drainages or sheet flows into the Study Area and ultimately to Laguna Lake. The USGS StreamStats tool estimates that the watershed draining through the Study Area is approximately 13.2 square miles in size (approximately 8,500 acres), calculated using the StreamStats tool for the outlet point in the Study Area, specifically the culvert at Madonna Road (USGS, 2016b).

3.2.2 Climate

The San Luis Obispo region has a Mediterranean climate, with mild, wet winters and warm, dry summers. The USDA NRCS WETS table (30-year climate summary for wetland delineations; 2016b) reports typical summertime highs in the 80s with wintertime temperatures generally in the low 40s. Average annual precipitation is reported in the City of San Luis Obispo at Cal Poly, the nearest climate station, as approximately 17.79 inches, most of which falls between

November and April. Total precipitation for the current year was near average at the time of the field survey, though the previous three years were well below average. Prevailing winds are from the west-northwest.

3.2.3 Geology and Soils

Surrounding hillsides are predominantly serpentine-influenced, and serpentine outcrops are present in the LLNR outside but close to the Study Area. Additionally, the Morros, a series of volcanic peaks that divide Los Osos Valley from the Chorro Creek watershed, consist of igneous dacite and rhyolite, and some igneous and sedimentary rocks are also present in the vicinity of the Study Area.

Based on the *Soil Survey of San Luis Obispo County, California, Coastal Part* (United States Department of Agriculture, Soil Conservation Service, 1978), Soil Survey Geographic Database (SSURGO) and Web Soil Survey (United States Department of Agriculture, Natural Resources Conservation Service, 2016), the Study Area contains six soil map units: Concepcion loam, 5 to 9 percent slopes; Cropley clay, 0 to 2 percent slopes; Cropley Clay 2 to 9 percent slopes; Diablo clay, 5 to 9 percent slopes; Salinas silty clay loam, 0 to 2 percent slopes; and water.

Concepcion loam, 5 to 9 percent slopes

Concepcion loam soils are moderately well drained, clay soils originating from alluvium derived from mixed rock sources with 5 to 9 percent slopes. Concepcion loam soils are typically used for grazing, production of dry farm grain or hay and for urban areas. A typical soil profile contains a very dark grayish brown (moist) sandy loam to a depth of 4 inches, very dark grayish brown sandy loam (moist) to a depth of 20 inches, dark gray (moist) sandy loam to a depth of 22 inches, dark grayish brown (moist) clay to a depth of 36 inches, grayish brown (moist) sandy clay loam to a depth of 51 inches, and light gray (moist) sandy loam to a depth of 64 inches. This soil map unit is not included on the *National Hydric Soils List* (United States Department of Agriculture, Natural Resources Conservation Service, 2015).

Cropley clay, 0 to 2 percent slopes

Cropley clay soils are moderately well drained, clay soils originating from alluvium derived from sedimentary rock with 0 to 2 percent slopes. Cropley soils are typically used for irrigated row and truck crops, irrigated and dry pasture, apricots, prunes and for urban development. Vegetation in uncultivated or undeveloped areas is annual grasses and forbs with some scattered live oak. A typical soil profile of Cropley clay contains very dark gray (moist) clay to 2 inches deep, very dark gray (moist) to a depth of 32 inches, very dark grayish brown clay (moist) to a depth of 51 inches, with brown clay below to a depth of 66 inches. This soil map unit is not included on the *National Hydric Soils List* (United States Department of Agriculture, Natural Resources Conservation Service, 2015).

Cropley clay, 2 to 9 percent slopes

Cropley clay soils are moderately well drained, clay soils originating from alluvium derived from sedimentary rock with 2 to 9 percent slopes. Cropley soils are typically used for irrigated row and truck crops, irrigated and dry pasture, apricots, prunes and for urban development.

Vegetation in uncultivated or undeveloped areas is annual grasses and forbs with some scattered live oak. A typical soil profile of Cropley clay contains very dark gray (moist) clay to 2 inches deep, very dark gray (moist) to a depth of 32 inches, very dark grayish brown clay (moist) to a depth of 51 inches, with brown clay below to a depth of 66 inches.
This soil map unit is not included on the *National Hydric Soils List* (United States Department of Agriculture, Natural Resources Conservation Service, 2015).

Diablo clay, 5 to 9 percent slopes

Diablo clay soils are well drained soils that formed in material weathered from calcareous sandstone and shale. Diablo clay soils are used mainly for grazing and for production of dry farmed grain, mainly barley. A typical soil profile contains dark gray clay (moist) to a depth of 5 inches, with very dark gray clay to a depth of 36 inches, and light olive brown clay to a depth of 50 inches, and pale yellow calcareous soft weathered sandstone to a depth of at least 50 inches. This soil map unit is not included on the *National Hydric Soils List* (United States Department of Agriculture, Natural Resources Conservation Service, 2015).

Salinas silty clay loam, 0 to 2 percent slopes

Salinas silty clay loam soils are well drained soils that formed in alluvium weathered from sandstone and shale. Salinas silty clay loam soils are used mainly for growing irrigated truck, field, and forage crops. A typical soil profile contains a black (moist) clay loam to a depth of 5 inches, very dark gray clay loam (moist or dry) to a depth of 13 inches, very dark gray clay loam (moist or dry) to a depth of 23 inches, dark grayish brown (moist) loam to a depth of 33 inches, very dark grayish brown (moist) sandy loam to a depth of 40 inches, olive brown (moist) sandy loam to a depth of 49 inches, and light olive brown (moist) sandy loam to a depth of 75 inches. This soil map unit is included on the *National Hydric Soils List*; an unnamed component occupying an estimated one percent of the soil map unit is listed as hydric (United States Department of Agriculture, Natural Resources Conservation Service, 2015).

Water

The soil survey identifies areas of open water including Laguna Lake, a large portion of the Study Area. Water levels can fluctuate over the course of a season and from year to year.

Site-Specific Observations

These soil units are from the USDA NRCS Soil Survey of San Luis Obispo County, California, Coastal Part, which was conducted on a broader scale than this study and did not necessarily include onsite observations within the jurisdictional delineation Study Area. The physical characteristics of each soil unit, as described above, are general and not necessarily indicative of characteristics actually present on the property. During our field work, we noted that the majority of native soils in the eastern Study Area had a very dark, heavy clay surface horizon. Soils in the bed of Prefumo Creek, in contrast, had layers of sand and gravel, and the clay texture was not predominant. On the banks of Prefumo Creek, some sandy areas were evident. Recently deposited gravel and sand were also noted in Prefumo Creek; these deposits are typically minimally developed.

3.3 VEGETATION COMMUNITIES/HABITATS

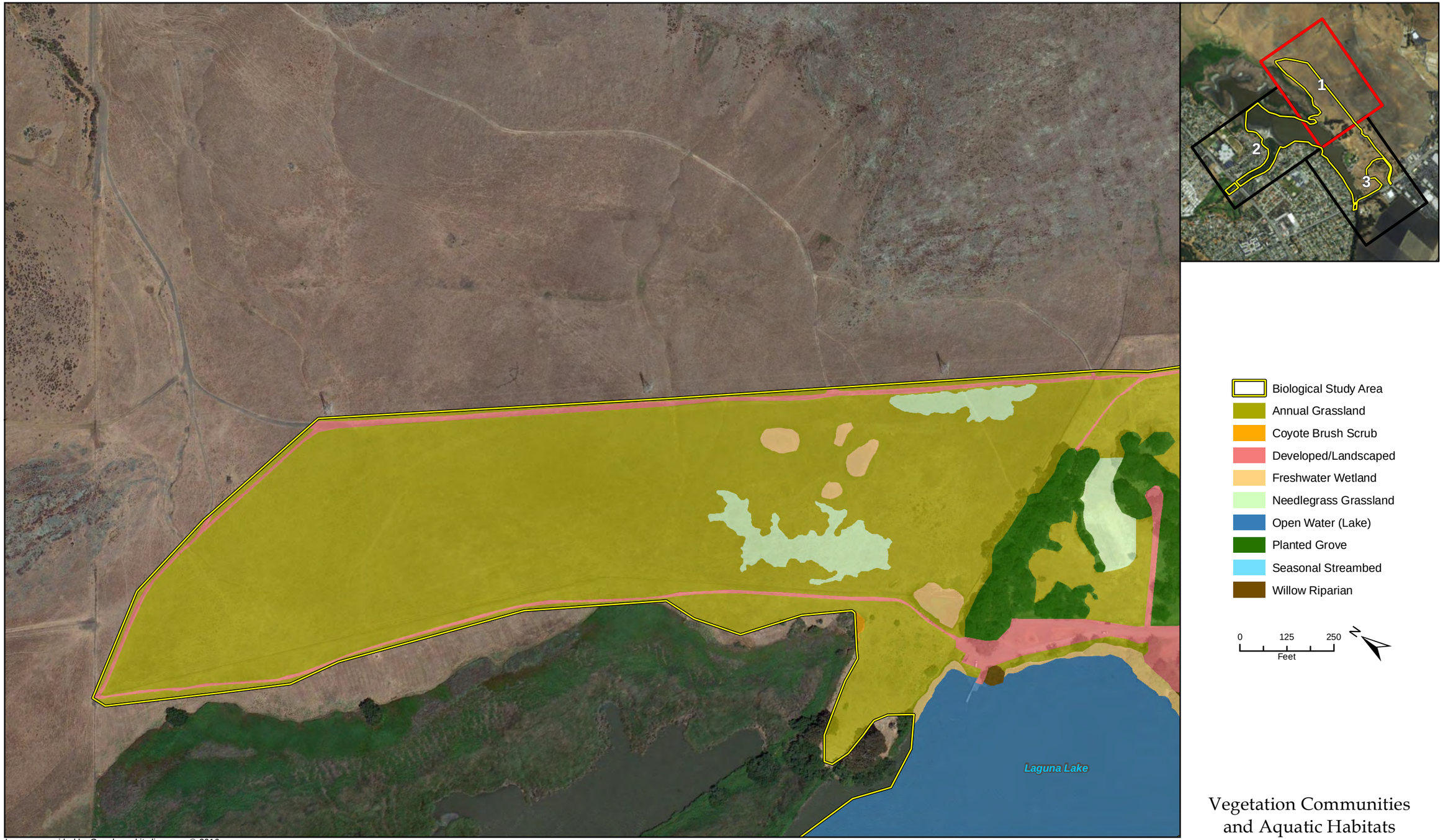
Vegetation classifications are based on the classification systems provided in *A Manual of California Vegetation, Second Edition* (Sawyer et al., 2009) and *Preliminary Descriptions of the Terrestrial Communities of California* (Holland, 1986); but have been modified to reflect the existing site conditions. Aquatic habitats, particularly open water in the lake, and sparsely vegetated areas of the seasonal streambed, are also included in this land cover description. Eight vegetation communities and habitat types were observed within the study areas during the field surveys:

- Non-native annual grassland
- Needlegrass grassland
- Developed and landscaped areas
- Planted tree groves
- Freshwater wetlands
- Willow riparian
- Open water (lake) habitat
- Seasonal stream beds

The eastern portion of the Study Area is primarily upland vegetation, consisting of annual grasslands, needlegrass grasslands, developed and landscaped areas, and planted tree groves. The western portion of the Study Area is predominantly occupied by open water of Laguna Lake, its adjacent wetland fringe, and riparian vegetation associated with Prefumo Creek. Where ephemeral streams bisect other habitats and are not differentiated by changes in vegetation type from surrounding upland areas, these features are included within the dominant vegetation type on Figure 3. The approximate acreages of each habitat type in the Study Area are provided in Table 1.

Table 1 - Vegetation Communities

Vegetation Community/Habitat	Extent within Study Area (acre)
Non-native annual grassland	54.11
Needlegrass grassland	5.95
Developed and landscaped areas	16.43
Planted tree groves	5.32
Freshwater wetlands	2.97
Willow riparian	6.75
Open water (lake) habitat	55.34
Seasonal stream beds	0.26
TOTAL	147.13



Imagery provided by Google and its licensors © 2016.

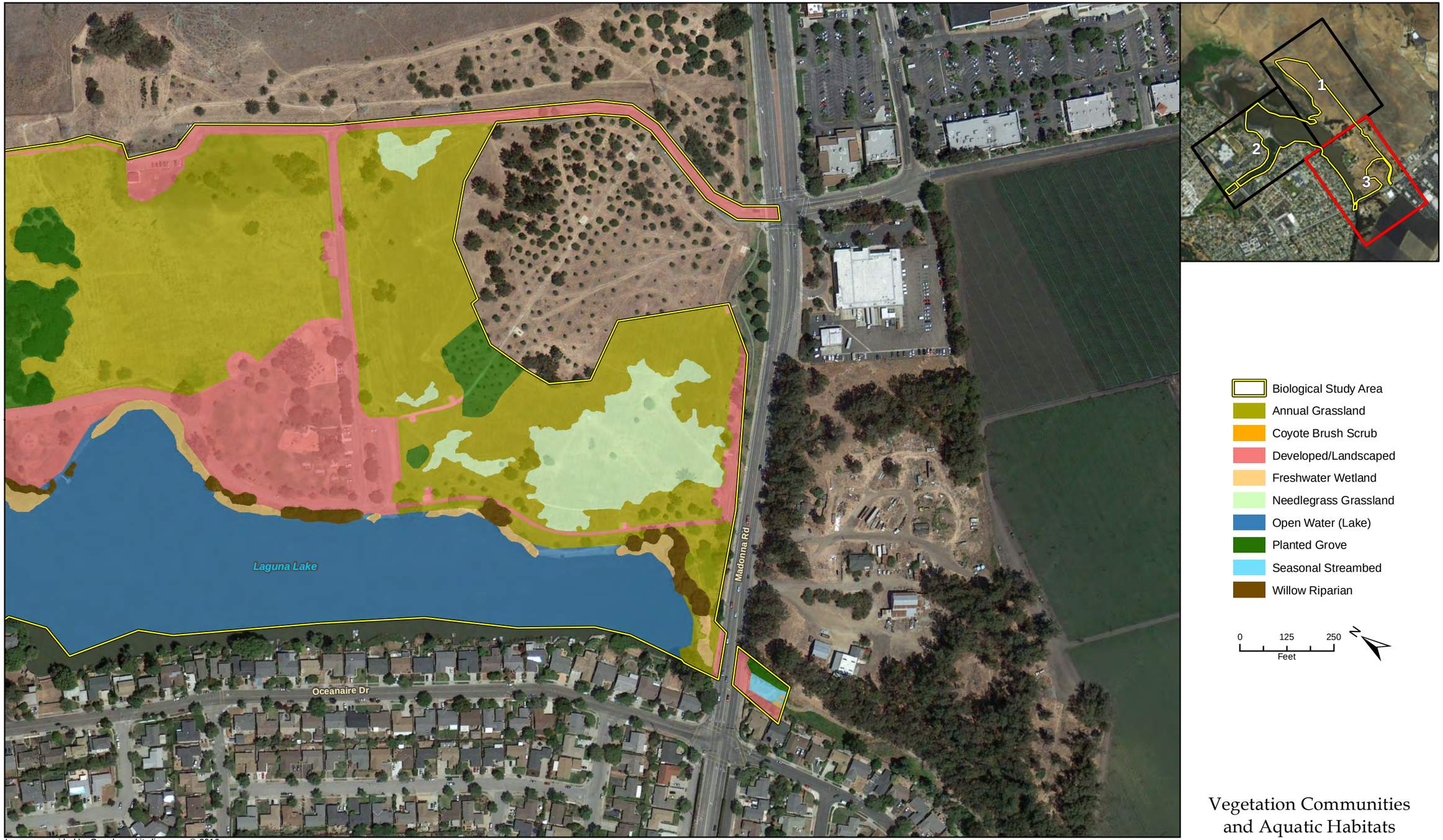
Vegetation Communities and Aquatic Habitats

Figure 3a

Imagery provided by Google and its licensors © 2016.

Vegetation Communities and Aquatic Habitats

Figure 3b



Imagery provided by Google and its licensors © 2016.

Vegetation Communities and Aquatic Habitats

Figure 3c

3.3.1 Non-native Annual Grasslands

Non-native annual grasslands are common in upland portions of the Study Area. Composition and condition varies across the Study Area. Within the LLNR, although non-native grasses such as ryegrass (*Festuca perennis*) and oats (*Avena fatua; A. barbata*) are dominant, native herbs are also common and several native wildflowers are commonly observed in annual grassland, and occasional meadow barley (*Hordeum brachyantherum*), purple needlegrass (*Stipa pulchra*), and California oat grass (*Danthonia californica*) are present at very low cover. Some rare plants, including San Luis Obispo owl's clover (*Castilleja densiflora* ssp. *obispoensis;* Rare Plant Rank 1B.2), Cambria morning glory (*Calystegia subacaulis* ssp. *episcopalis;* Rare Plant Rank 4), and Congdon's tarplant (*Centromadia parryi* ssp. *congdonii;* Rare Plant Rank 1B.2) occur in annual grasslands in the LLNR.

In other areas, the abundance and diversity of native herbs and grasses is lower, especially in grasslands south of the Study Area. These include recreational areas such as the dog park, disc golf course, and inter-canopy spaces between planted tree groves, and many of these areas are mowed periodically. Oats, ryegrass, ripgut brome (*Bromus diandrus*), and hare barley (*Hordeum murinum*) are dominant in these areas. Ruderal areas dominated by non-native herbs such as fennel (*Foeniculum vulgare*), purple star thistle (*Centaurea calcitrapa),* cheeseweed (*Malva parviflora*), common mustard, (*Brassica nigra*), and Italian thistle (*Carduus pycnocephalus*) are also present within annual grasslands, but are not extensive enough to warrant separate mapping. Cambria morning glory also occurs in small patches within non-native annual grasslands.

These grasslands most closely resemble element #42200 Non-native grassland in the Holland system (Holland, 1986), and include areas consistent with the Annual Brome Grasslands, Perennial Rye Grass Grasslands, and Wild Oats Grasslands Semi-Natural Stands in the Manual of California Vegetation, Second Edition system (Sawyer et al., 2009).

Ephemeral drainages are present within annual grasslands in the eastern portion of the Study Area, in the LLNR. These features are fed by seeps and spring upslope of the Study Area. As noted previously, these drainage features are discontinuous, hydrologically connected by swales that lack a defined bed and bank, and by overland flow toward the lower-lying lake, during storm events. Vegetation in these features was not notably distinct from annual grasslands other than having lower density and total cover. Only those portions with discernible bed, bank, and OHWM indicators were mapped as drainages, following agency guidance on delineation of waterways.

3.3.2 Needlegrass Grasslands

Intermixed with non-native annual grassland communities are areas with native perennial bunchgrass, primarily purple needlegrass, consistently forming at least 10 percent cover. With the exception of purple needlegrass, the species composition of this vegetation community is similar to what was observed within the non-native annual grassland stands. Mapping of this habitat type was based on the presence of intact and readily visible purple needlegrass inflorescences and basal bunches over continuous areas summing to at least a quarter acre across one acre of land, compared with native grass species occurring at very low percentages in small areas as described with non-native annual grasslands. Current understanding of

grassland types as summarized in the Manual of California Vegetation, Second Edition, defines purple needlegrass grassland as stands that have at least 10 percent relative cover of this species within the herbaceous vegetation layer (Sawyer et al., 2009). This habitat type most closely corresponds to Valley Needlegrass Grassland and Serpentine Bunchgrass Grassland in the Holland (1986) classification system; current classification systems do not differentiate types based on substrate. These areas are Purple Needlegrass Grassland Alliance in the Manual of California Vegetation, Second Edition (Sawyer et al., 2009). This habitat type is recognized as a sensitive natural community by the CDFW.

3.3.3 Developed and Landscaped Areas

Developed and landscaped areas include existing trails, roads, lawns, restroom facilities, parking areas, and maintained landscaping where a natural vegetation understory does not persist. Some habitat for nesting birds and other small- to medium-sized terrestrial wildlife persists in these areas, but habitat for native plants is limited to non-existent. This land cover type does not include areas where substantial naturalized vegetation persists.

3.3.4 Planted Groves

Planted groves range from recently planted saplings to mature, well established trees, and include a range of species, both native and introduced. These areas are differentiated from areas mapped as landscaped and developed by their relatively dense canopy spacing and differences in potential habitat provided for wildlife. Individual planted trees are also present in the Study Area but are generally not mapped separately from the habitat type in which they are planted. Planted trees include natives such as coast live oak (*Quercus agrifolia*), coast redwood (*Sequoia sempervirens*), and Monterey cypress (*Hesperocyparis macrocarpa*) as well as naturalized species including eucalypus trees (*Eucalyptus* spp.) and horticultural selections such as Strawberry tree (*Arbutus* 'Marina'), pines (*Pinus* spp.), plum (*Prunus* sp.), and grevillea (*Grevillea* sp.). Planted tree groves are not typically classified in the Manual of California Vegetation, Second Edition (Sawyer et al., 2009). However, eucalyptus trees have become naturalized in California since eucalyptus trees were first introduced to the state in the mid to late 1800's, and stands dominated by these trees most closely correspond to Eucalyptus Groves, Semi-Natural Woodland Stands (Sawyer et al., 2009). Stands of eucalyptus habitat in a windrow configuration are present in the Study Area; these areas are dominated by mature eucalyptus trees and generally lack understory species. The remaining tree groves observed within the properties do not correspond to any of the recognized elements in the Holland (1986) classification system or A Manual of California Vegetation, Second Edition (Sawyer et al., 2009).

3.3.5 Freshwater Wetlands

Freshwater wetlands in the Study Area include a wetland fringe in the shallows along the edge of Laguna Lake, wetlands in the bed of Prefumo Creek where wetland vegetation has recruited, and wetlands in depressions adjacent to Laguna Lake Park. Dominant vegetation varies by location and ranges from short annual and perennial herbs to tall tule and smartweed stands. Along the edges of Laguna Lake, California bulrush (*Schoenoplectus californicus*) is dominant in many areas. Smart weed (*Persicaria amphibia, P. lapathifolia)* is dominant in a depression adjacent to the lake and in some areas along the lake shore. Some additional wetland depressions

support Mediterranean barley (*Hordeum marinum*), spikerush (*Eleocharis macrostachya*), rabbitsfoot grass (*Polypogon monspeliensis*), and Mexican rush (*Juncus mexicanus*), and Congdon's tarplant is present in some of these. Mexican rush and spikerush are also dominant in some areas immediately adjacent to the lake.

Within the bed of Prefumo Creek upstream of the lake, Mexican rush, spikerush, and umbrella sedge (*Cyperus eragrostis*) are dominant in some low gradient areas of the channel. Horsetail (*Equisetum hyemale*) and small-headed rush (*Scirpus microcarpus*) are also present where wetlands form a fringe along the channel edge. Within the freshwater wetlands category are vegetation units consistent with California bulrush marsh, Smartweed/Cocklebur patches, Pale spikerush marshes, and Mexican Rush marsh herbaceous alliances in A Manual of California Vegetation, Second Edition (Sawyer et al., 2009). These alliances are consistent with Coastal and valley freshwater marsh, in the Holland classification (Holland, 1986).

3.3.6 Willow Riparian

Willow-dominated riparian scrub and riparian woodlands are present as patches along the margins of Laguna Lake, and as more extensive stands in the upper Prefumo Creek above the inlet to Laguna Lake. Arroyo willow (*Salix lasiolepis*) is predominant as a large shrub to small tree. Fremont cottonwood (*Populus fremontii*) trees are also present occasionally. Non-native weeping willow (*Salix babylonica*) trees are also present in riparian vegetation along Laguna Lake n ear its outlet. Understory vegetation varies with location; in some areas, the understory consists of freshwater wetland species, including spikerush, Mexican rush, and smartweed. In other locations farther from water, understory vegetation consists of upland annual grasses and weeds. Willow riparian vegetation units are consistent with Arroyo Willow Thickets Alliance in A Manual of California Vegetation, Second Edition (Sawyer et al., 2009) and Central Coast arroyo willow riparian forest in the Holland classification (Holland, 1986).

3.3.7 Open water (lake) habitat

Laguna Lake within the Study Area is primarily open water, forming shallow warm lake aquatic habitat. Vegetation around the margins is mapped with freshwater wetlands and riparian types. Laguna Lake occasionally dries up during periods of severe drought, as it did in 2015, but in most years, the lake contains water year-round. Laguna Lake provides suitable habitat for rare aquatic and semi-aquatic wildlife, including California red-legged frog (*Rana draytonii*), southern western pond turtle (*Actinemys pallida*), two-striped garter snake (*Thamnophis hammondii*), as well as other more common amphibians and reptiles. The lake is also suitable for some fish species, and connects upper and lower reaches of Prefumo Creek, which is designated as critical habitat for steelhead (*Oncorhynchus mykiss;* South Central DPS). Open water is not classified in A Manual of California Vegetation, Second Edition (Sawyer et al., 2009) or the Holland classification (Holland, 1986) because it is not a vegetation community.

Laguna Lake is the connection point between reaches of Prefumo Creek, which is designated as critical habitat for steelhead, South-Central California Coast DPS. The lake is a shallow, relatively warm lake. It dries out infrequently; most recently, surface water in the lake evaporated completely in fall 2015. When water is present, fish can inhabit the lake, including non-native predatory fish such as bass (*Micropteris* spp.) and bluegill (*Lepomis macrochirus*).

Non-native bullfrogs (*Lithobates catesbeianus*) are also documented in the lake; episodes of complete drying help control non-native fish and bullfrogs but are not expected to permanently remove all individuals.

Previous water quality studies at Laguna Lake conducted in the 1980s provide some background regarding water temperature, dissolved oxygen, nitrate, and phosphorus. Water temperature in the study period did not exceed 24 degrees C. Dissolved oxygen ranged from 2.8 to 12.4 mg/L (some dips are at the low end of suitable for steelhead). Nitrate-N ranged from 5 to 25 mg/L. This is higher than typical for freshwater streams and lakes. Total Phosphorus ranges from 0.1-1.3 mg/L. This is often higher than typical creek concentrations for San Luis Obispo County. Wind at Laguna Lake causes mixing of surface waters, reducing likelihood of stratification within the lake. The CCSE study reports that passage into Laguna Lake is limited by flow. The study goes on to comment that enhancing passage opportunities into the lake are not recommended until water quality in the lake is better understood.

Further discussion of the lake's potential to support special status wildlife is provided in Section 4 of this report.

3.3.8 Seasonal stream beds

Some portions of Prefumo Creek are sparsely vegetated. Overhanging canopy from adjacent banks is present in some areas but the streambed lacks vegetation. The majority of these areas have sandy or gravelly substrates, and are typically below the ordinary high water mark of the channel. Sparsely vegetated streambeds are not classified in the Manual of California Vegetation, Second Edition (Sawyer et al., 2009) or the Holland classification (Holland, 1986) because they are not distinct vegetation communities. When ponded water is seasonally present in these areas, common amphibians such as Sierran tree frog (*Pseudacris sierra*) and California toad (*Bufo boreas halophilus*) are expected to occur. Ponded water also serves as an important source for songbirds, mammals, and other wildlife. When water is flowing in Prefumo Creek, it provides a potential movement corridor for fish.

3.4 GENERAL WILDLIFE

Wildlife activity within the project area during surveys was typical for time of day and weather conditions. Vegetation onsite likely supports a suite of avian, mammalian, and reptilian wildlife. Aquatic habitats are suitable for a variety of amphibians and reptiles, as well as fish. Several bird species were observed during reconnaissance level surveys. Appropriately timed focused avian surveys would likely reveal additional bird species utilizing grassland habitat. Wildlife species observed within the project site during surveys for this report included a variety of songbirds and raptors; western fenced lizard; and sign of small mammal activity, including pocket gopher, were noted. White-tailed kite (*Elanus leucurus*), a state fully protected species, was observed flying above the lake during the first field survey. A complete list of species observed can be found in Appendix C. Special status species with potential to occur are discussed below in Section 4.

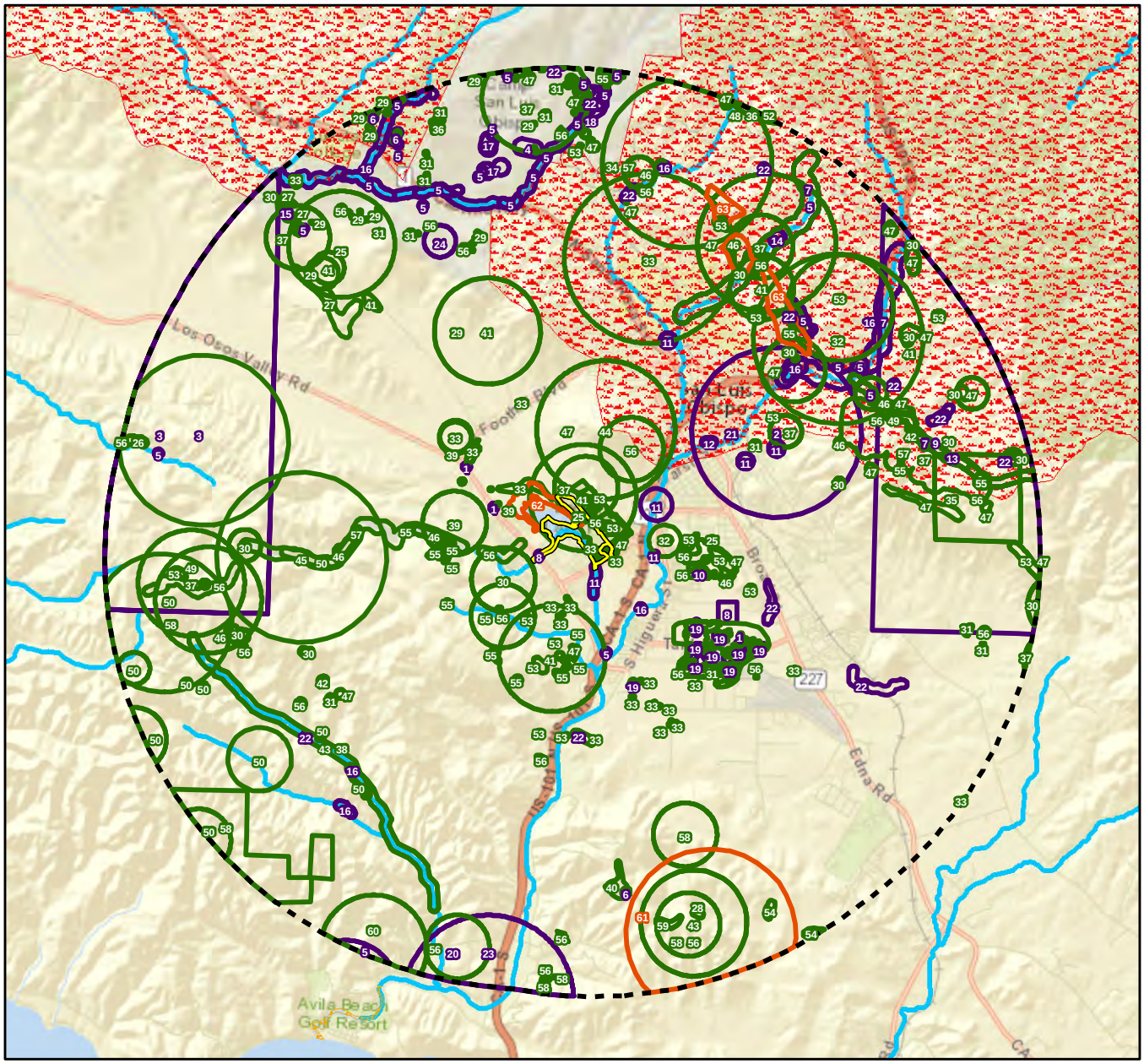
SECTION 4 – SENSITIVE BIOLOGICAL RESOURCES

This section discusses special status and sensitive biological resources observed on the project site, or with potential to occur there, and evaluates the potential for the project site to support other sensitive or special status biological resources. Local, state, and federal agencies regulate special status species and require an assessment of their presence or potential presence to be conducted on-site prior to the approval projects that may affect these resources.

The Study Area was evaluated for the potential support these resources, and previous reports were reviewed to include previous site-specific observations in this summary. Assessments for the potential occurrence of special status species are based upon known ranges, habitat preferences for the species, species occurrence records from the CNDDB, species occurrence records from other sites in the vicinity of the survey area, and previous reports for the project site. The potential for each special status species to occur in the survey area was evaluated according to the following criteria:

- *No Potential*. Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).
- *Low Potential*. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.
- *Moderate Potential*. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.
- *High Potential*. All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.
- *Present*. Species is observed on the site or has been recorded (e.g., CNDDB, other reports) on the site recently (within the last 5 years).

Figure 4 shows sensitive elements tracked by the CNDDB within five miles of the project site as well as designated critical habitats in the vicinity of the Study Area. Additionally, all species reported from a nine-quadrangle search surrounding the Study Area were evaluated for their potential to occur.



Imagery provided by ESRI and its licensors © 2016.
Additional data provided by the: California Natural Diversity Database, May 2016.

0 5,000 10,000 Feet

N

Biological Study Area

CNDDB Buffer

CNDDB

Animals

Plants

Natural Communities

Critical Habitat

California red-legged frog

Morro shoulderband (=Banded dune) snail

Tidewater goby

Steelhead

1 - American badger
2 - Atascadero June beetle
3 - black legless lizard
4 - California horned lark
5 - California red-legged frog
6 - coast horned lizard
7 - Coast Range newt
8 - ferruginous hawk
9 - foothill yellow-legged frog
10 - loggerhead shrike
11 - monarch - California overwintering population
12 - pallid bat
13 - prairie falcon
14 - San Luis Obispo pyrg
15 - silvery legless lizard
16 - steelhead - south-central California coast DPS
17 - Townsend's big-eared bat
18 - tricolored blackbird
19 - vernal pool fairy shrimp
20 - western bumble bee
21 - western mastiff bat
22 - western pond turtle
23 - western yellow-billed cuckoo
24 - white-tailed kite
25 - adobe sanicle
26 - Arroyo de la Cruz manzanita
27 - Betty's dudleya
28 - black-flowered figwort
29 - Blochman's dudleya
30 - Brewer's spineflower
31 - Cambria morning-glory
32 - chaparral ragwort
33 - Congdon's tarplant
34 - Cuesta Ridge thistle
35 - dune larkspur
36 - dwarf soaproot
37 - Eastwood's larkspur
38 - Hoover's bent grass
39 - Hoover's button-celery
40 - Indian Knob mountainbalm
41 - Jones' layia
42 - La Panza mariposa-lily
43 - mesa horkelia
44 - Miles' milk-vetch
45 - Morro manzanita
46 - most beautiful jewelflower
47 - mouse-gray dudleya
48 - Ojai fritillary
49 - Palmer's monardella
50 - Pecho manzanita
51 - saline clover
52 - San Benito fritillary
53 - San Luis mariposa-lily
54 - San Luis Obispo County lupine
55 - San Luis Obispo fountain thistle
56 - San Luis Obispo owl's-clover
57 - San Luis Obispo sedge
58 - Santa Margarita manzanita
59 - southern curly-leaved monardella
60 - umbrella larkspur
61 - Central Maritime Chaparral
62 - Coastal and Valley Freshwater Marsh
63 - Serpentine Bunchgrass

CNDDB Records and Critical Habitats within 5 Miles of the BSA Figure 4

4.1 SPECIAL STATUS SPECIES

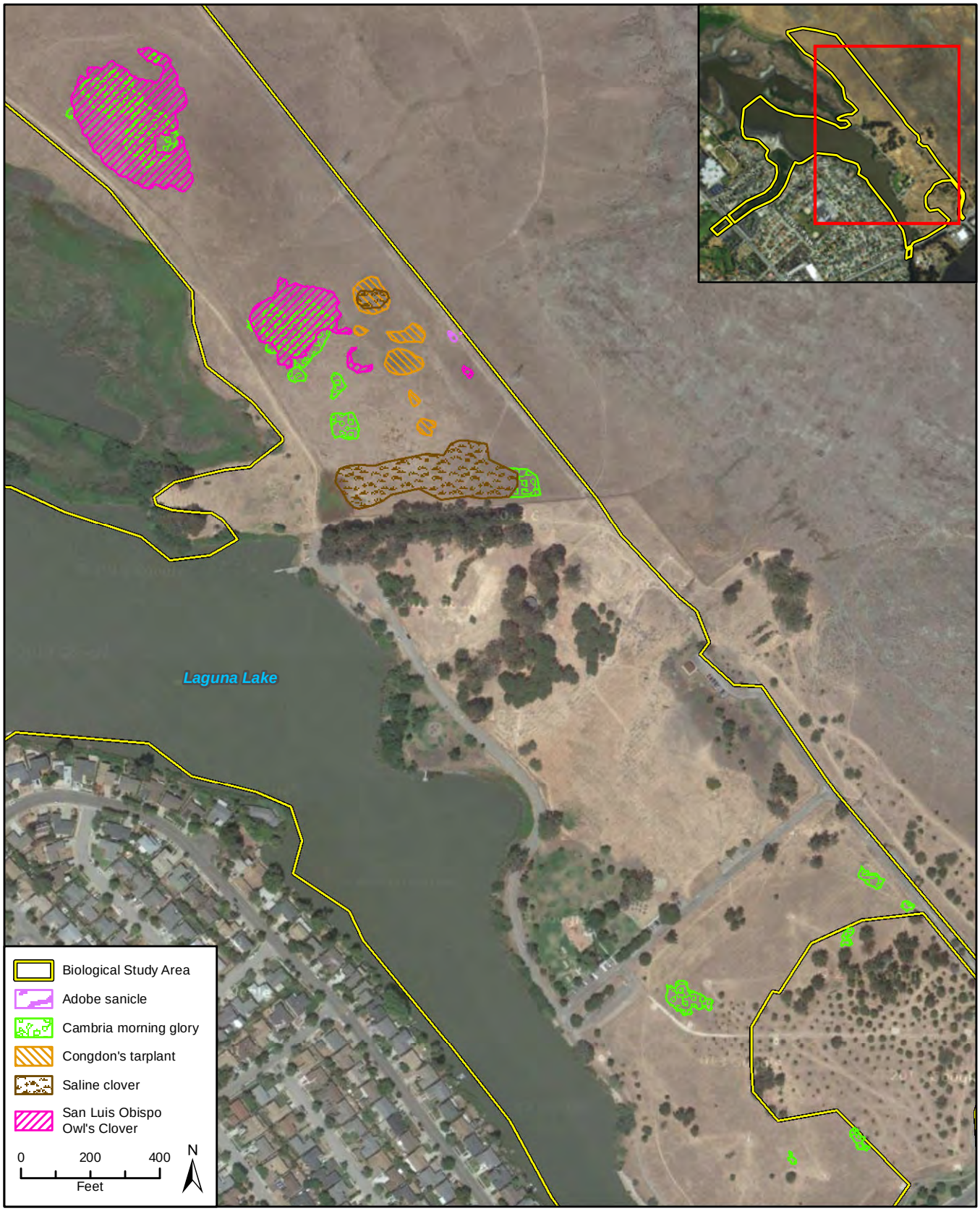
4.1.1 Special Status Plant Species

Based on the database search and literature review, there are numerous special status plant species known to or have the potential to occur within the vicinity of the Study Area (in the nine USGS quadrangles surrounding or containing the Study Area), as listed in Appendix D. Of these, eighteen special status plant species may occur onsite based on the presence of suitable habitat:

- Miles' milk vetch (*Astragalus didymocarpus* var. *milesianus*), CRPR 1B.2
- Coulter's saltbush (*Atriplex coulteri*), CRPR 1B.2
- Round-leaved filaree (*California macrophylla*), CRPR 1B.2
- Cambria morning-glory (*Calystegia subacaulis* ssp. *episcopalis*), CRPR 4.2
- San Luis Obispo mariposa lily (*Calochortus obispoensis*), CRPR 1B.2
- San Luis Obispo sedge (*Carex obispoensis*), CRPR 1B.2
- San Luis Obispo owl's-clover (*Castilleja densiflora* ssp. *obispoensis*), CRPR 1B.2
- Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*), CRPR 1B.1
- Chorro Creek bog thistle (*Cirsium fontinale* var. *obispoense*), Federally Endangered, California Endangered, CRPR 1B.2
- Eastwood's larkspur (*Delphinium parryi* ssp. *eastwoodiae*), CRPR 1B.2
- Hoover's button celery (*Eryngium aristulatum* var. *hooveri*), CRPR 1B.1
- San Joaquin spearscale (*Extriplex* [=*Atriplex*] *joaquiniana*), CRPR 1B.2
- Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*), CRPR 1B.1
- Jones' layia (*Layia jonesii*), CRPR 1B.2
- Woodland woollythreads (*Monolopia gracilens*), CRPR 1B.2
- Shining navarretia (*Navarretia nigelliformis* ssp. *radians*), CRPR 1B.2
- Adobe sanicle (*Sanicula maritima*), CRPR 1B.1
- Saline clover (*Trifolium hydrophilum*), CRPR 1B.2

Several additional special status plant species, including Brewer's spineflower (*Chorizanthe breweri*), Palmer's spineflower (*Chorizanthe palmeri*), and mouse-grey dudleya (*Dudleya abramsii* ssp. *murina*), are known to occur in rocky serpentine outcrops and sparse thin soils and barrens immediately upslope of the Study Area; however, suitable habitat for these species was not documented within the Study Area.

Recent biological surveys conducted by others and 2016 surveys by Rincon identified five special status species within the Study Area: Cambria morning glory, San Luis Obispo owl's clover, Congdon's tarplant, adobe sanicle, and saline clover. Perimeters of each patch/occurrence were mapped (Figure 5), and a summary of estimated occupied area within the Study Area is presented in Table 2.



Imagery provided by Google and its licensors © 2016.
Additional data provided by Terra Verde 2014; LFR 2003.

Special Status Species Occurrences at Laguna Lake

Figure 5

Table 2 - Vegetation Communities

Species	Approximate Extent of Occupied Habitat	Comments
Adobe sanicle	< 0.01 acre	A few individuals were documented in a very small wet area adjacent to an existing trail, near the northeast edge of the Study Area. Species was already known to occur in the LLNR nearby.
Cambria morning glory	1.91 acres	Hundreds to thousands of individuals in several patches. Additional areas were mapped in 2016. Co-occurs with non-native, similar bindweed.
Congdon's tarplant	0.48 acre	Mapping from previous survey and skeletal tarplants from previous years. Not blooming yet during 2016 surveys.
Saline clover	1.46 acres	Mapping from previous survey was used; no additional patches.
San Luis Obispo owl's clover	2.97 acres	Extensive patches with hundreds to thousands of individuals. This species does not germinate or bloom each year and can be difficult to detect during drought years.

Protected trees are discussed in Section 4.5 below.

4.1.2 Special Status Wildlife Species

Based on the database and literature review, numerous special status wildlife species known to or have the potential to occur within the vicinity of the project site (Appendix D). Note that species that are not locally protected, are not identified for management in local resource plans, and that have no status other than inclusion as "Special Animals" on CDFW's list and in the CNDDB (i.e., species that are not listed under CESA or FESA and that are not designated as Watch List, Fully Protected, or Species of Special Concern) were not evaluated. "Special Animals" include all animal taxa tracked by the CNDDB, regardless of their legal or protection status. Special Animals that lack other designations generally do not meet criteria for evaluation under CEQA.

Of the numerous wildlife species reported from the vicinity of the Study Area, nineteen species may occur onsite based on the presence of suitable habitat:

- Southern western pond turtle (*Actinemys pallida* [=*Clemmys marmorata*]), California Species of Special Concern (SSC)
- Cooper's hawk (*Accipiter cooperii*), Watch List (WL)
- Tricolored blackbird (*Agelaius tricolor*), SSC
- Grasshopper sparrow (*Ammodramus savannarum*)
- Pallid bat (*Antrozous pallidus*), SSC
- Golden eagle (*Aquila chrysaetos*), Fully Protected (FP), SSC
- Burrowing owl (*Athene cunicularia*), SSC
- Vernal pool fairy shrimp (*Branchinecta lynchi*), Federal Threatened (FT)
- White-tailed kite (*Elanus leucurus*), FP
- California horned lark (*Eremophila alpestris actia*), WL
- Merlin (*Falco columbarius*), WL
- Prairie falcon (*Falco mexicanus*), WL
- Steelhead – South/Central California Coast DPS (*Oncorhynchus mykiss*), FT

- Blainville's horned lizard (*Phrynosoma blainvilli*), SSC
- Purple martin (*Progne subis*), SSC
- California red-legged frog (*Rana draytonii*), FT, SSC
- Western spadefoot (*Spea hammondii*), SSC
- Coast range newt (*Taricha torosa torosa*), SSC
- American badger (*Taxidea taxus*), SSC

Terrestrial Species.

Special Status Birds. The Study Area contains at least some suitable habitat for ten special status birds, of which golden eagle and white-tailed kite are fully protected; tricolored blackbird, burrowing owl, and purple martin are SSC, and Cooper's hawk, grasshopper sparrow, California horned lark, merlin, and prairie falcon are WL species. These species utilize a variety of habitats and have at least some potential to nest in or near the Study Area. No nests of special status or watch list birds were documented during surveys.

One of these special status birds, white-tailed kite, was observed during reconnaissance site visit, flying over wetlands at the east edge of the lake. Kites are periodically reported from Laguna Lake on the local birding listserv (SLO Co Birding) and are expected to forage regularly in the Study Area. No nests were documented but planted tree groves could provide suitable nest sites for kites.

Special Status Mammals. The Study Area contains at least some suitable habitat for two SSC mammals, American badger and pallid bat. Badgers could forage and den in grasslands. Pallid bats are expected to forage in the Study Area, and could roost in tree hollows or crevices. A number of other bats are expected to forage on site but no suitable roosts are present in the Study Area. Neither of these species was observed during field surveys.

Special Status Reptiles. One upland SSC reptile, Blainville's horned lizard, could occur in grasslands and open areas within the Study Area. Better habitat is present in rocky and barren areas upslope of the Study Area. Horned lizards were not documented onsite during field surveys.

Other Nesting Birds. Habitats in the Study Area, including grasslands, tree groves, wetlands and riparian areas present in and surrounding the Study Area provides suitable habitat for other potentially nesting bird species protected under the Migratory Bird Treaty Act and the California Fish and Game Code. Several species of birds common to the area, that typically nest in the habitats found within the Study Area, such as western scrub jay were detected during the reconnaissance survey. Although no raptor nests were detected during 2016 surveys, any of the larger trees within and adjacent to the Study Area could be utilized by raptors for nesting. Additionally, a northern harrier (*Circus cyaneus*) nest was reported near the Study Area in marsh just north of the Study Area boundary.

Aquatic and Semi-Aquatic Species.

Because the major project elements are primarily focused on aquatic habitats, we provide more detailed discussion of aquatic and semi-aquatic species with potential to occur.

California red-legged frog (*Rana draytonii*): The California red-legged frog (CRLF) inhabits quiet pools of streams, marshes, and ponds. All life history stages are most likely to be encountered in and around breeding sites, which include coastal lagoons, marshes, springs, permanent and semi-permanent natural ponds, and ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds. Eggs are typically deposited in permanent pools, attached to emergent vegetation. The Study Area is located within the known range of CRLF in San Luis Obispo County based upon the current range depicted in the USFWS *Recovery Plan for the California Red-legged Frog* (USFWS, 2002). The Study Area does not occur within federally designated Critical Habitat for the CRLF.

A CRLF occurrence (Occurrence #895) has been recorded by the CNDDB approximately 1.25 miles downstream of the Study Area in San Luis Obispo Creek as depicted in Figure 4. Additional occurrences are reported in San Luis Obispo Creek; no current records are reported for Prefumo Creek. Surveys conducted in 2001 did not locate any red-legged frogs; only bullfrogs were found.

Portions of Laguna Lake and Prefumo Creek near its inlet into the lake within the Study Area contain potentially suitable breeding habitat for CRLF. Water depths within the lake are suitable for CRLF breeding and partially submerged tules and willow with roots extending into the water may provide a suitable site for egg mass attachment. Prefumo Creek may also serve as a dispersal and foraging corridor for CRLF as they move through the region.

Upland habitat quality within the Study Area is mixed. Natural grassland areas are moderately suitable, while managed landscapes are generally poor due to the lack of suitable habitat and constant maintenance activities such as mowing. The upland and dispersal habitat in the northeastern half of the Study Area is very limited due to lack of suitable pools and cover upstream of the lake. However, the southern half of the Study Area does contain patches of higher quality habitat (i.e. wetland) surrounded by lower quality habitat. There is a low potential CRLF may disperse through the low quality habitat to reach areas of higher quality for foraging.

Based upon the presence of suitable aquatic habitat within the Study Area as well as isolated patches of suitable upland habitat within the Study Area, this species has a high potential to occur onsite.

Southern western pond turtle (*Actinemys* (=*Clemmys*) *marmorata*): This species is an aquatic turtle that occurs in ponds, marshes, rivers, streams and irrigation ditches that typically support aquatic vegetation. It requires downed logs, rocks, mats of vegetation, or exposed banks for basking. Western pond turtle lay their eggs in nests that are dug along the banks of streams or other uplands in sandy, friable soils. Western pond turtles, especially those that reside in creeks are also known to over winter in upland habitats. Upland movements can be quite extensive and individuals have been recorded nesting or overwintering hundreds of feet from aquatic habitats. The typical nesting season is usually from April through August; however, variation exists depending upon geographic location.

No pond turtles were observed during the site survey. The CNDDB documents an occurrence (Occurrence #1162) within one of the holding ponds at the City's Water Resource Recovery Facility approximately 1.25 miles downstream, and unconfirmed reports of pond turtles are documented in previous studies. Laguna Lake and Prefumo Creek provide suitable aquatic habitat, and shorelines along the lake are suitable for basking. Riparian areas are present for nesting. Therefore, this species has a high potential to occur onsite.

Coast Range newt (*Taricha torosa*): The Coast Range newt occurs along the coast and within the Coast Range Mountains from Mendocino County south to San Diego County. A disjunct population occurs in the southern Sierra Nevada. Coast Range newt utilizes wet forests, oak woodlands, chaparral, and rolling grassland communities, but requires permanent or aquatic habitats such as ponds, reservoirs, and sluggish pools in streams for breeding. The Coast Range newt breeding season typically occurs during late December through February. Suitable habitat exists within Laguna Lake near the Prefumo Creek riparian corridor.

There are no documented occurrences within the Study Area; however, portions of the lake may provide suitable breeding habitat for this species. Portions of the annual grassland and wetland communities within the Study Area are considered suitable upland habitat for foraging and aestivation. Therefore, this species has a moderate potential to occur onsite.

Western spadefoot (*Spea hammondii*): Spadefoots are almost completely terrestrial as adults, but require water to breed. Spadefoots inhabit hot dry environments by burrowing underground using hardened spades on its hind feet. This species spends most of its life underground in earth-filled burrows, and is active above ground typically between October and May, depending on rainfall. Spadefoots typically breed in ephemeral to seasonal pools and ponds with limited vegetation cover.

Potentially suitable ephemeral pools are present in wetland basins that hold water for several weeks each year. Soils in the Study Area are primarily heavy clay, which may limit use by adults. This species is reported from the general vicinity of the Study Area but is not known to occur close to Laguna Lake. Therefore, there is low potential for this species to occur onsite.

Vernal Pool Fairy Shrimp (*Branchinecta lynchi*): This small freshwater crustacean is endemic to California and southern Oregon. The vernal pool fairy shrimp lives only in vernal pools or vernal pool-like habitats; the species does not occur in riverine, marine, or other permanent bodies of water, and its life cycle is ephemeral. Vernal pool fairy shrimp lacks any substantial anti-predator defenses and does not persist in waters with fish. Wetland depressions in the Study Area may be suitable for vernal pool fairy shrimp, though this species has not been documented there. Vernal pool fairy shrimp are reported from wetlands and basins near Tank Farm Road in soils of similar texture, derived from similar lithology. Therefore, there is moderate potential for this species to occur onsite.

Steelhead – South Central California DPS (*Oncorhynchus mykiss*):

Steelhead is the term used to denote the anadromous life-history form of rainbow trout (*Oncorhynchus mykiss*). Steelhead occur throughout the North Pacific Ocean and spawn in freshwater streams along the west coast of North America. Steelhead in coastal San Luis Obispo County are part of the South/Central California Coast Distinct Population Segment (DPS),

which is listed as Threatened under the ESA. Relatively cool water temperatures (between 10° and 15°C [50 and 59°F]) are preferred by adults, although they are relatively tolerant of elevated water temperatures (National Marine Fisheries Service, 1997) and may survive temperatures as high as 27°C (81°F) for short periods (Moyle et al., 1989).

Adult migratory steelhead need water with a minimum depth of 18 cm (0.6 ft) for successful upstream migration with velocities below 240 cm/s (8 ft/s) (Thompson, 1972). In riverine settings, Waite and Barnhart (1992) suggested that steelhead fry occupy a restricted range of depths and low velocities near stream banks, with smolts showing a greater preference for open water habitats and deeper water (Cavallo et al., 2003). Woody debris, overhanging vegetation, manmade objects, and overhanging vegetation provide some degree of cover for juvenile life stages regardless of water level.

Steelhead smolts tend to have much greater survival to adulthood if they outmigrate at a larger size (Bond et al., 2008). In most steelhead streams, fish large enough to have high survival are those that outmigrate as age 2+; age 1+ smolts, although common, contribute little to the numbers of returning adults (Moyle, 2002). Dissolved oxygen (DO) concentrations greater than 5 mg/L are considered suitable for rearing steelhead (ISU, 2008 as cited in Daniels et al., 2010). Dissolved oxygen concentrations near saturation are generally required for growth, but they can survive at dissolved oxygen concentrations as low as 1.5 to 2.0 mg/L at low temperatures (Moyle, 2002).

The Center for Ecosystem Management and Restoration (CEMAR) published a report on *Steelhead/Rainbow Trout (Oncorhynchus mykiss) Resources South of the Golden Gate, California* that summarizes information on a watershed by watershed basis. Prefumo Creek is included in this report (CEMAR, 2008). The CEMAR document states that in 1966 CDFW published a memo identifying Prefumo Creek as "an important tributary of the San Luis Obispo Creek system. It produces steelhead and contributes a significant flow to San Luis Obispo Creek" and in 1967, CDFW staff reportedly noted that steelhead were moved past a migration barrier at the Laguna Lake inlet of Prefumo Creek. In 2003, a basin-wide survey to determine the distribution and abundance of steelhead in the San Luis Obispo Creek watershed reported that Prefumo Creek has less than 0.5 mile of wetted channel during the study, leading to relatively low steelhead density estimates. The CEMAR report also noted that CDFW staff have observed juvenile *O. mykiss* in isolated pools upstream from Laguna Lake in 2004. The City also reported that 30 juveniles have been observed in a pool immediately upstream of Los Osos Valley Road. These fish were salvaged from the drying pool and released downstream in the wetted portion of Prefumo Creek, below the lake (Perry, pers. comm. 2016).

Prefumo Creek, tributary to Laguna Lake, including the connection through Laguna Lake itself, is designated critical habitat for south/central California coast steelhead. Adult steelhead are documented in San Luis Obispo Creek, downstream of Prefumo Creek. A project that addressed a major barrier to passage in Prefumo Creek at Highway 101 was completed in 2003. Additional partial barriers to movement are identified: the culvert and concrete apron at Madonna Road is noted as a partial barrier, and other unspecified barriers are reported further upstream. Adult steelhead have not been reported from Laguna Lake or upper Prefumo Creek in any recent reports and it is unknown if anadromous adults are present in the upper watershed.

4.2 SENSITIVE PLANT COMMUNITIES

According to the CNDDB, two sensitive plant communities have been previously documented within a five-mile radius the project site (Figure 5). These include: Coastal and Valley Freshwater Marsh and Serpentine Bunchgrass. Coastal Valley Freshwater Marsh has been previously documented within the project site which was also observed onsite during the spring 2016 biological field survey. Freshwater marshes are included with wetlands, and are discussed further under Section 4.3, Jurisdictional Areas.

Current vegetation classification does not differentiate serpentine bunchgrass grassland from other needlegrass grassland types, but the current list of sensitive natural communities includes purple needlegrass grassland alliances as a sensitive natural community. Purple needlegrass grasslands are mapped over 5.94 acres of the Study Area.

Finally, riparian woodland habitat types observed onsite are considered sensitive natural communities by CDFW and are discussed further in Section 4.3.

4.3 JURISDICTIONAL AREAS

The proposed project has potential to result in direct impacts to jurisdictional areas, including other waters, wetlands, and riparian habitats. A full jurisdictional delineation was completed for the Study Area (Rincon Consultants, Inc., 2016, under separate cover). Results of the jurisdictional delineation are also summarized here. Table 3, below, summarizes the total acreage of jurisdictional waters, wetlands, streambeds, lakes, and riparian areas onsite by agency and regulation. Figure 6 depicts the location and extent of USACE, RWQCB, and CDFW jurisdictions within the Study Area.

Table 3 – Summary of Potentially Jurisdictional Wetlands, Waters and Riparian Habitats

Jurisdictional Type	Jurisdictional Area
USACE/RWQCB Clean Water Act Section 404/401 Jurisdiction	
Other Waters below OHWM	56.77 acres 7,331 linear feet
Wetlands to edge of wetland (linear feet for wetland waters only; no length measurement for adjacent wetlands)	4.72 acres 427 linear feet
Total	61.49 acres 7,758 linear feet
CDFW CFGC Section 1602 and RWQCB Porter-Cologne Jurisdiction[1]	
Streambeds/Lakes below top of bank or to edge of riparian	65.89 Acres 7,758 linear feet
Total	65.89 Acres 7,758 linear feet

[1] No isolated wetlands or waters are present, thus CDFW 1602 and RWQCB Porter-Cologne jurisdictions are the same for this project, according to recent RWQCB guidance for the Central Coast Region.

Imagery provided by Google and its licensors © 2016.

Jurisdictional Wetlands,
Other Waters,
and Riparian Areas

Figure 6a

Imagery provided by Google and its licensors © 2016.

Jurisdictional Wetlands, Other Waters, and Riparian Areas

Figure 6b

Imagery provided by Google and its licensors © 2016.

Jurisdictional Wetlands, Other Waters, and Riparian Areas

Figure 6c

Prefumo Creek, Laguna Lake, and the unnamed ephemeral stream channels within the Study Area are considered waters of the U.S. under Clean Water Act Sections 404 and 401, and are subject to USACE and RWQCB jurisdictions. Portions of these features contain wetland vegetation, hydric soils, and wetland hydrology, and other areas are considered other waters. OHWM physical characteristics or indicators documented include a break in bank slope, benches, surface relief, change in vegetation cover, and the presence of bed and bank. Prefumo Creek is intermittent, with perennial pools in most years, and Laguna Lake is perennial except during extreme drought. Wetlands in the channel and lake edge below OHWM, and wetlands adjacent to Laguna Lake are likely under jurisdiction of the USACE. Ephemeral drainages were also mapped in the Study Area and these ephemeral drainages likely only flow during and immediately after rain events. The ephemeral drainages and wetland depressions are hydrologically connected by sheet flow and through grassy swales, ultimately contributing water into Laguna Lake a few hundred feet away.

Laguna Lake, Prefumo Creek, and the adjacent ephemeral drainages contain approximately 65.89 acres of lake and streambed (below top of bank) and associated riparian habitat, subject to the jurisdiction of CDFW. RWQCB has recently indicated that under Porter-Cologne, they also consider these areas above OHWM to be under state jurisdiction. Within ephemeral drainages average width of bank to bank is approximately 10 to 15 feet. Within Prefumo Creek above Laguna Lake, width of riparian habitat ranges from approximately 75 to 150 feet wide. Below Laguna Lake, bank to bank width of Prefumo Creek is approximately 65 feet. The width of Laguna Lake varies with location, varying between approximately 250 and 900 feet within the Study Area portion.

4.4 WILDLIFE MOVEMENT

Open spaces that connect to natural habitats, including the LLNR, provide important wildlife movement opportunities. Open spaces within the City connect provide some corridors that help link non-contiguous or fragmented wildlife habitats. The Study Area includes a portion of designated open space, and is adjoined to the west by undeveloped ranch and farmland that are less restrictive for wildlife movement than residential developments such as the neighborhoods south and east of the Study Area. Additional designated open space in the Irish Hills is separated from the Study Area by existing roads and development, but is close enough that some wildlife movement between these sites is anticipated to occur; most notably along the Prefumo Creek riparian corridor.

Drainages within the project area connect to natural areas south of the Study Area in the Irish Hills, enhancing movement opportunities through residential areas, and open grasslands connect to ranchland west and north of the Study Area. Streams and lakes also provide important movement corridors for aquatic species, such as fish, and semi-aquatic species, including frogs, particularly during periods of rainfall. Fish passage in Prefumo Creek and Laguna Lake related to designated critical habitat for the federally threatened steelhead trout (*O. mykiss*) is discussed above in Section 4.1.2.

4.5 RESOURCES PROTECTED BY LOCAL POLICIES

The City regulates tree removal within its jurisdiction. Implementation of the proposed project may require removal of trees onsite. If tree removal is required, a tree removal permit must be obtained from the City prior to the onset of these activities. Once the project plans have been finalized, the exact number, type, and locations of trees within the project site to be removed can be determined and the associated tree removal permit may be obtained, if needed.

SECTION 5 – RESOURCE EVALUATION AND RECOMMENDED CONSERVATION MEASURES

This section discusses resources regulated under the framework presented in Section 2, possible impacts to biological resources that may occur from implementation of the proposed project, permitting pathways, where applicable, and suggests conservation measures that could avoid and/or minimize adverse impacts to biological resources. Impacts would be fully quantified upon completion of project alternative review and selection of a final project option.

5.1 SPECIAL STATUS SPECIES

5.1.1 Special Status Plant Species

Five special status plant species, including one species listed as Rare under CESA, are present in the Study Area. San Luis Obispo owl's clover, Congdon's tarplant, adobe sanicle, and saline clover are CRPR 1B species, and adobe sanicle is also listed as Rare under CESA. For projects that involve a federal action, such as a USACE permit, effects to listed plants are considered during the Section 7 consultation process. For projects that affect state-listed Rare plants, CDFW may issue an Incidental Take Permit under recent revisions to the Native Plant Protection Act, effective January 1, 2015.

Non-listed CRPR 1 and 2 species are typically analyzed under CEQA. For species not listed under the federal or state Endangered Species Acts, impacts that do not contribute to substantial decline of local or regional populations are generally considered less than significant. Cambria morning-glory is a CRPR 4 species; CRPR 4 is regarded as a 'watch list.' CRPR 3 and 4 plant species are typically not considered rare or endangered pursuant to CEQA.

To avoid and minimize adverse impacts/effects to special status plants, the following conservation measures are recommended.

Recommended Conservation Measures

- Avoid impacts to occurrences of special status plants listed under ESA and/or CESA.
- To the maximum extent feasible, project activities would be designed to avoid non-listed CRPR species.

- If total avoidance of CRPR species is not feasible, minimize impacts to less than 10 percent of onsite populations.
- If permanent impacts to more than 10 percent of onsite populations of CRPR plants cannot be avoided, enhance existing populations through seeding, planting, and weed control to offset the impacted individuals. Pertinent logistic details regarding an enhancement program would be outlined in a Habitat Mitigation and Monitoring Plan. The mitigation areas would be monitored annually for at least five years to ensure successful establishment.
- Ensure exterior and undercarriage of equipment and vehicles are free of mud and weed seeds when they mobilize to the site to avoid introduction of noxious weeds.

5.2.1 Special Status Wildlife

Of the numerous wildlife species reported from the vicinity of the Study Area, twenty species may occur onsite based on the presence of suitable habitat, including ten birds, two mammals, two reptiles, three amphibians, one invertebrate, and one fish. To avoid and minimize adverse impacts/effects to special status wildlife, the following conservation measures are recommended which are divided between terrestrial and aquatic/semi-aquatic species.

Terrestrial Species

Birds: The proposed project has potential to result in direct impacts to nesting birds, including special status birds, if they are nesting within the project site and/or immediate vicinity during construction activities. Fully protected birds must be fully avoided; impacts cannot be authorized. Nesting birds are protected under the Migratory Bird Treaty Act and Fish and Game Code. Additional avoidance measures for non-nesting, special status birds such as burrowing owl are often required as part of CDFW Lake and Streambed Alteration Agreements. Conservation measures are recommended to avoid impacts to special status birds and other nesting birds.

Recommended Conservation Measures

- Fully avoid white-tailed kite and golden eagle nest sites and roosts.
- To avoid take of nesting birds, and raptor nests at any time of year (including inactive nests), activities requiring vegetation disturbance would occur outside the nesting season, which is approximately February 1 through September 15. If activities must begin within the bird breeding season, then no more than two weeks prior to initiation of ground disturbance and/or vegetation removal, a nesting bird pre-construction survey will be conducted by a qualified biologist within the disturbance footprint plus a 100-foot buffer. Pre-construction nesting bird surveys will be conducted during the time of day when birds are active and will be of sufficient duration to reliably conclude presence/absence of nesting birds and raptors onsite and within the designated vicinity. If no nests are observed no further mitigation is required.
- If nests are found, their locations will be flagged and then mapped onto an aerial photograph of the project site at a scale no less than 1″=200′ and/or recorded with the use of a Global Positioning System (GPS) unit. An appropriate avoidance buffer ranging

in size from 50 to 500 feet from the nest, depending upon the species and the proposed work activity, will be determined and demarcated by a qualified biologist with bright orange construction fencing or other high-visibility delineators. No ground disturbance will occur within this buffer until the qualified biologist confirms that the breeding/nesting is completed and all the young have fledged. If buffer zones are determined to be infeasible, a full-time qualified biological monitor can monitor project activity within the buffer zones to ensure active nests and nesting birds are not impacted.

Implementation of these recommended measures would avoid and/or minimize potential impacts to nesting birds, including special status birds.

Mammals: Two special status mammals, American badger and pallid bat, have potential to occur in the study area. The proposed project has potential to impact these species if the project requires work in native terrestrial habitats including grasslands, or removal of trees. Hibernacula and maternity colonies of bats are also protected by CDFW. Conservation measures are recommended as follows.

Recommended Conservation Measures

- Prior to activities that disturb native habitats in upland areas, a qualified biologist should complete a survey for badger dens. In order to avoid the potential direct take of adults and nursing young, no grading should occur within 50 feet of an active badger den between March 1 and June 30. Activities during July 1 and March 1 should comply with the following measures to avoid direct take of adult and weaned juvenile badgers.
    - Conduct a biological survey of the anticipated development areas between 2 weeks and 4 weeks of the start of ground clearing or grading activity. The survey should cover the entire area proposed for disturbance. Surveys should focus on both old and new den sites. If dens are too long to see the end, a fiber optic scope (or other acceptable method) can be used to assess the presence of badgers.
    - Inactive dens shall be excavated by hand with a shovel to prevent badgers from reusing them during construction.
    - Badgers should be discouraged from using currently active dens prior to the grading of the site by partially blocking the entrance of the den with sticks, debris and soil for 3 to 5 days or through use of a 1-way door. After badgers have stopped using active dens within the development area, the dens shall be hand excavated with a shovel to prevent re-use
- Prior to activities that require tree removal, a qualified biologist should inspect trees proposed for removal to ensure bats are not roosting.
- If bats are observed, the biologist shall determine if the roost is a hibernaculum or a maternity colony. If so, removal of the tree would be postponed until outside wintering or maternity seasons. If not, the bat(s) would be evicted using appropriate one-way devices and the tree inspected again prior to tree removal.

Reptiles: The proposed project has potential to result in direct impacts to Blainville's horned lizards if they are within the project site and/or immediate vicinity during construction activities.

Recommended Conservation Measures

- During new grading activities in upland habitats, a qualified biologist should be on-site to recover any coast horned lizards that may be excavated/unearthed with native material or found under vegetation. If the animals are in good health, they should be immediately relocated to a designated release area. If they are injured, the animals shall be turned over to an approved wildlife rehabilitator until they are in a condition to be released into the designated release area.

Aquatic and Semi-Aquatic Species

Invertebrates: Wetland depressions in the Study Area have potential to support vernal pool fairy shrimp. Impacts to vernal pool fairy shrimp would require take authorization by USFWS. The following conservation measures are recommended.

Recommended Conservation Measures

- The project would be designed to avoid impacts to the basins and wetland depressions (adjacent to but not abutting Laguna Lake), and would avoid altering hydrology of these features.
- Work areas would be flagged, resources to be avoided would be flagged, and no work would occur upslope and within 250 feet of vernal pool fairy shrimp habitat.

Amphibians:

Western spadefoot
Wetland depressions in the Study Area have potential to support breeding western spadefoots, and uplands may harbor adults. Measures for protection of spadefoots are often included in Lake and Streambed Alteration Agreements. This species is not currently listed under ESA or CESA, thus take permits are not required.

Recommended Conservation Measures

- The project would be designed to avoid impacts to the basins and wetland depressions (adjacent to but not abutting Laguna Lake), and would avoid altering hydrology of these features.
- During new grading activities in upland habitats, a qualified biologist should be on-site to recover any spadefoot toads that may be excavated/unearthed with native material or found under vegetation. If the animals are in good health, they should be immediately relocated to a designated release area. If they are injured, the animals shall be turned over to an approved wildlife rehabilitator until they are in a condition to be released into the designated release area.

California red-legged frog
Laguna Lake provides potential breeding and resident habitat for California red-legged frog. Prefumo Creek provides potential movement corridors and some possible breeding habitat. California red-legged frog is listed under ESA, and potential effects would be evaluated by USFWS during Section 7 consultation. Recommended conservation measures to avoid and minimize potential adverse effects are presented below.

Recommended Conservation Measures

- Prior to initiation of construction activities (including staging and mobilization), all personnel associated with project construction would attend a Worker Environmental Awareness Program (WEAP) training, conducted by a qualified biologist, to aid workers in recognizing special status resources that may occur in the project area. The specifics of this program would include identification of the sensitive species and habitats, a description of the regulatory status and general ecological characteristics of sensitive resources, and review of the limits of construction and avoidance measures required to reduce impacts to biological resources within the work area. A fact sheet conveying this information would also be prepared for distribution to all contractors, their employers, and other personnel involved with construction of the project.
- Ground disturbing activities associated with dry portions of Prefumo Creek should be conducted between May 1 and October 31 during dry weather conditions, which are periods of low activity for these species in dry habitats, to minimize the potential for encountering CRLF. Work should be restricted to daylight hours to the extent feasible.
    - If activities must occur between November 1 and April 30, the qualified biologist should conduct a pre-activity clearance sweep each morning prior to start of project activities after any rain events of 0.1 inch or greater.
    - All trash should be removed from the site daily and disposed of properly to avoid attracting potential predators to the site.
    - Non-automated operational activities (i.e. truck trips), shall not be conducted during rain events occurring at night to the extent feasible. If project activities requiring movement of equipment are to occur at night during rain events, a qualified biologist should conduct a pre-construction survey of the site each night.
- A qualified biologist should conduct a survey of work areas associated with the lake and creek within 48 hours of initial ground disturbing activities. The survey area would include the proposed disturbance area and all proposed ingress/egress routes, plus a 100-foot buffer. A biologist authorized to relocate frogs should be present for activities that require movement or placement of equipment into the lake, stream, and wetlands along the lake to monitor for frogs. If a frog is observed in the work area, the biologist would relocate it, with prior authorization from USFWS, out of the work area.
- If drying basins are used to remove water from the sediment, appropriate exclusion fence should be placed around the basins to prevent access by frogs.
- For equipment that remains in place for several hours or days, the biologist need not be present at all times, but should spot check at least weekly for frogs.

Reptiles: The proposed project has potential to result in direct impacts to southern western pond turtles if turtles move within the project site and/or immediate vicinity during construction activities.

Recommended Conservation Measures

- A qualified biologist should conduct a survey of work areas associated with the lake and creek within 48 hours of initial ground disturbing activities. The survey area would include the proposed disturbance area and all proposed ingress/egress routes, plus a 100-foot buffer. Turtles within work areas should be relocated outside the work area. A biologist authorized to relocate turtles should be present for activities that require movement or placement of equipment into the lake, stream, and wetlands along the lake to monitor for turtles. If a turtle is observed in the work area, the biologist would relocate it out of the work area.

Fish: Prefumo Creek and Laguna Lake are within designated critical habitat for steelhead. Historic records indicate steelhead used Prefumo Creek, and rainbow trout are reported from upper Prefumo Creek above the lake in recent years, but no recent documented observations of anadromous adults in or above were found for the Study Area. The proposed project is not currently expected to impact individuals given the lack of records of anadromous fish in Laguna Lake or upper Prefumo Creek.

Although dredging is expected to result in temporary short-term effects to turbidity, the project is not expected to permanently adversely affect designated critical habitat and is actually expected to result in beneficial aquatic habitat conditions. Management of excessive sedimentation from the Prefumo Creek watershed is expected to improve habitat conditions downstream and post-dredging is expected to result in an increased depth in the lake, which in turn is expected to promote cooler water temperatures.

Existing habitat features and possible habitat improvements that could be integrated into the project have been considered in project development. In contrast with Prefumo Creek, Laguna Lake has an increased depth, reduced velocity, and increase in turnover rate (time required for a volume of water to pass through an impoundment). The habitat in Laguna Lake is more suited to warm water fish such as small mouth bass and largemouth bass which are predators to steelhead and have wide environmental tolerances. In addition, Laguna Lake attracts wading birds such as egrets and herons which are highly effective fish predators. Any shallow ponded water makes the fish more visible to these predators.

Activities that adversely affect or destroy critical habitat for and/or may result in take of individual steelhead require authorization from the National Marine Fisheries Service (NMFS). Section 7 consultation with NMFS regarding a determination of the potential effects to steelhead and/or its critical habitat for projects in waters of the U.S. typically occurs as part of the permitting process led by the USACE. It is anticipated that consultation will occur to address all aspects of the project that may affect steelhead.

Recommended Conservation Measures

To minimize temporary effects on habitat and maximize benefits through habitat improvement the following conservation recommendations would be considered during project design and implementation:

- During project design, including options to stabilize banks along the lake, the following habitat parameters would be considered and incorporated as feasible:
    - The lake should provide abundant cover including woody debris, boulders, and undercut banks. Woody debris is very important to provide needed shelter for juvenile fish especially in low velocity refuges. Having appropriate cover and shelter would be imperative for steelhead to survive in Laguna Lake.
    - Depths greater than 0.5 meter are generally deep enough to avoid wading birds. Depth alone is not the determining factor in water temperature, but lake which has a depth to create a thermocline cold enough to support the fish during periods of higher water temperatures is desirable.
    - The lake should contain a regular and pronounced slope along its banks.
    - DO concentrations affect the migration and swimming performance of steelhead at all temperatures. Low DO levels decrease the rate of metabolism, swimming speed, growth rate, food consumption rate, efficiency of food utilization, behavior, and survival. Steelhead does best where DO concentration is at least 7.0 mg/L. DO concentrations should remain at or near saturation levels with temporary reductions no lower than 5.0 mg/L, which has been documented to result in severe production impairment (Carter, 2005).
    - Suspended and deposited fine sediment can directly affect steelhead by clogging gills, indirectly causing reduced feeding, destruction of food supplies, and changed rearing habitat. Silt loads of less than 25 mg/L permit good rearing conditions for juvenile steelhead. Controlling sediment loads into the creek and lake will improve conditions for steelhead.
- During project implementation, a biologist with fisheries experience should be present during activities movement or placement of equipment into the lake, stream, and wetlands along the lake to monitor for fish.
- If feasible, the active dredge area would be screened to reduce likelihood of aquatic vertebrate species in the active dredging area (e.g. intakes will be screened).
- If steelhead is observed, activities would cease until NMFS can be consulted.
- While dredging is underway, a biologist will monitor activities at least weekly.

5.2 SENSITIVE PLANT COMMUNITIES

Needlegrass grasslands, freshwater marsh and other freshwater wetland alliances, and riparian areas are recognized as sensitive natural communities by CDFW. Potential project-related effects on wetlands and riparian woodland are addressed under Section 5.3 below. To minimize project-related impacts on needlegrass grassland, conservation measures are recommended to keep effects to less than significant levels.

Recommended Conservation Measures

- To the maximum extent feasible, project activities would be designed to avoid needlegrass grassland habitat.
- If needlegrass grassland habitat areas cannot be avoided in temporary impact areas, purple needlegrass will be incorporated into the revegetation plant palette to functionally replace the impacted habitat.
- If permanent impacts remove needlegrass grassland habitat areas greater than 0.5 acre in size, an equivalent amount of this habitat type must be created within a City-designated and -approved needlegrass grassland habitat mitigation area onsite. Pertinent and logistic details regarding the creation of needlegrass grassland habitat would be outlined in a Habitat Mitigation and Monitoring Plan. The needlegrass grassland habitat mitigation areas will be monitored annually for at least five years to ensure successful establishment and that no-net-loss of this sensitive habitat has been achieved.
- To ensure no-net-loss of needlegrass grassland habitat, the City would create one acre of mitigation habitat for every one acre of needlegrass grassland habitat permanently removed through implementation of the project.

5.3 JURISDICTIONAL AREAS

Approximately 4.72 acres of wetlands and 56.77 acres of other waters potentially under USACE and RWQCB jurisdictions (Clean Water Act Sections 404 and 401, respectively) are present in the Study Area. Top of bank/edge of riparian areas potentially subject to regulation by CDFW under Section 1600 et seq. of the CFGC, and RWQCB under Porter-Cologne are also present. The exact location and size of impact to jurisdictional areas is unknown, but the project is likely to impact some portions of these jurisdictional features. Project alternatives have been developed to minimize negative impacts, and address existing conditions currently degrading quality of certain jurisdictional areas. Proposed activity in areas identified as jurisdictional waters and/or wetlands may be subject to the permit requirements of the USACE under Section 404 of the CWA, RWQCB under Section 401 of the CWA and under Porter-Cologne, and/or CDFW pursuant to Section 1600 et seq. of the CFGC.

Recommended Conservation Measures

- Jurisdictional areas that cannot be avoided will acquire all applicable regulatory permits. Temporary impact areas will be restored at a one to one (1:1) ratio (one acre of restoration for each acre of impact) to offset temporary losses in wetland, stream, or riparian function. Permanent impacts will be offset through creation, restoration, and/or enhancement of in-kind habitats at a minimum ratio of 2:1 to mitigate unavoidable permanent impacts to jurisdictional areas. Note the resource agencies may require a higher mitigation ratio. A Mitigation and Monitoring Plan will likely be required, and would be prepared by a biologist familiar with restoration and mitigation techniques. The plan will include, but not be limited to the following components:
    - Description of the project/impact site,
    - Goal(s) of the compensatory mitigation project,

  - Description of the proposed compensatory mitigation-site,
  - Implementation plan for the compensatory mitigation-site,
  - Maintenance activities during the monitoring period,
  - Monitoring plan for the compensatory mitigation-site,
  - Success criteria and performance standards,
  - Reporting requirements, and
  - Contingency measures and funding mechanisms.

- Erosion control and landscaping specifications shall allow only natural-fiber, biodegradable meshes and coir rolls, (i.e. no plastic-mesh temporary erosion control measures) to prevent impacts to the environment and to fish and terrestrial wildlife.
- Where feasible, aquatic habitat improvements such as root wads and downed logs will be incorporated into bank stabilization and sediment control efforts to enhance aquatic habitat in perennial waterways.

5.4 WILDLIFE MOVEMENT

The proposed project would potentially result in temporary short-term impacts to wildlife movement due to increased vehicle trips, equipment access and staging, temporary spoils and settling basins, soil disturbance, and dredging equipment. Upon completion of the project, wildlife movement conditions are expected to return to pre-project conditions.

5.5 LOCAL POLICIES AND ORDINANCES

Planted and naturally occurring trees are present in the Study Area. Some project options, such as sediment control structures and bank stabilization, may require removal of some trees to access work areas. The City regulates tree removal within its jurisdiction. If tree removal is required, a tree removal permit would be processed if needed prior to the onset of these activities to ensure the project is consistent with local policies.

Management of sediment issues in Laguna Lake and Prefumo Creek are identified in local conservation and management plan documents for Laguna Lake, and proposed project alternatives would be consistent with conservation goals in the Laguna Lake Natural Reserve Conservation Plan, where applicable.

5.6 ADOPTED OR APPROVED PLANS

No adopted Habitat Conservation Plan or Natural Community Conservation Plan is in effect within the Study Area. Thus, the proposed Project would not conflict with any Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plans.

SECTION 6 – LIMITATIONS, ASSUMPTIONS, AND USER RELIANCE

This Biological Resources Assessment has been performed in accordance with professionally accepted biological investigation practices conducted at this time and in this geographic area. The biological investigation is limited by the scope of work performed. Biological surveys for the presence or absence of certain taxa have been conducted as part of this assessment but were not performed during a particular blooming period, nesting period, or particular portion of the season when positive identification would be expected if present, and therefore, cannot be considered definitive. The biological surveys are limited also by the environmental conditions present at the time of the surveys. In addition, general biological (or protocol) surveys do not guarantee that the organisms are not present and will not be discovered in the future within the site. In particular, mobile wildlife species could occupy the site on a transient basis, or re-establish populations in the future. Our field studies were based on current industry practices, which change over time and may not be applicable in the future. No other guarantees or warranties, expressed or implied, are provided. The findings and opinions conveyed in this report are based on findings derived from site reconnaissance, jurisdictional areas, review of CNDDB RareFind5, and specified historical and literature sources. Standard data sources relied upon during the completion of this report, such as the CNDDB, may vary with regard to accuracy and completeness. In particular, the CNDDB is compiled from research and observations reported to CDFG that may or may not have been the result of comprehensive or site-specific field surveys. Although Rincon believes the data sources are reasonably reliable, Rincon cannot and does not guarantee the authenticity or reliability of the data sources it has used. Additionally, pursuant to our contract, the data sources reviewed included only those that are practically reviewable without the need for extraordinary research and analysis.

We note that based on discussions with Central Coast RWQCB staff there may be differing interpretations of the RWQCB's jurisdictional reach under Section 401 of the CWA and Porter-Cologne. Based on federal and state law and regulations, the Central Coast RWQCB's jurisdiction should be delineated at the OHWM. However, it has been clearly conveyed to us that the Central Coast RWQCB's interpretation of Porter-Cologne (i.e., Waters of the State) is that the RWQCB's jurisdictional limits extend to the top of bank or edge of riparian area, if present. This is, in our experience, inconsistent with previous policy. The *Preliminary Draft Water Quality Control Policy for Wetland Area Protection and Dredged or Fill Permitting* (State Water Resources Control Board 2013) does not contain any language specific to the limits of jurisdiction extending to the top of bank or edge of riparian area. We understand that in connection with this project, these differing approaches would not change the permit fees, required mitigation, or the overall analysis.

SECTION 7 - REFERENCES

American Ornithologists Union. 2015. AOU Checklist of North and Middle American Birds (7th Edition and Supplements). http://americanornithology.org/

Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken, editors. 2012. *The Jepson Manual: Vascular Plants of California, second edition*. University of California Press, Berkeley, California.

Bond, M.H., Hayes, S.A., Hanson, C.V., and R.B. MacFarlane. 2008. Marine survival of steelhead (*Oncorhynchus mykiss mykiss*) enhanced by a seasonally closed estuary. Canadian Journal of Fisheries and Aquatic Sciences, 65:2242–2252.

Bowers, N., R. Bowers, & K. Kaufman. 2004. Mammals of North America.

Burt, W.H., and R.P. Grossenheider. 1980. A Field Guide to the Mammals of North American North of Mexico. The Peterson Field Guide Series.

Calflora. 2009. Information on wild California plants for conservation, education, and appreciation. Berkeley, California. Updated online and accessed at: http://www.calflora.org/.

California Department of Fish and Wildlife. 2009. *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities.*

California Department of Fish and Wildlife. 2010. *List of Vegetation Alliances and Associations.* Vegetation Classification and Mapping Program, Sacramento, California. September 2010.

California Department of Fish and Wildlife. 2016a. California Natural Diversity Database, Rarefind 5. Accessed online from http://www.dfg.ca.gov/biogeodata. April 2016.

California Department of Fish and Wildlife. 2016b. Biogeographic Information and Observation System (BIOS). Retrieved April 14, 2016 from http://www.dfg.ca.gov/biogeodata/bios/

California Department of Fish and Wildlife. 2016c. Special Vascular Plants, Bryophytes, and Lichens List. Biogeographic Data Branch, California Natural Diversity Database. April 2016.

California Department of Fish and Wildlife. 2016d. Special Animals List. Biogeographic Data Branch, California Natural Diversity Database. April 2016.

California Invasive Plant Council. 2016. California Invasive Plant Inventory Database (online edition). Accessed May 9, 2016 from http://www.cal-ipc.org/paf/

California Native Plant Society. 2016. Inventory of Rare and Endangered Plants (Online Edition). V8-02. Updated online and accessed at http://www.rareplants.cnps.org. April 2016.

Carter, K. 2005. The Effects of Dissolved Oxygen on Steelhead Trout, Coho Salmon, and Chinook Salmon Biology and Function by Life Stage. North Coast Regional Water Quality Control Board. Santa Rosa, California.

Cavallo, B., R. Kurth, J. Kindopp, A. Seesholtz, and M. Perrone. 2003. Distribution and habitat use of steelhead and other fishes in the lower Feather River, 1999–2001. Interim Report SP-F10, Task 3a. Prepared for California Department of Water Resources, Division of Environmental Services, Sacramento, California.

Center for Ecosystem Management and Restoration (CEMAR). 2008. Steelhead/Rainbow Trout (Oncorhynchus mykiss) Resources South of the Golden Gate, California. San Luis Obispo County Chapter.

Central Coast Salmon Enhancement. 2014. A Review of Hydrology, Sedimentation, and Water Quality Issues for Laguna Lake, San Luis Obispo. Appendix F of the Laguna Lake Natural Reserve Conservation Plan.

City of San Luis Obispo. 2009. City Council Agenda Report: Laguna Lake Dredging Project Mitigated Negative Declaration.

City of San Luis Obispo. 2015. Laguna Lake Natural Reserve Conservation Plan. Final Approved Plan.

Cleveland, Paul. 1995. San Luis Obispo Creek Steelhead Trout Habitat Inventory and Investigation.

Daniels, M., D. Frank, R. Holloway, B. Kowalski, P. Krone-Davis, S. Quan, E. Stanfield, A. Young, A., and F. Watson. 2010. Evaluating good water quality habitat for steelhead in Carmel Lagoon: fall 2009. Publication No. WI-2010-03. The Watershed Institute, California State Monterey Bay.

EDW et al. 1982. Laguna Lake Management Plan.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. U.S. Army Engineers Waterways Experiment Station. Vicksburg, Mississippi.

Google Earth. 2014. Available at: http://earth.google.com/

Hector, Fred L. 1961. Laguna Lake Master Plan.

Holland, Robert F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Wildlife, Nongame Heritage Program. 156 pgs.

Jepson Flora Project (eds.) 2016. Jepson eFlora. Online at http://ucjeps.berkeley.edu/eflora/ [accessed April and May, 2016].

Keil, David J. 1996. Rare Plants, Vegetation and Flora of Laguna Lake Park, San Luis Obispo, California. San Luis Obispo.

LFR Levine Fricke. 2003. Ecological Resources and Potential Impacts of Dredging Operations at Laguna Lake. City and County of San Luis Obispo, California. March 2003.

Moyle, P.B., J.E. Williams, and E.D. Wikramanayake. 1989. Fish species of special concern of California. Final Report. Prepared by Department of Wildlife and Fisheries Biology, University of California, Davis for California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova.

National Marine Fisheries Service. 1997. Status review of West Coast steelhead from Washington, Oregon and California. NOAA Technical Memorandum NMFS-NWFSC-27. National Marine Fisheries Service. Seattle Washington.

Perry, Meg. 2016. Personal communications with Robert Hill and Freddy Otte, City of San Luis Obispo.

Sawyer, J. O., T. Keeler-Wolf, and J.M. Evens. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society, Sacramento, California.

Sedes et al. 1993. Laguna Lake Master Plan. Prepared for City of San Luis Obispo.

Stebbins, R. C. 2003. A Field Guide to Western Reptiles and Amphibians, 2nd ed. Houghton-Mifflin Company. Boston, Massachusetts.

State Water Resources Control Board. 2013. Preliminary Draft Water Quality Control Policy for Wetland Area Protection and Dredged or Fill Permitting. Available online at: http://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/wrapp/policy_draft.pdf

Thompson, K. 1972. Determining stream flows for fish life. In Proceedings of the instream flow requirement workshop. Pacific Northwest River Basin Commission, Vancouver, Washington.

United States Army Corps of Engineers. 2001. *Final Summary Report: Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest*. U.S. Army Corps of Engineers. San Francisco, California.

United States Army Corps of Engineers. 2005. *Regulatory Guidance Letter No. 05-05: Ordinary High Water Mark Identification*. U.S. Army Corps of Engineers. Washington, D.C.

United States Army Corps of Engineers. 2006. *Distribution of Ordinary High Water Mark (OHWM) Indicators and Their Reliability in Identifying the Limits of "Waters of the United States" in Arid Southwest Channels*. Technical Report ERDC/CRREL TR-06-5. U.S. Army Engineer

Research and Development Center, Cold Regions Research and Engineering Laboratory. Hanover, New Hampshire.

United States Army Corps of Engineers. 2008a. Regional *Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0).* Technical Report ERDC/EL TR-08-28. U.S. Army Engineer Research and Development Center. Vicksburg, Mississippi.

United States Army Corps of Engineers. 2008b. A *Field Guide to the Identification of the Ordinary High Water mark (OHWM) in the Arid West Region of the Western United States.* Technical Report ERDC/CRREL TR-08-12. U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory. Hanover, New Hampshire.

United States Army Corps of Engineers. 2010. *Updated Datasheet for the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States.* Technical Report ERDC/CRREL TN-10-1. U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory. Hanover, New Hampshire.

United States Army Corps of Engineers. 2016. National Wetland Plant List. Website. Available at: http://rsgisias.crrel.usace.army.mil/NWPL/

United States Department of Agricultural, Natural Resources Conservation Service. 2016a. Web Soil Survey. Accessed April 14, 2016. San Luis Obispo County, California, Coastal Part Soil Survey Area. Available at: http://websoilsurvey.nrcs.usda.gov/app/.

United States Department of Agricultural, Natural Resources Conservation Service. 2016b. WETS Table: San Luis Obispo. Accessed April 14, 2016. San Luis Obispo County, California.

United States Department of Agriculture, Natural Resources Conservation Service. 2015. National Hydric Soils List. National Cooperative Soil Survey, U.S. Department of Agriculture. Available online at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/. December.

United States Department of Agricultural, Soil Conservation Service. 1984. Soil Survey of San Luis Obispo County, California, Coastal Part.

United States Fish and Wildlife Service. 1973. The Endangered Species Act of 1973, as amended (16 U.S.C 1531 et seq.).

United States Fish and Wildlife Service. 2000. Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants. January 2000.

United States Fish and Wildlife Service. 2016a. Critical Habitat Portal. Available at: http://criticalhabitat.fws.gov

United States Fish and Wildlife Service. 2016b. *National Wetland Inventory.* Available at: http://www.fws.gov/wetlands/Data/Mapper.html.

United States Geological Survey. 2016a. National Hydrography Dataset. Accessed through the National Map at http://viewer.nationalmap.gov/viewer/

United States Geological Survey. 2016b. StreamStats Tool for California. http://water.usgs.gov/osw/streamstats/

Western Regional Climate Center. 2010. Climate of California. Available at: http://www.wrcc.dri.edu/narratives/CALIFORNIA.htm

Zeiner, D., W.F. Laudenslayer, Jr., and K.E. Mayer (May 1988). California's Wildlife. California Statewide Wildlife Habitat Relationship System, Volumes I, II, & III. California Department of Fish and Wildlife.

SECTION 8 – LIST OF PREPARERS

RINCON CONSULTANTS, INC.

- Primary Authors:
  - Meg Perry, Senior Biologist/Botanist
  - Noël Fie, Biologist
- Technical Review:
  - Colby J. Boggs, Principal/Senior Ecologist
- Graphics:
  - Doug Carreiro, GIS Analyst
- Field Survey:
  - Meg Perry, Senior Biologist/Botanist
  - Noël Fie, Biologist

Appendix A

Regulatory Setting

REGULATORY SETTING

Special-status habitats are vegetation types, associations, or sub-associations that support concentrations of special-status plant or wildlife species, are of relatively limited distribution, or are of particular value to wildlife.

Listed species are those taxa that are formally listed as endangered or threatened by the federal government (e.g. U.S. Fish and Wildlife Service [USFWS]; National Marine Fisheries Service [NMFS]), pursuant to the Federal Endangered Species Act (FESA) or as endangered, threatened, or rare (for plants only) by the State of California (i.e. California Fish and Game Commission), pursuant to the California Endangered Species Act or the California Native Plant Protection Act. Some species are considered rare (but not formally listed) by resource agencies, organizations with biological interests/expertise (e.g. Audubon Society, CNPS, The Wildlife Society), and the scientific community.

The following is a brief summary of the regulatory context under which biological resources are managed at the federal, state, and local levels. A number of federal and state statutes provide a regulatory structure that guides the protection of biological resources. Agencies with the responsibility for protection of biological resources within the project site include:

- U.S. Army Corps of Engineers (wetlands and other waters of the United States);
- Regional Water Quality Control Board (waters of the State);
- U.S. Fish and Wildlife Service (federally listed species and migratory birds);
- National Marine Fisheries Service (anadromous fish)
- California Department Fish and Wildlife (riparian areas and other waters of the State, state-listed species);

U.S. Army Corps of Engineers. Under Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (USACE) has authority to regulate activities that could discharge fill of material or otherwise adversely modify wetlands or other "waters of the United States." Perennial and intermittent creeks are considered waters of the United States if they are hydrologically connected to other jurisdictional waters. The USACE also implements the federal policy embodied in Executive Order 11990, which is intended to result in no net loss of wetland value or acres. In achieving the goals of the Clean Water Act, the USACE seeks to avoid adverse impacts and offset unavoidable adverse impacts on existing aquatic resources. Any fill or adverse modification of wetlands that are hydrologically connected to jurisdictional waters would require a permit from the USACE prior to the start of work. Typically, when a project involves impacts to waters of the United States, the goal of no net loss of wetland acres or values is met through compensatory mitigation involving creation or enhancement of similar habitats.

Regional Water Quality Control Board. The State Water Resources Control Board (SWRCB) and the local Central Coast Regional Water Quality Control Board (RWQCB) have jurisdiction over "waters of the State," pursuant to the Porter-Cologne Water Quality Control Act, which are defined as any surface water or groundwater, including saline waters, within the boundaries of the State. The SWRCB has issued general Waste Discharge Requirements

(WDRs) regarding discharges to "isolated" waters of the State (Water Quality Order No. 2004-0004-DWQ, Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the U.S. Army Corps of Engineers to be Outside of Federal Jurisdiction). The Central Coast RWQCB enforces actions under this general order for isolated waters not subject to federal jurisdiction, and is also responsible for the issuance of water quality certifications pursuant to Section 401 of the Clean Water Act for waters subject to federal jurisdiction.

United States Fish and Wildlife Service. The USFWS implements the Migratory Bird Treaty Act (16 United States Code [USC] Section 703-711) and the Bald and Golden Eagle Protection Act (16 USC Section 668). The USFWS and National Marine Fisheries Service (NMFS) share responsibility for implementing the Federal Endangered Species Act (FESA) (16 USC § 153 *et seq.)*. The USFWS generally implements the FESA for terrestrial and freshwater species, while the NMFS implements the FESA for marine and anadromous species. Projects that would result in "take" of any federally listed threatened or endangered species are required to obtain permits from the USFWS or NMFS through either Section 7 (interagency consultation with a federal nexus) or Section 10 (Habitat Conservation Plan) of FESA, depending on the involvement by the federal government in permitting and/or funding of the project. The permitting process is used to determine if a project would jeopardize the continued existence of a listed species and what measures would be required to avoid jeopardizing the species. "Take" under federal definition means to harass, harm (which includes habitat modification), pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Proposed or candidate species do not have the full protection of FESA; however, the USFWS and NMFS advise project applicants that they could be elevated to listed status at any time.

California Department of Fish and Wildlife. The CDFW derives its authority from the Fish and Game Code of California. The California Endangered Species Act (CESA) (Fish and Game Code Section 2050 *et. seq.)* prohibits take of state listed threatened, endangered or fully protected species. Take under CESA is restricted to direct mortality of a listed species and does not prohibit indirect harm by way of habitat modification. The CDFW also prohibits take for species designated as Fully Protected under the Code.

California Fish and Game Code sections 3503, 3503.5, and 3511 describe unlawful take, possession, or destruction of birds, nests, and eggs. Fully protected birds (Section 3511) may not be taken or possessed except under specific permit. Section 3503.5 of the Code protects all birds-of-prey and their eggs and nests against take, possession, or destruction of nests or eggs.

Species of Special Concern (SSC) is a category used by the CDFW for those species which are considered to be indicators of regional habitat changes or are considered to be potential future protected species. Species of Special Concern do not have any special legal status except that which may be afforded by the Fish and Game Code as noted above. The SSC category is intended by the CDFW for use as a management tool to include these species into special consideration when decisions are made concerning the development of natural lands.

The CDFW also has authority to administer the Native Plant Protection Act (NPPA) (Fish and Game Code Section 1900 *et seq.*). The NPPA requires the CDFW to establish criteria for

determining if a species, subspecies, or variety of native plant is endangered or rare. Under Section 1913(c) of the NPPA, the owner of land where a rare or endangered native plant is growing is required to notify the department at least 10 days in advance of changing the land use to allow for salvage of plant. California Fish and Game Code was recently amended to allow for issuance of 2081 permits for impacts to state-listed Rare plants.

Additionally, special status plant species are given a California Rare Plant Rank (CRPR) code. The code definitions are:

- Rank 1A = Plants presumed extinct in California;
- Rank 1B.1 = Rare or endangered in California and elsewhere; seriously endangered in California (over 80% of occurrences threatened/high degree and immediacy of threat);
- Rank 1B.2 = Rare or endangered in California and elsewhere; fairly endangered in California (20-80% occurrences threatened);
- Rank 1B.3 = Rare or endangered in California and elsewhere, not very endangered in California (<20% of occurrences threatened or no current threats known);
- Rank 2 = Rare, threatened or endangered in California, but more common elsewhere;
- Rank 3 = Plants needing more information (most are species that are taxonomically unresolved; some species on this list meet the definitions of rarity under CNPS and CESA);
- Rank 4.2 = Plants of limited distribution (watch list), fairly endangered in California (20-80% occurrences threatened); and
- Rank 4.4= Plants of limited distribution (watch list), not very endangered in California (<20% occurrences threatened or no current threats known).

Perennial and intermittent streams and associated riparian vegetation, when present, also fall under the jurisdiction of the CDFW. Section 1600 et seq. of the Fish and Game Code (Lake and Streambed Alteration Agreements) gives the CDFW regulatory authority over work within the stream zone (which could extend to the 100-year flood plain) consisting of, but not limited to, the diversion or obstruction of the natural flow or changes in the channel, bed, or bank of any river, stream or lake.

Appendix B

Site Photographs

Photo 1. Planted tree groves – gum trees – in the Study Area.

Photo 2. Needlegrass grassland in the Study Area in April 2016.

Photo 3. Wetland depression in the Study Area in April 2016.

Photo 4. Wetland habitat at the lake margin in the Study Area in May 2016.

Photo 5. Open water in Laguna Lake in the Study Area, looking toward the Prefumo Creek inlet, in May 2016.

Photo 6. Prefumo Creek upstream of Los Osos Valley Road.

Photo 7. Prefumo Creek between Los Osos Valley Road and Laguna Lake. Note wetland vegetation in the channel bed.

Photo 8. Cambria morning glory in the Study Area in April 2016.

Photo 9. Adobe sanicle in the Study Area in April 2016.

Photo 10. San Luis Obispo owl's clover in the Study Area in April 2016.

Appendix C

Floral and Fauna Compendia

Plant Species Observed within the Laguna Lake Study Area
Spring 2016

Species observed are presented grouped by Family and organized alphabetically by scientific name.

Scientific Name	Common Name	Origin	Community
Agavaceae			
Chlorogalum pomeridianum var. *pomeridianum*	soap root	Native	Grasslands
Aizoaceae			
Carpobrotus edulis	Hottentot fig	Introduced; Cal-IPC High	Grasslands (ruderal areas)
Anacardiaceae			
Pistacia chinensis	Chinese pistache	Planted	Planted tree groves; Landscaped and Developed
Apiaceae			
Foeniculum vulgare	Fennel	Introduced; Cal-IPC High	Grasslands
Lomatium caruifolium	Biscuitroot	Native	Grasslands
Lomatium utriculatum	Bladder parsnip	Native	Grasslands
Sanicula maritima	Adobe sanicle	Native; California Rare	Seeps
Apocynaceae			
Asclepias fascicularis	narrow-leaf milkweed	Native	Grasslands
Asteraceae			
Anthemis cotula	mayweed	Introduced	Grasslands
Baccharis pilularis	coyote brush	Native	Grasslands
Baccharis salicifolia	mulefat	Native	Freshwater wetlands; riparian
Carduus pycnocephalus	Italian thistle	Introduced; Cal-IPC Moderate	Grasslands
Centaurea calcitrapa	Purple star thistle	Introduced; Cal-IPC Moderate	Grasslands
Centromadia parryi ssp. congdonii	Congdon's tarplant	Native; CRPR 1B.1	Grasslands; wetland depressions
Cirsium vulgare	Bull thistle	Introduced; Cal-IPC Moderate	Grasslands
Corethrogyne filaginifolia	California aster	Native	Grasslands
Hedypnois cretica	Crete weed	Introduced	Grasslands
Helenium puberulum	sneezeweed	Native	Freshwater wetland, streambeds
Helminthotheca echioides	Bristly ox tongue	Introduced; Cal-IPC Limited	Grasslands; Riparian; streambeds
Hemizonia congesta ssp. luzulifolia	tarplant	Native	Grasslands
Hypochaeris glabra	smooth cat's ear	Introduced; Cal-IPC Limited	Grasslands
Lactuca serriola	Prickly lettuce	Introduced	Grasslands
Layia platyglossa	Coastal tidy tips	Native	Grasslands

Matricaria discoidea	Pineapple weed	Native	Grasslands
Microseris douglasii ssp. *douglasii*	Douglas's microseris	Native	Grasslands
Pseudognaphalium luteoalbum	cudweed	Introduced	Streambeds; freshwater wetlands
Silybum marianum	milk thistle	Introduced; Cal-IPC Limited	Grasslands
Sonchus asper	Prickly sow thistle	Introduced	Grasslands
Sonchus oleraceus	Common sow thistle	Introduced	Grasslands
Taraxacum officinale	dandelion	Introduced	Grasslands
Betulaceae			
Alnus rhombifolia	White alder	Native (Planted)	Landscaped and Developed
Boraginaceae			
Cryptantha muricata	prickly popcorn flower	Native	Grasslands
Brassicaceae			
Brassica nigra	Black mustard	Introduced; Cal-IPC Moderate	Grasslands
Hirschfeldia incana	perennial mustard	Introduced; Cal-IPC Moderate	Grasslands
Lepidium draba	heart-pod hoary cress	Introduced; Cal-IPC Moderate	Grasslands
Lepidium nitidum	pepperweed	Native	Grasslands
Raphanus sativus	wild radish	Introduced; Cal-IPC Limited	Grasslands
Sisymbrium orientale	hedge mustard	Introduced	Grasslands; Landscaped and Developed
Caryophyllaceae			
Silene gallica	windmill pink	Introduced	Grasslands
Spergularia rubra	spurry	Introduced	Grasslands
Chenopodiaceae			
Atriplex semibaccata	Australian salt brush	Introduced; Cal-IPC Moderate	Grasslands
Convolvulaceae			
Calystegia macrostegia ssp. cyclostegia	California morning glory	Native	Grasslands
Calystegia subacaulis ssp. *episcopalis*	Cambria morning glory	Native; CRPR 4.2	Grasslands
Convolvulus arvensis	bindweed	Introduced	Grasslands; Landscaped and Developed
Dichondra micrantha	dichondra	Introduced	Landscaped and Developed
Cupressaceae			
Cedrus sp.	Cedar	Planted	Planted tree groves; Landscaped and Developed
Hesperocyparis macrocarpa	Monterey cypress	Native (Planted)	Planted tree groves; Landscaped and Developed
Sequoia sempervirens	coast redwood	Native (Planted)	Planted tree groves; Landscaped and Developed

Cyperaceae			
Cyperus eragrostis	Umbrella sedge	Native	Freshwater wetlands
Eleocharis macrostachya	Spikerush	Native	Freshwater wetlands
Schoenoplectus californicus	Bulrush	Native	Freshwater wetlands
Dipsacaceae			
Dipsacus fullonum	Fuller's teasel	Introduced; Cal-IPC Moderate	Grasslands; Freshwater wetlands
Ericaceae			
Arbutus 'Marina'	Strawberry tree	Planted	Landscaped and Developed
Euphorbiaceae			
Euphorbia spathulata	warty spurge	Native	Grasslands
Fabaceae			
Acmispon brachycarpus	Hill lotus	Native	Grasslands
Acmispon strigosus	Strigose lotus	Native	Grasslands
Acmispon americanus	Spanish clover	Native	Grasslands
Astragalus gambelianus	Dwarf locoweed	Native	Grasslands
Ceratonia siliqua	Carob	Planted	Planted tree groves; Landscaped and Developed
Genista monspessulana	French broom	Introduced; Cal-IPC High	Streambeds
Lotus corniculatus	Bird's foot trefoil	Introduced	Grasslands; Freshwater wetlands
Lupinus bicolor	miniature lupine	Native	Grasslands
Lupinus nanus	Sky lupine	Native	Grasslands
Lupinus succulentus	Arroyo lupine	Native	Grasslands
Medicago polymorpha	bur clover	Introduced; Cal-IPC Limited	Grasslands; Landscaped and Developed
Melilotus indicus	Annual yellow sweetclover	Introduced	Grasslands; streambeds
Trifolium depauperatum	sack clover	Native	Grasslands
Trifolium fucatum	Bull clover	Native	Grasslands
Trifolium hirtum	Rose clover	Introduced; Cal-IPC Limited	Grasslands
Trifolium hydrophilum	Saline clover	Native; CRPR 1B.2	Grasslands
Trifolium repens	white clover	Introduced	Landscaped and Developed
Trifolium willdenovii	Tomcat clover	Native	Grasslands
Vicia sativa	common vetch	Introduced	Grasslands
Vicia villosa	hairy vetch	Introduced	Grasslands
Fagaceae			
Quercus agrifolia	Coast live oak	Native	Planted tree groves; Landscaped and Developed
Quercus suber	Cork oak	Planted	Planted tree groves; Landscaped and Developed
Geraniaceae			
Erodium botrys	Storksbill	Introduced	Grasslands
Erodium cicutarium	redstem filaree	Introduced; Cal-IPC Limited	Grasslands

Geranium dissectum	cut-leaved geranium	Introduced; Cal-IPC Limited	Grasslands
Iridaceae			
Iris sp.	Iris	Introduced	Grasslands; Landscaped and Developed
Sisyrinchium bellum	blue-eyed grass	Native	Grasslands
Juncaceae			
Juncus bufonius	Common toad rush	Native	Freshwater wetlands
Juncus mexicanus	Mexican rush	Native	Freshwater wetlands
Juncus patens	spreading rush	Native	Freshwater wetlands
Juncus phaeocephalus	Brown headed rush	Native	Freshwater wetlands
Malvaceae			
Malva nicaeensis	bull mallow	Introduced	Grasslands; Landscaped and Developed
Malva pseudolavatera	Cretan mallow	Introduced	Grasslands
Montiaceae			
Calandrinia menziesii	Redmaids	Native	Grasslands
Myrsinaceae			
Lysimachia arvensis	Scarlet pimpernel	Introduced	Grasslands
Myrtaceae			
Corymbia citriodora	lemon-scented gum	Introduced (planted)	Planted tree groves; Landscaped and Developed
Eucalyptus globulus	blue gum	Introduced; Cal-IPC Limited	Planted tree groves; Landscaped and Developed
Oleacea			
Fraxinus sp.	Ash	Planted	Planted tree groves; Landscaped and Developed
Onagraceae			
Epilobium brachycarpum	Willowherb	Native	Grasslands
Epilobium ciliatum	Willowherb	Native	Freshwater wetlands
Orobanchaceae			
Castilleja densiflora ssp. obispoensis	San Luis Obispo owl's clover	Native; CRPR 1B.2	Grasslands
Oxalidaceae			
Oxalis pes-caprae	Bermuda buttercup	Introduced; Cal-IPC Moderate	Grasslands
Papaveraceae			
Eschscholzia californica	California poppy	Native	Grasslands
Pinaceae			
Pinus sp.	Pine	Planted	Planted tree groves; Landscaped and Developed
Plantaginaceae			
Kickxia elatine	Kickia	Introduced	Grasslands near wetlands
Plantago lanceolata	English plantain	Introduced; Cal-IPC Limited	Grasslands

Platanaceae			
Platanus racemosa	western sycamore	Native	Riparian
Poaceae			
Avena barbata	slender wild oat	Introduced; Cal-IPC Moderate	Grasslands
Avena fatua	wild oat	Introduced; Cal-IPC Moderate	Grasslands
Brachypodium distachyon	False brome	Introduced; Cal-IPC Moderate	Grasslands
Bromus catharticus	Rescue grass	Introduced	Riparian
Bromus diandrus	ripgut brome	Introduced; Cal-IPC Moderate	Grasslands
Bromus hordeaceus	soft chess	Introduced; Cal-IPC Limited	Grasslands
Bromus madritensis ssp. rubens	red brome	Introduced; Cal-IPC High	Grasslands
Cynodon dactylon	Bermuda grass	Introduced	Streambeds
Danthonia californica	California oat grass	Native	Grasslands
Festuca arundinacea	tall fescue	Introduced; Cal-IPC Moderate	Grasslands
Festuca microstachys	Annual fescue	Native	Grasslands
Festuca perennis	Ryegrass	Introduced; Cal-IPC Moderate	Grasslands; Freshwater wetlands
Hordeum brachyantherum	Meadow barley	Native	Grasslands; Freshwater wetlands
Hordeum marinum ssp. gussoneanum	Mediterranean grass	Introduced; Cal-IPC Moderate	Grasslands; Freshwater wetlands
Hordeum murinum ssp. leporinum	Foxtail barley	Introduced; Cal-IPC Moderate	Grasslands
Hordeum vulgare	Cultivated barley	Introduced	Grasslands
Lamarckia aurea	Goldentop	Introduced	Grasslands
Pennisetum clandestinum	Kikuyu grass	Introduced; Cal-IPC Limited	Riparian
Pennisetum villosum	feathertop	Introduced	Grassland; Riparian
Phalaris aquatica	Harding grass	Introduced; Moderate	Grasslands
Polypogon interruptus	Ditch grass	Introduced	Freshwater wetlands
Schismus arabicus	Mediterranean grass	Introduced; Cal-IPC Limited	Grasslands
Stipa pulchra	purple needlegrass	Native	Grasslands
Polemoniaceae			
Leptosiphon parviflorus	Common linanthus	Native	Grasslands
Polygonaceae			
Persicaria amphibia	smartweed	Native	Freshwater wetlands
Persicaria lapathifolia	smartweed	Native	Freshwater wetlands
Polygonum aviculare	Prostrate knot weed	Introduced	Grasslands; Landscaped and Developed
Rumex crispus	curly dock	Introduced; Cal-IPC	Grasslands; Freshwater wetlands

		Limited	
Rumex pulcher	Fiddle dock	Introduced	Grasslands
Rumex salicifolius	willow-leaved dock	Native	Freshwater wetlands; riparian
Proteaceae			
Grevillea robusta	Silk oak tree	Introduced (planted)	Landscaped and Developed
Ranunculaceae			
Ranunculus californicus	California buttercup	Native	Grasslands
Rhamnaceae			
Frangula californica	Coffeeberry	Native	Grassland
Rosaceae			
Potentilla anserina	Common silverweed	Native	Freshwater wetlands
Prunus sp.	plum	Planted	Landscaped and Developed
Pyracantha fortuneana	Firethorn	Planted	Landscaped and Developed
Rosa sp.	climbing rose	Planted	Landscaped and Developed
Rubus armeniacus	Himalayan blackberry	Introduced; Cal-IPC High	Riparian
Rubus ursinus	blackberry	Native	Riparian
Rubiaceae			
Galium aparine	Common bedstraw	Native	Grasslands
Salicaceae			
Populus fremontii	Fremont's cottonwood	Native	Riparian
Salix babylonica	Weeping willow	Introduced	Riparian
Salix lasiolepis	Arroyo willow	Native	Riparian
Themidaceae			
Dichelostemma capitatum	Blue dicks	Native	Grasslands
Urticaceae			
Urtica dioica	stinging nettle	Native	Riparian; freshwater wetland
Verbenaceae			
Phyla nodiflora	common lippia	Native	Grasslands, margins of wetlands

Wildlife Species Observed With in the Laguna Lake Study Area
Spring 2016

Scientific Name	Common Name
Birds	
Agelaius phoeniceus	red-winged blackbird
Anas platyrhynchos	Mallard
Aphelocoma californica	Western scrub jay
Ardea herodias	great blue heron
Buteo jamaicensis	Red-tailed Hawk
Buteo lineatus	red-shouldered hawk
Calypte anna	Anna's hummingbird

Scientific Name	Common Name
Cathartes aura	Turkey vulture
Corvus brachyrhynchos	American Crow
Elanus leucurus	White-tailed kite
Empidonax difficilis	Pacific-slope flycatcher
Euphagus cyanocephalus	Brewer's blackbird
Fulica americana	American coot
Haemorhous mexicanus	house finch
Larus californicus	California gull
Melospiza melodia	song sparrow
Mimus polyglottos	northern mockingbird
Passerculus sandwichensis	savannah sparrow
Psaltriparus minimus	Bushtit
Sayornis nigricans	black phoebe
Sialia mexicana	western bluebird
Sturnella neglecta	western meadowlark
Tyrannus verticalis	Western kingbird
Zenaida macroura	mourning dove
Mammals	
Otospermophilus beecheyi	California ground squirrel
Reptiles	
Sceloporus occidentalis bocourtii	Coast range fence lizard
Amphibians	
Pseudacris sierra	Sierran treefrog

Appendix D

Special Status Species Evaluation Tables

Table D-1. Regionally Occurring Special Status Plants and Lichens

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Agrostis hooveri Hoover's bent grass Poaceae	--/-- 1B.2	Santa Barbara and San Luis Obispo counties.	Usually occurs on sandy substrates within closed-cone coniferous forest, chaparral, cismontane woodland, and valley and foothill grassland. Elevations range: 6-610 meters. Blooms April-July	No Potential	Suitable sandy sites not present onsite. Furthermore, this species was not observed onsite during field surveys.
Arctostaphylos luciana Arroyo de la Cruz manzanita Ericaceae	--/-- 1B.2	San Luis Obispo County	Perennial evergreen shrub. Blooms Dec-Mar. Chaparral. On shale outcrops, on slopes, in chaparral. Elevations 350-850m (1150-2790ft). Blooms December-March	No Potential	Suitable habitat for this species does not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Arctostaphylos Luciana Santa Lucia manzanita Ericaceae	--/-- 1B.2	San Luis Obispo County.	Shale substrates within chaparral and cismontane woodland. Elevations range: 350-850 meters. Blooms December- March	No Potential	Suitable substrates and vegetation communities for this species do not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Arctostaphylos morroensis Morro manzanita Ericaceae	FT/-- 1B.1	San Luis Obispo County.	Baywood fine sand substrates within maritime chaparral, cismontane woodland, coastal dunes and coastal scrub. Elevations: 5-205 meters. Blooms December- March	No Potential	Suitable sandy habitat for this species does not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Arctostaphylos pechoensis Pecho manzanita Ericaceae	--/-- 1B.2	Santa Barbara and San Luis Obispo counties.	Siliceous shale substrates within closed-cone coniferous forest, chaparral, and coastal scrub. Elevations range: 125-850 meters. Blooms November-March	No Potential	Suitable shale substrate and appropriate habitats for this species do not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Arctostaphylos pilosula Santa Margarita manzanita Ericaceae	--/-- 1B.2	Monterey and San Luis Obispo counties.	Broadleaf upland forest, closed-cone coniferous forest, chaparral, and cismontane woodland, reported growing on decomposed granite or sandstone. Elevations range: 170-1100 meters. Blooms December-May	No Potential	Suitable substrates and habitats for this species do not occur onsite. Furthermore, this species was not observed onsite during field surveys.

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Arctostaphylos tomentosa ssp. *daciticola* Dacite manzanita Ericaceae	--/-- 1B.1	San Luis Obispo County	Perennial evergreen shrub. Blooms Mar-May. Chaparral, cismontane woodland. Only known from one site in SLO County on dacite porphyry buttes. Elevation about 120m (395ft). Blooms March -May	No Potential	Suitable substrates and habitats for this species do not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Arenaria paludicola marsh sandwort Caryophyllaceae	FE/CE 1B.1	Los Angeles, San Bernardino*, Santa Cruz*, San Francisco*, and San Luis Obispo counties.	Sandy openings within freshwater marshes and swamps. Elevations range: 3-170 meters. Blooms May through August.	Low Potential	Although freshwater marsh is present, the substrate is not sandy and thus is not suitable habitat for this species.
Astragalus didymocarpus var. *milesianus* Miles' milk-vetch Fabaceae	--/-- 1B.2	Santa Barbara, San Luis Obispo, and Ventura counties.	Clay substrates within coastal scrub and native grasslands. Elevations range: 20-90 meters. Blooms March-June	High Potential	This species has been documented from similar grassland and soil conditions at the South Hills in San Luis Obispo. However, the species was not detected in the Study area during field surveys.
Atriplex coulteri Coulter's saltbush Chenopodiaceae	--/-- 1B.2	Channel Islands; Southern California	Coastal bluff scrub, coastal dunes, coastal scrub, valley and foothill grassland. Ocean bluffs, ridgetops, as well as alkaline low places. Elevations 10-440m (30-1445ft). Blooms March - October	Moderate Potential	Moderately suitable grassland habitat is present in the Study Area. However, this species was not observed onsite during field surveys conducted in 2016 or in previous years.
Bryoria spiralifera Twisted horsehair lichen Parmeliaceae	--/-- CALS 1B.1	Del Norte, Humboldt, Monterey, San Luis Obispo, and Sonoma counties	Fruticose lichen (epiphytic). Usually on conifers. North Coast coniferous forest (immediate coast). Elevations 0-30m.	No Potential	Suitable habitat for this species does not occur onsite. Appropriate species on which this lichen typically grows are not naturally occurring in the Study Area. Furthermore, this species was not observed onsite during field surveys.
California macrophylla Round-leaved filaree Geraniaceae	--/-- 1B.2	Widely distributed in California	Annual herb. Cismontane woodland, valley and foothill grassland. Clay soils. Elevations 15-1200m (50-3935ft). Blooms March-May	Moderate Potential	Grasslands with clay soils in the Study Area are appropriate for this plant species. However, this species was not observed onsite during field surveys conducted in 2016 or in previous years.

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Calochortus obispoensis San Luis mariposa-lily Liliaceae	--/-- 1B.2	San Luis Obispo County.	Often on serpentinite substrates within chaparral, coastal scrub, and valley and foothill grassland. Elevations range: 50-730 meters. Blooms May-July	Low Potential	This species is known to occur upslope of the Study Area in serpentine outcrops and thin soils. However, within the Study Area, conditions are less conducive to growth. No serpentine outcrops occur within the Study Area itself. This species was not observed onsite during field surveys conducted in 2016 or in previous years within the Study Area boundaries.
Calochortus simulans La Panza mariposa-lily Liliaceae	--/-- 1B.3	Santa Barbara and San Luis Obispo counties.	Sandy, granitic or serpentine within chaparral, cismontane woodland, lower montane coniferous forest, and valley and foothill grassland. Elevations range: 395-1100 meters. Blooms April through June	No Potential	This species was reported in South Hills on similar soils, but that population was later determined to be clay mariposa lily (*Calochortus argillosus*), a common species which is also known to occur at Laguna Lake Natural Reserve. The project site is below the documented elevation range for this species. Furthermore, this species was not observed during field surveys nor reported during previous field efforts.
Calystegia subacaulis ssp. *episcopalis* Cambria morning-glory Convolvulaceae	--/-- 4.2	Santa Barbara and San Luis Obispo counties.	Occurs in cismontane woodland, coastal prairie, and valley and foothill grassland. Elevations range: 30-500 meters. Blooms March-July	Present	The grasslands onsite are suitable habitat for this species and populations were observed onsite.
Camissoniopsis hardhamiae Hardham's evening-primrose Onagraceae	--/-- 1B.2	Monterey and San Luis Obispo Counties	Annual herb. Chaparral, cismontane woodland. Decomposed carbonate. Elevations 330-500m (1080-1640ft). Blooms March through May	No Potential	Suitable carbonate soils and habitat for this species do not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Carex obispoensis San Luis Obispo sedge Cyperaceae	--/-- 1B.2	Monterey, San Diego, and San Luis Obispo counties.	Often serpentinite seeps and clay soils, occasionally gabbro substrates within closed-cone coniferous forest, chaparral, coastal prairie, coastal scrub, and valley and foothill grassland. Elevations range: 10-820 meters. Blooms April-June	High Potential	Wetlands and grasslands onsite are suitable habitat for this species; however, botanical surveys were conducted during the bloom period and no individuals were observed. Previous field surveys did not report this species within the Study Area.

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Castilleja densiflora ssp. *obispoensis* San Luis Obispo owl's-clover Orobanchaceae	--/-- 1B.2	San Luis Obispo County.	Occasionally serpentinite substrates; found within meadows and seeps and valley and foothill grassland. Elevations range: 10-400 meters. Blooms March-May	Present	The grasslands onsite are suitable habitat for this species and several patches were observed onsite. This species was previously reported in the Study Area in the CNDDB and the Keil Flora, but specific location data were not provided in those records.
Centromadia parryi ssp. *congdonii* Congdon's tarplant Asteraceae	--/-- 1B.1	Alameda, Contra Costa, Monterey, Santa Clara, Santa Cruz*, San Luis Obispo, San Mateo, and Solano* counties.	Alkaline valley and foothill grassland. Elevations range: 0-230 meters. Blooms May-November	Present	This species is known from naturally occurring and created depressions, including some wetland depressions, as well as grasslands on site. This species typically blooms in summer and was not yet in flower during site surveys in 2016, but previously reported occurrences are presumed extant and were included.
Chenopodium littoreum Coastal goosefoot Chenopodiaceae	--/-- 1B.2	Los Angeles, Santa Barbara, and San Luis Obispo counties.	Annual herb. Coastal dunes. Elevations 10-30m. Blooms April-August	No Potential	Suitable dune habitat for this species does not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Chlorogalum pomeridianum var. *minus* dwarf soaproot Agavaceae	--/-- 1B.2	Colusa, Lake, San Luis Obispo, Sonoma, and Tehama counties.	Serpentinite substrates within chaparral. Elevations range: 305-1000 meters. Blooms from May to August	No Potential	Although serpentine influenced soils are present, suitable chaparral habitats are not present. Suitable habitat for this species does not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Chloropyron maritimum ssp. *maritimum* Salt marsh bird's-beak Orobanchaceae	--/-- 1B.2	Los Angeles, Orange, Santa Barbara, San Bernardino, San Diego, San Luis Obispo, and Ventura counties.	Annual herb (hemiparasitic). Coastal salt marsh, coastal dunes. Limited to the higher zones of the salt marsh habitat. Elevations 0-30m (0-100ft). Blooms May-October	No Potential	Salt marsh habitats do not occur in the Study Area, thus this species would not occur onsite. Furthermore, this species was not observed onsite during field surveys.

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Chorizanthe breweri Brewer's spineflower Polygonaceae	--/-- 1B.3	Monterey and San Luis Obispo counties.	Serpentinite, rocky or gravelly substrates within closed-cone coniferous forest, chaparral, cismontane woodland, and coastal scrub. Elevations range: 45-800 meters. Blooms April-August	No Potential	This species is known to occur upslope of the Study Area in serpentine outcrops and thin soils. However, within the Study Area, conditions are less conducive to growth. No serpentine outcrops occur within the Study Area itself. This species was not observed onsite during field surveys conducted in 2016 or in previous years within the Study Area boundaries.
Chorizanthe rectispina Straight-awned spineflower Polygonaceae	--/-- 1B.3	Monterey, Santa Barbara, and San Luis Obispo counties.	Annual herb. Chaparral, cismontane woodland, coastal scrub. Often on granite in chaparral. Elevations 85-1035m (280-3395ft). Blooms April – July	No Potential	Suitable habitat with appropriate soil for this species does not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Cirsium fontinale var. *obispoense* Chorro Creek Bog thistle Asteraceae	FE/CE 1B.2	San Luis Obispo County.	Serpentinite seeps and drainages within chaparral, cismontane woodland, coastal scrub, and valley and foothill grassland. Elevations range: 35-380 meters. Blooms February – September	High Potential	Wetlands and grasslands onsite are suitable habitat for this species, and it is documented to occur upslope of the Study Area; however, botanical surveys were conducted during the bloom period and no individuals were observed. Previous field surveys did not report this species within the Study Area.
Cirsium occidentale var. *lucianum* Cuesta Ridge thistle Asteraceae	--/-- 1B.2	San Luis Obispo County.	Serpentinite substrates and often on steep rocky slopes and disturbed roadsides within openings in chaparral. Elevations range: 500-750 meters. Blooms April-June	No Potential	Serpentine outcrop are present upslope of the Study Area but are not documented in the Study Area. While serpentine-influence soil substrates are present, suitable slopes, exposed rock, and chaparral habitat are not. Furthermore, the species was not observed onsite during field surveys.
Cirsium rhothophilum Surf thistle *Asteraceae*	--/CT 1B.2	Santa Barbara and San Luis Obispo counties.	Perennial herb. Coastal dunes, coastal bluff scrub. Open areas in central dune scrub; usually in coastal dunes. Elevations 3-60m (10-195ft). Blooms April - June	No Potential	Suitable dune and coastal bluff habitats for this species do not occur onsite. Furthermore, the species was not observed onsite during field surveys.

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Cladonia firma Firm cup lichen Cladoniaceae	--/-- CALS 2B.1	San Luis Obispo County	Maritime habitats in Europe and North America. Stabilized sand dunes on the coast. On soil and detritus on stabilized sand dunes, in pure stands or intermixed with other lichens and mosses forming biotic soil crusts, covering areas up to several meters.	No Potential	Suitable dune habitat for this species does not occur onsite.
Clarkia speciosa ssp. *immaculata* Pismo clarkia Onagraceae	FE/CR 1B.1	southern San Luis Obispo County	Sandy substrates, margins and openings within chaparral, cismontane woodland, and valley and foothill grassland. Elevations range: 25-185 meters. Blooms April - July	No Potential	Suitable soils and habitat for this species do not occur within the project site. The substrates within the grasslands onsite are not sandy.
Delphinium parryi ssp. *blochmaniae* dune larkspur Ranunculaceae	--/-- 1B.2	Santa Barbara, San Luis Obispo, and Ventura counties.	Maritime chaparral and coastal dunes. Elevations range: 0-200 meters. Blooms April-June	No Potential	Maritime chaparral and coastal dune habitats do not occur onsite. Furthermore, the species was not observed onsite during field surveys.
Delphinium parryi ssp. *eastwoodiae* Eastwood's larkspur Ranunculaceae	--/-- 1B.2	San Luis Obispo County	Coastal serpentinite substrates within openings in chaparral and valley and foothill grassland. Elevations range: 75-500 meters. Blooms February – March	High Potential	Grasslands onsite are suitable habitat for this species; however, botanical surveys were conducted during the bloom period and no individuals were observed. Previous field surveys did not report this species within the Study Area.
Delphinium umbraculorum Umbrella larkspur Ranunculaceae	--/-- 1B.3	San Luis Obispo County.	Perennial herb. Cismontane woodland. Mesic sites. Elevations 400-1600m (1310-5250ft). Blooms April-June	No Potential	Suitable habitat for this species does not occur onsite, and the Study Area is well below the typical elevation range of the species. Furthermore, this species was not observed onsite during field surveys.
Dithyrea maritima Beach spectaclepod Brassicaceae	--/CT 1B.1	Los Angeles, Ventura, Santa Barbara, San Luis Obispo Counties; channel islands	Perennial rhizomatous herb. Coastal dunes, coastal scrub. Formerly more widespread in coastal habitats in So. Calif. Sea shores, on sand dunes, and sandy places near the shore. Elevations 3-50m (10-165ft). Blooms March-May	No Potential	Suitable habitat for this species does not occur onsite. The substrates within the grasslands onsite are not sandy and the site is not coastal. Furthermore, the species was not observed onsite during field surveys.

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Dudleya abramsii ssp. *bettinae* Betty's dudleya Crassulaceae	--/-- 1B.2	San Luis Obispo County	Perennial herb. Coastal scrub, valley and foothill grassland, chaparral. On rocky, barren exposures of serpentine within scrub vegetation. Elevations 20-180 m (65-590ft). Blooms May - July	No Potential	Although rocky, barren exposures are present upslope of the study area, suitable habitat is not present in the Study Area due to lack of suitable low-density, barren and rocky areas.
Dudleya abramsii ssp. *murina* mouse-gray dudleya Crassulaceae	--/-- 1B.3	San Luis Obispo County.	Serpentinite outcrops within chaparral, cismontane woodland, and valley and foothill grassland. Elevations range: 90-440 meters. Blooms May - June	No Potential	Although rocky, barren exposures are present upslope of the study area, suitable habitat is not present in the Study Area due to lack of suitable low-density, barren and rocky areas.
Dudleya blochmaniae ssp. *blochmaniae* Blochman's dudleya Crassulaceae	--/-- 1B.1	Los Angeles, Orange, Santa Barbara, San Diego, San Luis Obispo, and Ventura counties.	Rocky, often clay or serpentinite substrates within coastal bluff scrub, chaparral, coastal scrub, and valley and foothill grassland. Elevations range: 5-450 meters. Blooms April - June	No Potential	Although rocky, barren exposures are present upslope of the study area, suitable habitat is not present in the Study Area due to lack of suitable low-density, barren and rocky areas.
Eriastrum luteum Yellow-flowered eriastrum Polemoniaceae	--/-- 1B.2	Monterey and San Luis Obispo counties.	Annual herb. Broadleaved upland forest, cismontane woodland, chaparral. On bare sandy decomposed granite slopes. Elevations 360-1000m (1180-3280ft). Blooms May - June	No Potential	Suitable habitat and soils for this species do not occur onsite. Furthermore, the species was not observed onsite during field surveys.
Erigeron blochmaniae Blochman's leafy daisy Asteraceae	--/-- 1B.2	Santa Barbara and San Luis Obispo counties.	Perennial rhizomatous herb. Coastal dunes. Sand dunes and hills. Elevations 3-185m (9-605ft). Blooms June - August	No Potential	Dunes are not present within the Study Area. Furthermore, the species was not observed onsite during field surveys.
Eriodictyon altissimum Indian Knob mountainbalm Boraginaceae	FE/CE 1B.1	San Luis Obispo County	Perennial evergreen shrub. Chaparral (maritime), cismontane woodland, coastal scrub. Ridges in open, disturbed areas within chaparral on Pismo sandstone. Also occurs on Baywood sands. Elevations 80-270m (260-885ft). Blooms March – June	No Potential	Suitable habitat and substrates for this species does not occur onsite. Furthermore, this species was not observed onsite during field surveys.

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Eryngium aristulatum var. *hooveri* Hoover's button-celery Apiaceae	--/-- 1B.1	Alameda, San Benito, Santa Clara*?, San Diego, and San Luis Obispo counties.	Vernal pools and serpentine seeps in mesic grasslands. Elevations range: 3-45 meters. Blooms in July and August.	High Potential	Reported from several collections at Laguna Lake, though some lack specific location data. The majority of collections with specific location data are from seeps upslope of the study area, but this species could also occur in wetlands within the Study Area. It was not observed onsite during field surveys. .
Extriplex [=Atriplex] joaquiniana San Joaquin spear scale Chenopodiaceae	--/-- 1B.2	Southern and Central California and the Great Valley	Annual herb. Alkaline, chenopod scrub, meadows and seeps, playas, valley and foothill grassland. Elevations 1-835 m. Blooms April through October	Low Potential	Moderately suitable grassland habitat is present in the Study Area, though soils are not strongly alkaline. This species was not observed onsite during field surveys conducted in 2016 or in previous years.
Fritillaria ojaiensis Ojai fritillary Liliaceae	--/-- 1B.2	Monterey, Santa Barbara, San Luis Obispo, and Ventura counties.	Perennial bulbiferous herb. Broadleaved upland forest (mesic), chaparral, lower montane coniferous forest. Rocky sites; one reported as "moist shale talus." Elevations 300-670m (985-2200ft). Blooms February-May	No Potential	Suitable habitat for this species does not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Fritillaria viridea San Benito fritillary Liliaceae	--/-- 1B.2	Fresno, Monterey, San Benito, and San Luis Obispo counties	Perennial bulbiferous herb. Chaparral. Serpentine slopes. Elevations 200-1525m (655-5000ft). Blooms March-May	No Potential	Although serpentine-influenced soils substrates are present, suitable chaparral habitat for this species does not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Horkelia cuneata var. *puberula* mesa horkelia Rosaceae	--/-- 1B.1	Los Angeles, Orange, Riverside*, Santa Barbara, San Bernardino, San Diego*, San Luis Obispo, and Ventura counties.	Sandy or gravelly substrates within maritime chaparral, cismontane woodland, and coastal scrub. Elevations: 70-810 meters. Blooms February-September	No Potential	Suitable scrub or woodland habitats with sandy or gravelly soils do not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Lasthenia glabrata ssp. *coulteri* Coulter's goldfields Asteraceae	--/-- 1B.1	Colusa, Kern, Los Angeles, Merced, Orange, Riverside, Santa Barbara, San Bernardino, San Diego, San Luis Obispo, Santa Rosa Island, Tehama, Tulare, Venture, and Yolo counties.	Annual herb. Coastal salt marshes, playas, valley and foothill grassland, vernal pools. Usually found on alkaline soils in playas, sinks, and grasslands. Elevations 1-1400m (3-4595ft). Blooms February-June	Low Potential	Grasslands onsite are moderately suitable but alkaline soils are not present. Furthermore, this species was not observed onsite during field surveys.

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Layia heterotricha Pale-yellow layia Asteraceae	--/-- 1B.1	Fresno, Kings, Kern, Los Angeles, Monterey, Santa Barbara, San Benito, San Luis Obispo, and Ventura counties.	Annual herb. Cismontane woodland, pinyon-juniper woodland, valley and foothill grassland. Alkaline or clay soils; open areas. Elevations 270-1365m (885-4480ft). Blooms March - June	No Potential	Suitable habitat for this species does not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Layia jonesii Jones' layia Asteraceae	--/-- 1B.2	San Luis Obispo County.	Clay or serpentinite substrates within chaparral and valley and foothill grassland. Elevations range: 5-400 meters. Blooms March-May	High Potential	Highly suitable grasslands in clay soils derived from serpentine are present onsite. This species is reported from the vicinity of the Study Area in herbarium records that report the plant from the northeast edge of Laguna Lake, though collections with specific location data do not plot within the Study Area. This species was not observed during field surveys in the Study Area in 2016.
Lupinus ludovicianus San Luis Obispo County lupine Fabaceae	--/-- 1B.2	San Luis Obispo County.	Sandstone or sandy substrates within chaparral and cismontane woodland. Elevations range: 50-525 meters. Blooms April-July	No Potential	Suitable habitat and substrates for this species do not occur onsite. Furthermore, this species was not observed onsite during field surveys.
Malacothamnus gracilis Slender bush-mallow Malvaceae	--/-- 1B.1	Santa Barbara and San Luis Obispo counties.	Perennial deciduous shrub. Usually rocky chaparral. Dry, rocky slopes. Elevations 190-575 m. Blooms May-October	No Potential	Suitable chaparral habitat and rocky areas for this species does not occur onsite. Furthermore, no plants in the genus Malacothamnus were observed in the Study Area during field surveys.
Malacothamnus palmeri var. *palmeri* Santa Lucia bush-mallow Malvaceae	--/-- 1B.2	Monterey and San Luis Obispo counties.	Perennial deciduous shrub. Chaparral. Dry rocky slopes, mostly near summits, but occasionally extending down canyons to the sea. Elevations 60-365m (200-1200ft).Blooms May – July	No Potential	Suitable chaparral habitat and rocky areas for this species does not occur onsite. Furthermore, no plants in the genus Malacothamnus were observed in the Study Area during field surveys.
Monardella palmeri Palmer's monardella Lamiaceae	--/-- 1B.2	Monterey and San Luis Obispo counties.	Serpentinite substrates within chaparral and cismontane woodland. Elevations range: 200-800 meters. Blooms June-August	No Potential	Within the Study Area, conditions are not suitable due to lack of typical habitats and lack of serpentine outcrops. This species was not observed onsite during field surveys conducted in 2016 or in previous years within the Study Area boundaries.

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Monardella sinuata ssp. *sinuata* Southern curly-leaved monardella Lamiaceae	--/-- 1B.2	Santa Barbara, San Luis Obispo, and Ventura counties	Coastal dunes, coastal scrub, chaparral, cismontane woodlands. Sandy soils. Elevations 0-300 m. Blooms April-September	No Potential	Suitable habitat for this species does not occur onsite. No sandy dunes or scrub occur onsite. Furthermore, this species was not observed during field survey. .
Monolopia gracilens Woodland woollythreads Asteraceae	--/-- 1B.2	Alameda, Contra Costa, Monterey, San Benito, Santa Clara, Santa Cruz, San Luis Obispo, and San Mateo counties.	Annual herb. Chaparral, valley and foothill grasslands (serpentine), cismontane woodland, broadleafed upland forests, north coast coniferous forest. Grassy sites, in openings; sandy to rocky soils. Often seen on serpentine after burns but may have only weak affinity to serpentine. Elevations 100-1200m (330-3940ft). Blooms February-July	Moderate potential	Suitable grassland habitat on serpentine-influenced soils is present onsite. However, this species was not observed during field survey.
Navarretia nigelliformis ssp. *radians* Shining navarretia Polemoniaceae	--/-- 1B.2	Alameda, Contra Costa, Colusa, Fresno, Madera, Merced, Monterey, San Benito, San Joaquin, and San Luis Obispo counties.	Annual herb. Cismontane woodland, valley and foothill grassland, vernal pools. Apparently in grassland, and not necessarily in vernal pools. Elevations 200-1000m (655-3280ft). Blooms April - July	Low Potential	Suitable habitat is present but the site is well below typical elevation range for this species. This species was not observed during field survey
Nemacaulis denudata var. *denudata* Coast woolly-heads Polygonaceae	--/-- 1B.2	Los Angeles, Orange, Santa Catalina Island, San Diego, and San Luis Obispo counties.	Annual herb. Coast dunes. Elevations 0-100m (0-330ft). Blooms April-September	No Potential	Suitable habitat for this species does not occur onsite. No coastal dunes occurs onsite. Furthermore, this species was not observed during field survey. .
Plagiobothrys uncinatus Hooked popcorn flower Boraginaceae	--/-- 1B.2	Monterey, San Benito, Santa Clara, San Luis Obispo, and Stanislaus counties.	Annual herb. Chaparral, cismontane woodland, valley and foothill grassland. Sandstone outcrops and canyon sides; often in burned or disturbed areas. Elevations 300-760m (985-2495ft). Blooms April-May	No Potential	Suitable habitat for this species does not occur onsite. Suitable substrates are not present. Furthermore, this species was not observed during field survey. .

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Poa diabolic Diablo Canyon blue-grass Poaceae	--/-- 1B.2	San Luis Obispo County	Perennial rhizomatous herb. Shale; sometimes burned areas. Closed-cone coniferous forest, chaparral (mesic), cismontane woodland, coastal scrub. Elevations 120-400m. Blooms March-April	No Potential	Suitable habitat and appropriate substrates for this species does not occur onsite. Furthermore, this species was not observed during field survey. .
Sanicula maritima adobe sanicle Apiaceae	--/CR 1B.1	Alameda*, Monterey, San Francisco*, and San Luis Obispo counties.	Clay and serpentinite substrates within chaparral, coastal prairie, meadows and seeps, and valley and foothill grassland. Elevations range: 30-240 meters. Blooms February – May	Present	One occurrence was mapped within the Study Area, and additional patches are known upslope of the Study Area in the Laguna Lake Natural Reserve.
Scrophularia atrata black-flowered figwort Scrophulariaceae	--/-- 1B.2	Santa Barbara and San Luis Obispo counties.	Closed-cone coniferous forest, chaparral, coastal dunes, coastal scrub, and riparian scrub. Elevations range: 10-500 meters. Blooms March-July.	No Potential	Suitable habitat for this species does not occur onsite. Furthermore, this species was not observed during field survey. .
Senecio aphanactis chaparral ragwort Asteraceae	--/-- 2B.2	Alameda, Contra Costa, Fresno, Los Angeles, Merced, Monterey, Orange, Riverside, Santa Barbara, San Benito, Santa Clara, Santa Cruz, Santa Catalina Island, San Diego, San Luis Obispo, Solano, Santa Rosa Island, and Ventura counties.	Occasionally alkaline substrates within chaparral, cismontane woodland, and coastal scrub. Elevations range: 15-800 meters. Blooms January – April. Blooms January-April	No Potential	Suitable habitat for this species does not occur onsite. Furthermore, this species was not observed during field survey. .
Sidalcea hickmanii ssp. *anomala* Cuesta Pass checkerbloom Malvaceae	--/CR 1B.2	San Luis Obispo County	Perennial herb. Closed-cone coniferous forest. Rocky serpentine soil; associated with Sargent cypress forest. Elevations 600-800m (1970-2625ft). Blooms May-June	No Potential	Suitable rocky areas are present upslope of the Study Area, but within the Study Area, conditions are not suitable due to lack of typical habitats and lack of serpentine outcrops. This species was not observed onsite during field surveys conducted in 2016 or in previous years within the Study Area boundaries.

Scientific Name/ Common Name Family	Status Fed/State ESA CRPR	Distribution	Habitat Requirements	Potential to Occur	Rationale
Streptanthus albidus ssp. *peramoenus* most beautiful jewel-flower Brassicaceae	--/-- 1B.2	Alameda, Contra Costa, Monterey, Santa Clara, and San Luis Obispo counties.	Serpentinite substrates within chaparral, cismontane woodland, and valley and foothill grassland. Elevations range: 94-1000 meters. The Jepson eFLora does not recognize *S. albidus ssp. peramoenus* reported from SLO County as distinct from the common *Streptanthus glandulosus* ssp. *glandulosus.* Blooms March - October	No Potential	Suitable rocky areas are present upslope of the Study Area, but within the Study Area, conditions are not suitable due to lack of typical habitats and lack of serpentine outcrops. This species was not observed onsite during field surveys conducted in 2016 or in previous years within the Study Area boundaries.
Suaeda californica California seablite Chenopodiaceae	FE/-- 1B.1	Alameda, Contra Costa, Santa Clara, San Francisco, and San Luis Obispo counties.	Perennial evergreen subshrub. Found on the margins of coastal salt marshes and swamps. Elevations 0-15 meters (0-50 feet). Blooms July-October	No Potential	Salt marshes are not present in the Study Area.
Sulcaria isidiifera Splitting yarn lichen Alectoriaceae	--/-- CALS 1B.1	San Luis Obispo County	Chaparral, cismontane woodland. On branches of oaks and shrubs. Elevations 20-30m (65-100ft).	No Potential	Suitable habitat and host sites for this species do not occur onsite.
Trifolium hydrophilum saline clover Fabaceae	--/-- 1B.2	Alameda, Contra Costa, Colusa, Lake, Monterey, Napa, Sacramento, San Benito, Santa Clara, Santa Cruz, San Luis Obispo, San Mateo, Solano, Sonoma, and Yolo counties.	Marshes and swamps, mesic and alkaline areas within valley and foothill grassland, and vernal pools. Elevations range: 0-300 meters. Blooms April-June	Present	This species was documented in the vicinity by Dr. David Keil in his 1996 Flora of Laguna Lake Park. Occurrences were mapped in 2014. No additional occurrences were found in 2016.

Table D-2. Regionally Occurring Special Status Animals

Scientific Name/ Common Name	Status Federal/State ESA CDFW Status-	Distribution	Habitat Requirements; Detection Periods	Potential to Occur	Rationale
Invertebrates					
Branchinecta lynchi vernal pool fairy shrimp	FT/--	Endemic to the grasslands of the Central Valley, and Central Coast and the South Coast mountains of San Luis Obispo County.	Rain-filled pools; small, clear-water sandstone-depression pools and grassland swale, earth slump, or basalt-flow depression pools. Adults: wet season, approximately December-April; Cysts: dry season, approximately June-October	Moderate Potential	Wetland depressions that hold water for more two weeks are potentially suitable for fairy shrimp.
Helminthoglypta walkeriana Morro shoulderband snail	FE/-- Special Animal	Restricted to the coastal strand in the immediate vicinity of Morro Bay.	Coastal dunes and scrub. Inhabits the duff beneath *Haplopappus, Salvia, Dudleya,* and *Mesembryanthemum a*s well as iceplant. Can be detected year round.	No Potential	The Study Area is outside the range of this species.
Fish					
Eucyclogobius newberryi tidewater goby	FE/-- SSC	Coastal California from Del Norte County to San Diego County.	Occurs in brackish and freshwater shallow lagoons and slow-moving lower stream reaches. Requires fairly calm and still waters, but not stagnant. Avoids open areas with strong currents or wave action. Typically July-October (occasionally outside this period with agency consultation)	No Potential	The site is too far inland for this species.

Scientific Name/ Common Name	Status Federal/State ESA CDFW Status-	Distribution	Habitat Requirements; Detection Periods	Potential to Occur	Rationale
Oncorhynchus mykiss Steelhead – South/Central California Coast DPS	FT/-- --	All naturally spawned populations that occur in coastal streams from the Pajaro River south to, but excluding the Santa Maria River. The major watersheds include the Pajaro, Salinas, and Carmel, as well as the smaller rivers along the Big Sur Coast and south.	Occurs in perennial water within riparian, emergent, and palustrine habitats. Spawning and rearing occurs in cool, clear fast-flowing streams with abundant gravel or cobble and riffles. Feeds and forages in open waters within estuarine subtidal and riverine habitats. Connectivity to the Pacific Ocean is required to complete its life cycle. Can be detected year round.	High Potential	Rainbow trout are known to occur in lower Prefumo Creek and San Luis Obispo Creek, and have been reported anecdotally from the Lake. The City has also observed juvenile trout above the Los Osos Valley Road culvert. Confirmation of anadromous individuals (those that have gone to sea and returned) is not confirmed for recent years. Prefumo Creek, including Laguna Lake, is designated critical habitat for steelhead – south /Central California Coast DPS. CNDDB has three recorded occurrences within a 5 mile diameter search radius.
Amphibians					
Rana boylii Foothill yellow-legged frog	--/-- SSC	Occurs along the coast of California and east of the Central Valley.	Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Need at least some cobble-sized substrate for egg-laying. Need at least 15 weeks to attain metamorphosis.	Low Potential	Prefumo Creek provides some potentially suitable aquatic habitat; however, substrates are mud and sand, the required cobble and rocky substrates are not present.

Scientific Name/ Common Name	Status Federal/State ESA CDFW Status-	Distribution	Habitat Requirements; Detection Periods	Potential to Occur	Rationale
Rana draytonii California red-legged frog	FT/-- SSC	Coastal drainages of central California, from Marin County, south to San Diego County	Found in permanent and temporary pools of deep water in streams, marshes, and ponds with dense grassy, shrubby, or emergent vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to upland aestivation habitat. The Survey period is typically between November and June	High Potential	Laguna Lake provides potential habitat for CRLF, although CRLF predators are known from the existing waterways, including bullfrog and crayfish.
Spea hammondii Western spadefoot	-- / -- SSC	Occurs in Central Valley and bordering foothills of California and along the coast ranges in the USA south of San Francisco Bay.	Open areas with sandy or gravelly soils, including mixed woodlands, grasslands, coastal sage scrub, chaparral, sandy washes, lowlands, river floodplains, alluvial fans, playas, alkali flats, foothills, and mountains. Rain pools that do not support bullfrogs, fish, or crayfish are required for breeding. Breeding season: January-August	Low Potential	Laguna Lake contains predatory invasive species, including bullfrogs and crayfish. However, some wetland depressions that hold water for several weeks may be suitable for Western spadefoot to breed.
Taricha torosa torosa *Coast Range newt*	--/-- SSC	Coastal drainages from Mendocino County to San Diego County.	Prefers wooded rocky streamsides in forested and wooded areas and will migrate over 1 kilometer to breed in slow water. Fall to late Spring	Moderate Potential	Pools within Prefumo Creek and Laguna Lake adjacent to the creek outlet where some tree canopy is available may be suitable for breeding.

Scientific Name/ Common Name	Status Federal/State ESA CDFW Status-	Distribution	Habitat Requirements; Detection Periods	Potential to Occur	Rationale
Reptiles					
Actinemys pallida [=Emys marmorata] Southern western pond turtle	--/-- SSC	Western portion of California, including the coast ranges and the central valley, west of the crest of Cascades and Sierra Nevadas.	Occurs in river/streams w/deep pools and irrigation canals with moderate amounts of riparian and emergent vegetation. Slow moving waters, perm aquatics. Note that taxonomy of pond turtles in southern California has been revised multiple times in recent years. Detection is most likely between March-October	High Potential	Laguna Lake is suitable for pond turtles, and Prefumo Creek also provides potential habitat in areas with pools during the dry season. Pond turtles are known to occur in San Luis Obispo Creek, downstream of the Study Area.
Anniella pulchra nigra Black legless lizard	-- / -- SSC	Occurs from southern edge of the San Joaquin River in northern Contra Costa County south to Ventura County. Also occurs in coastal dunes from Morro Bay south to the mouth of the Santa Maria River in San Luis Obispo County.	Sand dunes and sandy soils in the Monterey Bay and Morro Bay regions. Inhabit sandy soil/dune areas with bush lupine and mock heather as dominant plants. Moist soil is essential. Detectable Year Round.	No Potential	No suitable habitat (i.e., loose sandy soils).
Anniella pulchra pulchra silvery legless lizard	--/-- SSC	Contra Costa County south through the Coast, Transverse, and Peninsular Ranges, along the western edge of the Sierra Nevada Mountains and parts of the San Joaquin Valley and Mojave Desert.	Requires dune scrub, coastal scrub, chaparral, pine-oak woodland, oak woodland, and riparian woodland. Utilizes loose sandy or loamy soils for burrowing, moisture, warmth, and adequate vegetative cover. Detectable Year Round.	No Potential)	No suitable habitat (i.e., loose sandy soils).

Scientific Name/ Common Name	Status Federal/State ESA CDFW Status-	Distribution	Habitat Requirements; Detection Periods	Potential to Occur	Rationale
Phrynosoma blainvillii Blainville's[coast] horned lizard	--/-- SSC	Fragmented distribution that includes the Pacific coast from the Baja California border west of the deserts and the Sierra Nevada, north to the Bay Area, and inland as far north as Shasta Reservoir, and south into Baja California.	Coastal sage, chaparral, grassland, conifer forests and other woodlands, riparian, with open areas and patches of loose soil. Peak detection is between May and September.	Low Potential	Horned lizard could occur on rock outcrops and in barren areas adjacent to the Study Area. Vegetation within the study area is dense and less conducive to use by horned lizard but some animals could move through the Study Area
Birds					
Accipiter cooperii Cooper's hawk (nesting)	--/-- WL	Breeding resident throughout most of the wooded portion of the state. Breeds in southern Sierra Nevada foothills, New York Mts., Owens Valley, and other local areas in southern California.	Forages and nests in open woodlands and wood margins, riparian forests. Can be detected Year Round.	High Potential	Suitable habitat onsite for nesting is present in eucalyptus trees, and Cooper's hawks are known from the area.
Agelaius tricolor Tricolored blackbird (Nesting colony)	--/-- SSC	Common locally throughout Central Valley and in coastal districts from Sonoma County to southern California counties.	Grassland and cropland habitats with emergent wetland with tall, dense cattails and/or tules. Also occurs in thickets of willow, blackberry, and tall herbs. Can be detected Year Round.	Moderate Potential	Suitable marsh vegetation is present, although nesting tri-colored blackbirds are not reported from Laguna Lake.
Ammodramus savannarum Grasshopper sparrow	--/-- SSC	Coastal districts from Humboldt County to San Diego County as well as east to the Great Plains.	Dense grasslands on rolling hills, lowland plains, in valleys and on hillsides on lower mountain slopes. Favors native grasslands with a mix of grasses, forbs and scattered shrubs. Loosely colonial when nesting. Detection during Summer.	Moderate Potential	Grasslands in the Study Area are suitable for Grasshopper sparrow, though nesting records are not reported from Laguna Lake.

Scientific Name/ Common Name	Status Federal/State ESA CDFW Status-	Distribution	Habitat Requirements; Detection Periods	Potential to Occur	Rationale
Aquila chrysaetos Golden eagle (nesting & wintering)	--/-- FP	Extensive range throughout California. Known to occur in San Luis Obispo.	Nests on cliffs, rocks, and large trees and forages in open country, grasslands. Can be detected year round.	Moderate Potential	Golden eagles are known to forage near Laguna Lake. Potentially suitable nest habitat is present in mature eucalyptus trees, though no eagle nests are currently documented at Laguna Lake.
Athene cunicularia burrowing owl	--/-- SSC	Central Valley, the Modoc Plateau and northeastern California, and the southeastern portions of the state.	Occurs in open dry grasslands and desert habitats. Also occurs in open areas within pinyon-juniper habitat. Can be detected year round.	Moderate Potential	Burrowing owls were previously reported from Laguna Lake Park but have not been documented there in recent years. Suitable grasslands are present.
Buteo regalis Ferruginous hawk	--/-- WL	Uncommon winter resident and migrant at lower elevations and open grasslands in the Modoc Plateau, Central Valley, and Coast Ranges.	Open grasslands, sagebrush flats, desert scrub, low foothills surrounding valleys, and fringes of pinyon-juniper habitat. Winter.	No Potential (nesting)	Wintering birds are expected occasionally; however, nesting birds are not expected.
Charadrius alexandrinus nivosus western snowy plover	FT/-- SSC	Range is largely restricted to coastal California. Also occurs in a few inland alkaline lakes, the Salton Sea. and Mono Lake.	Requires dune-backed beaches, barrier beaches, and salt-evaporated ponds. Uses sandy, gravelly, or friable soils for nesting. Occasionally uses agricultural waste ponds of the Central Valley. Year Round	No Potential	In San Luis Obispo County, snowy plovers nest at the coast.
Coccyzus americanus occidentalis Western yellow-billed cuckoo	FT/CE --	Coastal valleys from the Mexican border to Sebastopol, Sonoma County and the Central Valley from Bakersfield and Weldon, Kern County, north to Redding, Shasta County.	Riparian plants, prefers willows, cottonwoods, aspens, sycamores and alders for resting and foraging. Year Round.	No Potential	No suitable habitat on site. Riparian woodland lacks the structural diversity and contiguous habitat required for this species.

Scientific Name/ Common Name	Status Federal/State ESA CDFW Status-	Distribution	Habitat Requirements; Detection Periods	Potential to Occur	Rationale
Elanus leucurus white-tailed kite	--/-- FP	California's coastal and valley regions excluding the Cascades, Sierra Nevadas, Mojave Desert, and Peninsular Ranges.	Grasslands, dry farmed agricultural fields, savannahs and relatively open oak woodlands, and other relatively open lowland scrublands. Year Round	Present	Suitable habitat onsite for foraging and nesting. An individual was documented foraging during surveys. No nests were documented in the study area, but white tailed kites could nest in eucalyptus.
Eremophila alpestris actia California horned lark	--/-- WL	A common resident throughout California, and known populations in San Luis Obispo County.	Grasslands, open coastal plains, and alkali flats. Prefers low, sparse vegetation. Year Round	High Potential	Grasslands in the Study Area are suitable.
Falco columbarius Merlin	--/-- WL	Extensive range throughout California. Known to occur in San Luis Obispo.	Forages over coastlines, open grasslands, savannahs, woodlands, and wetlands. Winter	High Potential	The Study Area provides suitable habitat for foraging.
Falco mexicanus Prairie falcon	--/-- WL	Southeastern deserts northwest throughout the Central Valley and along the inner Coast Ranges and Sierra Nevada.	Dry, open terrain, flat or hilly with breeding sites located on cliffs. February-September	High Potential	The Study Area provides suitable habitat for foraging.
Lanius ludovicianus Loggerhead shrike	--/-- SSC	Extensive range throughout California. Known to occur in San Luis Obispo.	Coastal sage scrub, grasslands. Year Round	High Potential	Grasslands provide foraging habitat, and shrubs and brushy trees in landscaped areas are suitable for nesting
Laterallus jamaicensis coturniculus California black rail	-- /CT FP	Placer County,San Joaquin County, the San Francisco Bay area, Marin County, and Morro Bay in San Luis Obispo County. Populations have also been found in Yuba, Butte, and Nevada Counties.	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about one inch that does not fluctuate during the year and dense vegetation for nesting habitat. Year Round	No Potential	This species is not known from inland areas. All records for San Luis Obispo County are from the immediate coast. Wetland fringes within the Study Area are not extensive enough to be suitable for black rail.

Scientific Name/ Common Name	Status Federal/State ESA CDFW Status-	Distribution	Habitat Requirements; Detection Periods	Potential to Occur	Rationale
Progne subis Purple martin (nesting)	--/-- SSC	San Luis Obispo County.	Inhabits woodlands including sycamores, low elevation coniferous forest of Douglas fir, ponderosa pine, and Monterey pine. Primarily nests in old woodpecker cavities. Summer	Low Potential	**Suitable trees with appropriate nest cavities are not abundant in the Study Area.**
Rallus longirostris obsoletus California clapper rail	FE/CE FP	Humbolt County, Monterey County, and in Morro Bay in San Luis Obispo County.	Salt-water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickle weed, but feeds away from cover on invertebrates from mud-bottomed sloughs. Year Round	No Potential	Salt marsh and brackish marsh are not present.
Mammals					
Antrozous pallidus Pallid bat	--/-- SSC	Throughout California except for the high Sierra Nevada from Shasta to Kern Cos., and the northwestern corner of the state from Del Norte and western Siskiyou Cos. to northern Mendocino Co.	Rock crevices, tree hollow, mines, caves, structures. Open, lowland areas. Year Round	Low Potential	Many species of bats are expected to forage in the Study Area. However, suitable roosts for pallid bat are limited in the Study Area. Tree hollows or crevices may be suitable; however, no bat roosts were found.
Corynorhinus townsendii Townsend's western big-eared bat	--/CCT SSC	Extensive range throughout California. Known to occur in San Luis Obispo.	Requires caves, mines, tunnels, buildings, or other human-made structures for roosting. Year Round	No Potential (roosts)	Many species of bats are expected to forage in the Study Area. However, suitable roosts for Townsend's bat are not present in the Study Area.
Dipodomys heermanni morroensis Morro Bay kangaroo rat	FE/CE FP	Coast range along Morro Bay and between Spooner Cover and Hazards Canyon in Montano de Oro in San Luis Obispo County.	Commonly associated with stabilized sand dune, coastal dune, and coastal sage scrub, and maritime chaparral communities. Year Round	No Potential	Appropriate substrates are not present, and the Study Area is outside the range of this species.

Scientific Name/ Common Name	Status Federal/State ESA CDFW Status-	Distribution	Habitat Requirements; Detection Periods	Potential to Occur	Rationale
Eumops perotis californicus Western mastiff bat	-- / -- SSC	Coast ranges from Monterey County southward through Southern California, from the coast eastward to the Colorado desert.	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral, etc. Roosts in crevices in cliff faces, high buildings, trees and tunnels. Year Round	No Potential (Roosting)	Many species of bats are expected to forage in the Study Area. However, suitable roosts for Western mastiff bats are not present in the Study Area
Neotoma lepida intermedia San Diego desert woodrat	-- / -- SSC	Found throughout central and southern California from San Luis Obispo south through the Transverse and Peninsula Ranges in Baja California.	Commonly inhabit Joshua tree woodlands, pinyon-juniper woodlands, mixed chaparral, sagebrush, and desert habitats. Known to construct dens in the cracks between boulders using sticks, yucca leaves, and tin cans.	No Potential	Suitable habitats are not present in the study area for desert wood rat.
Nyctinomops macrotis Big free-tailed bat	-- / -- SSC	Rare in California, from urban areas of San Diego and Alameda County.	Low-lying arid areas in Southern California. Need high cliffs or rocky outcrops for roosting sites. Feeds principally on large moths.	No Potential (Roosting)	Many species of bats are expected to forage in the Study Area. However, suitable roosts for big free-tailed bats are not present in the Study Area
Taxidea taxus American badger	-- / -- SSC	Extensive range throughout California. Known to occur in San Luis Obispo.	Requires open, arid habitats, but are most commonly associated with grasslands, savannahs, mountain meadows, and open areas of desert scrub. Soils must be friable for burrow excavation. Year Round	Low Potential	Soils in the Study Area are not ideal for badger; however, badgers have been reported near the Study Area as recently as 2008 and suitable grassland habitat is present.

STATUS CODES

Federal: United States Fish and Wildlife Service

FE Federally Endangered
FT Federally Threatened
FD Federally Delisted
FW Federal Watchlist
FC Federal Candidate
FSC Federal Species of Concern

State: California Department of Fish and Wildlife

CE California Endangered
CT California Threatened
CC California Candidate
CR California Rare
SSC California Species of Special Concern
CFP California Fully Protected

CALS = California Lichen Society Ranks (consistent with CRPR definitions)

CRPR: California Rare Plant Rank

1B Plants Rare, Threatened, or Endangered in California and Elsewhere

2 Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere

4 Plants of Limited Distribution - A Watch List

? Uncertain About Distribution or Identity

* May be Extirpated

Threat Ranks

0.1 Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)

0.2 Fairly threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)

0.3 Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known)

Sources: USFWS, 2016; CDFW, 2016; and CNPS, 2016

Appendix D - Dredge Sediment and Geotechnical Characterization Report

GEOTECHNICAL CHARACTERIZATION REPORT
LAGUNA LAKE SEDIMENT MANAGEMENT PROJECT
SAN LUIS OBISPO, CALIFORNIA

Prepared for:

MNS ENGINEERS

201 Industrial Way, Suite A
Buellton, California 93427

Leighton Consulting Project 11254.001

August 26, 2016

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

August 26, 2016

Project No. 11254.001

MNS Engineers
201 Industrial Way, Suite A
Buellton, California 93427

Attention: Mr. Doug Pike

Subject: Geotechnical Site Characterization Report, Laguna Lake Pre-Dredging Project san Luis Obispo, California

Leighton Consulting, Inc. is pleased to submit this geotechnical site characterization summarizing existing site data, field exploration and sampling, geotechnical and environmental laboratory test data, subsurface soil conditions, and preliminary geotechnical recommendations for the lake sediments within Laguna Lake for the sediment management project in San Luis Obispo, California. This study was authorized by you on January 29, 2016, and was performed in general accordance with the scope of work outlined in our agreement.

We appreciate the opportunity to be of service to you on this geotechnical study, and look forward to continuing to provide consulting services for MNS Engineers and the City of San Luis Obispo. Please contact us if you have any questions or when we can be of further assistance.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

REGISTERED PROFESSIONAL ENGINEER
LAUREN J. DOYEL
No. 2981
Exp. 6/30/17
GEOTECHNICAL
STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST
ROBIN J. FERBER
NO. 5756
Exp. 7/31/17
STATE OF CALIFORNIA

Lauren J. Doyel, P.E., G.E. 2981
Principal Geotechnical Engineer

Robin Ferber, P.G.5756
Principal Geologist

LD/RF/RR/gv

Distribution: (1) Addressee

TABLE OF CONTENTS

Section Page

1.0 EXECUTIVE SUMMARY 1

2.0 INTRODUCTION 3

2.1 Purpose and Scope 3
2.2 Project Description and Conceptual Design 3
2.3 Site Background and Available Data 4

3.0 PREVIOUS STUDIES 6

3.1 Central Coastal Laboratories (1980) 6
3.2 Earth Systems Consultants (1992) 6
3.3 Levine Fricke (2001) 7
3.4 Levine Fricke (2003) 7

4.0 FIELD EXPLORATION AND LABORATORY TESTING 8

4.1 Field Exploration 8
4.2 Laboratory Testing 9

4.2.1 Geotechnical 9

5.0 SITE GEOLOGY AND SEDIMENT CHARACTERISTICS 12

5.1 Regional Geologic Setting 12

5.1.1 Shallow Lake Sediments 12
5.1.2 Mapped Geologic Units 13

5.2 Sediment Characteristics – Data and Analyses 14

5.2.1 Grain Size 14
5.2.2 In Situ Density and Water Content 15
5.2.3 Sediment Strength 16

6.0 SOIL AND SEDIMENT CHEMISTRY 17

6.1 Results of Sampling and Analytical Testing of Soil and Sediment Samples18
6.2 Summary of Environmental Concerns Associated with Dredging Laguna Lake Sediment 20

7.0 WATER QUALITY 23

8.0 PRELIMINARY FINDINGS AND RECOMMENDATIONS 26

8.1 Dredging 27

8.1.1 Dredged sediment characteristics 27
8.1.2 Dredge Cuts 27

8.2 Storage and/or Disposal of Dredge Sediments 28

Leighton

8.3 Sedimentation Basins 29
8.3.1 Pond Construction 29
8.4 Shoreline Stabilization 29
8.4.1 Recommended Management and Protection Practices 30
8.4.2 Activities and structures around the shoreline 31
8.5 Creek Bank Stabilization 31
9.0 LIMITATIONS 33
10.0 REFERENCES 34

ATTACHMENTS

Important Information About Your Geotechnical Engineering Report

Figures and Plates

Figure 1 - Project Location Map
Figure 2 - Regional Geology Map
Figure 3 - Exploration and Sampling Location Map – Previous Studies
Figure 4 - Exploration Location Map – 2016
Figure 5 - Elevated Metal Sampling
Plate 1 - Interpreted Soil Profile Cross-sections

APPENDICES - VOLUME 1

Appendix A – Data from Previous Studies
Appendix A-1 – Previous Geotechnical Data, 1982 - 2001
Appendix A-2 – Previous Soil Chemistry Data, 2001
Appendix A-3 - Previous Water Quality Data, 10982 - 2001
Appendix B - Field Exploration
Table B-1 Location of Explorations Summary
Vibracore Photographs: VC-01, VC-03, VC-07 through VC-14
(VC-02, VC-05, VC-06 not performed, no photographs VC-04)
Appendix C – Geotechnical Laboratory Testing
Table C-1 Laboratory Tests Performed
Table C-2 Laboratory Test Results Summary
Appendix D –Dredge Cut Analyses
Appendix E – Discrete Sediment Chemistry Testing
Appendix F – Composite Dredge Sediment Chemistry Testing
Appendix G – Elutriate Water Quality and Toxicity

Leighton

1.0 EXECUTIVE SUMMARY

This report presents the results of the preliminary site characterization analysis performed by Leighton Consulting, Inc. (Leighton) for MNS Engineers, to support the City of San Luis Obispo's Laguna Lake Sediment Management Project.

Key findings are as follows:

- Laguna Lake is within a valley and fault zone, and appears to have originally formed as a sag pond i.e. a low lying area formed as a depression within a fault zone that collects surface drainage and seepage.

- In Late March and April, 2016 Leighton conducted soil sampling around and within the Laguna Lake to characterize the sediments within the drainages contributing to the lake and within the lake itself. Recent geotechnical and environmental data collected at the site are in general agreement with previous data collected, but provide more detail than previous studies with respect to sediment characterization and chemistry, depth and extent.

- Water quality testing of the dredge elutriate was conducted and is similar to water quality information presented in previous studies and is considered not toxic to aquatic life.

- The lake sediment profile consists of approximately three feet of soft silty clay (CL/ML) underlain by 7 to 10 feet brown fat clay CH which becomes grey greenish and stiff at a depth of about 7 to 8 feet to the depths explored (up to 14 feet). Near the mouth of Prefumo Creek, 2 to 3 feet of silty sand (SM) was encountered near the surface overlying fat clay.

- The geologic rock formations that comprise the hillsides and peaks around Laguna Lake are principally Franciscan greenstone, which contribute to the elevated levels of Nickel and Chromium in the lake sediments. These metals may impact the options for handling and disposal of sediment.

- Proposed dredging as configured (30-foot setback from shoreline and dredge cuts of 3H:1V) is not anticipated to affect the shore line.

- The shoreline of Laguna Lake is affected by wind driven wave erosion, most notably along the shoreline of the park where the main parking area and shoreline access roads intersect. Recommendations for shoreline erosion protection have been provided.

- Erosion along Prefumo Creek is occurring and is accelerated during periods of high rainfall. Engineering recommendations for creek bank stabilization have been included.

- Evaluation of geohazards such as fault rupture, ground shaking, liquefaction, seismic settlement, and slope stability of the shore line banks of Laguna Lake are beyond the scope of this study.

2.0 INTRODUCTION

2.1 Purpose and Scope

This report presents the results of the preliminary site characterization, sediment chemistry and geotechnical recommendations by Leighton for MNS Engineers (MNS) and the City of San Luis Obispo (the City) to support the management and evaluation and design of dredging at Laguna Lake. Leighton was contracted to provide soil exploration, sediment chemistry and water quality characterization for the project. Leighton provided field exploration staff, laboratory testing services and site characterization to evaluate dredging and sediment disposal options. Leighton conducted the site exploration in several phases: site reconnaissance, surface soil sampling within the surrounding drainages that contribute to the lake, and soil sampling of the lake sediments within the areas to be dredged. Water quality sampling to characterize water coming into the lake will be conducted later in the summer.

Leighton characterized the geology and seismic setting of the site for consideration in future design projects.

2.2 Project Description and Conceptual Design

The City is in the process of evaluating final sediment removal options, and developing a sediment management strategy for Laguna Lake. Laguna Lake is an elongate shallow lake with the long axis oriented Northwest-Southeast within the southern end of the Los Osos Valley in San Luis Obispo (see Figure 1). The lake is bounded on the east by a community park and grassy open space at the base of hills underlain by bedrock. The northern shore is bounded by open grassy fields that belong to a neighboring ranch. The western and southwestern shore is bordered by homes and public school sites, with homes and appurtenant walls, docks and boat ramps immediately adjacent to the lake. This neighborhood is bifurcated by Prefumo Creek, which was diverted to discharge into Laguna Lake in 1965. The southern border of the lake is the continuation of Prefumo Creek and the single point of discharge for the lake water.

This report summarizes the results of a preliminary dredging study intended to address the project elements as proposed. As a publicly funded project, the goal is to provide a feasible project with public benefits for the City of San Luis Obispo as well as the residents of the immediate surrounding neighborhoods, within the constraints of budget considerations, water quality regulations, and public safety.

This report is part of the Sediment Management Plan being developed by MNS Engineers for the City of San Luis Obispo.

At present, there are three conceptual Plan alternatives proposed for the Laguna Lake identified as Alternatives 1, 2 and 3 and summarized as follows:

Alternative	Area Covered	Depth (ft.)	Volume (cy)
Alt. 1	Central Area 1	5.2	38,500
Alt. 2	Central Area 1 & 2	5.9	85,000
Alt. 3	Central and Southeast Arm, Area 1, 2, and 3	6.1	167,000

Other projects to be included in the Laguna Lake Sediment Management Plan are creek bank stabilization and shoreline stabilization. Additional amenities not addressed by this report include fish passage, a peninsula boardwalk, accessible paths and new signage, a recycled water extension and outfall, and floodplain mitigation.

2.3 Site Background and Available Data

The most recent summary of background data and previous studies of Laguna Lake are presented in the City of San Luis Obispo, Laguna Lake Natural Reserve Conservation Plan (2014). This document summarizes sediment and water quality data collected for Laguna Lake since 1982, and outlines current and future goals for management and preservation of the Laguna Lake environment. Our findings, interpretations and analyses have incorporated relevant data from the prior studies and corresponding subsurface interpretation. Leighton performed the geotechnical exploration, laboratory testing and summarized existing geologic and geotechnical data for site characterization. MNS Engineers provided the topographic survey and preliminary design conditions for our evaluation.

Published geologic papers and previous reports for this project were reviewed for pertinent regional geologic information and used as the basis for Figure 2. Regional Geology Map. MNS Engineers and the City of San Luis Obispo provided prior geotechnical studies for the project (discussed in the following section), along with other environmental studies by the City, and aerial

photographs. To supplement basic geologic information in published maps, Leighton researched our library and requested the City provide geotechnical reports for nearby projects. No geotechnical reports for recent projects within the neighborhood or park were available from the City. Leighton obtained a geotechnical report addressing a City water reuse project that included geotechnical evaluation of a pipeline route within the vicinity of Laguna Lake (Fugro West, 2002).

3.0 PREVIOUS STUDIES

Since 1982, the City has had one major study of Laguna Lake about every decade. The purpose of these studies was to describe the lake environment evaluate conditions and sedimentation rates, and provide baseline recommendations for sediment removal. These studies are part of the ongoing development of knowledge of the lake physical characteristics and ecosystem, and intended to provide the City with baseline data needed to manage Laguna Lake as a resource, major drainage and public amenity. The geotechnical studies related to sediment removal and management have provided background data incorporated into this study and are summarized in the following sections and shown on Figure 3 – Exploration and Sampling Location Map, Previous Studies. Pertinent information has been included in Appendix A – Data from Previous Studies.

3.1 Central Coastal Laboratories (1980)

Laguna Lake Management Program Technical Appendix, Laguna Lake Study Committee (1982). Central Cost Laboratories conducted a study to characterize soils within the upper 5 feet of the lake bottom as part of a study performed by Envicom (1981) for the City of San Luis Obispo. Ten soils samples were collected within the delta area on the west side of the lake and near the boat ramp on the east side of the lake. Limited geotechnical testing was conducted, but no sediment chemistry testing was performed. The sediment was characterized as clay and silt, and the report concluded there was no reasonable use for the dredged soils. Analysis of sedimentation rates and water quality testing were performed by others and included in the same 1982 study. In general, the lake was characterized as having high nutrient levels typical of a low elevation, large watershed area eutrophic lake, with sedimentation rates between 0.05 to 0.6 feet per year in most of the lake, and up to 3 feet per year in the delta area near the mouth of Prefumo Creek.

3.2 Earth Systems Consultants (1992)

Geotechnical Report Laguna Lake Dredging Project. Earth Systems was contracted in 1992 to provide a comprehensive geotechnical report to address waterfront slopes, provide dredging recommendations for depth and extent of sediment removal as well as storage and or disposal of dredge sediments, decanting/dewatering recommendations and associated grading. A hydrographic survey was conducted by the City at that time. Ten thin-walled Shelby tube samples 10 to 30 inches in depth were through the Laguna Lake. Geotechnical

testing was performed; no sediment chemistry or water chemistry testing was performed. Geotechnical testing included grain size analysis and Atterberg limits. Dredging recommendations included setback and dredge cut recommendations based stability analyses using strength data provided by CCL (1980).

3.3 Levine Fricke (2001)

Characterization of Sediment and Water at Laguna Lake. Levine Fricke collected 16 surface bottom sediment grab samples from across the lake, and 4 core samples to 4 feet deep. Grab samples were grouped by area and core sediment samples were composited laterally across sampling locations at depths of 1, 2, 3 and 4 feet respectively, rather than vertically or within specified areas. The report is included in Volume 2 Technical Report References report the geotechnical and soil chemistry data is summarized in Appendix A, Data from Previous Studies. Their findings indicate the soil is considered non-hazardous and sediment chemistry profile is consistent with previous information and data from the current study. Although the sediment analytical test data are more than a decade old, the Levine Fricke Data is useful by comparison because it indicates that conditions in the lake have not changed in any significant way over the last 15 years. The only sediment constituent of concern was elevated metals. No geotechnical analysis of the dredge cuts was performed and LFR adopted Earth Systems recommended setbacks.

3.4 Levine Fricke (2003)

Engineering Analysis of Dredging and Disposal Alternatives at Laguna Lake. Levine Fricke provided a detailed summary of previous dredging studies and soil and water sampling, as well as a review of applicable dredging methods. They evaluated beneficial reuse of material both onsite and offsite and ranked the alternatives as low, moderate or high based on cost, feasibility and effectiveness. Data from their 2001 report was incorporated in the final engineering recommendations, but no new data was collected.

4.0 FIELD EXPLORATION AND LABORATORY TESTING

4.1 Field Exploration

The subsurface investigation for conceptual dredging project was developed in conjunction with MNS Engineers and the project team, and included both geotechnical and environmental sampling of soil and sediment. The field program was developed with the intent to fill in data gaps from previous studies and address the current conceptual project. Surficial sampling was conducted within the primary drainage areas that contribute sediment to the lake, and subsurface sampling was conducted within the lake sediments, concentrated with areas being considered for dredging. The sampling locations are shown on Figure 4 Exploration Location Map – 2016. Surficial soil sampling was conducted on March 21, 2016 within select areas on the west side of the lake, and in a primary drainage outlet in the lake adjacent to the boat ramp, and upstream within Prefumo Creek on the east side of the lake. Subsurface sampling was performed on March 30 and 31, 2016 by vibracoring to a depth of up to 14 feet. Lake access was obtained by utilizing a floating barge platform by Leighton's subcontractor, Kinnetic Laboratories. A description of field equipment, exploration operations and sampling methodology is included in Appendix B Field Exploration, along with logs of vibracores, and field photographs of the vibracores as logged. Each vibracore was initially sampled by KLI for composite dredge chemistry testing. A Leighton staff engineer then sampled each core at discrete intervals (three per core) for detailed sediment chemistry testing, and finally logged and sampled sediment types from a geotechnical perspective.

- **Five (5) surface soil samples** were taken in 5 different locations (LS-1 to LS-5) around the lake, within tributary drainages to the lake. Materials generally encountered included greenish gray to brown lean clay (CL) to silty sand (SM).

- **11 vibracores** (VC-01, VC-03, VC-04, and VC-07 to VC014) were advanced to depths of 6 to 14 feet below the lake bottom. Sediment recovery ranged from between 6 and 13 feet below ground surface, with less recovery in some vibracores. Materials generally encountered included olive gray to brown lean (CL) to fat clay (CH) containing varying amounts of sand, organic material and freshwater shell fragments. Three other locations originally planned, VC-2, VC-5 and VC-6 were not sampled as they were outside the area of dredging.

The locations of the explorations are shown on Figure 4. Logs of the explorations are included in Appendix B and are represented graphically on the subsurface cross sections presented on Plate 1 Subsurface Cross sections. Explorations conducted by CCL (1980), Earth Systems (1992) and Levine Fricke (2001) are indicated by the prefix “CCL,” “ES,” and “LF.” Vibracore explorations for the recently completed program are indicated by the prefix “LACI.”

Leighton relied on bathymetry and topographic data provided by MNS Engineers and the City of San Luis Obispo to determine elevations for vibracores. One typical geotechnical cross-section was developed, based on field exploration and limited data provided to Leighton and taken from adjacent studies.

4.2 Laboratory Testing

Both geotechnical testing and environmental testing of soil and sediment samples were performed for this study. Geotechnical testing was performed by Leighton’s in-house laboratory. Environmental testing was performed by ATL for discrete environmental samples. Composite sediment and elutriate toxicity chemistry testing was performed by Euro Fins and Pacific EcoRisk.

4.2.1 Geotechnical

Geotechnical laboratory testing included visual classification and where possible, strength tests of cohesive materials to characterize the engineering characteristics of the lake sediment.

Additional laboratory soil testing was subsequently performed to define pertinent classification and engineering soil properties. The laboratory testing program included grain size characteristics, Atterberg limits, moisture content, and unit weights (where possible) and limited shear strength testing of intact cohesive core samples. The test procedures generally conform to the applicable ASTM standards. Results of geotechnical laboratory tests are included in Appendix C - Geotechnical Laboratory Testing.

The following sampling and testing was conducted to characterize the geo-chemical characteristics of the lake sediment, surrounding sediment source materials and elutriate samples for water toxicity testing. The location and types of sampling are shown on Figure 4 – Exploration and Sampling Locations.

- **Surface Sampling with Drainages**: Based on the review of historical soil sampling performed at the site, Leighton collected 5 surface soil samples (LS-1 through LS-5) from ephemeral drainage areas that flow into Laguna Lake and from a serpentinite outcrop to evaluate the source material chemistry, in particular with respect to the metals chromium and nickel. Soil samples were transported under proper chain of custody to Advanced Testing Laboratories (ATL) in Signal Hill, CA and analyzed using US EPA Method US EPA Method 6010B. Selected soil samples exceeding 10 times and 20 times their respective CA Soluble Threshold Limit Concentration (STLC) were subsequently analyzed using the CA Waste Extraction Test (CA WET) and Toxicity Characteristic Leaching Procedure (TCLP), respectively. Soil samples were also analyzed for hexavalent chromium using US EPA Method 7196, and nitrates and phosphates using EPA Method 300.

- **Dredge Sediment Composite sampling**: KLI composited 2 representative samples of dredged sediments from 9 of the 11 vibracores within areas proposed to be dredged (VC-4, VC-7 to VS-14). VC-1 and VC-3 were not included in the composite dredge sediment samples. These samples were sent under chain of custody to CalScience Laboratories for soil chemistry testing for the following:

  - CCR Title 22 Metals,
  - Organopesticides/PCB combination,
  - Chlorinated Herbicides,
  - Semi-Volatile and Volatile Organic Compounds (SVOC, VOC), and
  - Total Petroleum Hydrocarbon

  Elutriate samples were transported to Pacific EcoRisk for water toxicity testing using the following established guidelines:

  - Methods for Estimating the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition" (EPA-821-R-02-012); and

  - USACE Technical Note EEDP-04-02. Interim Guidance for Predicting Quality of Effluent Discharged from Confined Dredged Material Disposal Areas-Test Procedures. U.S. Army Corps of Engineers, US Army Corps of

Engineers Waterways Experiment Station, Vicksburg, MS. USACE (1985).

Pacific EcoRisk indicated the biological test performed for each site composite sample MET consisted of the 96-hr standard elutriate acute fish test with fathead minnows (*Pimephales promelas*).

- **Discrete Sediment Chemistry Testing**: Leighton collected discrete environmental samples from select vibracores at near the surface (0 to 1 feet depth), mid-core (typically 5-foot depth) and at the bottom of each vibracore (typically 10-foot depth). The vibracores sampled were selected as representative of the depositional regimes within the lake, near multiple sediment inflow areas. Soil samples were sent under chain of custody to ATL for analysis.

5.0 SITE GEOLOGY AND SEDIMENT CHARACTERISTICS

5.1 Regional Geologic Setting

Laguna Lake is located at the southern end of the Los Osos valley between the San Luis range to the south and the Santa Lucia Range to the north, and is part of the southern Coast Ranges. The southern Coast Ranges represent Mesozoic-age to recent sedimentary, volcanic, metamorphic and igneous rocks. In this area, the older Jurassic to Cretaceous-age basement rocks (66 million to 208 million years old) of the Franciscan formation were intruded by younger volcanic and igneous rocks that formed volcanic "plugs." These plugs form the peaks along the ridges of the hills on either side of the Los Osos Valley. The Los Osos Valley fault strikes northwest-southeast along the western side of the valley, and Laguna Lake appears to be a sag pond within this fault zone, portions of which are mapped as active (i.e. surface rupture within the last 10,000 years). The lake is located within the valley flood plain, and the quaternary age alluvium deposited by streams overlies the Franciscan age metamorphic greenstones.

The geologic setting of the project location is shown on Figure 2, Regional Geologic Map. Shallow lake sediments are based on this study. Major geologic units identified within the valley in the vicinity of Laguna Lake and the slopes above it are based on Wiegers and Gutierrez (2010). Only those bedrock units likely to be encountered within the project area, or contributing significant sediment to lake are described below:

5.1.1 Shallow Lake Sediments

Within Laguna Lake, the sediments are relatively uniform across the lake, mostly fine grained clays and silts that are representative of a relatively low energy depositional environment of sediments. Near the mouth of Prefumo Creek, clays are interlayered with sands and silty sands in the upper 3 feet to 5 feet. This is due to the periodic higher energy depositional environment at the mouth of the creek. Vibracores encountered interlayered sandy SILT (ML) and clay (CL) and fat silty clay (CH) and inorganic silts (MH) from depths of 0 to 13 feet. Generally, the clay became stiffer at depths of 7 to 8 feet below the lake bottom, and this may represent an older lake bottom surface or the top of the alluvium that covered the bottom of the valley. Layering and thickness in the vibracores is variable (likely due to core compression)

- **0 to 3 feet:** Relatively loose silt (MH) and clay (CL/CH) interlayered with silty sand (SM) near the mouth of Prefumo Creek
- **3 to 7 feet:** medium soft silts (MH) and clay (CH) with shell fragments.
- **7 to 13 feet (depths explored):** stiff to very stiff clay (CH).

5.1.2 Mapped Geologic Units

- **Quaternary Alluvium (Qa):** Alluvial flood-plain deposits (late Holocene) - Active and recently active flood-plain deposits. Consists of unconsolidated sandy, silty, and clay-bearing alluvium.
- **Qya, Young alluvial flood-plain deposits:** Young alluvial flood-plain deposits, undivided (Holocene to late Pleistocene). Unconsolidated sand, silt, and clay-bearing alluvium deposited on flood-plains and along valley floors.
- **Qyf, Young alluvial fan deposits (Holocene to late Pleistocene):** Fine-grained alluvial fan and flood-plain sediments deposited on gently-sloping margins of Los Osos Valley. Consists primarily of clay with interbedded lenses of sand and minor gravel.
- **Qoa, Old alluvial flood-plain deposits (late to middle Pleistocene):** Fluvial sediments preserved above active flood plains and channels. These deposits are moderately consolidated, slightly dissected and capped by moderate to well-developed pedogenic soils. These deposits consist of gravel, sand, silt, and clay-bearing alluvium.
- **Jos, Serpentinized ultramafic rocks:** Pervasively sheared serpentinite appearing as lenticular fault-bounded bodies in Franciscan mélange, also referred to as greenstone. Considered to be dismembered bodies of the Coast Range Ophiolite tectonically interleaved with mélange during subduction. Locally, hydrothermally altered to silica-carbonate rock (sc).
- **Kjfm, Franciscan Complex – Melange (Cretaceous to Jurassic):** Chaotic mixture of fragmented rock masses embedded in a penetratively sheared matrix of argillite and crushed metasandstone. Individual rock masses contained in the matrix range from less than a meter to kilometers in scale. Blocks large enough to be shown on map

include high grade blue schist (bs), greenstone (mv), graywacke (gw) and chert (ch). Penetrative deformation of matrix postdates metamorphism of enclosed rock masses.

5.2 Sediment Characteristics – Data and Analyses

Subsurface soil conditions described in this study correlate well with conditions described in previous studies. However, previous studies only described the soils from 0 to 4 feet in depth within the lake, and did not provide any discrete sediment characteristics. The current study characterizes lake bottom sediments up to 14 feet deep. This study provides a more detailed understanding of the variations of sediment with the lake to the projected dredge depths, along with more detail on grain size, strength characteristics, and sediment chemistry.

5.2.1 Grain Size

Key findings of the lab test data on recovered vibracore samples indicate that the sediment:

- Includes relatively small percentage of fine to medium sand (5 to 15% by weight (i.e. particles coarser than a No. 40 sieve opening (0.4mm).
- Typically includes 60 to 95 percent (by weight) of particles that are finer than a #200 sieve opening (0.075mm), which is the differentiator between sand-sized and silt-sized particles.
- Typically includes 45 to 70 percent (by weight) or particles that are clay size or finer (0.005mm).

Atterberg Limit tests on several of the more fine-grained samples indicate that the sediments are moderately to highly Plastic which corroborates with previous studies, field observations and tests during vibracoring operations. The sediments are primarily composed of fine grained, cohesive particles. The fine grained nature of the soil is important with respect to moisture content and ability to dry out the soils once dredged. This implies that the sediments are prone to hold water, and are soft and prone to creep, and low in bearing capacity.

Stratigraphy and Layering. Although the lab test results and visual descriptions of the recovered vibracore samples show limited indications

of layering, visual evaluation of the vibracores show stratigraphic layering that is typical of sedimentation patterns within lakes: long-term gradual sedimentation of fine grained soils, punctuated by periods of low water stand as indicted by the presence organics, and/or closer to drainages, periods of high energy sediment deposition as indicated by sand layers. Visual observation of the vibracores in the field suggests the sediment can be divided into three different depth intervals (or layers) with somewhat different resistances. Interpretation of the different depth intervals is shown on the following table. Because the vibracores were sub-sampled and packaged over 1-ft or larger depth intervals, the lab test data likely show composite results rather than discrete results for the different thin layers. This is appropriate as any method of removal will result in a mixing of the sediments across the areas dredged.

Table 5.1 Lake Bottom Sediment Layers

Typical Depth	Soil Type	Penetration Resistance	Typical Moisture Content
0 to 2 feet	**Clay and Sand (CH/SM)** interlayered with sand	Soft	25 to 45
2 to 7 feet	**Lean to fat clay (CL/CH) and silt (MH)** with sand, occ. organics and shells,	Stiff	60 to 80
7 to 14 feet	**Fat clay (CH)** with sand and occasional organics and shells	Very Stiff	40 to 60

5.2.2 In Situ Density and Water Content

Estimated total and submerged unit weights based on the limited testing of relatively undisturbed samples suggest that the typical range of submerged unit weight of the range from 45 to 62 pcf.

The measured water contents of the disturbed samples recovered from the vibracores vary depending on soil type. For silts (MH) and fat clays (CH), the water contents range between 60 to 80 percent (measured as weight of water divided by the weight of dry soil). The measured water

contents of lean clay (CL) and silty sand (SM) range between 25 to 45 percent (measured as weight of water divided by the weight of dry soil).

5.2.3 Sediment Strength

Empirical relationships based on Atterberg Limits and grain size testing conducted during previous studies and this study provides similar strength results. Two direct shear tests on relatively undisturbed vibracore samples provide two different methods to estimate the in situ strength of the clayey sediments underlying the project site. These were compared to direct shear tests previously conducted.

The estimated effective angle of internal friction (ø) are from the Stark and McCone correlation, and the correlation chart is presented in Appendix C. These interpretations were confirmed by direct shear tests performed in the laboratory, run at relatively slow rates of shear, on relatively intact vibracore samples. The typical range of effective angle of internal friction of the sandy silts are presented below. These strengths were utilized in evaluating the stability of dredge cuts.

Table 5.2 Interpreted Strength Parameters

Soil Type	Direct Shear Test	Stark and McCone Correlation
sandy fat Clay (CH)		
Peak Strength	C = 250 psf, Φ = 25°	--
Residual Strength	C = 170 psf, Φ = 25°	C = 30 psf, Φ = 12°
elastic silt (MH)		
Peak Strength	C = 200 psf, Φ = 23°	--
Residual Strength	C = 150 psf, Φ = 20°	C = 150 psf, Φ = 21°

6.0 SOIL AND SEDIMENT CHEMISTRY

As part of the dredged sediment characterization, sediment source areas and sediment from Laguna Lake were collected and analytically tested for the metals previously identified as elevated. The sediment samples collected from the sediment source areas were also tested for nitrate and phosphate due to the presence of significant vegetation and equine influences. In addition, modified elutriate tests (MET) were performed on sediment collected from Laguna Lake.

Based on Leighton's review of previous studies, background literature, site geology and the presence of exposed serpentine and greenstone bedrock in the drainages surrounding Laguna Lake, elevated levels of select metals, primarily chromium and nickel, were anticipated. Previous studies indicated lake sediments contained elevated levels of total chromium, nickel and manganese. Additional sediment testing conducted by Levine Fricke (2001) also detected the same elevated metal levels. Due to the elevated presence of total chromium, Levine Fricke additionally analyzed two sediment samples with the highest total chromium concentrations for hexavalent chromium (chromium +6) and no hexavalent chromium was detected above laboratory method detection limits. Levine Fricke's review of the analytical test data indicated that the metals were below US EPA Region 9 Regional Screening Levels established for residential and industrial/ commercial settings. In addition, Levine Fricke determined the sediment samples do not require management as California or Federal RCRA hazardous waste. If the sediment required management as hazardous waste, special handling, disposal and/or treatment of the sediment could be required. Levine Fricke indicated that no other constituents of concern were noted with the lake sediment.

Chromium +6 is a known human carcinogen, tetragen, and mutagen and is mainly a concern via inhalation and to a lesser degree via ingestion. Typically, chromium +6 is most often found in soil due to man-made sources of contamination; however, recent literature indicated that natural chromium +6 may be commonly found in areas where ultramafic rock, such as serpentinite, may be present. Chromium +3 is not a carcinogen and is a common human essential nutrient. Chromium +3 can convert to chromium +6 in oxidizing environments. Sediment conditions at Laguna Lake are generally anoxic or reducing and favor chromium +3. However, the studies reviewed by Leighton and subsequent conferring with authors of these studies, indicated that there was a potential for naturally chromium +6 to be present in the soils and sediment within the lake due to presence of serpentinite outcrops proximal to Laguna Lake. Our primary concern with the Laguna Lake sediment was the potential for the chromium +3 in the sediment to revert to chromium +6 when it was dredged from the lake and deposited in an oxygen-

rich setting (e.g., on Laguna Lake Park slopes adjacent to the northeast side of the lake).

To evaluate concerns with transition from chromium +3 to chromium +6 by placing the anoxic Laguna Lake sediment into an oxygen-rich setting, Leighton modified our sampling and analytical testing program to include surface soil and sediment sampling from Prefumo Creek and selected ephemeral drainages that flowed into the lake from the northeast slopes and originated the nearby serpentinite outcrop. In addition, Leighton collected a soil sample (i.e., soil sample LS-2) from coarse sandy soil located in a serpentinite outcrop. To evaluate concerns with nickel and other metals in the sediment, analytical testing of discrete and composite soil and sediment samples included the 17 metals listed in the California Code of regulations, Title 22, Article 11 (CAM-17 Metals) as well as chromium +6 in selected samples that exhibited elevated total chromium concentrations. Additional testing was performed to evaluate the levels of chromium in the sediment to assess if it may require management as California Hazardous Waste and/or Federal RCRA waste.

6.1 Results of Sampling and Analytical Testing of Soil and Sediment Samples

The location of the soil/sediment samples and types of sampling methods used are shown on Figure 4 – Exploration and Sampling Locations Map. The formal laboratory analytical test reports and chain of custody documents are presented in Appendix E – Discrete Sediment Chemistry Testing and Appendix F – Composite Dredge Sediment Chemistry Testing.

- **Surface Soil Sampling from Drainages and Serpentinite Outcrop**: Leighton collected five surface soil samples (LS-1 through LS-5) on March 21, 2016 from the drainage areas around Laguna Lake and from a serpentinite outcrop to evaluate the background levels of CAM-17 metals. Figure 5 summarizes the concentration of nickel, total chromium and chromium +6 detected in the background soil samples. Total chromium in the soil samples ranged from 67 mg/kg to 2,500 mg/kg (sample LS-2). Nickel in the soil samples ranged from 63 mg/kg to 2,400 mg/kg (sample LS-2). The detection of total chromium above 500 mg/kg required additional testing to assess the waste characteristics of the samples. Accordingly, soil samples exceeding 500 mg/kg total chromium were also tested for chromium +6 using EPA Method 7196. Leighton found chromium +6 in three of five soil samples at concentrations ranging from 1.6 mg/kg to 8.5 mg/kg (sample LS-3). The US EPA Region 9 Regional Screening Level (RSL) for a residential scenario for chromium +6 is 0.3 mg/kg and was exceeded in the three soil samples where chromium +6 was

detected. The 6.3 mg/kg US EPA Region 9 RSL for chromium +6 in an industrial/commercial setting was exceeded in two of the three soil samples where chromium +6 was detected. When analyzed for their waste characteristic using the CA Waste Extraction Test, none of the soil samples exceeded the 5.0 mg/L CA Soluble Threshold Limit Concentration for chromium and therefore, are not a CA hazardous waste.

Although not relevant to the much lower nickel concentrations detected in Laguna Lake sediment (see below section), the 2,400 mg/kg concentration of nickel detected in soil sample LS-2 exceeded the 2,000 mg/kg CA Total Threshold Limit Concentration (TTLC) and therefore, would be considered a CA hazardous waste if this soil was excavated; however, this demonstrates that the serpentinite source rock material has elevated nickel and chromium that were the likely origin for the levels found in Laguna Lake sediment.

Based on the presence of serpentinite outcrops proximal to the lake and professional articles regarding the presence of natural chromium +6 under similar regimes, (as summarized in published studies included in the reference section), Leighton concludes that the presence of chromium +6 in the soil and sediment samples is geogenic or naturally occurring. In addition, no anthropogenic sources of the chromium +6 (e.g., plating and manufacturing facilities) are found in the Laguna Lake area, which reinforces the likelihood that the prevalence of chromium +6 in the soil and sediment samples are natural in origin.

Nitrates and phosphates analyzed from samples collected from the source areas did not appear elevated.

- **Discrete Sediment Chemistry Testing**: A total of 16 discrete soil samples were collected on March 31, 2016 from selected vibracores and analyzed for total chromium, nickel, and chromium +6 using the analytical test methods previously described. Total chromium was detected in all of the discrete sediment samples at concentrations lower than the surface samples and ranged from 140 mg/kg to 210 mg/kg. Detectable chromium +6 concentrations were found in 5 of 16 in Laguna Lake sediment (ranging from 1.4 mg/kg to 3.1 mg/kg) as shown on Figure 5. Overall, the detected concentrations of total chromium and chromium +6 in the lake sediment were lower than in the serpentinite background land-based source material described above. However, the chromium +6 concentrations detected in five sediment samples were above the 0.3 mg/kg US EPA Region 9 RSL established for a residential setting.

The detected chromium +6 levels were well above the US EPA Region 0.00067 mg/kg Risk-Based Soil Screening Levels established for the protection of groundwater. A recent news story (see web link below) indicates that chromium +6 has been found regionally in groundwater within the Los Osos Community Service District and that a natural source is suspected. This would be a valid concern if the dredged Laguna Lake sediment was placed into a surface setting (e.g., Laguna Lake park environs) where leachate could potentially affect shallow groundwater near the lake or a water body source.

http://www.sanluisobispo.com/news/local/article56198340.html

The results of CA WET testing for chromium on the soil/sediment samples reveal they will not require management as either California or Federal RCRA hazardous waste. None of the nickel levels found in the Laguna Lake sediment were elevated enough to require performance of the CA WET.

- **Dredge Sediment Composite Samples**: The two sediment composite samples were also collected on March 31, 2016. The total chromium analytical test results for the two Laguna Lake dredge composite sediment samples (i.e., LL16-PA1 and LL-SA1), which ranged from 170 mg/kg and 175 mg/kg, are similar to the total chromium results found in the discrete sediment samples and those previously found by Levine Fricke (March 2001). US EPA method 7199, which is more sensitive for chromium +6 than the US EPA 7196 method, was performed on the composite sediment samples. The results of the chromium +6 testing revealed no detections of chromium +6 (method detection limit is 0.350 mg/kg).

  Overall, the concentrations of total chromium in the lake sediment are much lower than in the background source material on the slopes. The nickel concentrations in the composite sediment samples ranged from 294 mg/kg to 305 mg/kg and overall, were lower than those found in the background samples.

6.2 Summary of Environmental Concerns Associated with Dredging Laguna Lake Sediment

Geogenic Source of Elevated Chromium and Nickel Levels Found in Laguna Lake Sediment - The source material for the Laguna Lake sediment originates from the local rocks which are largely composed of serpentinite. These types of rocks, which are common in the San Luis Obispo area, typically have high concentrations of chromium and nickel. Therefore, the elevated chromium

and nickel detected in the sediment samples likely originate from natural sources. This was confirmed by source material sampling and analysis of soils derived from serpentinite outcrops and from the seasonal steams that flow into Laguna Lake that was performed in late March 2016 by Leighton.

Exceedance of US EPA Region 9 RSL for a Residential Setting – In 5 of 16 discrete sediment samples collected from Laguna Lake, the chromium +6 levels detected exceed the 0.3 mg/kg US EPA Region 9 RSL established for a residential setting. There is significant residential development peripheral to the Laguna Lake area. Placement of dredged sediment collected from an anoxic or low oxygen setting to an oxygen-rich setting (i.e., on the ground surface), combined with the likelihood of manganese minerals in the sediment (e.g., chromite, a common mineral associated with ultra-mafic rocks like serpentinite) could potentially result in the oxidation of chromium +3 to chromium +6. Significant wind events (e.g., seasonal Santa Ana or sundowner winds) could create fugitive dust emissions from deposited sediment into nearby residential and commercial areas with uncertainty regarding exposures to chromium +6 laden particulates. Inhalation is the primary concern when exposed to chromium +6. Modelling using Laguna Lake sediment to evaluate this potential mechanism could be performed but would take significant time and funding and would need to be performed, validated and ultimately approved by a regulatory entity (e.g., the CA DTSC). It may be prudent to look at other alternatives such as transporting the sediment as nonhazardous waste for use as ground cover at a certified municipal landfill. Though costlier than placing the sediment in the park, it may be more prudent from a public safety perspective.

Potential Affect to Groundwater form Laguna Lake Sediment – The US EPA Region 9 Risk-Based Soil Screening Level of 0.00067 mg/kg established for the protection of groundwater is extremely low and was exceeded in all of the 5 Laguna Lake sediment samples. It should be noted that the laboratory method reporting limit for all 16 sediment samples analyzed for chromium exceeds the 0.00067 mg/kg level and therefore, more than 6 of the sediment samples could actually exceed this soil screening level. Because local municipal landfills likely have liners designed to be protective of groundwater, reuse of the dredged sediment as landfill ground cover should be considered as a reasonable option. Modelling could assess the potential threat to groundwater but again, may be time and cost prohibitive and still require validation with regulatory oversight, in this case, with the California Regional Water Quality Control Board.

Waste Classification of Laguna Lake Sediment – Review of the analytical test data for the Lake Laguna sediment samples suggests the sediment **does not** require management as California or Federal RCRA hazardous waste. In our opinion, the sediment, once dredged, should be managed as a nonhazardous waste and assuming it meets the landfill profiling criteria, should be acceptable for use as ground cover for a local municipal landfill.

7.0 WATER QUALITY

The water quality of Laguna Lake is controlled by the season (inflow of water), water quality of the tributary drainages, the amount of sediment that flows into the lake, and the atmospheric conditions around the lake (primarily wind). Water quality data has been collected during previous studies, but there is no water quality monitoring program testing at this time. The current conservation plans recommend establishing water quality monitoring. Prefumo Creek is the only creek of significant size that flows into the lake, and the downstream leg of Prefumo Creek joins San Luis Obispo Creek and eventually flows into the Pacific Ocean. Various storm drains and surface run-off appear to drain into the lake.

Water quality of Laguna Lake has been studied since 1982, and previous water quality testing data is included in the reports in Volume 2, Technical Appendices. In 1982, a limnologic study of the lake was performed by Envicom which concluded that the lake is eutrophic in nature, and water quality varies by season. Levine Fricke conducted water testing as part of their study in 2001. Water Quality of the Lake is indicated by the following parameters: Dissolved Oxygen, Turbidity, Temperature, pH, Phosphates and Nitrates. Table 7.1 summarizes typical ranges of these values for the lake water measured in the past and compares them. Overall, the water quality indicators have comparable values between the two data sets, with the exception of the phosphates and nitrates, which were lower in 2001 than in 1982. Going forward, it will be important to establish a consistent set of meaningful water quality parameters (for both quality and regulatory requirements), sampling locations and procedures and schedule in order to develop a comprehensive picture of Laguna Lakes baseline water quality condition and patterns of variation.

Table 7.1 Previous Water Quality Results

Parameter	Range (1980)	Range (2001)	Location	Comments
Temperature, C	9 to 19	9.4 to 11.6	upper 4 feet of lake water	CiSLO (2014) Taken at inlets and center of lake,
Dissolved Oxygen, mg/l	3.5 to 11.5	N/A	Throughout lake	Varies by season, higher in late Spring (1980)
Total Dissolved Solids (TDS) mg/l	N/A	220 - 250		
Turbidity, NTU	10 to 35 NTU 40 to 64 NTU	N/A	Typical values Higher values after rain	Turbidity varies based on season and weather (1980)
pH	7.4 to 8.4	7.1-7.3	Throughout lake	Varies by season, higher in late Spring (1980)
Nitrates, mg/l	6 to 21	<0.5 mg/l	Throughout lake	Varies by season, (1980) increase late fall due to vegetation die off
Phosphorous, mg/l	0.4 to 1.6	N/A	Throughout lake	Varies by season, (1980), increase late fall due to vegetation die off
Potassium, mg/l	N/A	2.8 – 2.9		
Pollutants (TPH, VOC, SVOC, PCB , Pesticides, Metals	ND	Toluene 0.9 ug/l Barium 0.04 mg/l All other ND	Throughout lake 2001 - At cores	2 water samples in 2001

During vibracoring, Leighton collected water samples to test for elutriate water quality and toxicity. The results are included in Appendix G Elutriate Water Quality and Toxicity and indicate that the elutriate is not toxic to aquatic life. Additional testing will be conducted at the end of summer during low water condition and when vegetation has died off to measure Dissolved Oxygen, Temperature, pH, Turbidity, Nitrates, and Phosphates.

An important aspect of the dredging operation at Laguna Lake is the impact on the water quality not only of the lake, but on the downstream reach of Prefumo Creek. Region 3 of the California Regional Water Quality Control Board has been monitoring water quality in Prefumo Creek since 2002, testing for the following constituents: Nitrates, Phosphates, Ammonia, Boron, Chloride, Chlorophyll (i.e. algae), Electrical Conductivity, Nitrogen – Total Ammonia, Temperature, Sediment Toxicity, Bio-Toxicity, Sodium, pH, fecal coliform, Low Dissolved Oxygen, and is considering adding Turbidity to the list of monitored water quality parameters. Of the 15 parameter's monitored, Nitrate is the only one that has exceeded standards 14 out of 15 measurements over an 8-year period.

8.0 PRELIMINARY FINDINGS AND RECOMMENDATIONS

Preliminary engineering analysis and recommendations were provided in previous studies. Leighton has reiterated and supplemented those engineering recommendations within this section. Supporting engineering analysis is presented in Appendix D, Dredge Cut. The evaluation of project alternatives is based upon the latest information provided by MNS Engineers on June 22, 2016.

The lake sediments can be characterized as follows:

- The soils present are largely silty to fat clays (CH) interlayered with lean clay (CL) and inorganic silt (MH) throughout the lake and within the principal proposed dredging areas. There is limited sand present in thin surface layers within the delta formed at the mouth of Prefumo Creek. The soil has limited beneficial reuse, and is not suitable for use as structural fill.
- From an agricultural evaluation standpoint, the soil has no serious deficiencies, but in general is however, generally too fine grained, too wet to be desirable for agricultural use.
- Soil chemistry is typical of the general region, with no contamination noted from man-made sources such as Total Petroleum Hydrocarbons (TPH), Volatile or Semi-Volatile Organic Compounds (VOC or SVOC, SVOC), or Pesticides.
- The sediments contain elevated metals typical of the regional soil and bedrock, principally chromium +3 and Nickel, which is naturally occurring in the local metamorphic rocks.
- Naturally occurring chromium +6 is present and poses a constraint on sediment storage and disposal from a residential health risk standard.

The soils have high moisture content, on average 60 to 65%.

Key geotechnical considerations for the Laguna Lake Sediment Management project include:

- Grain size characteristics, unit weight and water content of dredged sediments.
- Concentration of heavy metals of concern and EPA Health Risk guidelines.

Key geotechnical and environmental recommendations for the project components and alternatives are discussed below.

8.1 Dredging

The soils present are largely silty to fat clays (CH) throughout the lake and within the principal proposed dredging areas. There are some sands and gravels within the Delta and creek, but not in sufficient quantities to affect the characteristics of the sediment removed. Typically, the lake sediments have a high water content, high plasticity, and relatively low strength. The soils will not be difficult to remove or dredge, if done from a water based operation. If, however, the drought continues and the lake dries up, special consideration will have to be given to sequence and equipment as the soils have low bearing capacity and will likely need to be improved in order to support equipment.

8.1.1 Dredged sediment characteristics

Dredging is proposed to a maximum depth of approximately six feet (5.7 to 6.2 feet) and removal may extend slightly deeper due to overcut. In general, the material is silty fat clay (CH), and the key characteristics of the dredged sediments within the proposed dredged areas are summarized following:

Parameter	Value	Comments
Organic Content, percent	2.7 to 3.2	Based on composite samples, older samples up to 5%
Dry Density, pcf	75-85	Few data points, loose
Water Content, Percent	35 to 80, avg 60	
Grain Size, D50 (mm)	.002 to .005	
Classification	CH and MH	
Atterberg Limits (LL/PI)	60-80/50-50	Excludes outliers

The soil can be expected to bulk once excavated by a factor of about 20%.

8.1.2 Dredge Cuts

Due to the clayey nature of the low strength, dredge cuts should be setback from the shoreline a minimum of 30 feet and be at no steeper

than 3H:1V cut up to 10 feet deep. Stability analyses of this configuration (included in Appendix D) demonstrate that this configuration results in a static factor of safety above 1.5 for the typical condition. Under rapid drawdown conditions (I.e. the lake begin drained quickly) the factor of safety drops to 1.3, however the 1.5 factor of safety line is well within the setback zone established. The dredge cuts as proposed do not affect the slopes of the surrounding lake shoreline.

8.2 Storage and/or Disposal of Dredge Sediments

The principle consideration for storage and or disposal of the sediments is the presence of elevated levels of heavy metals above EPA Risk Screening Level guidelines. Based on the test results and the project setting, Leighton recommends commercial disposal of dredge sediments offsite in a permitted landfill as the best option to address the presence of chromium +6 above EPA recommended levels for long-term residential exposure. The project team is considering disposal at nearby municipal landfills. Special Waste Acceptance Guidelines for Chiquita Canyon Landfill (Santa Clarita) is reportedly identical to the profiling criteria required for Cold Canyon Landfill (Appendix H). The profiling criteria present information required by landfill operators to evaluate the suitability of sediments for disposal. Analytical testing performed on the sediment indicates that the material appears to be suitable for landfill disposal as a nonhazardous waste, and may be used as landfill cover Other nearby municipal landfills, such as Santa Maria Landfill, Paso Robles Landfill, and Chicago Grade could also be considered for disposal of Laguna Lake sediment.

Alternatively, if permanently disposed of onsite within the park area, the sediments should be capped, vegetated and may require active management and monitoring. This option may have implications for environmental permitting and required CEQA documentation. If this option is considered, the project team environmental specialists should evaluate requirements indicated based on the sediment characterization provided in this report.

From an agricultural evaluation standpoint, the soil has no serious mineral deficiencies, but is, generally too fine grained, too wet to be desirable for agricultural use.

8.3 Sedimentation Basins

Sedimentation basins may be constructed to dewater the dredge sediments before removal offsite. MNS has identified several locations within the park on the north side of the pond between Madonna Road and the main parking lot. No geotechnical investigation in these areas has been performed, however, based on visual observation and information from nearby geotechnical borings along Madonna Road (Fugro West, 2003), it is anticipated that the near surface soils consist of clayey silts and silty clays underlain by alluvium.

8.3.1 Pond Construction

1. Settling ponds should be constructed in accordance with County of San Luis Obispo Standard for Public Works (2014).
2. Native soils may be used to construct the berms, forma geotechnical perspective; however, the soil is anticipated to be clayey, plastic and may be difficult to moisture condition, or dry back, if not near optimum moisture content.
3. The maximum slope for inside and outside faces of the berms should not be steeper than a 2H:1V slope.
4. Fill should be placed in lifts not exceeding 8 inches and, moisture conditioned and compacted to a minimum of 90 percent maximum dry density.
5. Soils should be kept moist during earthwork to reduce the potential for dust.
6. The berms should be no higher than 6 to 7 feet measured vertically from the outside face.
7. The upland ponds and containment area should have at least two feet of freeboard.
8. The City's geotechnical consultant should review plans for the basins once prepared by the contractor.

8.4 Shoreline Stabilization

Laguna Lake shoreline is eroding on the park side of the lake near the picnic and parking area due to wind-driven waves. The prevailing wind is from Morro Bay, and creates wind waves that, due to the angle of the lake, erode the bank where

the main access and parking road meets the shoreline access road. The bank has already been eroded, and parts of the path and road have failed due to undermining by wave action. The low angle shoreline has about a 3 foot cut bank where erosion is occurring.

The State Water Resources Control provides recommended guidelines for creek bank and/or shoreline erosion. “Soft” or vegetation based methods are preferred over armoring. Guidelines can be found here:

http://www.waterboards.ca.gov/water_issues/programs/nps/encyclopedia/5_2a_hydromod_erosion_cntrl.shtml

Three basic principles should govern selection of shore line erosion protection:

1. Indirect or vegetative methods are preferred over structural methods.
2. Protect and conserve stream bank and shoreline features with the potential to attenuate polluted runoff., and
3. Plan and manage activities within water bodies adjacent to, or on stream banks and shorelines so that erosion is limited or eliminated.

8.4.1 Recommended Management and Protection Practices

- Appropriate native plant species should be used preferably collected from stock within the same watershed as the revegetated site. Use bioengineering and other non-structural controls over structural controls to restore damaged habitat and protect shoreline and stream bank erosion.

- One of several forms of bioengineering (live staking, brush layering or brush mattressing for example) should be used in conjunction with structural controls to either support the bank or dissipate the wave energy.

- It does not appear that the shoreline needs heavy armoring, however, this should be evaluated by the design civil engineer. Breakwaters and groins are not recommended for energy dissipation due to the soft nature of the soils underneath and the potential for transferring energy to another part of the shoreline, potentially inducing erosion.

- A rock blanket of engineered riprap over a filter layer (fabric or soil filter) of fines would provide armoring and still allow vegetation to be incorporated into the shoreline

- Another option is installing gabions (stone-filled wire baskets) or interlocking blocks of precast concrete along eroding banks. In addition to the surface layer of armor stone, gabions, or rigid blocks, successful revetment designs also include an underlying layer composed of either a geotextile filter fabric with gravel or a crushed stone filter and bedding layer.

8.4.2 Activities and structures around the shoreline

- Setbacks should be established to minimize disturbance of land adjacent to stream bank and shorelines. Setbacks most often take the form of restrictions on the siting and construction of new standing structures along the shoreline or stream bank.

- Stream bank or shoreline protection projects may result in a transfer of energy from one area to another, which causes increased erosion in the adjacent or downstream area. The project team should consider the possible effects of any installed measures, and adjacent and erosion control measures on other properties located along the shoreline or stream bank.

- Minimize loads on top of stream banks or shorelines.

- Upland drainage from development should be directed away from the shoreline banks so as to avoid accelerating erosion.

8.5 Creek Bank Stabilization

Areas of creek bank erosion were note during field reconnaissance and reported by the City of San Luis Obispo. The creek flows from the Los Osos Valley road through the neighborhood surrounding Laguna Lake before entering the Lake on the west side. Erosion of the creek banks, which are up to 15 feet in height, should be addressed so that future erosion does not encroach on the yards of the properties abutting the creek. Based on the soil characterization by Fugro West (2002) along Los Osos Valley Road, where it crosses over Prefumo Creek,

the soil profile appears to consist of 2 to 3 feet of clayey (CH) over silty sand (SM) to sandy clay (CL).

The following qualitative engineering recommendations provide options for addressing creek bank erosion, and should be evaluated on a site by site location. Stabilization measures can be combined to achieve the desired results

- **Grading and Revegetation**: Where possible, the creek bank may be regraded to remove verticals and laid back to a 2H:1V to 2.5H:1V slope and revegetated with native species. Based on the soil type encountered along the creek, slope reinforcement may be required in the form of geogrid reinforcement

- "**Soft" Reinforcement:** Locally the toes of eroding banks can be reinforced with either placement of heavier gravels or stones, or planted with bio roles and willow tree stakes at the toe. This has been used successfully along sections of San Luis Obispo Creek in conjunction grading and lay back of vertical banks.

- **Armoring of existing creek bank slopes**: Lower portions of creek banks can be armored using either rip rap or gabions where there is not enough room to accommodate a "softer," vegetated solutions or in areas where the slope is expected to erode under design flow conditions. Rip rap may best suited where the creek bank is sloped. Gabions can be used to slow the velocity of concentrated runoff or to stabilize slopes with seepage problems and/or non-cohesive soils, and in areas where more vertical construction required than can be accommodated by rip rap.

- **Flood Walls:** Where erosion has created steep banks close to property lines, or there are other physical limitations that prevent use of softer creek bank stabilization options, flood walls may be considered. The draw back with flood walls is that they may change the hydraulics of creek channel and may cause erosion upstream or downstream of the installed wall. If the City is considering flood walls, then a site specific geotechnical study should be performed to provide site specific design recommendations to the civil designer.

9.0 LIMITATIONS

Our services consist of professional opinions, conclusions, and recommendations that are made in accordance with generally accepted geotechnical engineering principles and practices in the area and at the time of preparation of this report. This warranty is in lieu of all other warranties, either expressed or implied.

The recommendations contained in this report are based on the data obtained from the subsurface explorations conducted for this study as well as previous subsurface explorations by others at, or in the near vicinity of, the project site. These explorations indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. Variations may exist and conditions not observed or described in this report could be encountered during construction. Our conclusions and recommendations are based on our analysis of the observed conditions. If conditions other than those described in this report are encountered, we should be notified so that we can provide additional recommendations, if warranted.

This report has been prepared for the exclusive use of MNS Engineers and The City of San Luis Obispo and its consultants for specific application to the Laguna Lake Sediment Management Project, as described herein. In the event that there are any changes in the ownership, nature, design, or location of the proposed project, or if any future additions are planned, the conclusions and recommendations contained in this report should not be considered valid unless: 1) the project changes are reviewed by Leighton, and 2) conclusions and recommendations presented in this report are modified or verified in writing. Reliance on this report by others must be at their risk unless we are consulted on the use or limitations. We cannot be responsible for the impacts of any changes in geotechnical standards, practices, or regulations subsequent to performance of services without our further consultation. We can neither vouch for the accuracy of information supplied by others, nor accept consequences for unconsulted use of segregated portions of this report.

10.0 REFERENCES

Buckley PhD, Brian and Robert Stiles PhD (2009) Evaluation of Methods for Quantifying Cr (VI) and Cr (III) in Soils and Wastes, SR06-051, submitted to NJDEP, March 2009, 33pp.

California Water Boards, 2010, Integrated Report on Water Quality with Web-Based Interactive Map, April 2010.

City of San Luis Obispo, 1982a, Laguna Lake Management Program Technical Appendix, Laguna Lake Study Committee, dated January 1982.

City of San Luis Obispo, 1982b, Laguna Lake Management Program, Laguna Lake Study Committee, dated January 1982.

City of San Luis Obispo, 2009, Council Agenda Report, Laguna Lake Dredging Environmental Document, dated November 17.

City of San Luis Obispo, 2010, Council Agenda Report, Laguna Lake Dredging Recommendation and Report in Brief Document, dated August 17.

City of San Luis Obispo, 2014a, Planning Commission, Laguna Lake Natural Reserve Conservation Plan, dated June 11.

City of San Luis Obispo, 2014b, City Administration, Natural Resources Program, Laguna Lake Natural Reserve Conservation Plan, dated July 15.

City of San Luis Obispo, 2015, Storm Drain Maps, sheets F11, G11, G13, H14, scale 1 inch to 250 feet, dated November 2, 2016.

City of San Luis Obispo, 2015, Laguna Lake Dredging Project, Sheets G-1 and G-2, Plan View – Existing Layout and Lake Cross Sections – Existing, scales as noted on sheets.

County of San Luis Obispo, 2014), Public Works Standards, http://www.slocounty.ca.gov/PW/DevServ/PublicImprovementStandards.htm

Earth Systems Consulting, 1992, Geotechnical Report Laguna Lake Dredging Project, San Luis Obispo, California, dated August 3, 1992.

Erosion Control Handbook, 2005, Upper Salinas-Las Tablas Resource Conservation District and the San Luis Obispo Planning and Building Department, a Practical Guide to Erosion Control and Sediment Reduction, Third Edition, July 2005.

Fred L. Hector, 1961, Master Plan Laguna Lake San Luis Obispo, California, dated February 3.

LFR Levine•Fricke, 2001, Characterization of Sediment and Water at Laguna Lake, City and County of San Luis Obispo, California, dated March 19. 7743.00-2.

LFR Levine•Fricke, 2003a, Ecological Resources and Potential Impacts of Dredging Operations at Laguna Lake, City and County of San Luis Obispo, California, dated March, 2003. 021-07743-00.

LFR Levine•Fricke, 2003b, Engineering Analysis of Dredging and Disposal Alternatives at Laguna Lake, City and County of San Luis Obispo, California, dated March, 2003. 021-07743-00-005.

Manning, Andrew H., Christopher T. Mills, Jean M. Morrison, Lyndsay B. Ball (2015), “Insights into controls on hexavalent chromium in groundwater provided by environmental tracers, Sacramento Valley, California, USA”, Applied Geochemistry 62 (2015) 186–199, Elsevier, May 21, 2015.

Mills, Christopher T., Jean M. Morrison, Martin B. Goldhaber, Karl J. Ellefsen (2011), “Chromium (VI) generation in vadose zone soils and alluvial sediments of the southwestern Sacramento Valley, California: A potential source of geogenic Cr (VI) to groundwater”, Applied Geochemistry 26 (2011) 1488–1501, Elsevier, May 28, 2011.

Mills, Christopher T., and Martin B. Goldhaber (2012), “Laboratory investigations of the effects of nitrification-induced acidification on Cr cycling in vadose zone material partially derived from ultramafic rocks”, Science of the Total Environment 435–436 (2012) 363–373, Elsevier August 4, 2012.

Morrison, Jean M., Martin B. Goldhaber, Lopaka Lee, JoAnn M. Holloway, Richard B. Wanty, Ruth E. Wolf, James F. Ranville (2009), “A regional-scale study of chromium and nickel in soils of northern California, USA”, Applied Geochemistry 24 (2009) 1500–1511, Elsevier, May 3, 2009.

Morrison, Jean M., Martin B. Goldhaber, Christopher T. Mills, George N. Breit, Robert L. Hooper, JoAnn M. Holloway, Sharon F. Diehl, James F. Ranville, (2015),

"Weathering and transport of chromium and nickel from serpentinite in the Coast Range ophiolite to the Sacramento Valley, California, USA" Applied Geochemistry 61 (2015) 72–86, Elsevier, May 27, 2015.

Oze, Christopher, (2003) Chromium Geochemistry of Serpentine and Serpentine Soils, PhD Thesis Department of Geological and Environmental Studies, Stanford University, May 2003, 215pp.

Oze, Christopher, Dennis K. Bird, and Scott Fendorf, (2007), "Genesis of hexavalent chromium from natural sources in soil and groundwater", Proceedings of the National Academy of Sciences, (PNAS), vol. 104 no. 16, April 17, 2007, pp6544–6549.

Pehaim, Jennifer, 2004, Heavy Metals in Clams and Sediments from Morro Bay, Masters Thesis, California Polytechnic State University, June 2004.

Regional Water Quality Control Board, 2010, Final California 2010 Integrated Report (303(d) List/305(b) Report).

Sedes, Crawford Multari & Starr, Leisure Visions, 1993, City of San Luis Obispo, Laguna Lake Park Master Plan, Program Elements and Development Guidelines, dated July 2, 1993.

USGS, 1994, Chromite Deposits near San Luis Obispo, San Luis Obispo County, California, Strategic Minerals Investigation 1944.

Werner, M.L.; Nico, P.S.; Marcus, M.A.; Anastasio, C.; Environ. Sci. and Technol. 2007; 41(14), 4919- 4924. "Speciation of Chromium in Airborne Fine Particles in the Sacramento Valley" (LBNL- 62779)

Wiegers, Mark, 2010, Geologic Map of the San Luis Obispo 7.5 Minute Quadrangle, San Luis Obispo County, Version 1.0 scale 1:24,000 published by California Geologic Survey.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation*.

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

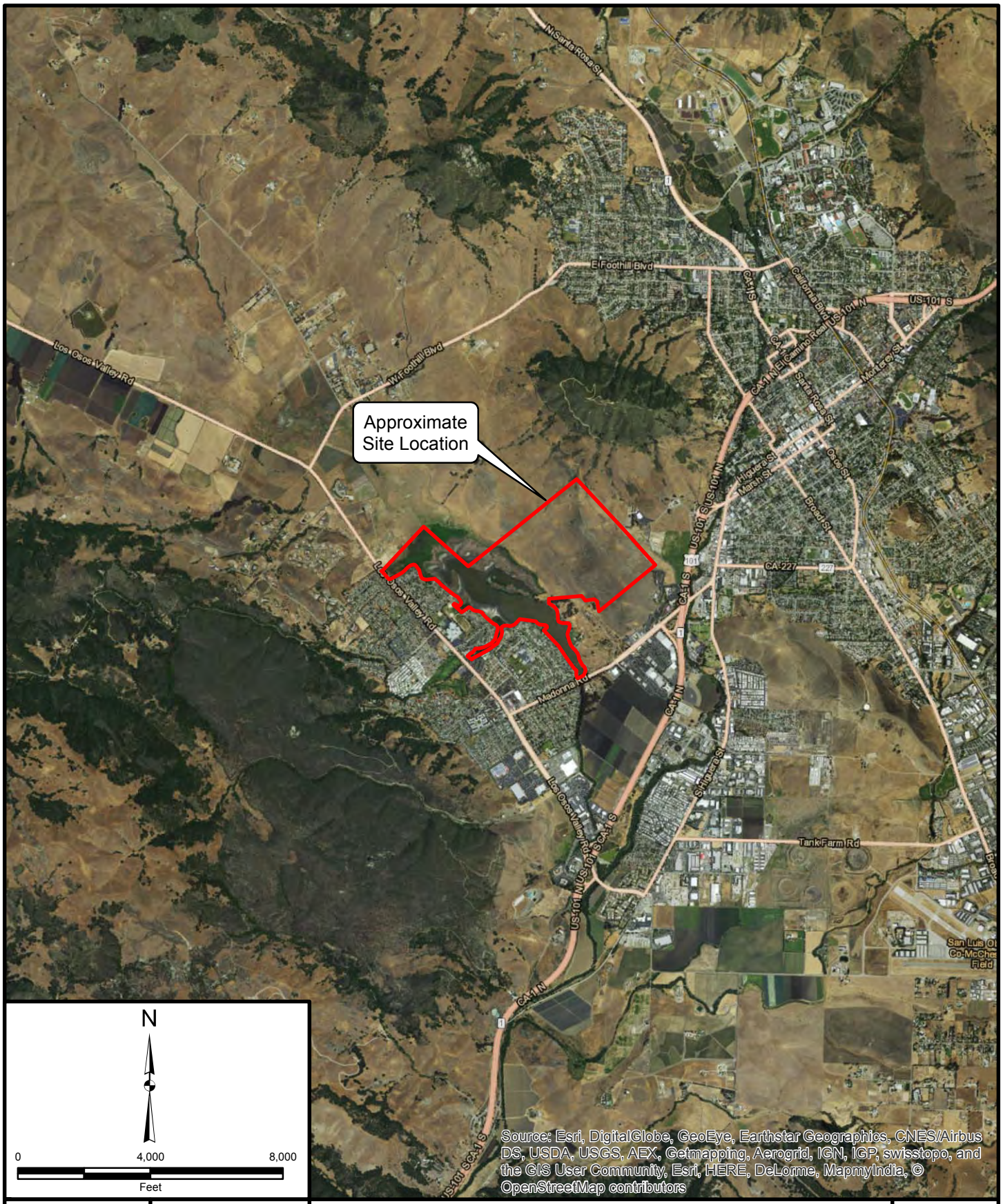
Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Copyright 2016 by Geoprofessional Business Association (GBA). Duplication, reproduction, or copying of this document, in whole or in part, by any means whatsoever, is strictly prohibited, except with GBA's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of GBA, and only for purposes of scholarly research or book review. Only members of GBA may use this document or its wording as a complement to or as an element of a report of any kind. Any other firm, individual, or other entity that so uses this document without being a GBA member could be committing negligent



Project: 11254.001	Eng/Geol:LD
Scale:1 " = 4,000 '	Date: February 2016

Base Map: ESRI ArcGIS Online 2016
Thematic Information: Leighton
Author: Leighton Geomatics (asakowicz)

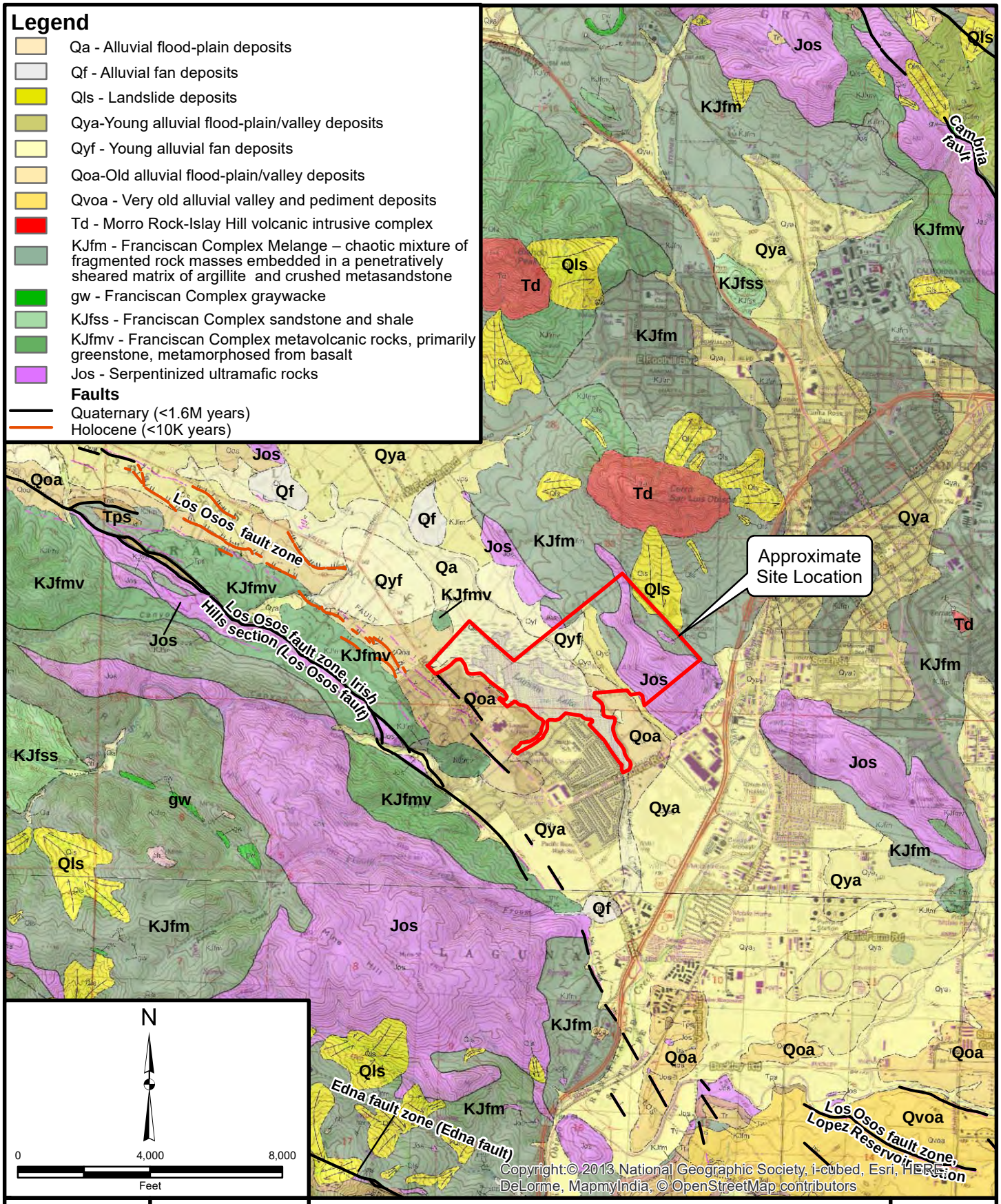
SITE LOCATION MAP

Laguna Lake Sediment Management
San Luis Obispo CA

Figure 1

Leighton

Map Saved as V:\Drafting\11254\001\Maps\11254_001_F01_SLM_2-18-2016.mxd on 2/25/2016 12:07:02 PM



Project: 11254.001	Eng/Geol:LJD
Scale:1 " = 4,000 '	Date: June 2016

Base Map: ESRI ArcGIS Online 2016
CGS Pismo Beach 7.5' Quad and San Luis Obisbo 7.5' Quad
Thematic Information: Leighton
Author: Leighton Geomatics (asakowicz)

REGIONAL GEOLOGY MAP

Laguna Lake Sediment Management
San Luis Obispo CA

Figure 2

Leighton

Map Saved as V:\Drafting\11254\001\Maps\11254_001_F02_RGM_3-3-2016.mxd on 6/24/2016 2:05:04 PM

Project: 11254.001	Eng/Geol: LD
Scale: 1 " = 500 '	Date: June 2016

Base Map: ESRI ArcGIS Online NAIP 2014
USGS San Luis Obispo Quad 1995
Sedimentary Map, City of San Luis Obispo 1982
Thematic Information: Leighton
Author: Leighton Geomatics (asakowicz)

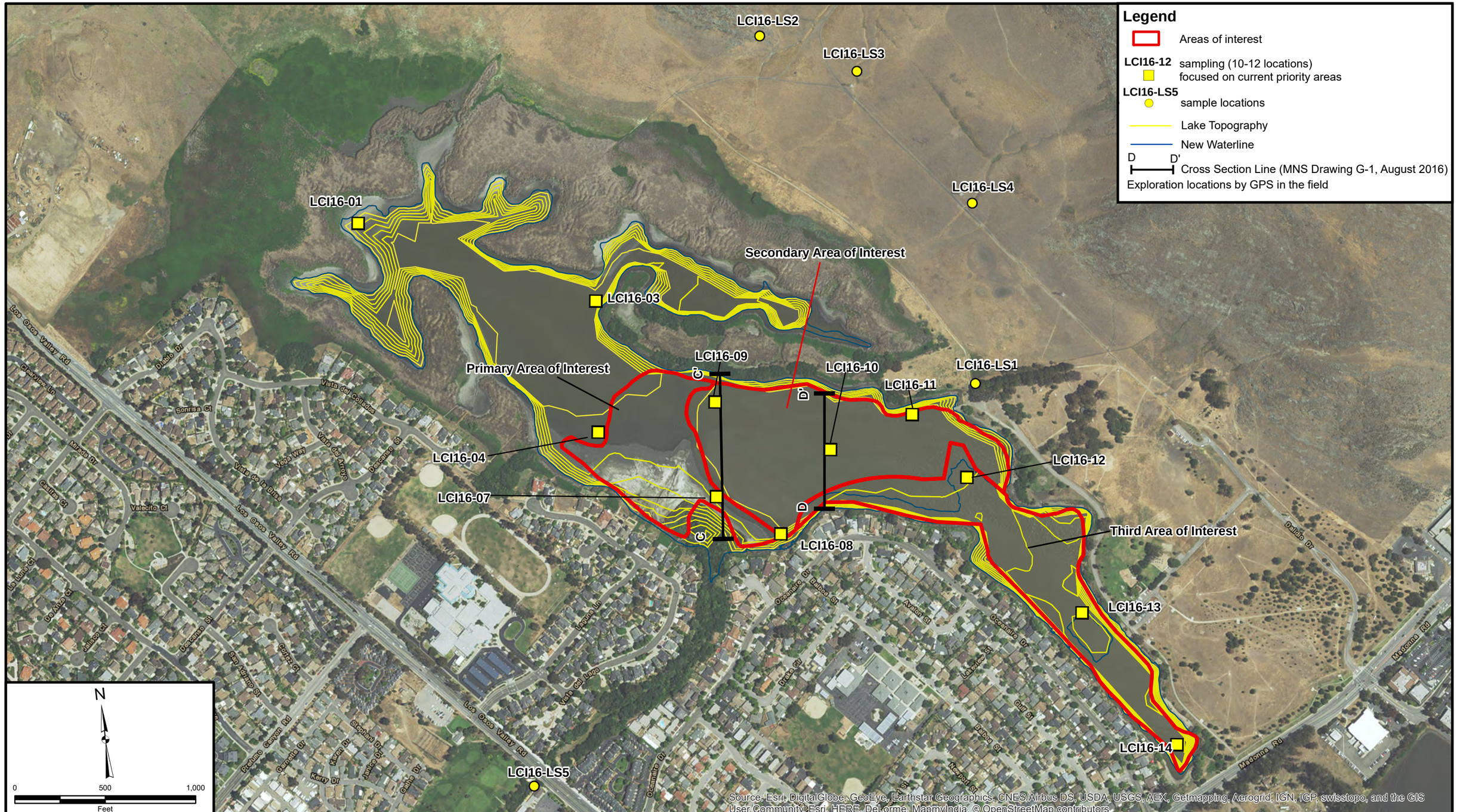
EXPLORATION AND SAMPLING LOCATION MAP - PREVIOUS STUDIES

Laguna Lake Sediment Management
San Luis Obispo CA

Figure 3

Leighton

Map Saved as V:\Drafting\11254\001\Maps\11254_001_F03_ESLM_others_2016-06-24.mxd on 6/24/2016 9:47:29 AM



Project: 11254.001	Eng/Geol: LD
Scale:1 " = 500 '	Date: August 2016

Base Map: ESRI ArcGIS Online NAIP 2014
USGS San Luis Obispo Quad 1995
Sedimentary Map, City of San Luis Obispo 1982
Thematic Information: Leighton
Author: Leighton Geomatics (asakowicz)

EXPLORATION AND SAMPLING LOCATION MAP - 2016

Laguna Lake Sediment Management
San Luis Obispo CA

Figure 4

Leighton

Map Saved as V:\Drafting\11254\001\Maps\11254_001_F04_ESLM_LCIs_2016-06-24.mxd on 8/29/2016 9:06:43 AM

APPENDIX A
DATA FROM PREVIOUS STUDIES

Appendix A-1 – Previous Geotechnical Data, 1982 - 2001

Appendix A-2 – Previous Soil Chemistry Data, 2001

Appendix A-3 - Previous Water Quality Data, 10982 – 2001

this. In general, the area where such dredging is stockpiled or disposed of should be an area which will be not intended for use for any subsequent construction or agricultural purposes.

It has been the intent of this report to basically identify the characteristics which are predominate in the study area and to generally point out any potential hazards which may develop as a result of excavation of the lake itself. Under no consideration should excavation be considered adjacent to the existing lake shore where homes are now built without a very detailed stability study of this issue. In the event that you would wish to pursue this issue in further detail, please feel free to contact this office at your convenience.

Respectfully submitted,

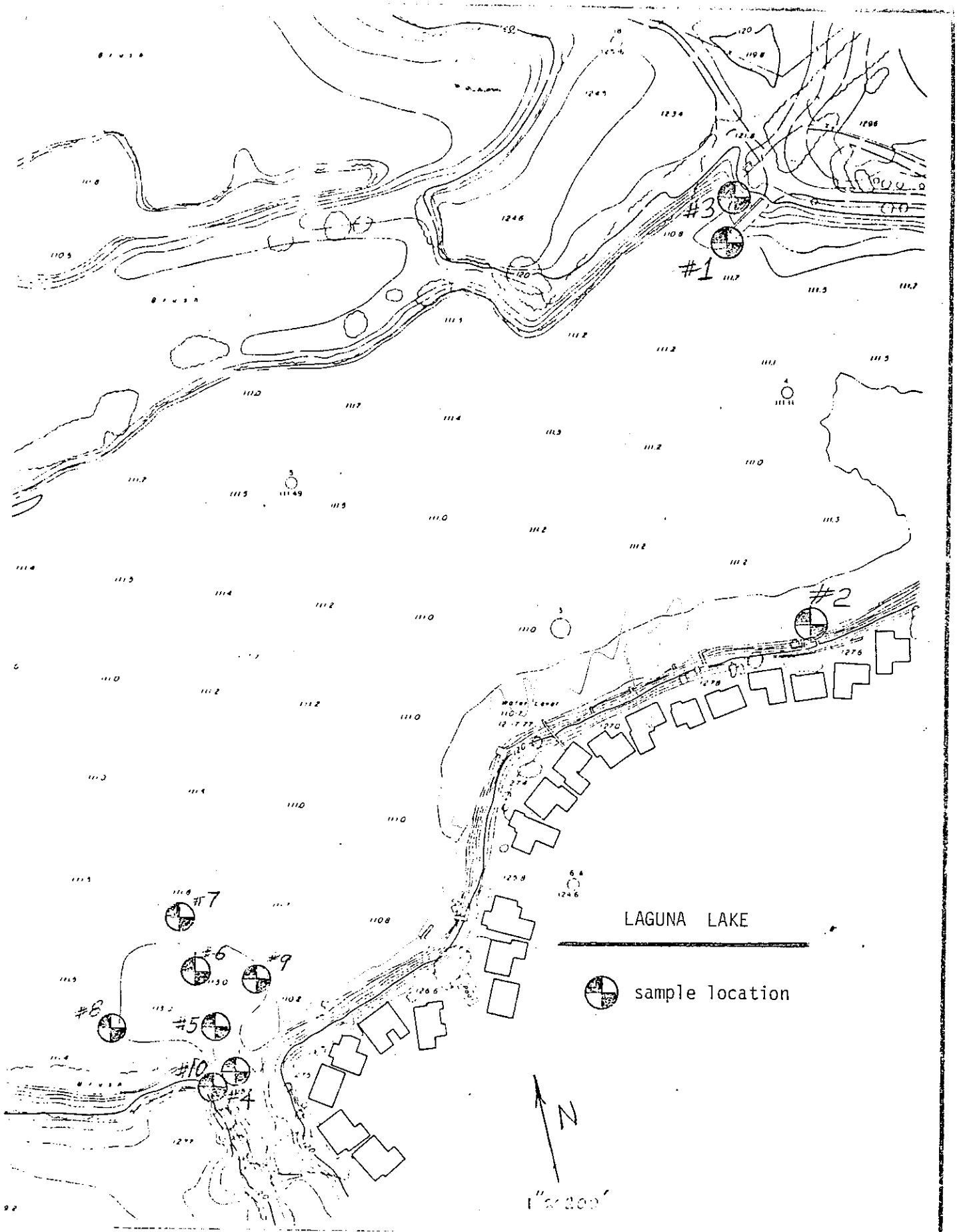
CENTRAL COAST LABORATORIES

Robert E. Williams, Consulting Engineer
Soil Mechanics and Foundations

REW:jak

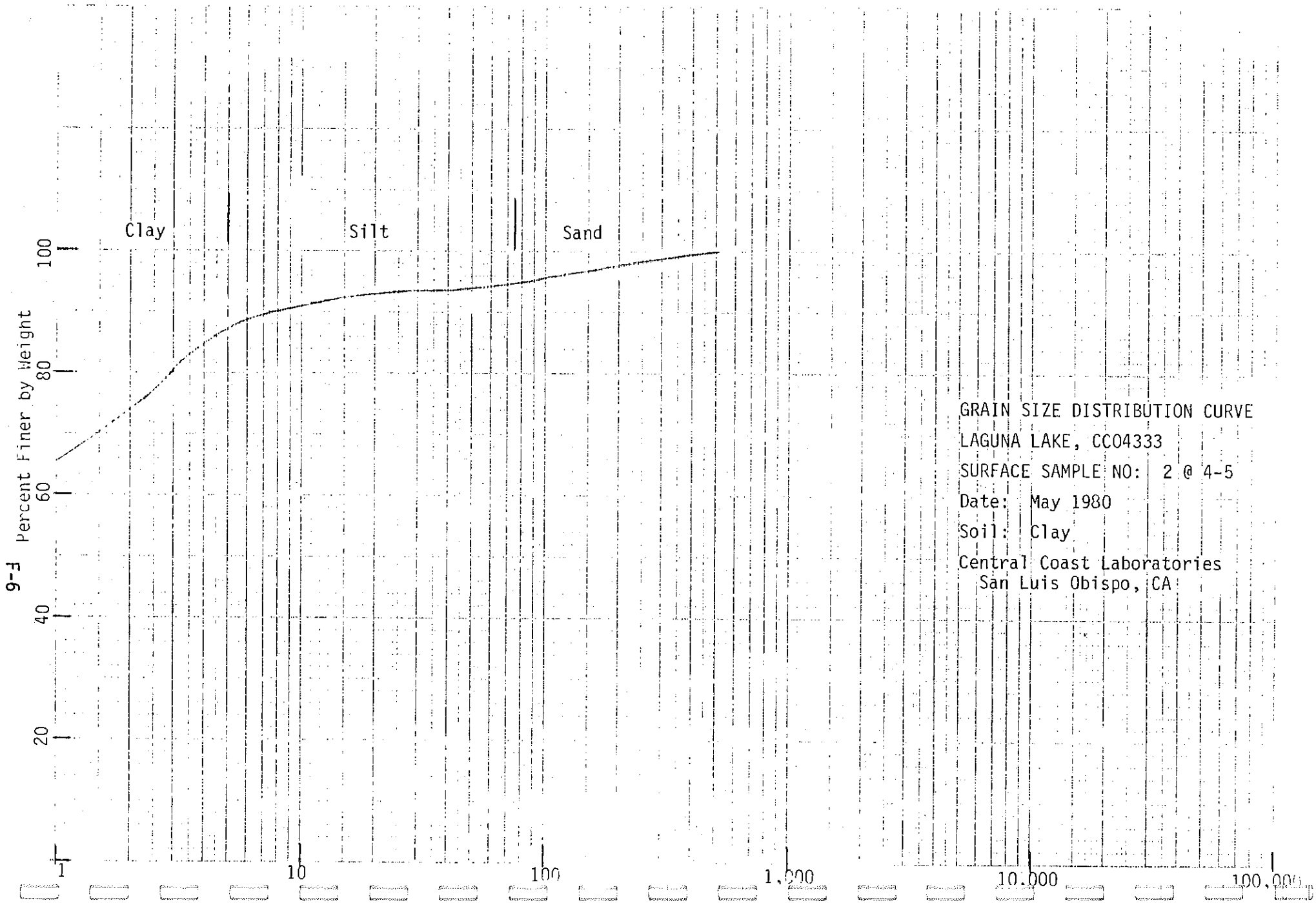
LAGUNA LAKE SOIL SAMPLES

Descriptive Location	Sample No.	Depth Below Lake Bottom	Soil Type	Soil Test Data
North Shore	1	0'-1'	CLAY	-----
South Shore	2A	0'-0.5'	CLAY	-----
South Shore	2B	1'-2'	CLAY	-----
South Shore	2C	3'-4'	CLAY	-----
South Shore	2D	4'-5'	CLAY	3% sand, 7% silt, 90% clay, plastic index = 63 liquid limit = 111 plastic limit = 48
North Shore	3	0'-1'	CLAY	Angle of internal friction Peak: 15° Ultimate: 12° Cohesion, Peak: 30 psf Ultimate: 22 psf
River Mouth	4	0'-1'	SILTY SAND	50% sand, 40% silt, 10% clay
100' North of River Mouth	5	0'-1'	SILTY SAND	46% sand, 44% silt, 10% clay
200' North of River Mouth	6	0'-1'	SANDY SILT	18% sand, 67% silt, 15% clay
300' North of River Mouth	7	0'-1'	SANDY SILT	25% sand, 62% silt, 13% clay
200' Northwest of River Mouth	8	0'-1'	SANDY SILT	-----
200' Northeast of River Mouth	9	0'-1'	SANDY SILT	-----
River Mouth (near shore)	10	0'-1'	SANDY SILT	31% sand, 54% silt, 15% clay Plastic Index = 8 Liquid Limit = 35 Plastic Limit = 27



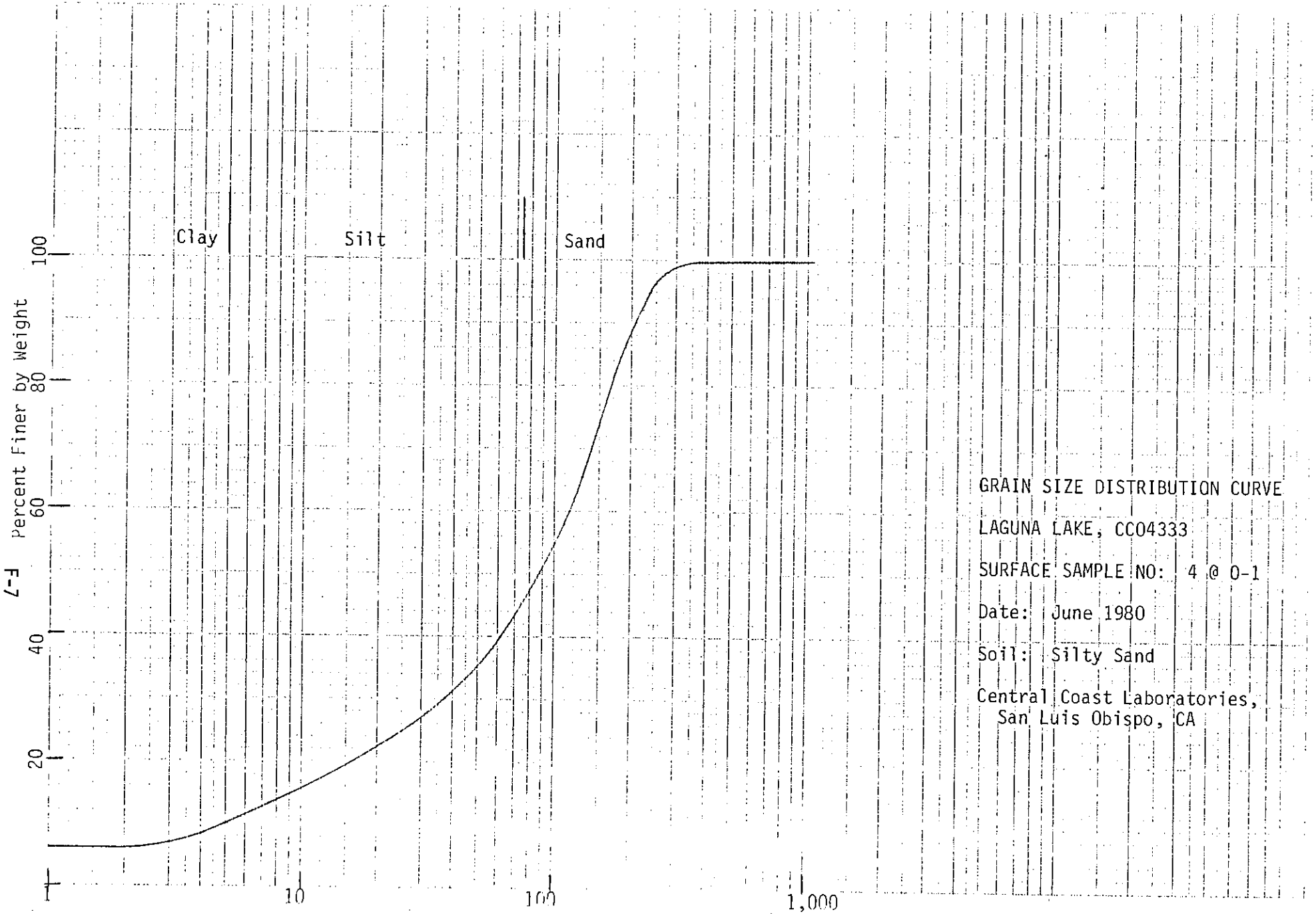
CENTRAL COAST LABORATORIES
SOIL MECHANICS · FOUNDATION ENGINEERING
396 BUCKLEY RD. SAN LUIS OBISPO, CA 93401 / 805-544-3276

SEMI-LOGARITHMIC 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. 46 6210



GRAIN SIZE DISTRIBUTION CURVE
LAGUNA LAKE, CC04333
SURFACE SAMPLE NO: 2 @ 4-5
Date: May 1980
Soil: Clay
Central Coast Laboratories
San Luis Obispo, CA

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. 46 6210



GRAIN SIZE DISTRIBUTION CURVE

LAGUNA LAKE, CC04333

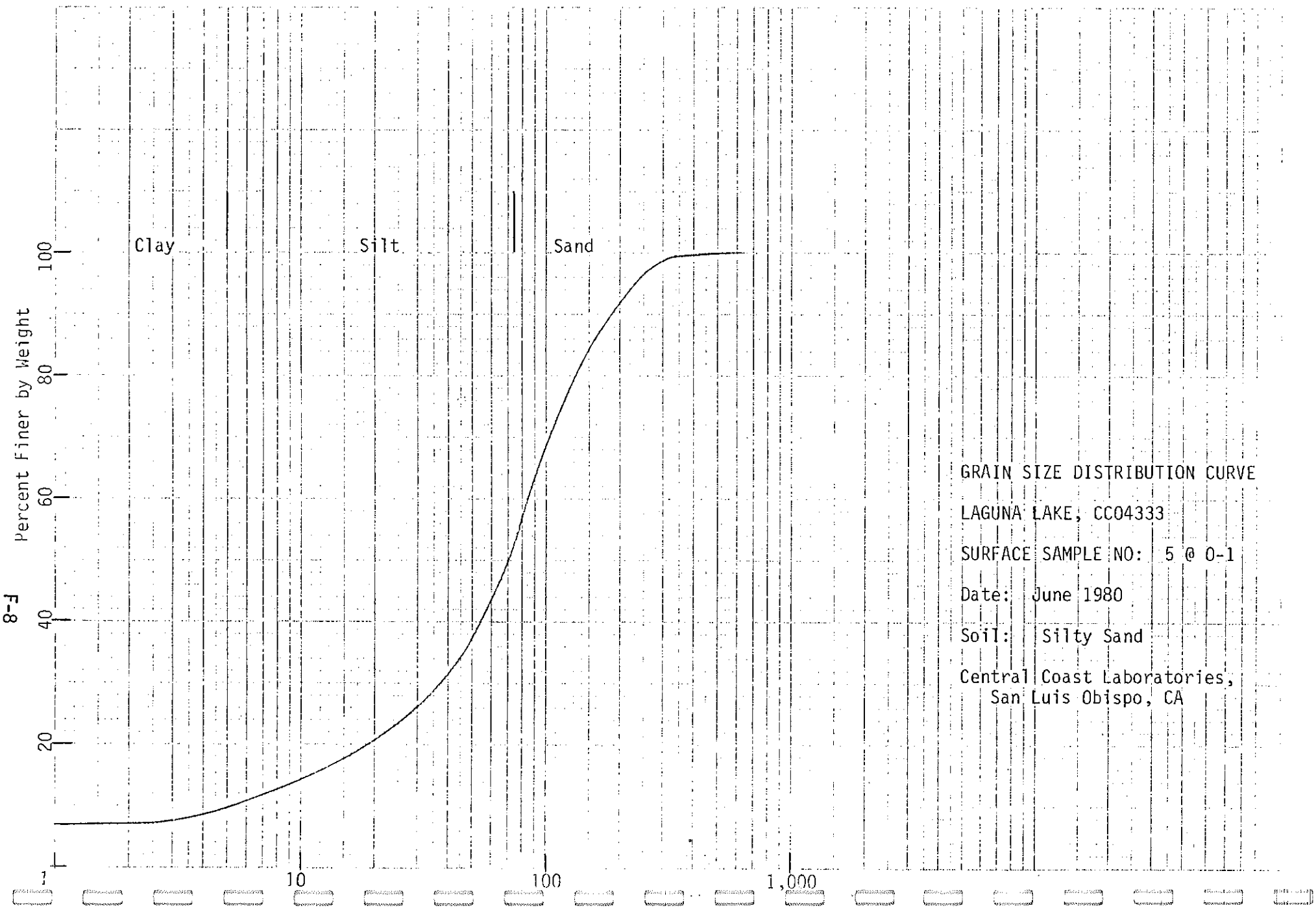
SURFACE SAMPLE NO: 4 @ 0-1

Date: June 1980

Soil: Silty Sand

Central Coast Laboratories,
San Luis Obispo, CA

K&E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6210



GRAIN SIZE DISTRIBUTION CURVE

LAGUNA LAKE, CC04333

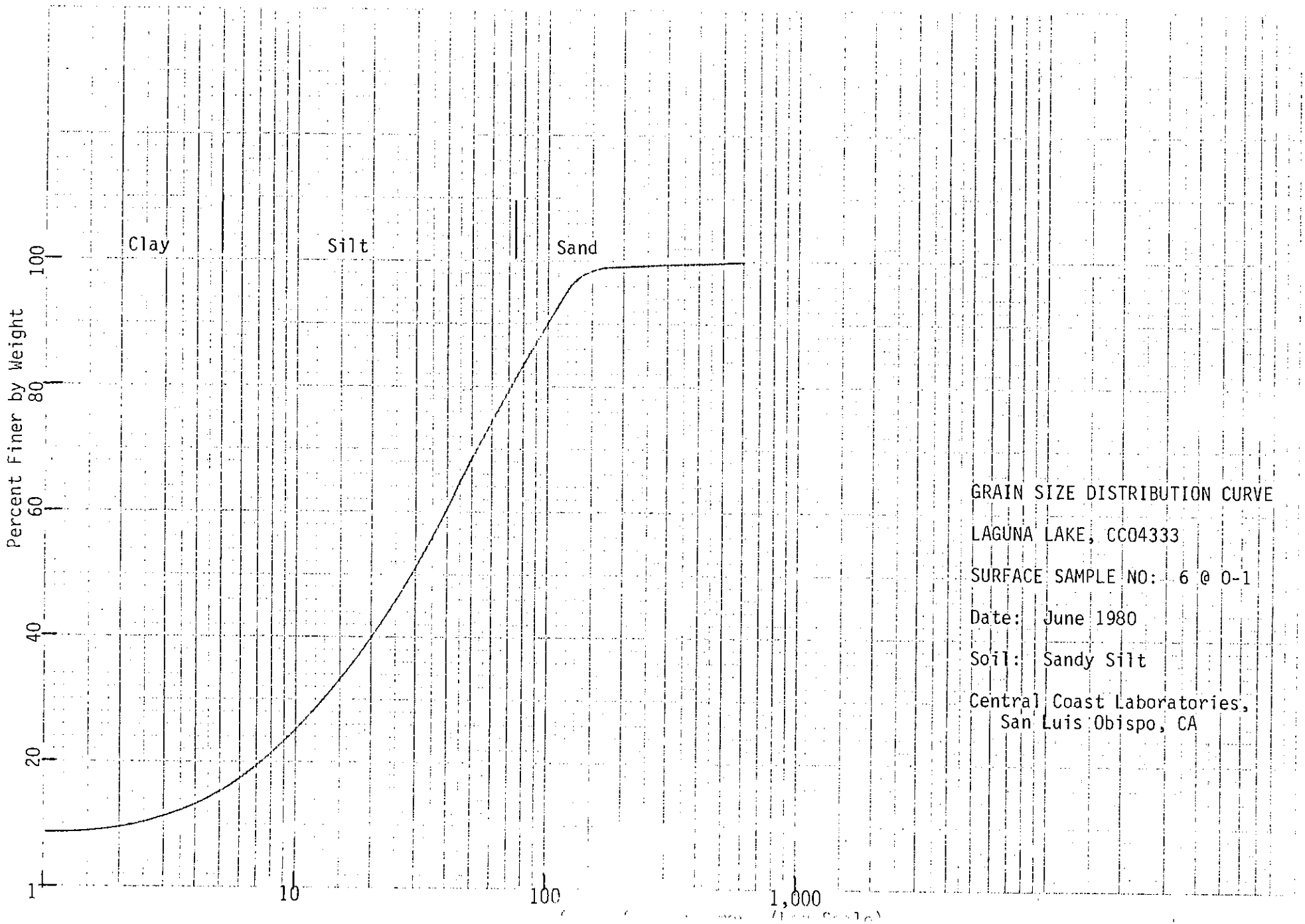
SURFACE SAMPLE NO: 5 @ 0-1

Date: June 1980

Soil: Silty Sand

Central Coast Laboratories,
San Luis Obispo, CA

SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
46 6210



GRAIN SIZE DISTRIBUTION CURVE

LAGUNA LAKE, CC04333

SURFACE SAMPLE NO: 6 @ 0-1

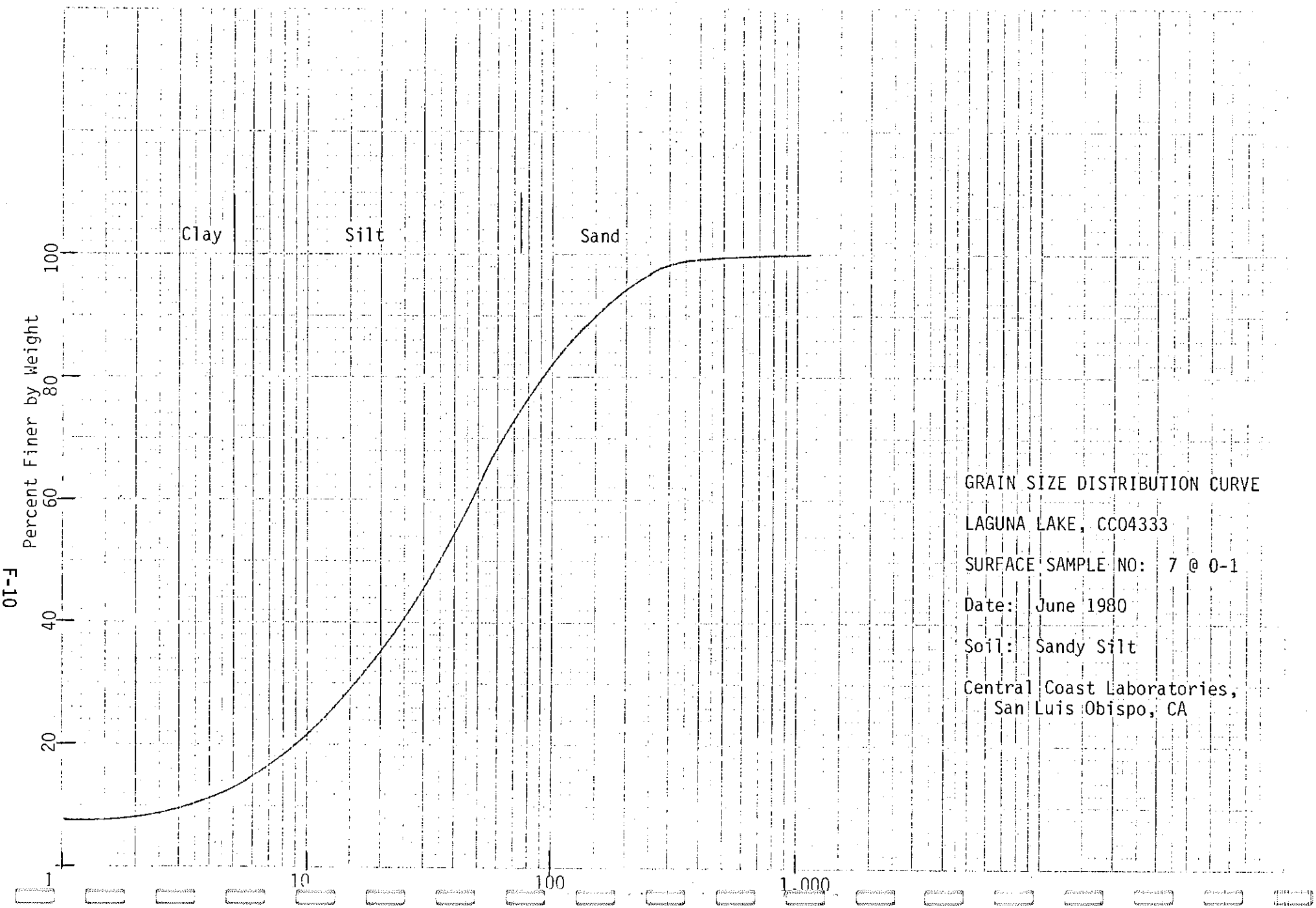
Date: June 1980

Soil: Sandy Silt

Central Coast Laboratories,
San Luis Obispo, CA

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.

46 6210



GRAIN SIZE DISTRIBUTION CURVE

LAGUNA LAKE, CC04333

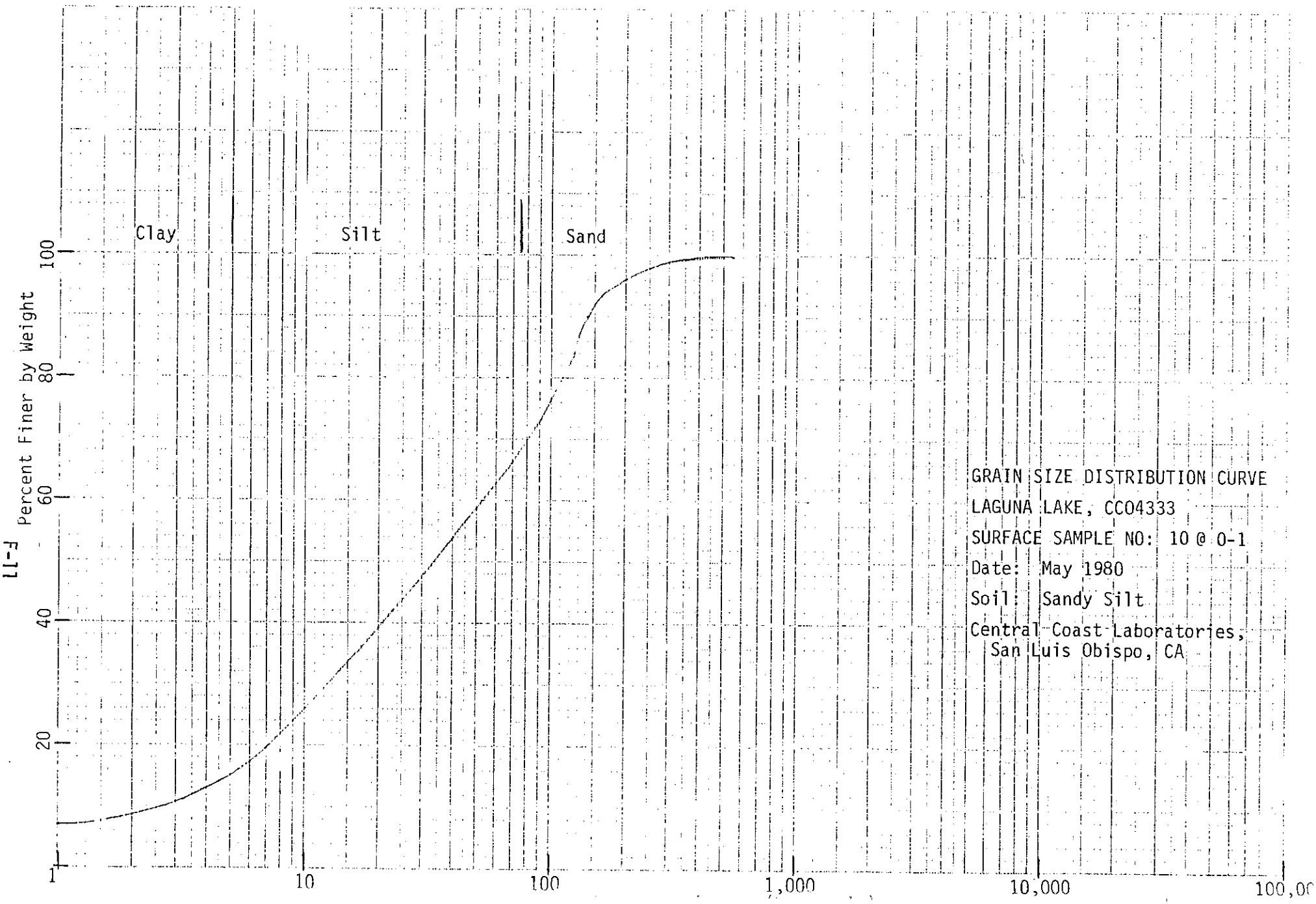
SURFACE SAMPLE NO: 7 @ 0-1

Date: June 1980

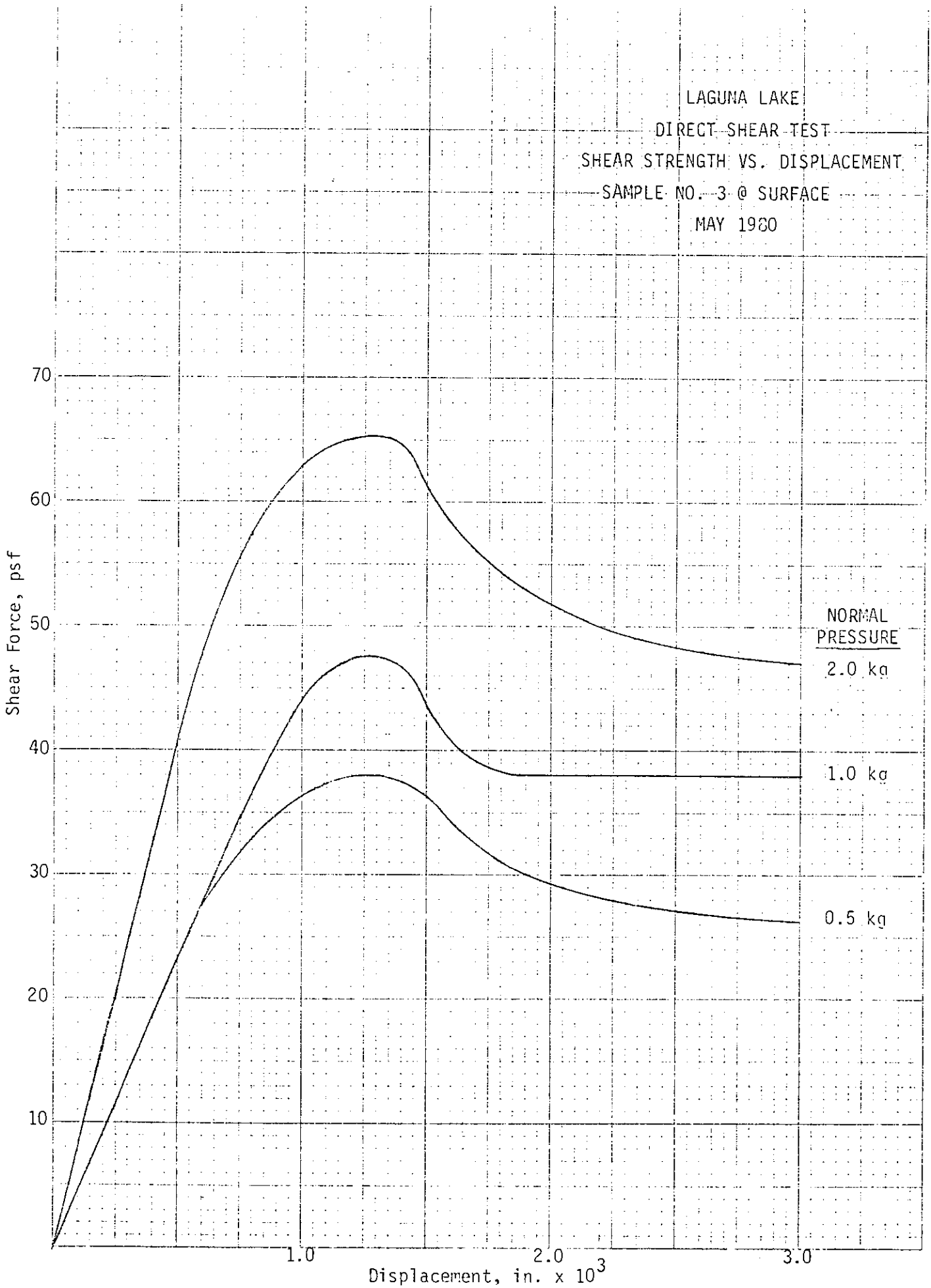
Soil: Sandy Silt

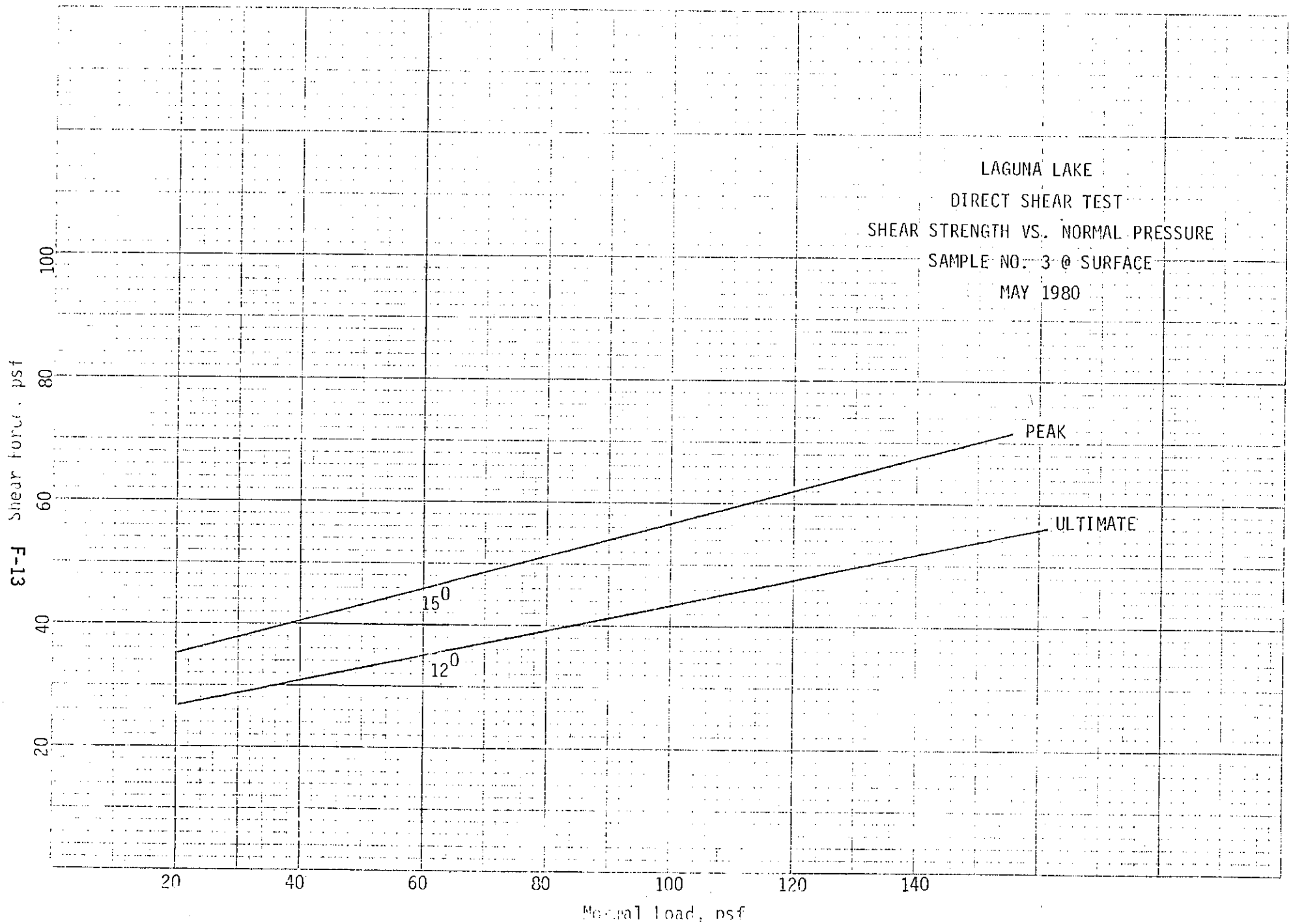
Central Coast Laboratories,
San Luis Obispo, CA

SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
46 6210



GRAIN SIZE DISTRIBUTION CURVE
LAGUNA LAKE, CCO4333
SURFACE SAMPLE NO: 10 @ 0-1
Date: May 1980
Soil: Sandy Silt
Central Coast Laboratories,
San Luis Obispo, CA


LAGUNA LAKE
DIRECT SHEAR TEST
SHEAR STRENGTH VS. DISPLACEMENT
SAMPLE NO. 3 @ SURFACE
MAY 1980
Shear Force, psf
70
60
50
40
30
20
10
1.0
2.0
3.0
Displacement, in. x 10^3
NORMAL PRESSURE
2.0 kg
1.0 kg
0.5 kg


LAGUNA LAKE
DIRECT SHEAR TEST
SHEAR STRENGTH VS. NORMAL PRESSURE
SAMPLE NO. 3 @ SURFACE
MAY 1980
PEAK
ULTIMATE
15°
12°
Shear force, psf
Normal load, psf
20
40
60
80
100
120
140

GEOTECHNICAL REPORT
LAGUNA LAKE DREDGING PROJECT
SAN LUIS OBISPO, CALIFORNIA

PG-7873-W01

AUGUST 3, 1992

Copyright © 1992
Earth Systems Consultants
Northern California
All Rights Reserved

DRAFT

August 3, 1992

JOB NO.: PG-7873-W01
DOC. NO.: 9207-366.RPT

NOT FOR DESIGN PURPOSES

Ms Barbara Lynch
City of San Luis Obispo
955 Morro Street
San Luis Obispo, CA 93401

PROJECT: LAGUNA LAKE DREDGING PROJECT
SAN LUIS OBISPO, CALIFORNIA

SUBJECT: Geotechnical Report

Dear Ms Lynch:

This draft geotechnical report has been prepared for your review prior to use in the development of plans for the proposed dredging of Laguna Lake in San Luis Obispo, California.

Three copies of this report are submitted for your review.

We appreciate the opportunity to have provided geotechnical services for this project and look forward continuing to work with you in the future. If there are any questions concerning this report, please do not hesitate to contact the undersigned.

Sincerely,

EARTH SYSTEMS CONSULTANTS
Northern California, Pacific Geoscience Division

Dennis Shallenberger, G.E.

lr

NOT FOR DESIGN PURPOSES

AUGUST 3, 1992

TABLE OF CONTENTS

GEOTECHNICAL REPORT
LAGUNA LAKE DREDGING PROJECT
SAN LUIS OBISPO, CALIFORNIA

JOB NO. PG-7873-W01

		Page
1.0	INTRODUCTION	1
2.0	SCOPE OF WORK	2
3.0	PREVIOUS INVESTIGATION	3
4.0	FIELD AND LABORATORY INVESTIGATION	3
5.0	PRESENTATION OF LABORATORY TEST DATA	5
6.0	CONCLUSIONS	6
7.0	RECOMMENDATIONS	9
7.1	Pond Construction	9
7.2	Dredging Operations	10
7.3	Pond Operation	10
7.4	Pond Drain System	12
7.5	Pond Subdrains	13
7.6	Discharge of Water to Lake	14
8.0	OBSERVATION AND TESTING	14
9.0	CLOSURE	16

APPENDIX A
Site Map (see map pocket
Cross Sections (see map pocket)
APPENDIX B
Laboratory Test Results
APPENDIX C
Suggested Drain System

DRAFT

1.0 INTRODUCTION

The Laguna Lake Dredging Project will involve the removal of up to 5 feet of material from about 80 acres of the lake bottom. The dredging operations are expected to result in approximately 300,000 yards of sediment. The dredging equipment will mix water and the lake bottom sediment at a ratio of about 10:1; the material will then be removed to a 25-acre site located northwest of Laguna Lake Park. The material will be left in place, and eventually used as parkland. No future buildings or other types of improvements are planned. The dredging operations are expected to continue for several years, with an anticipated start date of 1993.

We understand that the work is expected to be performed for 8 hours per day, which will result in approximately 6 hours of actual dredging each day. Due to environmental concerns, no dredging will be conducted during the winter months. While the specific model of dredge has not been determined at this time, we assume that it will remove on the order of 100 yards of sediment per hour. Mixing it at a ratio of 10:1 will result in approximately 1100 yards of slurry per hour. The dredge will traverse the lake in a pattern controlled by a cable system. It is anticipated that the dredge will remove the sediment in relatively shallow, successive layers.

The 25-acre parcel that is to receive the spoils is owned by the City. We understand that there may be some environmental concerns that need to be considered in the placement of the spoils; however, the nature, extent, and potential limitations imposed by these concerns are unknown to this office at this time.

2.0 SCOPE OF WORK

Our scope of work was based upon information provided in a Request for Proposal dated August 20, 1992 issued by the City, as modified by several meetings with representatives of the City and the City's environmental consultants. Our firm was retained to address several specific geotechnical concerns associated with the project. These included the following:

- address the stability of the waterfront slopes and develop recommendations for how to conduct dredging operations without compromising the integrity of the existing waterfront structures;
- develop recommendations for preparation of the site to receive the dredged spoils, placement, drying, and compaction of the soils;
- provide recommendations for transport of water from the basins back to the lake;
- provide recommendations for finish grading, dust control, and landscape.

To aid in the analysis of the site, the City provided a hydrographic survey of the lake bottom and five cross sections. The cross sections are shown on the attached site map (Appendix A) as Sections A through E.

It should be noted that, due to the nature of the project, standard tests were not available to develop the data necessary to address some of the specific concerns of the City. Some of the tests performed during the course of this study were therefore devised by this firm specifically for this project. The City should be aware that the conclusions based upon the tests are necessarily of a theoretical nature and are presented for preliminary planning purposes. Field observations will be required and modifications to the recommended program

may be necessary once such parameters as drying times are more firmly established under actual field conditions.

3.0 PREVIOUS INVESTIGATION

A dredging program for the lake was previously addressed in an evaluation performed by Central Coast Laboratories in June, 1980. During that investigation, samples were taken from the south shore of the lake and from the mouth of Prefumo Creek. The locations of the samples are shown on the site map. The samples taken from the south shore of the lake yielded clay contents of up to 90 percent. In the subsequent report, Central Coast Laboratories estimated that the expansion of these soils from a dry to a wet condition would be in the range of 20 to 30 percent. In contrast, the soil samples obtained from the mouth of Prefumo Creek were found to consist primarily of silty sands and sandy silts.

A direct shear test was performed on a sample taken from the surface of the lake bottom near the boat ramp (the north shore.) The sample yielded a cohesion of 30 psf and an angle of shearing resistance of 14 degrees.

The report recommended that dredging operations be set back a minimum of 30 feet from the shoreline and that the slopes resulting from the dredging not exceed 5 to 10 percent.

4.0 FIELD AND LABORATORY INVESTIGATION

As part of the current investigation, ten samples were obtained by driving Shelby thin tubes into the bottom of the lake. This was accomplished using hand equipment. The locations of the samples are shown on the site map; the depths of the samples were from 10 to 30 inches below the bottom of the lake.

The Shelby tube samples were tested for unit weight and moisture in accordance with ASTM D 1188-83, as modified for soil, and tested with a pocket penetrometer. Due to the

variations in soil type, the samples were then combined to form a composite sample. The purpose of this was to obtain "average" values for planning purposes, although the client must recognize that in the field the values will actually vary according to soil type. A specific gravity test was performed on the solids of the composite sample. The sample was also analyzed for organic content in accordance with ASTM D 2974-87, Method A. The maximum dry density of the soil was determined by performing a maximum density versus optimum moisture test in accordance with ASTM D 1557-78.

Hydrometer and sieve analyses were then performed upon the composite sample. Sieve analyses were performed in accordance with ASTM C 136. Two hydrometer analyses were performed; the first was conducted for the purpose of soil classification in accordance with ASTM D 422-63 using distilled water and a dispersing agent. To more closely simulate the actual field conditions, a second hydrometer analysis was performed using tap water and no dispersing agent. For the second test, the grain size in suspension versus elapsed time and the percentage of sediment in suspension versus elapsed time were then plotted.

To estimate the drying times required for the sediment slurry, a composite sample was mixed with water to achieve a consistency that is expected to be similar to the dredged slurry. The mixture was then distributed into two molds 10 inches in diameter and 12 inches in height (.61 cubic feet). The soils were allowed to settle and the water was decanted. The sequence was then repeated until the molds were full of sediment and no free water remained. The molds were weighed at this time. One mold was then placed outdoors and one was placed in the laboratory. The outdoor sample was protected from rain during inclement weather by an awning. The laboratory sample was subjected to a fan to create an artificial wind situation for 8 hours per day. The samples were periodically weighed and data regarding wet density

versus elapsed time and moisture content versus elapsed time was plotted. After just a few days, it became apparent that the volume loss was going to be considerable. The volume was then measured on a periodic basis, and the percent volume loss versus elapsed time was also plotted.

Please refer to Appendix B for the laboratory test data.

5.0 PRESENTATION OF LABORATORY TEST DATA

The dry densities of the Shelby thin tube samples ranged from 32.1 pcf to 92.0 pcf. The moisture content ranged from 31.2 percent to 125.7 percent. There was, expectedly, a strong correlation between high moisture content and low dry density in the samples. Pocket penetrometer readings on the Shelby tube samples yielded a range of unconfined compressive strengths of 0.20 tsf to over 4.75 tsf, with the majority of the samples in the range of 0.25 tsf to 0.75 tsf.

The specific gravity of the composite sample was found to be 2.35; the organic content was 5.5 percent. The maximum density of the composite sample was 111.4 pcf at a moisture content of 14.3 percent.

The sieve and hydrometer analyses indicated that the composite sample was a clayey sand. While there were only minimal differences in the results yielded by the two methods used, the test using the dispersing agent indicated a 2 to 3 percent higher content of clay size particles than the test performed without the dispersing agent.

A smooth curve depicting moisture loss versus elapsed time was generated for the sample dried outdoors. An anomaly was apparent, however, in the curve generated for the indoor sample ten days after the initiation of the test. This was due to the fan used to create the artificial wind, which was inadvertently left operating over a weekend. The anomaly is

brought to the client's attention as it graphically demonstrates the acceleration in drying time that is brought about by wind.

6.0 CONCLUSIONS

The unit weights (dry densities) of the samples obtained varied from about 1/2 the weight of water to 1.5 times the weight of water. This is indicative of highly variable soils, some of which will very likely contain a high proportion of organic material. The samples we obtained yielded a clay content of approximately 2 percent, while the samples taken from a different part of the lake and analyzed by Central Coast Laboratories had a clay content of 90 percent. As with the other tests performed, this indicates wide variation in the soils types found in the lake environment.

The unconfined compressive strengths were somewhat higher than anticipated; the actual data were therefore incorporated into the slope stability analysis. The purpose of the analysis was to assess the *changes* in the safety factor that would result as the configurations of the existing slopes along the lake edge were altered by dredging. Please note that evaluation or opinions regarding the existing stability of the lake banks were not included within our scope of work. Cross Section B was selected for analysis as it is considered, in its present condition, the most critical slope. The PCSTABL5 computer program was used. This program, which was developed at Purdue University, has been used internationally for many years and is considered the foremost slope stability program in the industry. It is an IBM-PC/XT version of the mainframe program STABL5. Three limit equilibrium procedures are available in this program. These include the Modified Bishop, the Simplified Janbu, and the Spencer methods. These three procedures are all "method of slices", but they differ from the Ordinary Method of Slices in the simplifying assumptions that have been made to achieve

statistical determinancy, and the particular conditions of equilibrium are satisfied. The Modified Bishop method was used for this project.

Cross Section B was analyzed under the existing slope configuration and found to exhibit a safety factor of 1.80. When a 5-foot vertical cut is made at a distance of 25 feet from the shoreline, the safety factor is reduced to 1.37. This is considered an unacceptable reduction in the safety factor. The existing slope of the lake bottom for the purposes of this analysis, was then extended for a distance of 5 feet. A safety factor of 1.67 resulted. Again, this reduction in the safety factor indicates that this configuration would render the slope less stable than it is in its current condition. The third scenario involved a 2.5-foot vertical cut made at 50 feet from the shoreline, then continuing for an additional 25 feet before making a second 2.5 foot vertical cut. The safety factor resulting from this dredging configuration was 1.79, which is considered the same safety factor as the existing configuration. As this indicates that the dredging operation would not result in less stable conditions than those currently existing, this dredging configuration is recommended. Soil creep resulting from the dredging operations is not expected to affect lakefront structures.

Our laboratory studies relative to the drying times of samples indicated that optimum moisture content should be reached 35 to 55 days after the drying operations begin. Workable moisture, however, will be reached somewhat sooner as soils generally become workable at a moisture level of about 4 percent above optimum moisture. Workable moisture levels in the soil should be reached at 25 to 35 days after the drying operations begin.

The volume loss expected to result due to drying is about 25 to 30 percent at 25 to 35 days after the drying operations begin. This correlates well with the results obtained earlier

by Central Coast Laboratories, where a degree of soil expansion of 20 to 30 percent was anticipated.

If the soils are compacted to 80 percent of maximum dry density during the drying period, the volume loss is expected to increase to 28 to 38 percent (this *includes* the loss due to drying). If compacted to 90 percent of maximum dry density, the loss in volume is expected to be on the order of 42 percent.

Please note that the above estimates of time versus moisture loss are based upon ideal drying conditions, and do not take into account atmospherical conditions such as rain, foggy or cloudy conditions, or other situations that could result in disruption to the drying cycle.

Hydrometer analysis indicated that after one hour, 99 percent of the solids will have precipitated out of solution; the particles remaining in suspension will have a diameter of 8 microns or less. After 12 hours, the only particles remaining in suspension will be those having a diameter of 2.5 microns or less.

In summary, our field investigation and laboratory analyses indicate that the dredging operation is feasible from a geotechnical standpoint. The dredging operations should begin a minimum of 50 feet from the shoreline, and the first cut should have a maximum depth of 2.5 feet. Another 2.5-foot vertical cut can be made at an additional distance of 25 feet from the first cut, or a total distance of 75 feet from the shoreline. This dredging configuration is not expected to result in destabilization of any shoreline improvements.

Our laboratory studies have shown that use of a rotating sequence of drying ponds is a feasible approach for placement of spoils, and that drying can be achieved within a reasonable time (4 to 6 weeks) period. Conventional cut and fill construction is expected to be the most economical alternative for ponds. After the dredging operations are completed, the pond sites

should be suitable for use as parkland, although importation of topsoil may be necessary for landscaping purposes. No structures or other improvements should be constructed in the parkland area unless additional analysis is performed.

7.0 RECOMMENDATIONS

7.1 Pond Construction

1. On-site materials are suitable for use in pond construction. A balanced cut and fill would be the most appropriate grading solution from an economic standpoint.
2. No special preparation of the subgrade between ponds will be necessary. Beneath the berms, the soil should be scarified to a depth of 1 foot, moisture conditioned, and recompacted.
3. The maximum slopes for the inside and outside faces of the berms should not exceed 2:1.
4. Fill should be placed in level lifts not exceeding 8 inches, moisture conditioned and compacted to a minimum of 90 percent of maximum dry density.
5. The soil should be kept moist during earthwork operations to reduce the potential for dust. Provided that the soils are kept moist, no significant dust is anticipated during berm construction. Dust is not expected to be significant when compaction of the spoils is in progress as the soils will be in a moist state.
6. When the dredging operations have been completed and the ponds filled and dried, the berms can be demolished and the area contoured to achieve a natural appearance. Landscaping should be planted to minimize erosion.

7.2 Dredging Operations

1. No dredging operations should take place within 50 feet of the shoreline. The shoreline should be considered the water's edge when the lake is at its maximum elevation, i.e., spillway elevation.
2. At a distance of 50 feet from the shoreline, a maximum vertical cut of 2.5 feet may be made.
3. At a distance of 75 feet from the shoreline, a maximum vertical cut of an additional 2.5 feet may be made.
4. These vertical cut slopes will not be maintained in the lake environment; within a period of one year, it is anticipated that the vertical cuts will be reduced to smooth slopes.
5. If the above setbacks are maintained, no adverse impacts upon shoreline structures due to the dredging operations are anticipated. This includes creep, as well as catastrophic failures. The City should be aware, however, that damage to any shoreline structures, whether or not attributable to the dredging operations, is likely to be blamed upon such operations. It would be prudent to conduct a reconnaissance that includes comprehensive documentation and photographs of the shoreline area, including existing residences, fences, retaining walls, and other improvements prior to initiating the dredging operations.

7.3 Pond Operation

1. The ponds should be planned to operate in pairs. As one pond is in the process of being filled with spoils, the second pond should be draining. Our studies

have indicated that most of the solids will have precipitated from a suspended state within a 12-hour time period.

2. Spoils should be pumped into the ponds until approximately 1 foot of sediment has accumulated. The pond should then be allowed to begin the drying process. If more than 1 foot of sediment is allowed to accumulate, the drying time could be significantly increased. Please note that this recommended maximum thickness is based upon our laboratory studies which do not take into consideration rain, fog, or other such factors. The appropriate thickness may be adjusted depending upon the actual field conditions, or varied seasonally.

3. A sufficient number of pond pairs should be planned so that the rotational cycle can allow for a pair to be left to dry for a period of 4 to 6 weeks. At the end of this period, the first pair of ponds should be sufficiently dry to allow the first layer of sediment to be compacted. The filling and draining sequence may then be repeated.

4. Obtaining a uniform 1-foot thickness of soil across the entire pond bottom may be difficult, particularly when dredging more granular soil. Granular soils tend to more readily settle out of suspension, which will lead to piles of sediment concentrated near the pump discharge point. It may be necessary to adjust the location of the hose several times during one filling period to avoid this.

5. The ponds should be planned to be as large as possible, while still maintaining a 6-week drying time. Six weeks should be anticipated for drying, although under favorable conditions a 4-week drying time is possible. The advantage of larger ponds is primarily in relationship to berm construction; the larger the

NOT FOR DESIGN PURPOSES

pond the less berms will be necessary, and lower berm heights will be sufficient as thinner sediment lifts will be possible.

7.4 Pond Drain System

1. Several systems were considered in the development of suggestions for a drain system for the ponds. Siphons and pump systems would readily dispose of the majority of the water; however, they would not be effective in removing the last few inches of water. The last few inches of water should be removed, however, as its presence will greatly increase the drying time of the spoils. A concrete structure with a weir that could be adjusted to varying elevations as the water level decreased was also considered. This solution was discarded due to the cost of constructing such a structure in each pond; a single point of discharge is also not the most effective method of draining as there are likely to be variations in the elevations of the areas to be drained.

2. We recommend a system of a solid central drain fed by slotted vertical pipes (please see attached diagram, Appendix C). The vertical slotted pipes, i.e. well casing, could consist of relatively short standpipes that could be augmented as necessary by additional pipe as the depth of sediment increases.

3. The slotted pipes should be wrapped in silt fence material to provide additional filtering capacity. The client should be aware, however, that despite the use of the filter material, very fine-grained sediment will be suspended in the water and will settle out and accumulate when water is standing in the pipes. Provisions should be made to accommodate this; the pipes should be sufficiently

sloped to scour clean with each discharge. It is recommended that a cleanout be planned at the upper end of the pipe.

4. The tops of the pipes should always be above the water level, or should be capped to prevent floating debris from gaining access to the pipe.

5. A valve should be installed downslope of the berm. The valve should be closed when the pond is filled so that no water can escape until sufficient time has elapsed for the contained water to have deposited most of its sediment load.

7.5 Pond Subdrains

1. There will be a tendency for water to percolate out of the sediment and accumulate at the bottom of the pond. Such water will not be intercepted by the pond drain system. To accommodate this water and therefore facilitate the drying of the spoils, it is recommended that a gravel subdrain (French drain) be installed at the bottom of each pond. This drain would be separate from the pond drain system; its purpose is to provide a long-term mode of discharge for "nuisance" water that will not be removed by the pond drain system.

2. The subdrain should consist of a central general subdrain that will run the length of the pond. It should have a minimum width of 18 inches and a minimum depth of 2 feet. Lateral subdrains should be installed to cross the pond at intervals of 30 to 50 feet, and should feed into the central subdrain. The lateral subdrains should have a minimum width of 12 inches and a minimum depth of 12 inches.

3. All of the subdrains should have a minimum slope of 1 percent. The gravel should be encased in filter fabric. They should flow beneath the berms to

discharge to a convenient daylight point. As the drain system will be intercepting only "nuisance" water, large quantities of drainage are not anticipated.

7.6 Discharge of Water to Lake

1. We understand that the City has given some consideration to discharging water into the marsh at the northwest end of the lake. The purpose of this would be for the water to filter through the marsh before recirculating into the lake. If the City elects to do this, we recommend that the water be discharged over as wide an area as possible and that the water be discharged via perforated pipes.
2. To facilitate uniform discharge, the water should be discharged under pressure. This can be accomplished by gravity flow if the ponds are situated at a sufficiently higher elevation than the marsh, or by directing flow to a holding pond, where it would be pumped to a distribution pipe.
3. While sizing of pipes and other design aspects of draining the ponds is beyond the scope of this report, the City should be aware that a certain amount of sediment will remain suspended in the water for a period of time. This suspended sediment will eventually precipitate out and accumulate in the pipes. Cleanouts will be essential. In addition, the pipe should be sufficiently sloped or pressurized to provide a velocity that will clean the pipe of accumulated sediment.

8.0 OBSERVATION AND TESTING

It must be recognized that the recommendations contained in this report are based on limited subsurface information and rely on continuity of the subsurface conditions encountered.

It is assumed that this firm will be retained to review final plans once they are available, to provide consultation prior to and during construction, to interpret this report during construction, and to provide construction monitoring in the form of testing and observation. Unless otherwise stated, the term "compacted" or "recompacted" refers to soils (fill or native soils) placed in level lifts not exceeding 8 inches compacted to a minimum of 90 percent of maximum dry density. The standard test used to define maximum dry density and field density should be ASTM D 1557-78, ASTM D 2922-81, respectively, or other methods acceptable to the soils engineer or jurisdiction. Unless otherwise stated, "moisture conditioning" refers to the moistening or drying of soils to a near optimum level (generally within 3 percent of optimum moisture) prior to application of compactive effort. Soil moisture should be uniform throughout soils to be compacted. At a minimum, the following items should be observed by this firm:

- Stripping and clearing of vegetation and deleterious materials in berm areas
- Recompaction of scarified soils in berm areas
- Fill placement and compaction

It will be necessary to develop a program of quality control prior to beginning grading. It is the responsibility of the owner, contractor, or project manager to determine any additional inspection items required by other design professionals or the governing jurisdiction. A preconstruction conference between a representative of the owner, this firm, the grading engineer and general contractor is recommended to discuss planned construction procedures and quality control requirements. This firm should be notified at least 48 hours prior to beginning grading operations.

DRAFT

If Earth Systems Consultants Northern California is not retained to provide construction observation and testing services, it shall not be responsible for the interpretation of the information by others or any consequences arising therefrom.

9.0 CLOSURE

This report is valid for conditions as they exist at this time for the type of development described herein. The investigation was performed in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the locality of this project under similar conditions. No other representation, warranty, or guarantee is either expressed or implied.

This report is intended as a general guideline to aid the City in the planning of this project. Experimental methods were developed to address the specific questions posed by the City, and the recommended methods may require modification, depending upon actual findings in the field.

This report is intended strictly for use by the design team in the preparation of the project plans and specifications. Application beyond the intent of this report is strictly at the user's risk.

If changes with respect to development type or location become necessary, if items not addressed in this report are incorporated into plans, or if any of the assumptions stated in this report are not correct, this firm shall be notified for modifications to this report. Any items not specifically addressed in this report shall comply with the Uniform Building Code and the requirements of the governing jurisdiction.

This document, the data, conclusions, and recommendations contained herein are the property of Earth Systems Consultants Northern California. This report shall be used in its

NOT FOR DESIGN PURPOSES

entirety, with no individual sections reproduced or used out of context. Copies may be made only by this firm, the client, and his authorized agents for use exclusively on the subject project. Any other use is subject to federal copyright laws and the written approval of Earth Systems Consultants Northern California.

Thank you for this opportunity to have been of service. If you have any questions or if discussion of alternate concepts is desired, please feel free to contact this office at your convenience.

End of Text

APPENDIX A

Site Map (see map pocket)

Cross Sections (see map pocket)

APPENDIX B

Laboratory Test Results

DRAFT

Date:

NOT FOR DESIGN PURPOSES

PROJECT: LAGUNA LAKE DREDGING PROJECT
JOB NO.: PG-7873-W01
DATE: June 23, 1992

BULK DENSITY TEST RESULTS

SITE NO.	DEPTH Inches	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf	POCKET PENETROMETER tsf
1	20-30	41.4	113.2	80.1	0.75
2	10-20	57.9	95.1	60.2	0.50
3	10-22	117.9	82.6	37.9	0.20
4	10-22	125.7	72.5	32.1	0.75
5	10-22	31.6	121.0	92.0	1.50
6	24-36	48.4	107.0	72.1	0.25
7	10-20	68.9	90.3	53.5	0.25
8	10-22	31.2	114.7	87.4	>4.75
9	10-24	34.0	109.7	81.9	0.50
10	10-22	77.5	84.3	47.5	0.75

COMPOSITE SAMPLE

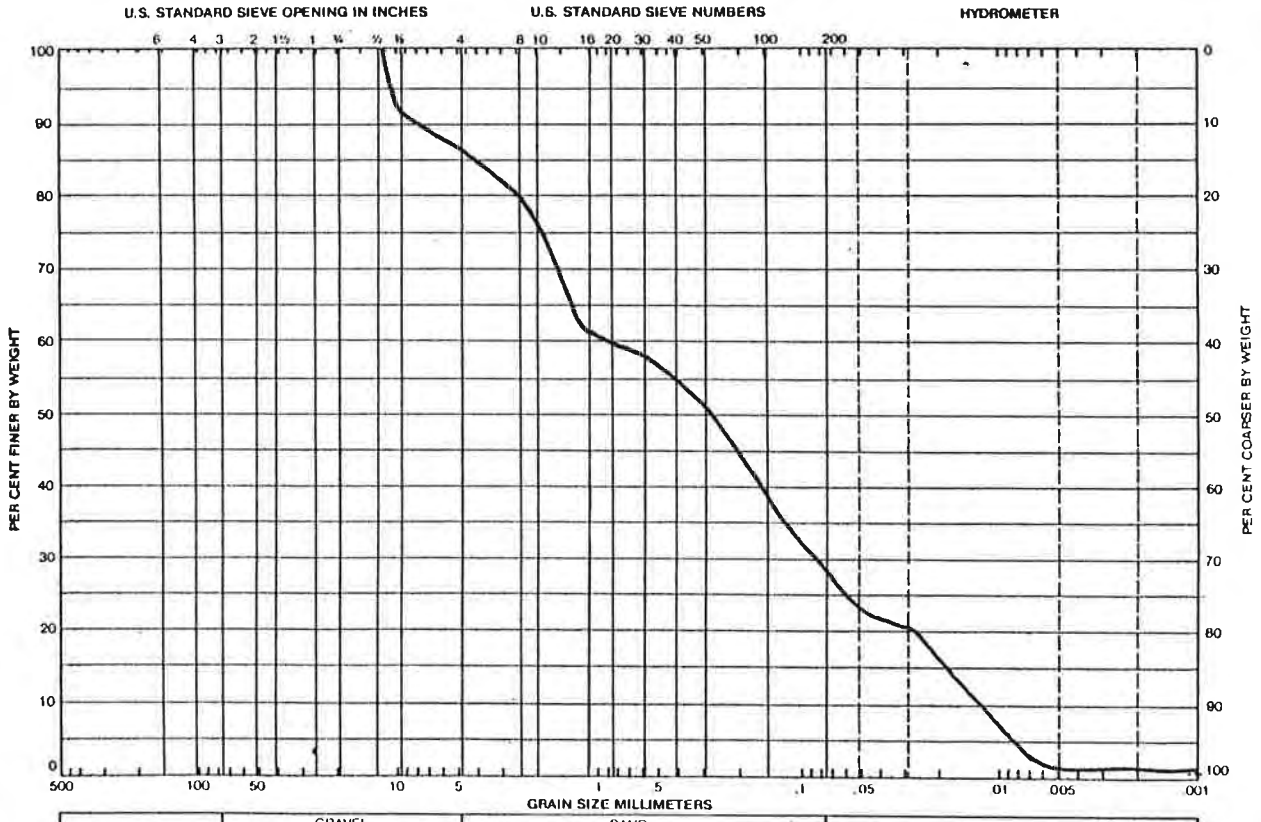
Specific Gravity: 2.35
Unified Soil Classification: SC
Soil Description: Dark Brown Silty Sand
Organic Content (ASTM D2974-87, Method C): 5.5%

DRAFT
Date:
NOT FOR DESIGN PURPOSES

PROJECT: LAGUNA LAKE DREDGING PROJECT
JOB NUMBER: PG-7873-W01
SAMPLE I.D.: COMPOSITE/WITHOUT DISPERSING AGENT
DATE: 23-Jun-92

PARTICLE SIZE ANALYSIS

Sieve size	% Retained (Cumulative)	% Passing (Cumulative)
1/2"	0	100
3/8"	8	92
#4	13	87
#8	20	80
#16	39	61
#30	42	58
#50	49	51
#100	62	38
#200	72	28
53 microns		23
28 microns		20
5 microns		1
2.5 microns		1
Colloids		1



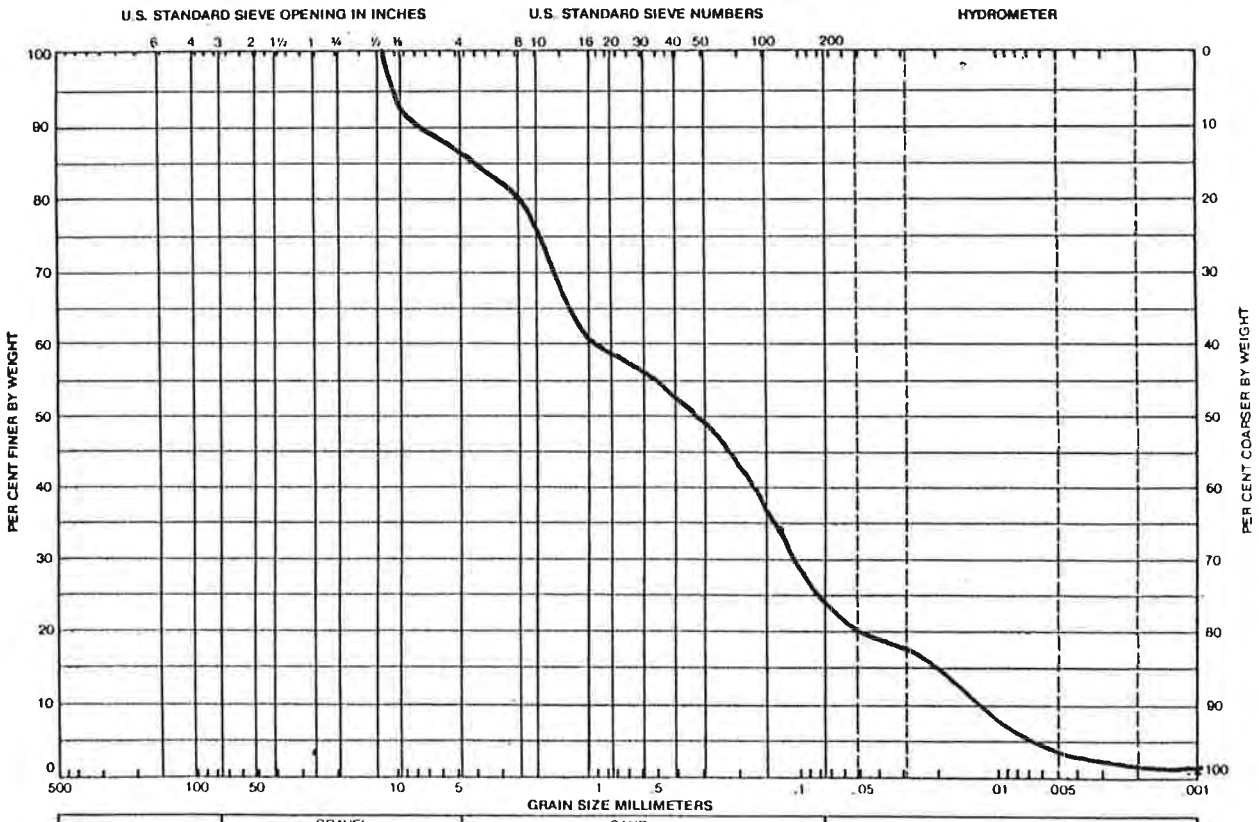
CLASSIFICATION	SYMBOL	LL	PL	PI
CLAYEY SAND	SC	–	–	–

DRAFT
Date:
NOT FOR DESIGN PURPOSES

PROJECT: LAGUNA LAKE DREDGING PROJECT
JOB NUMBER: PG-7873-W01
SAMPLE I.D.: COMPOSITE/WITH DISPERSING AGENT
DATE: 23-Jun-92

PARTICLE SIZE ANALYSIS

Sieve size	% Retained (Cumulative)	% Passing (Cumulative)
1/2"	0	100
3/8"	8	92
#4	13	87
#8	20	80
#16	40	60
#30	44	56
#50	51	49
#100	65	35
#200	76	24
53 microns		20
28 microns		18
5 microns		3
2.5 microns		1
Colloids		1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

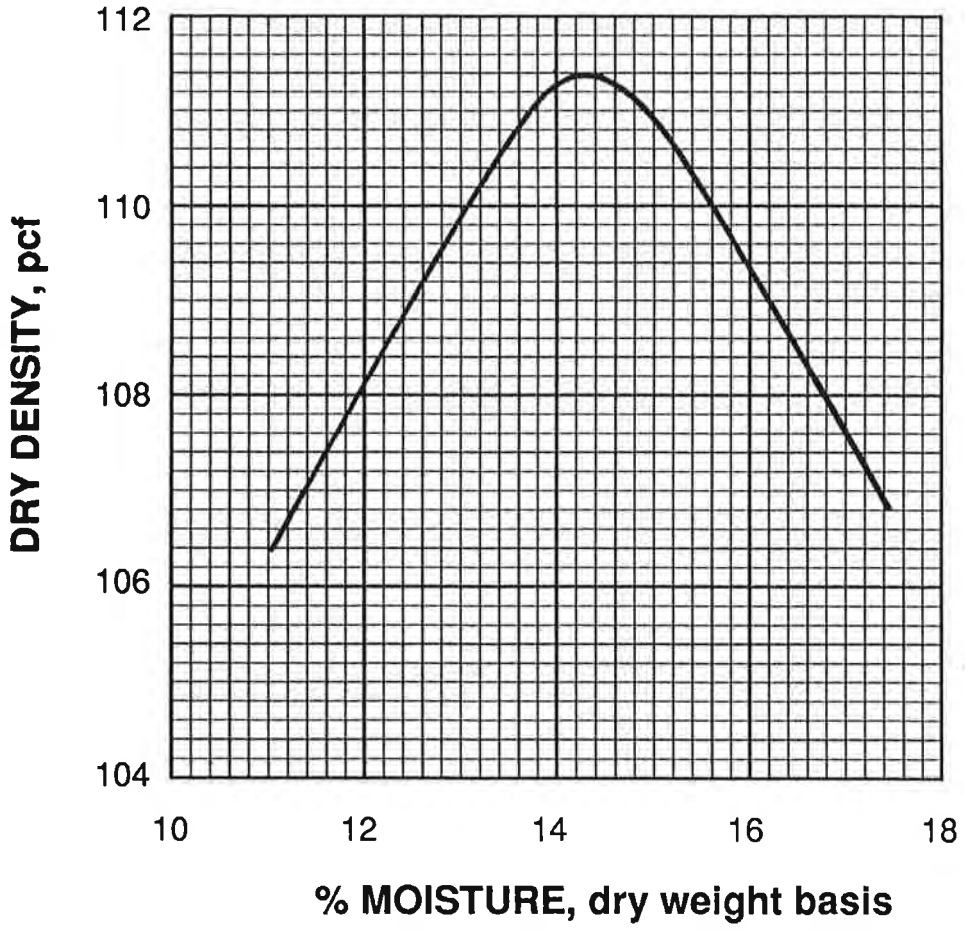
CLASSIFICATION	SYMBOL	LL	PL	PI
CLAYEY SAND	SC	—	—	—

DRAFT
Date:
NOT FOR DESIGN PURPOSES

MAXIMUM DENSITY/OPTIMUM MOISTURE CURVE

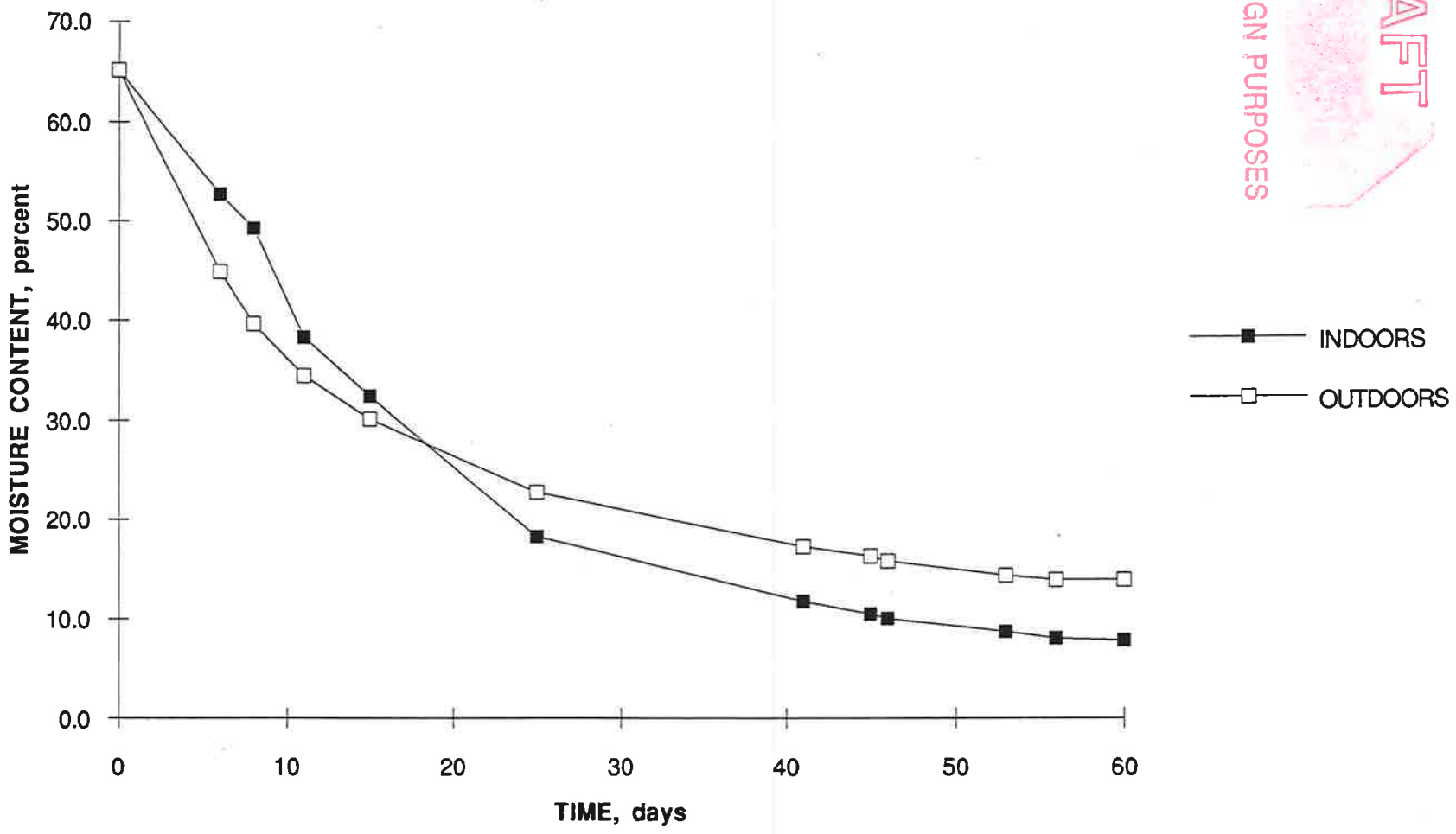
ASTM D-1557 METHOD: A

PROJECT: LAGUNA LAKE DREDGING PROJECT
DATE: 6/23/92
JOB NUMBER: PG-7873-W01



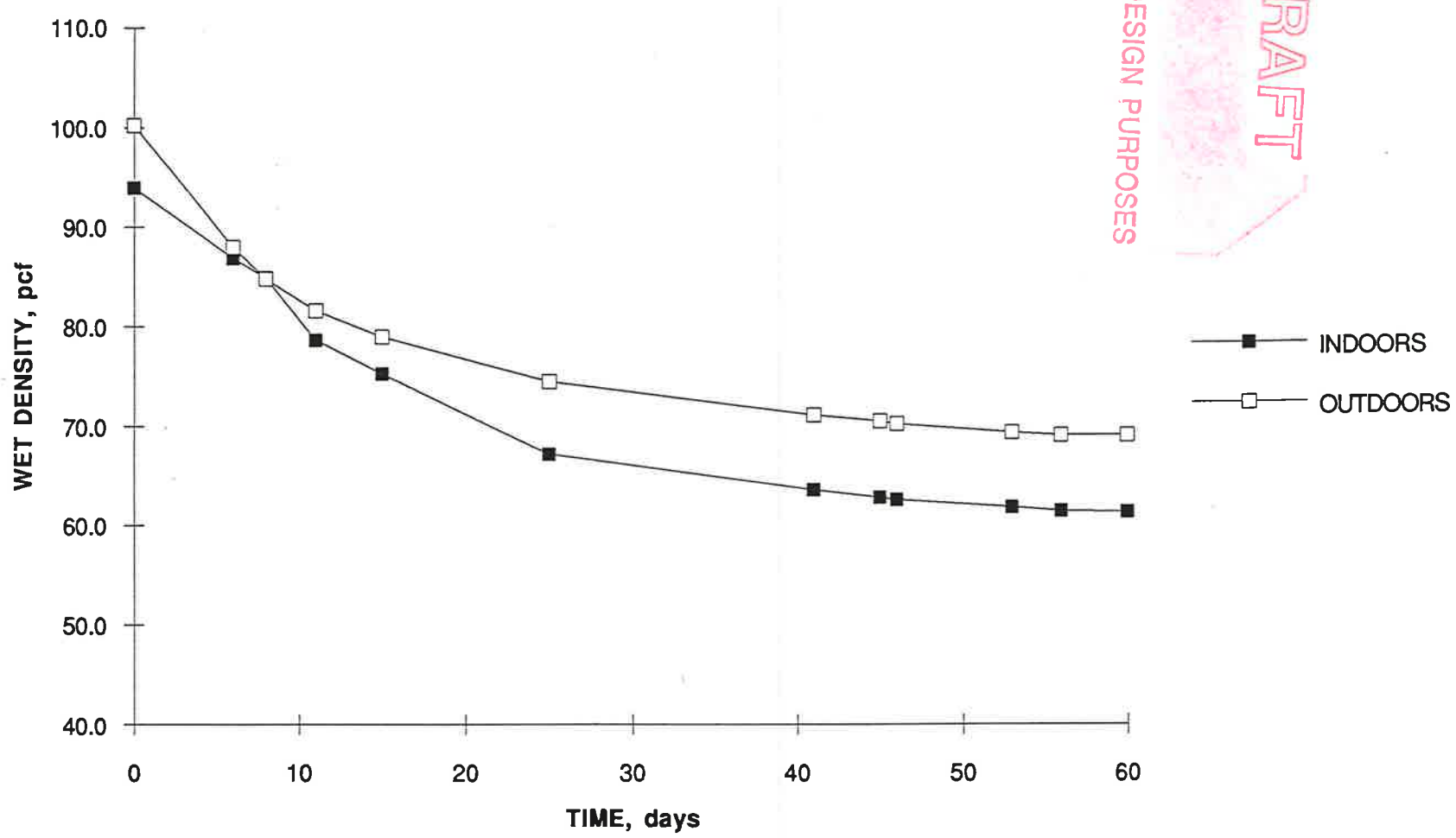
SAMPLE I. D.: COMPOSITE SAMPLE
SOIL DESCRIPTION: DARK BROWN CLAYEY SAND (SC)
MAXIMUM DENSITY, pcf: 111.4
OPTIMUM MOISTURE, percent: 14.3

MOISTURE CONTENT vs. TIME



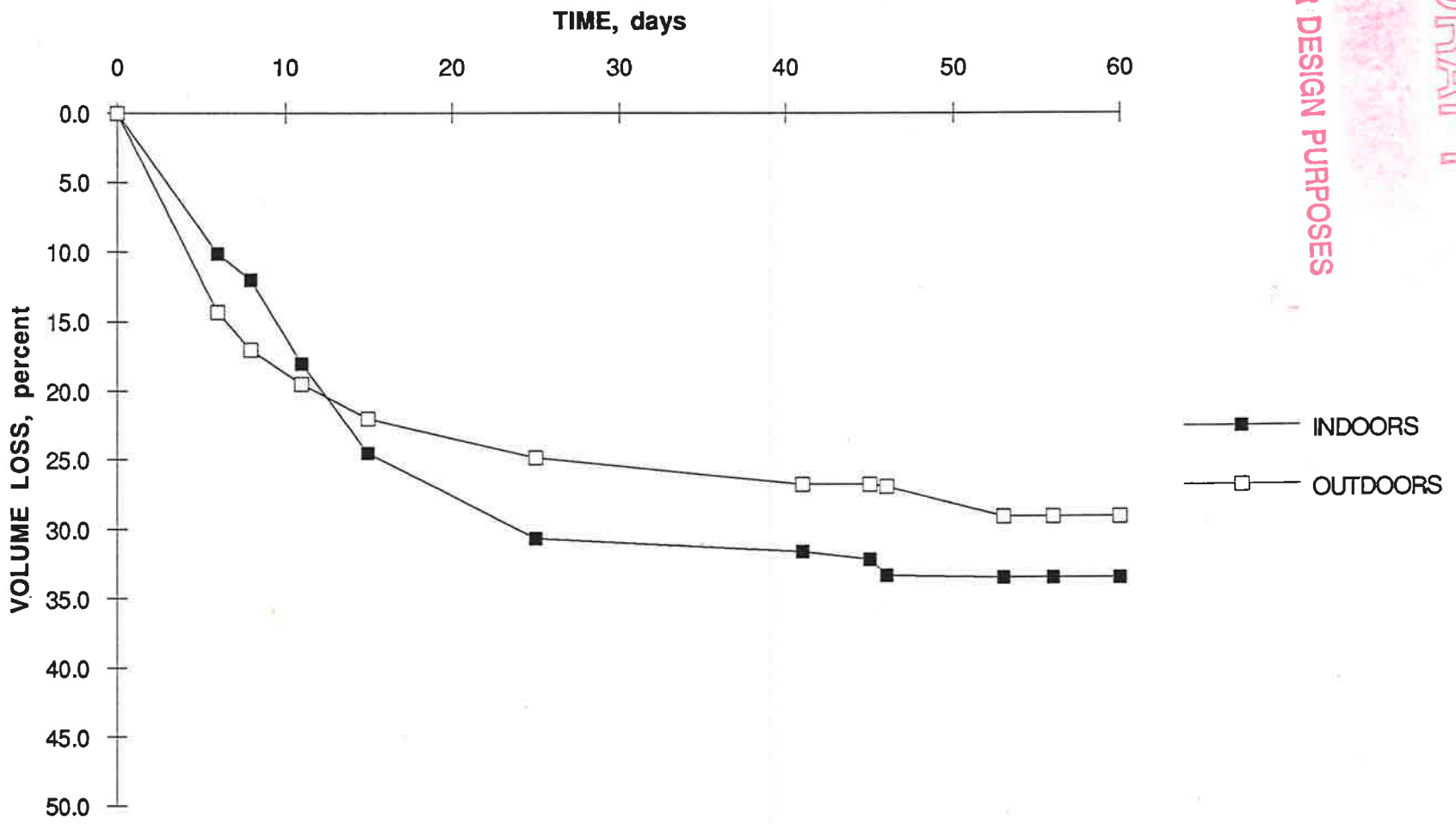
DRAFT
Date:
NOT FOR DESIGN PURPOSES

WET DENSITY vs. TIME



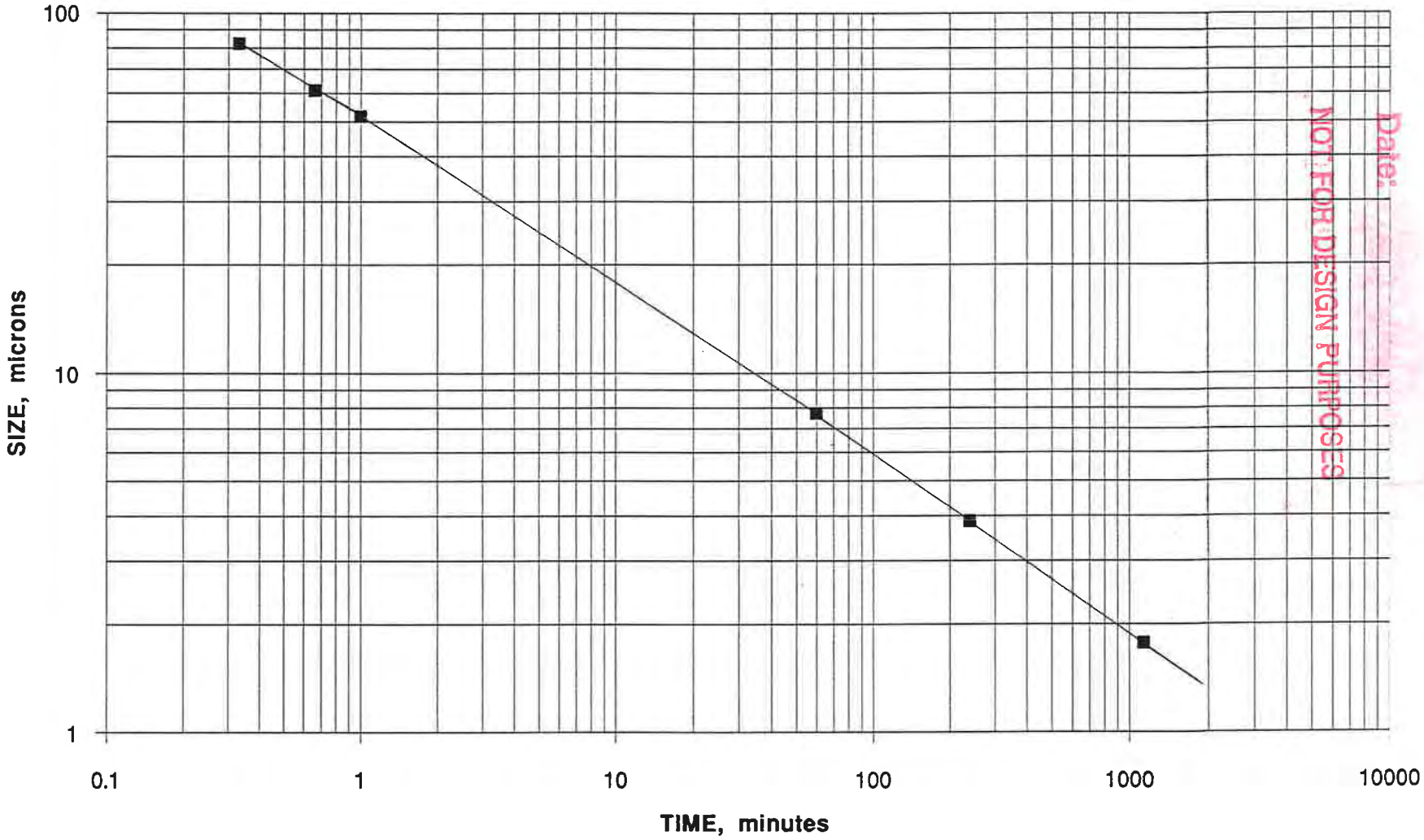
DRAFT
Date:
NOT FOR DESIGN PURPOSES

% VOLUME LOSS vs. TIME



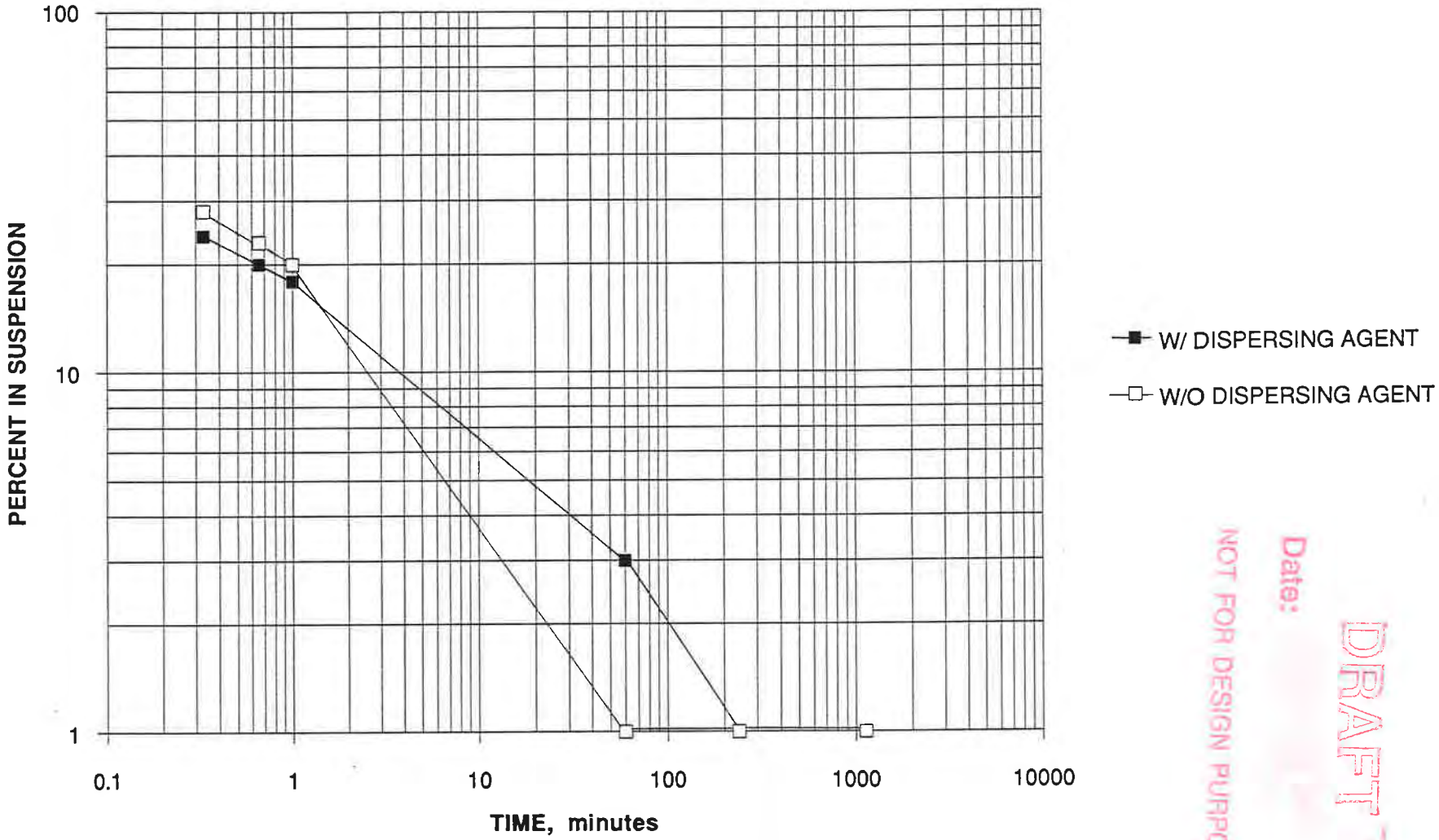
DRAFT
Date:
NOT FOR DESIGN PURPOSES

GRAIN SIZE IN SUSPENSION vs. TIME



DRAFT
NOT FOR DESIGN PURPOSES
Date:

PERCENT IN SUSPENSION vs. TIME

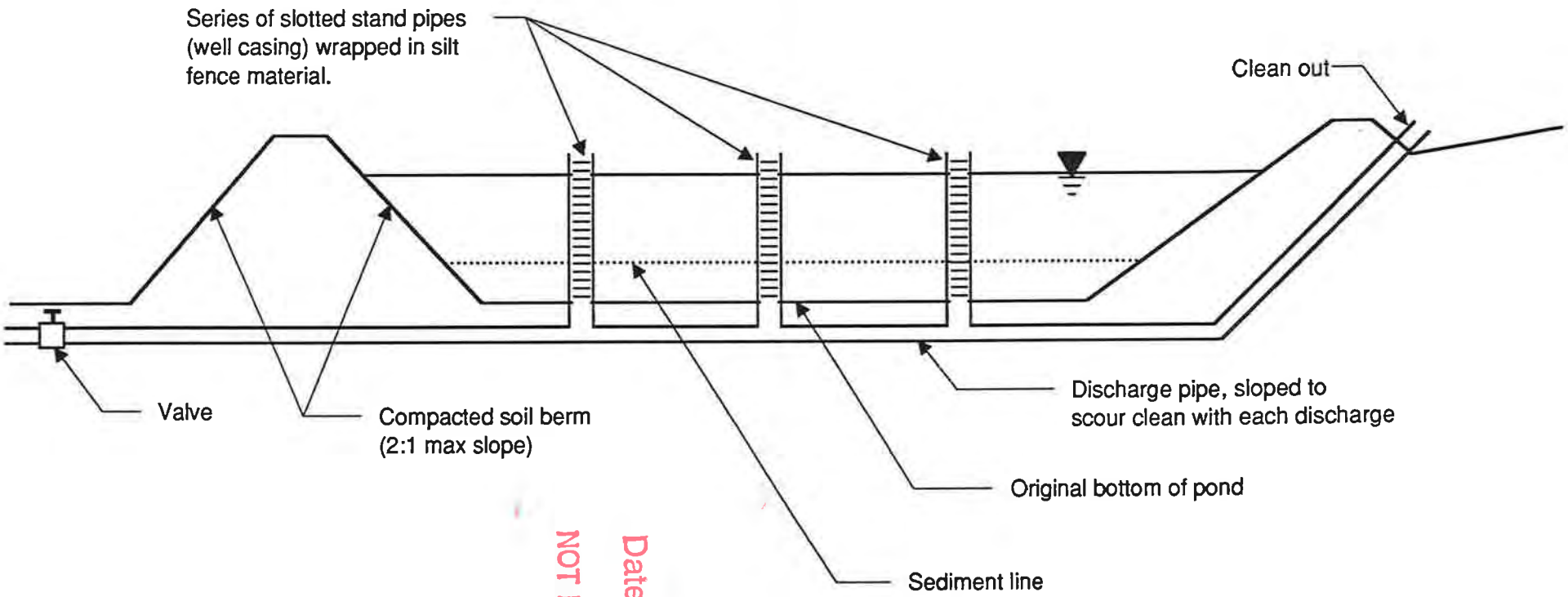


DRAFT
Date:
NOT FOR DESIGN PURPOSES

SUGGESTED DRAIN SYSTEM

(Schematic Only)

NOT TO SCALE

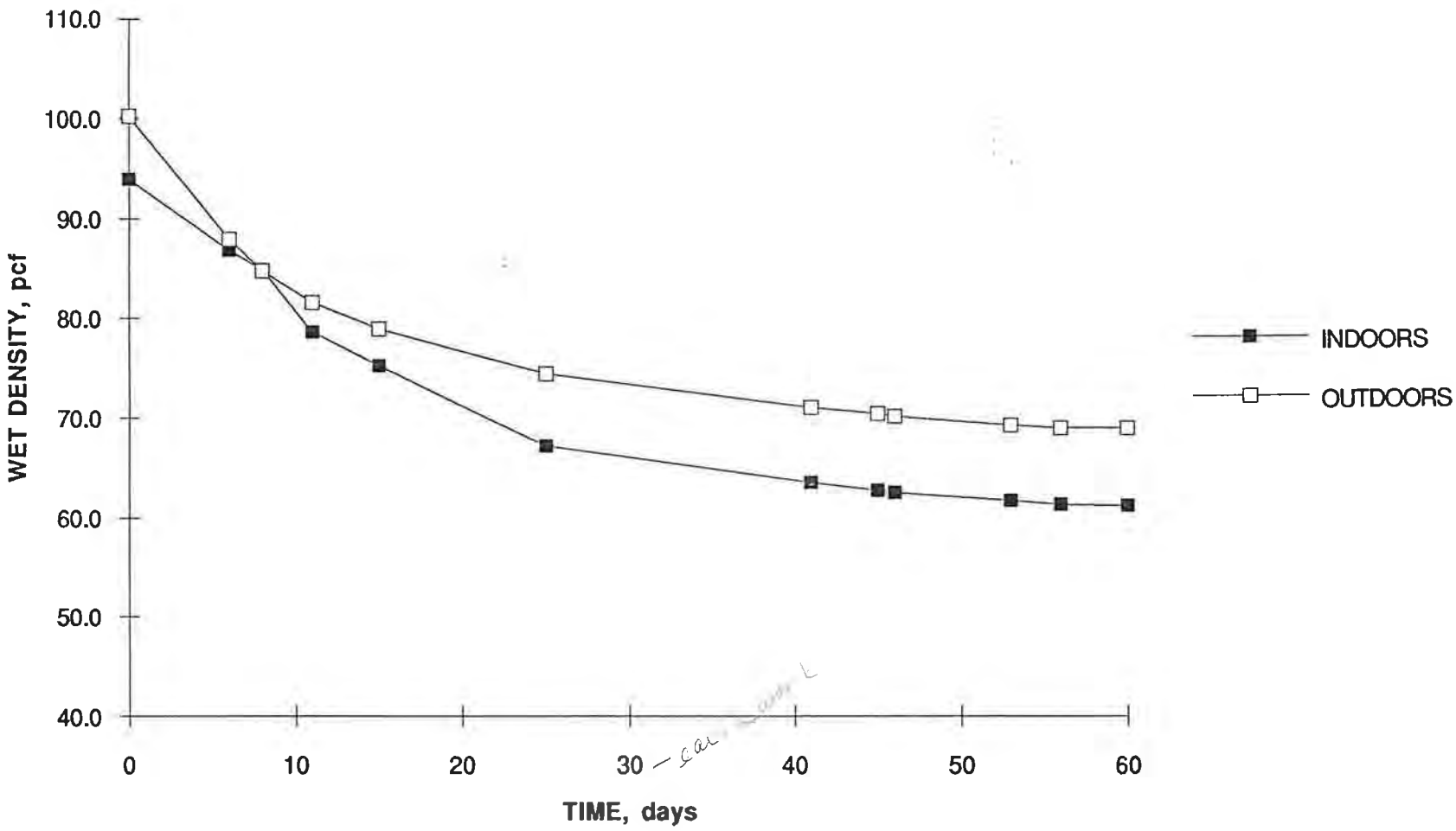


DRAFT
Date:
NOT FOR DESIGN PURPOSES

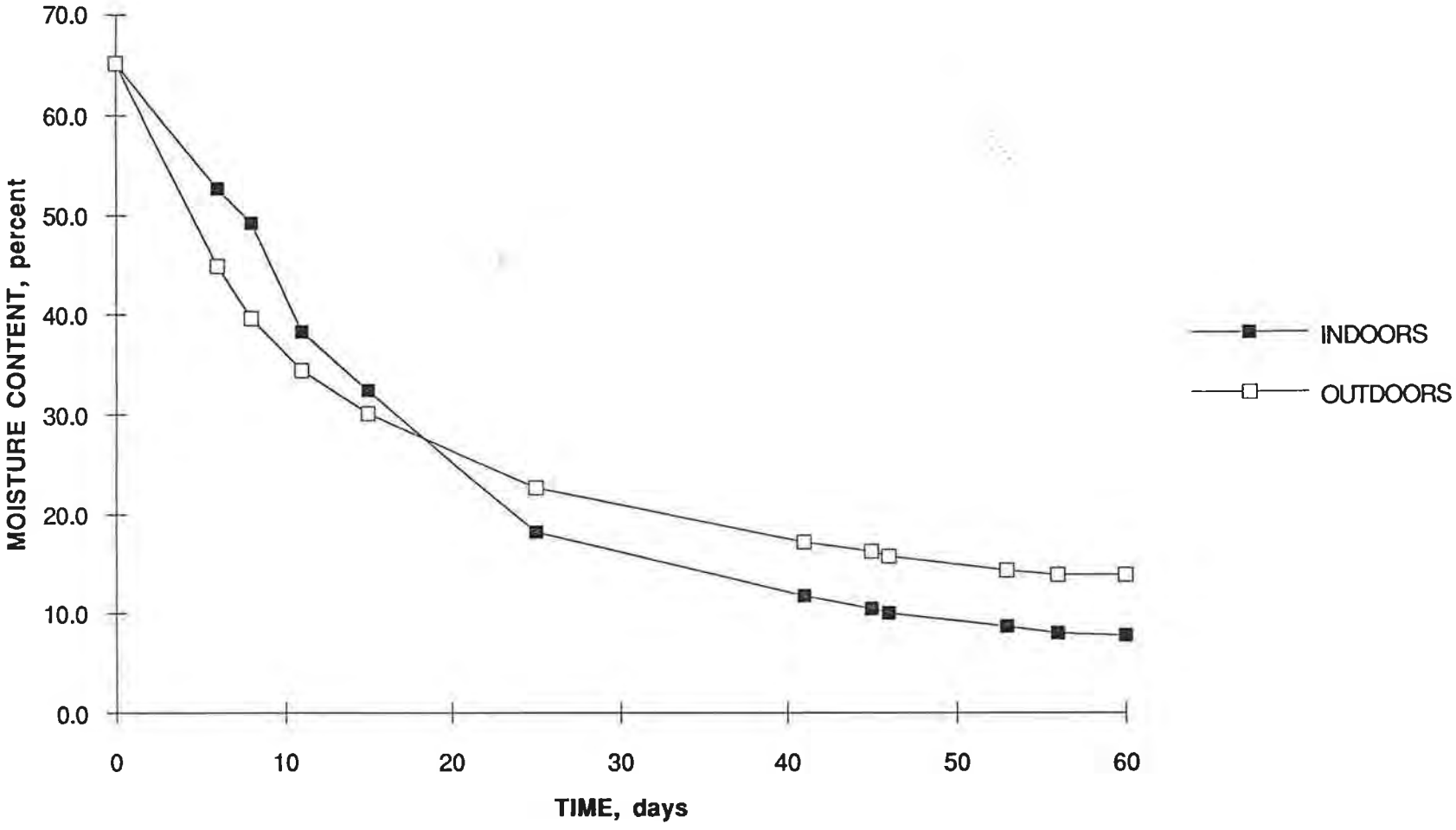
LAGUNA LAKE DREDGING PROJECT

PG-7873-W01

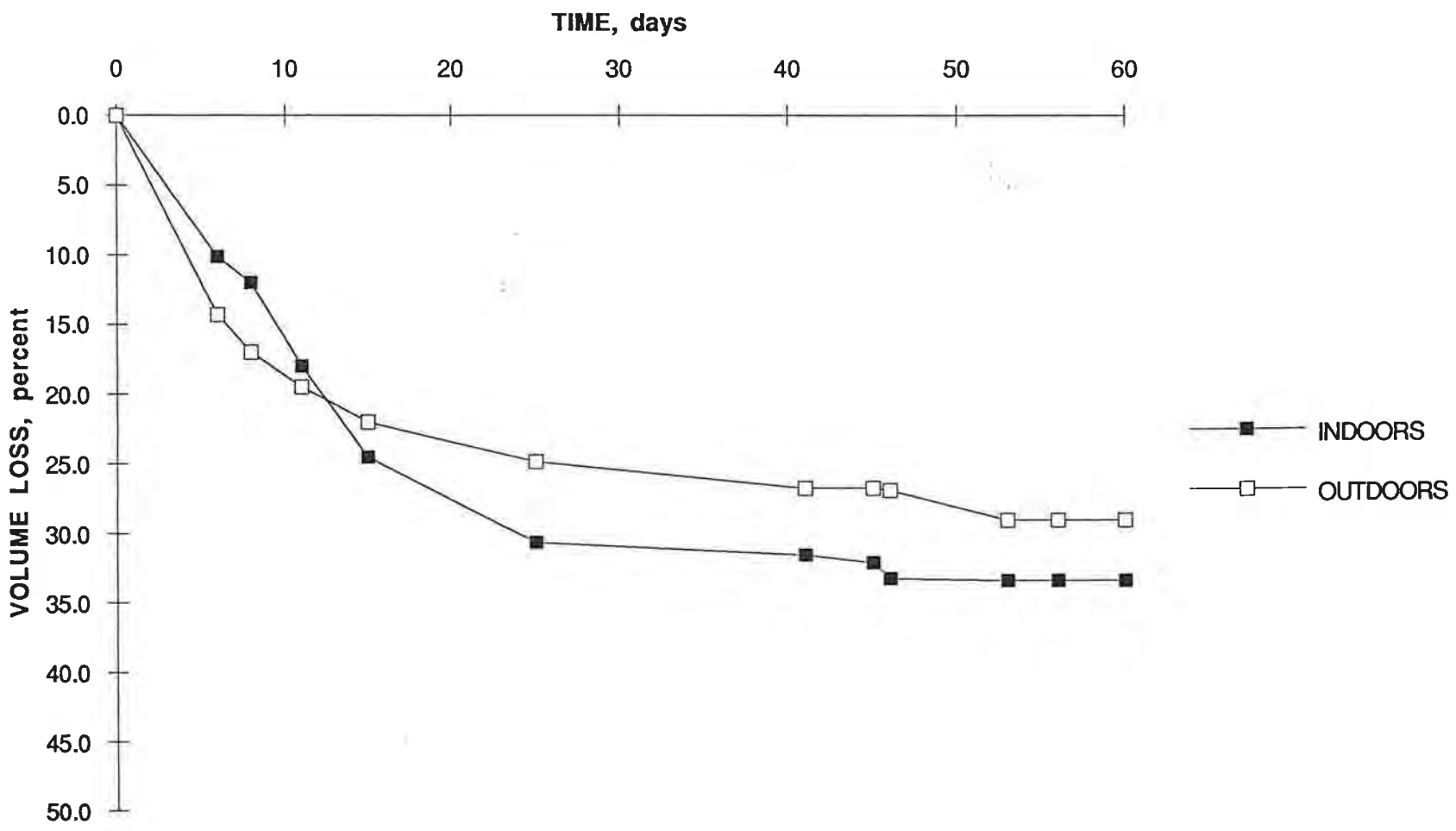
WET DENSITY vs. TIME



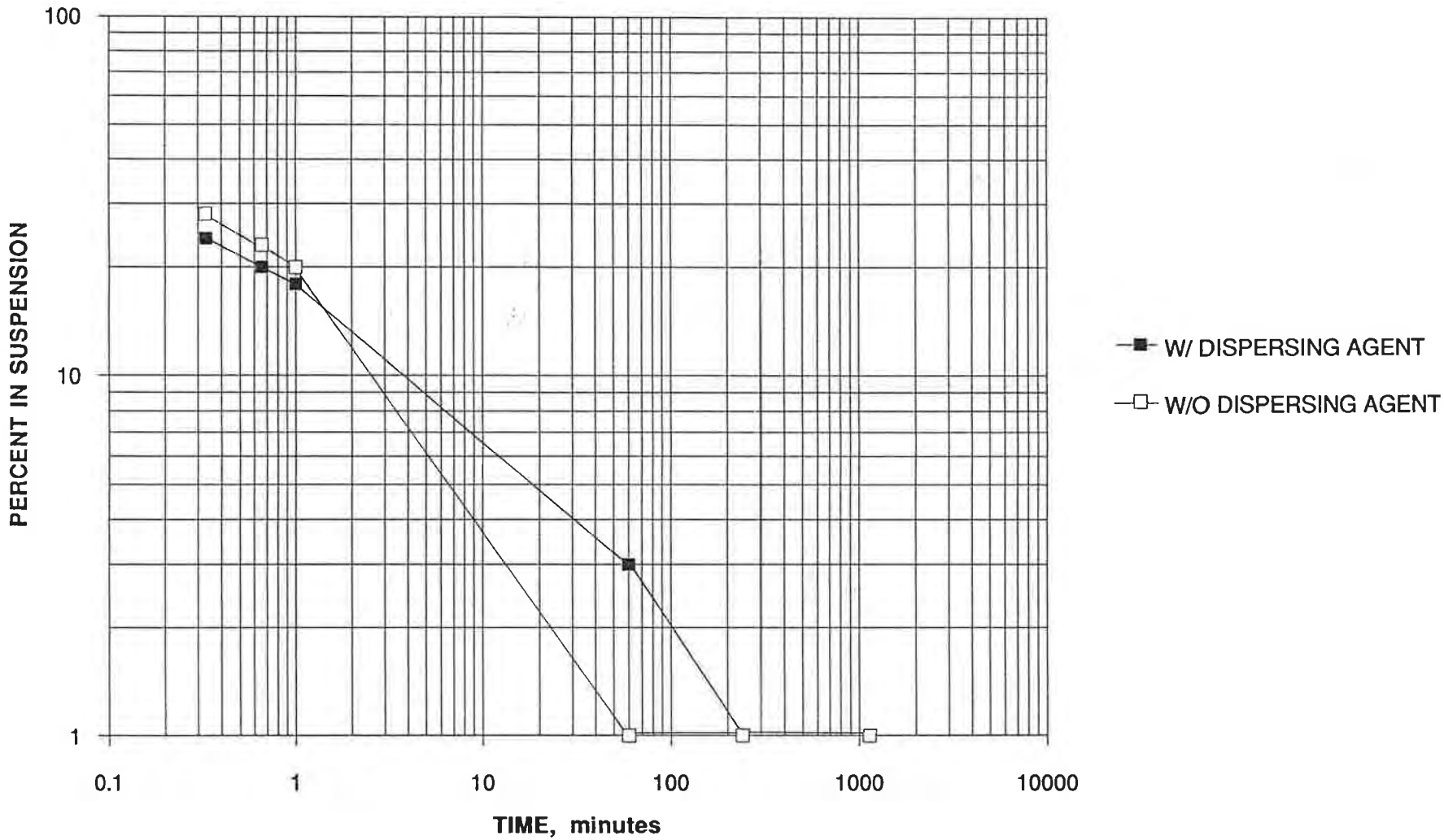
MOISTURE CONTENT vs. TIME



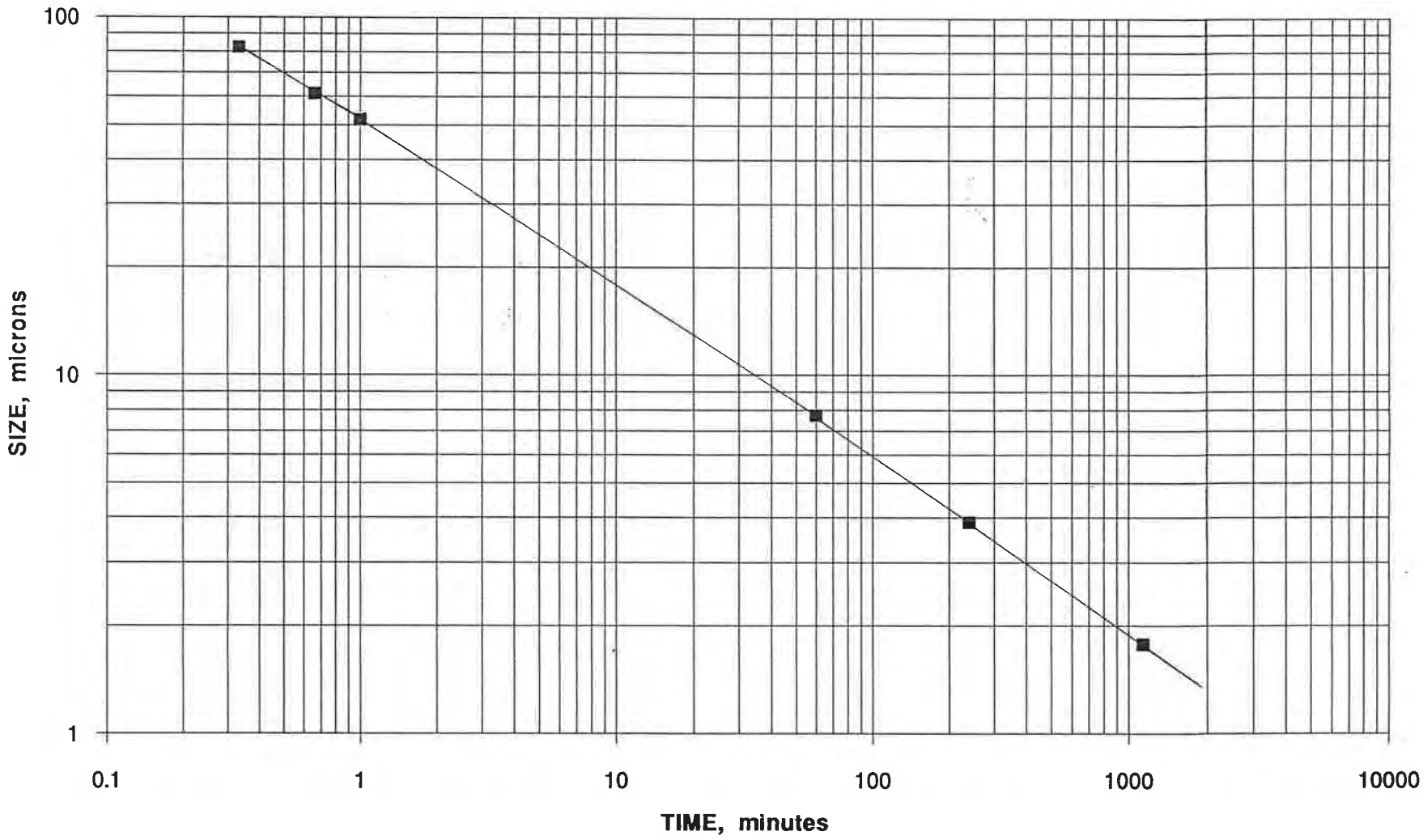
% VOLUME LOSS vs. TIME



PERCENT IN SUSPENSION vs. TIME



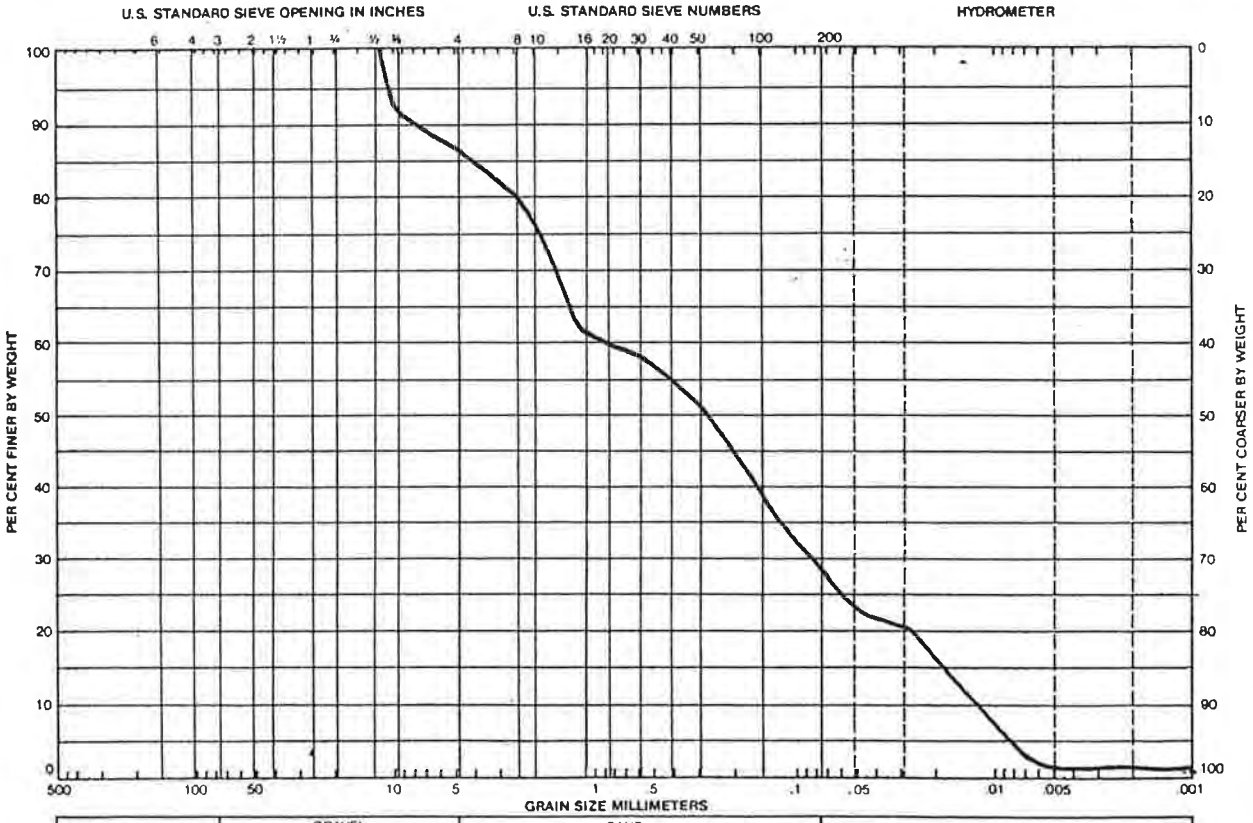
GRAIN SIZE IN SUSPENSION vs. TIME



PROJECT: LAGUNA LAKE DREDGING PROJECT
JOB NUMBER: PG-7873-W01
SAMPLE I.D.: COMPOSITE/WITHOUT DISPERSING AGENT
DATE: 23-Jun-92

PARTICLE SIZE ANALYSIS

Sieve size	% Retained (Cumulative)	% Passing (Cumulative)
1/2"	0	100
3/8"	8	92
#4	13	87
#8	20	80
#16	39	61
#30	42	58
#50	49	51
#100	62	38
#200	72	28
53 microns		23
28 microns		20
5 microns		1
2.5 microns		1
Colloids		1

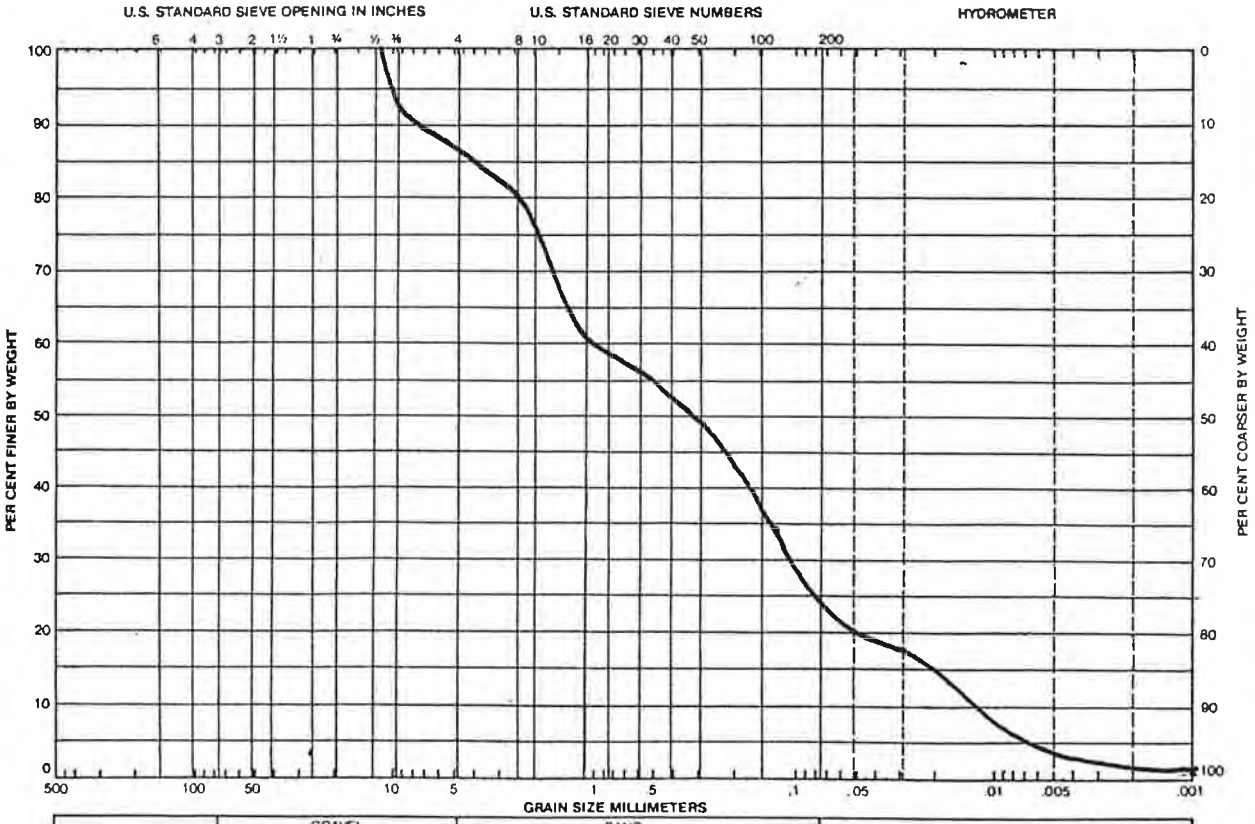


CLASSIFICATION	SYMBOL	LL	PL	PI
CLAYEY SAND	SC	–	–	–

PROJECT: LAGUNA LAKE DREDGING PROJECT
JOB NUMBER: PG-7873-W01
SAMPLE I.D.: COMPOSITE/WITH DISPERSING AGENT
DATE: 23-Jun-92

PARTICLE SIZE ANALYSIS

Sieve size	% Retained (Cumulative)	% Passing (Cumulative)
1/2"	0	100
3/8"	8	92
#4	13	87
#8	20	80
#16	40	60
#30	44	56
#50	51	49
#100	65	35
#200	76	24
53 microns		20
28 microns		18
5 microns		3
2.5 microns		1
Colloids		1

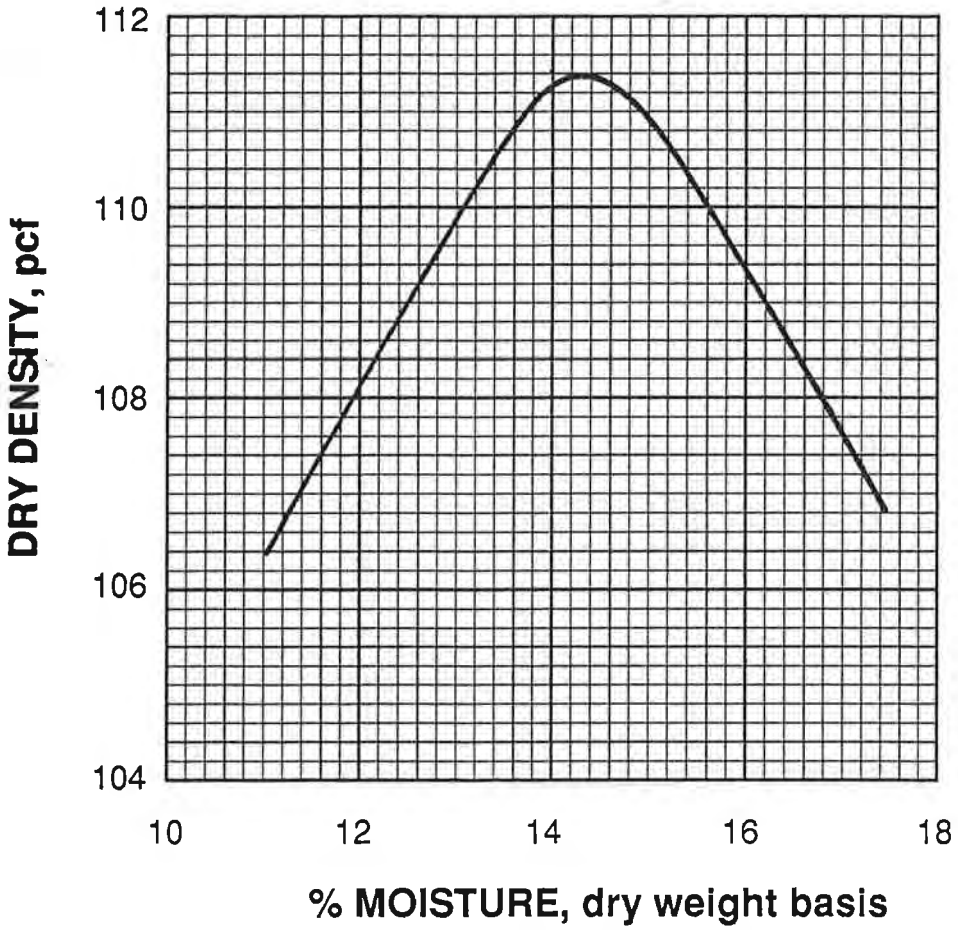


CLASSIFICATION	SYMBOL	LL	PL	PI
CLAYEY SAND	SC	—	—	—

MAXIMUM DENSITY/OPTIMUM MOISTURE CURVE

ASTM D-1557 METHOD: A

PROJECT: LAGUNA LAKE DREDGING PROJECT
DATE: 6/23/92
JOB NUMBER: PG-7873-W01



SAMPLE I. D.: COMPOSITE SAMPLE
SOIL DESCRIPTION: DARK BROWN CLAYEY SAND (SC)
MAXIMUM DENSITY, pcf: 111.4
OPTIMUM MOISTURE, percent: 14.3

PROJECT: LAGUNA LAKE DREDGING PROJECT
JOB NO.: PG-7873-W01
DATE: June 23, 1992

BULK DENSITY TEST RESULTS

SITE NO.	DEPTH inches	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf
1	???	41.4	113.2	80.1
2	???	57.9	95.1	60.2
3	???	117.9	82.6	37.9
4	???	125.7	72.5	32.1
5	???	31.6	121.0	92.0
6	???	48.4	107.0	72.1
7	???	68.9	90.3	53.5
8	???	31.2	114.7	87.4
9	???	34.0	109.7	81.9
10	same 10-22	77.5	84.3	47.5

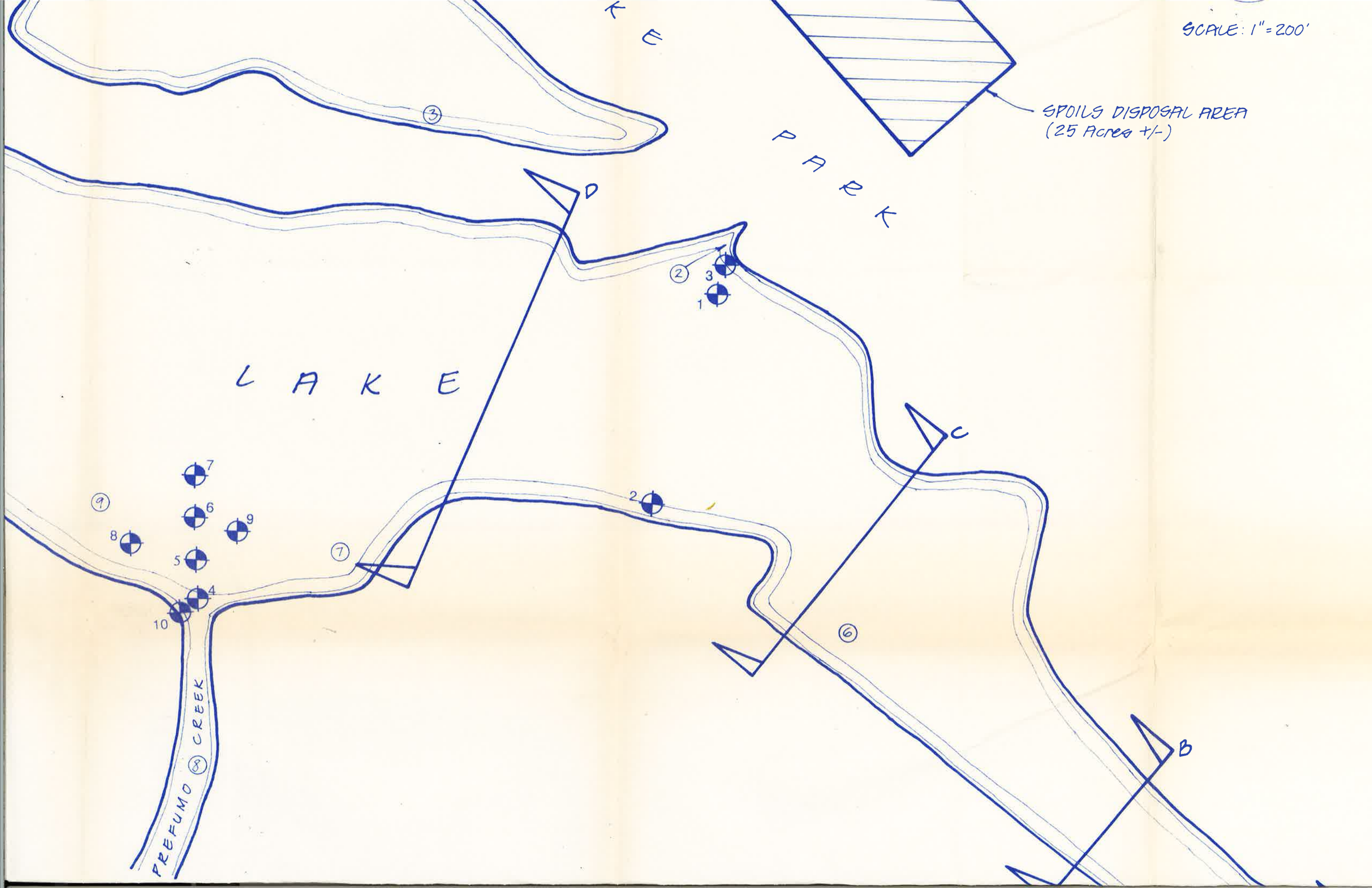
LEGEND

CCL SAMPLES, MAY, 1980

ESC SAMPLES, DECEMBER, 1991

LAGUNA LAKE CROSS SECTIONS
AS SURVEYED BY CITY OF SAN LUIS OBISPO APRIL 1992

EARTH SYSTEMS CONSULTANTS
Northern California
4378 Santa Fe Road • San Luis Obispo, CA 93401


SCALE: 1" = 200'
SPOILS DISPOSAL AREA
(25 Acres +/-)
PARK
LAKE
PREFUMO CREEK
A
B
C
D
1
2
3
4
5
6
7
8
9
10
2
3
6
7
8
9

LFR
LEVINE • FRICKE

Characterization of Sediment and Water
at Laguna Lake
City and County of San Luis Obispo, California

March 19, 2001
7743.00-2

Prepared For
City of San Luis Obispo
Public Works Department
955 Morro Street
San Luis Obispo, California 93401

CONTENTS

CERTIFICATION* III

1.0 INTRODUCTION 1

2.0 BACKGROUND 1

2.1 Site Setting 1

2.2 Previous Dredging Studies 2

2.3 Previous Soil and Groundwater Sampling 3

3.0 OBJECTIVES AND SCOPE OF WORK 4

3.1 General Objectives 4

3.2 Scope of Work 4

4.0 SAMPLING PROGRAM 5

4.1 Sediment Samples 5

4.2 Surface Water Samples 7

5.0 ANALYTICAL PROGRAM 7

5.1 Chemical Analyses 7

5.2 Geotechnical Analyses 8

5.3 Agricultural Analyses 8

6.0 ANALYTICAL RESULTS 9

6.1 Chemical Analyses 9

6.1.1 Organic Compounds 9

6.1.2 Metals and General Minerals 9

6.2 Geotechnical Analyses 10

6.3 Agricultural Analyses 10

7.0 DISCUSSION AND INTERPRETATION 11

7.1 Results of Chemical Analysis 11

7.1.1 Compounds of Potential Concern 11

7.1.2 Potential Sources of Metals 11
7.1.3 Metals and Hazardous Waste Criteria 12
7.1.4 Metals and Human Health Criteria 13
7.1.5 Metals and Ecological Criteria 14
7.1.6 Metals and Water Resources 14
7.2 Results of Geotechnical Analyses 15
7.3 Results of Agricultural Analyses 15

8.0 CONCLUSIONS 15

9.0 REFERENCES 17

TABLES

1 Summary of Metals in Sediment – Wet Weight Concentrations
2 Summary of Metals in Sediment – Dry Weight Concentrations
3 Summary of Metals in Sediment – Soluble Concentrations
4 Summary of Analytical Results for Aqueous Samples

FIGURES

1 Sampling Locations

APPENDICES

A Zymax Laboratory Reports
B ESP Geotechnical Report
C FGL Agricultural Report
D Geotechnical Evaluation by John Ho, CE, GE

CERTIFICATION*

All hydrogeologic and geologic information, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by an LFR Levine·Fricke California Registered Geologist.

Steven C. Beadle, PhD Date
Senior Geologist
California Registered Geologist (6129)
California Certified Engineering Geologist (EG 2098)
California Certified Hydrogeologist (HG 503)

*A registered geologist's certification of conditions comprises a declaration of his or her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations, and ordinances.

1.0 INTRODUCTION

LFR Levine-Fricke (LFR) was retained by the City of San Luis Obispo (CSLO) to provide engineering and environmental designs for the dredging of Laguna Lake. As part of that work, LFR has performed preliminary sediment and surface water sampling at the lake. This study was needed to help evaluate the feasibility of dredging.

Dredging of Laguna Lake would generate large volumes of sediment and water. The feasibility of dredging will depend, in part, on whether cost-effective options for the reuse or disposal of the dredged material can be identified. The feasibility of reuse or disposal will depend, in part, on the physical and chemical properties of the dredged material.

This study included comprehensive laboratory analyses of the sediment in Laguna Lake. A similar study of water quality characteristics will be presented under separate cover. Based on the results of these analyses, LFR has evaluated:

- The potential effects of dredged material on **human and ecological receptors**
- The potential effects of dredged material on **surface water and groundwater resources**
- The potential **disposal or reuse options** for the dredged material, including:
  - its potential use for **landscaping modifications**
  - its potential suitability for **agriculture or horticulture**
  - its potential **waste classification** for landfill disposal

2.0 BACKGROUND

2.1 Site Setting

Laguna Lake is a shallow urban lake located in the City and County of San Luis Obispo, California (Figure 1). It is currently surrounded by residential development to the southwest, ranch land to the northwest, the municipal Laguna Lake Park to the northeast, and Madonna Road to the southeast.

The major open-water portions of the lake, known as the Central Lake and the Southeast Arm, cover a total area of approximately 75 acres. In addition, there are approximately 26 acres of open water and 78 acres of marshes in adjoining areas,

including the Prefumo Inlet, the Northwest Marsh and Inlets, and the Peninsula Inlet (CSLO, 1982, section III).

The area now occupied by Laguna Lake was historically a low-lying area that collected storm water drainage from the surrounding fields and hillsides. In 1963, nearby Prefumo Creek was rerouted to drain into the lake area. Continued siltation from the creek began to gradually fill the lake, and so a small dam was subsequently built at the southeastern end of the lake, near Madonna Road, to raise the lake's water level. In spite of these measures, the lake has gone nearly dry twice during the last 20 years. In order to maintain the lake's suitability for recreational purposes and wildlife habitat, the City is considering several management options, including dredging. Laguna Lake has not previously been dredged, although Prefumo Creek Inlet has been periodically dredged in the past to remove deposited sediment.

2.2 Previous Dredging Studies

LFR has reviewed four previous reports that addressed the possibility of dredging the central part of Laguna Lake. These reports are briefly summarized below:

- **CSLO, 1981:** This study suggested dredging of the central area of the lake as a "future alternative" (p. 1), with deposition of the spoils at a 25-acre site to the north of the lake, in the northwestern part of Laguna Lake Park (p. 8; fig. 5).

- **CSLO, 1982:** This report considered dredging in more detail (pp. 66-76), while identifying the same 25-acre site (fig. 9) as "the most reasonable area" for depositing dredged material (p. 68). Transportation of the dredged material to other areas was not considered economically feasible. The report estimated that up to 200,000 cubic yards of dredged material could be accommodated at the 25-acre site, using maximum lifts of five feet.

- **Earth Systems Consultants (ESC), 1992:** This study concluded that dredging was feasible from a geotechnical standpoint. The report recommended that dredging operations should begin at a minimum distance of 50 feet from the shoreline, with a maximum cut depth of 2.5 feet; at a minimum distance of 75 feet from the shoreline, the maximum cut depth could be increased to 5 feet (p. 10). The expected volume of dredged material was estimated at 300,000 cubic yards (p. 1). The report assumed that the dredged material would be placed on the same 25-acre site (Site Map, App. A), which would eventually be used as parkland (p. 1).

- **CSLO, 1993:** This report suggested that dredged material could be used in Laguna Lake Park to "create berms in several key locations" (p. 5), and "create landform modifications and recontouring to emphasize drainage swales in the land between the hills and the marsh" (p. 7). The area identified for reuse of dredged material (fig. 1) appears to generally correspond with the 25-acre site identified in previous reports.

2.3 Previous Soil and Groundwater Sampling

The available data regarding the properties of soil and groundwater in Laguna Lake are relatively limited. These data are briefly summarized below:

- **Central Coast Laboratories (CCL), 1980:** Geotechnical analyses were conducted on soil samples. These included six particle size analyses; two plasticity tests; and one direct shear test on a drained sample. All of the soil samples were collected within 300 feet of the lake shore; most of them were collected near the mouth of Prefumo Creek.

- **CSLO, 1982:** This report included a map (fig. 6) showing lake bottom sediment types and estimated sedimentation rates. The report also included the following brief discussion of water quality issues in the Southeast Arm of the lake:

  > "The urban area southwesterly of the arm drains into the lake here via several small culverts. This possibly creates temporary local degradations in water quality caused by the runoff of urban pollutants, particularly oil and grease, heavy metals, and organic material. However, given the small amount of urban area, the amount of organic pollutants potentially transported to the lake are within the lake ecosystem's ability to degrade them and does not cause a substantial impact. While heavy metals occur at higher concentrations in this area (H.D. Heinz, 1980, unpublished data), they do not appear to be significantly great enough to cause major impacts" (p. 31).

  The report included an analysis of sedimentation rates in the lake (App. E) and the CCL (1980) report (App. F).

- **ESC, 1992:** Geotechnical analyses were conducted on soil samples. These included 10 analyses of moisture content, wet and dry density, and unconfined compressive strength; two particle size analyses (with and without a dispersing agent); two analyses of moisture loss over time; and one analysis each of specific gravity, organic content, and maximum density versus optimum moisture. The samples were collected throughout the lake, but within about 200 feet of the lake shore.

- **Leong & Brown, 1982**. This report includes monthly lake water measurements collected between November 1979 and June 1980. Analyzed parameters included turbidity, temperature, conductance, pH, dissolved oxygen, ammonia, nitrate, and phosphorus.

3.0 OBJECTIVES AND SCOPE OF WORK

3.1 General Objectives

The objective of this study was to characterize sediment and surface water at Laguna Lake, so that potential reuse or disposal options for this material could be evaluated. As stated in the introduction, the study specifically addressed the following issues:

- The potential effects of dredged material on **human and ecological receptors**
- The potential effects of dredged material on **surface water and groundwater resources**
- The potential **disposal or reuse options** for the dredged material, including:
  - its potential use for **landscaping modifications**
  - its potential suitability for **agriculture or horticulture**
  - its potential **waste classification** for landfill disposal

3.2 Scope of Work

The principal focus of the study was the shallow sediment on the lake bottom. LFR assumed, based on the recommendations of ESC (1992), that dredging would only occur at distances of at least 50-75 feet from the shoreline, to a maximum depth of five feet below the sediment surface. Sampling locations were planned accordingly.

For comparison, LFR also collected one surface sample of the sediment in Prefumo Inlet. Prefumo Inlet has the highest sedimentation rate in the Laguna Lake area (CLSO, 1982, fig. 6), and it has been dredged periodically in the past.

Finally, LFR also analyzed two samples of the surface water in Laguna Lake. Some lake water would be removed, along with the sediment, during any future dredging operations.

These materials were analyzed to obtain the following information:

- **Chemical Data.** The bottom-sediment in Laguna Lake was analyzed for potential pollutants, such as petroleum hydrocarbons, volatile and semivolatile organic compounds, metals, polychlorinated biphenyls (PCBs), and pesticides. Relatively few chemical analyses were previously available, although CSLO (1982, p. 31) indicated that heavy metals were a potential concern in the lake sediment (see section 2.3).

The two lake water samples were analyzed for general minerals and for the same potential pollutants as the sediment samples.

- **Geotechnical Data.** CSLO (1993) proposed the reuse of dredged material to create "berms" and "landform modifications", including "recontouring to emphasize drainage swales" (see Section 2.2). Geotechnical data were collected from the sediment samples to help prepare and finalize such landscape designs. The LFR samples were collected throughout the lake, rather than along the shore, and are likely to be more representative of the dredged material than those collected during previous geotechnical studies.

- **Agricultural Data.** CSLO (1993, pp. 3 and 5) proposed to plant native shrubs and trees on the dredged material, including "a mix of native conifers and oaks" to act as windbreaks, as well as "oaks and native shrubs" to provide wildlife corridors. CSLO (2000, verbal comments) has also proposed placing dredged material on nearby agriculturally zoned land, where it would be subject to continued agricultural use. The LFR sediment samples were tested for general agricultural suitability, to help determine if soil amendments would be warranted to promote plant growth.

4.0 SAMPLING PROGRAM

4.1 Sediment Samples

The San Francisco District of the U.S. Army Corps of Engineers (USACE-SF) recently proposed sediment sampling guidelines for dredging projects (USACE-SF, 1999). It should be noted Laguna Lake is technically within the Los Angeles District of the U.S. Army Corps of Engineers, but no applicable guidelines from this district are presently available.

The expected volume of dredged material has been estimated at 300,000 cubic yards (ESC, 1992). According to the USACE-SF proposed guidelines, projects involving 300,000 to 400,000 cubic yards of dredged material should include a minimum of 20 sample stations and a minimum of 5 composite samples.

Based on this guidance, LFR collected samples at 20 stations throughout Laguna Lake and Prefumo Creek Inlet (Figure 1). The sediment sampling was conducted on October 4 and 5, 2000. All but one of the samples were collected at distances of at least 50-75 feet from the shoreline, in accordance with the dredging recommendations of ESC (1992); the only exception was the sample collected from the narrow Prefumo Creek Inlet. The samples were located to provide representative coverage throughout the lake and the associated inlets, and at depths from the sediment surface to approximately four feet (Figure 1). Sample locations were identified using a portable global positioning system (GPS) unit.

At 16 locations, surface grab samples were collected from a boat using a Birge-Ekman style stainless-steel box sediment sampler. The grab sampling locations were designated Grab Sample #1 to #16 (Figure 1). The 16 grab samples were then composited by the analytical laboratories to form five samples, each representing a different region of the lake:

- **GRAB 1,2,3,4:** this composite sample represents the northwestern part of the lake.
- **GRAB 5,6,7,9:** this composite sample represents the west-central part of the lake.
- **GRAB 8,10,11:** this composite sample represents the east-central part of the lake, near the Prefumo Inlet.
- **GRAB 12,14,15,16:** this composite sample represents the southeastern arm of the lake.
- **GRAB 13:** this individual sample was collected within the Prefumo Inlet; it appeared to be lithologically distinct from the lake samples, and was therefore analyzed separately.

At the remaining four locations, core samples were collected from a boat using an AMS stainless steel, soft sediment core sampler. The core sampling locations were designated Core Sample #1 to #4 (Figure 1). The lengths of the recovered cores ranged from approximately two to four feet. Samples from the four cores were then composited by the analytical laboratories to form four composite samples, each representing a different depth below the top of the sediment:

- **1 FOOT CORE:** this composite sample represents the lake sediment at depths of 0 to 1 foot below the sediment surface; it includes material from all four cores.
- **2 FOOT CORE:** this composite sample represents the lake sediment at depths of 1 to 2 feet below the sediment surface; it includes material from all four cores.
- **3 FOOT CORE:** this composite sample represents the lake sediment at depths of 2 to 3 feet below the sediment surface; it includes material from Core Samples #1, #2, and #3 (there was insufficient recovery from Core Sample #4).
- **4 FOOT CORE:** this composite sample represents the lake sediment at depths of 3 to 4 feet below the sediment surface; it includes material from Core Samples #1 and #2 (there was insufficient recovery from Core Samples #3 and #4).

This represents a total of eight composite sediment samples and one individual sediment sample from 20 sampling locations, which substantially exceeds the USACE-SF sampling requirements for a dredging project of this magnitude.

4.2 Surface Water Samples

LFR collected two surface water samples from a boat on March 2, 2001. One surface water sample was collected near the Core Sample #1 location, while the other was collected near the Grab Sample #14 location (Figure 1).

5.0 ANALYTICAL PROGRAM

The samples were placed in a chilled container and delivered promptly, under strict chain-of-custody protocol, to analytical laboratories for compositing and analysis.

5.1 Chemical Analyses

Chemical analyses were conducted by ZymaX envirotechnology (Zymax) of San Luis Obispo, California. Each of the nine sediment and two surface water samples were analyzed for all listed parameters, except as noted below. Chemical testing included the following suite of analyses:

- **Total Petroleum Hydrocarbons (TPH)** in the C10-C40 range by GC/MS Combination. This method is comparable to EPA Method 8015, but provides more detailed information about hydrocarbon composition.

- **Volatile Organic Compounds (VOCs)** by EPA Method 8260. The analyte list included a total of 60 VOCs.

- **Semivolatile Organic Compounds (SVOCs)** by EPA Method 8270. The analyte list included a total of 68 SVOCs.

- **Chlorinated Pesticides** by EPA Method 8082. The analyte list included a total of 20 chlorinated pesticides.

- **Polychlorinated Biphenyls (PCBs)** by EPA Method 8081. The analyte list included a total of seven PCB (Aroclor) mixtures.

- **California Title 22 Metals** by EPA Method 6020. The analyte list included the 17 California Title 22 metals, which are antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc. Mercury was analyzed using EPA Method 7471. The samples were initially analyzed for total metals concentrations.

  The water samples were analyzed for metals using unpreserved containers followed by laboratory filtration. Thus, the results represent dissolved metals concentrations, rather than total metals concentrations.

- **Additional Metals Analyses.** Based on the total metals results, two selected sediment samples were additionally analyzed for hexavalent chromium by EPA Method 7196, soluble chromium by the Toxicity Characteristic Leaching Procedure (TCLP) and EPA Method 6020, soluble nickel by the Waste Extraction Test (WET) and EPA Method 6020, and magnesium and manganese by EPA Method 6020.

- **Moisture Content** by EPA Method 160.3. This analysis was conducted on the nine sediment samples so that any detected compounds could be expressed as either wet weight concentrations or as dry weight concentrations.

- **General Minerals.** The two water samples were analyzed for total alkalinity, bicarbonate alkalinity, carbonate alkalinity, and hydroxide alkalinity by EPA Method 310.1, calcium, iron, magnesium, manganese, potassium, and sodium by EPA Method 6020, chloride, nitrate-nitrogen, nitrite-nitrogen, and sulfate by EPA Method 300.0, hardness by Standard Method 2340B, total dissolved solids by EPA Method 160.1, pH by EPA Method 150.1, and conductivity by EPA Method 120.1.

5.2 Geotechnical Analyses

Geotechnical analyses were conducted on each of the nine sediment samples by Earth Systems Pacific (ESP) of San Luis Obispo, California. Geotechnical testing included the following analyses:

- **Particle Size Distribution** by ASTM D422 (sieve and hydrometer). This procedure quantified the amounts of sand, silt, and clay in the samples.

- **Plasticity Index** by ASTM D4318. This procedure determined the plastic limit, liquid limit, and plasticity index of the samples.

5.3 Agricultural Analyses

Agricultural suitability analyses were conducted on each of the nine sediment samples by Fruit Growers Laboratory (FGL) of Santa Paula, California. Comprehensive soil suitability analyses were conducted, including tests for the following parameters:

- **Primary Nutrients,** including nitrate-nitrogen, phosphorus, and potassium

- **Secondary Nutrients,** including calcium, magnesium, sodium, and sodium adsorption ratio

- **Toxic Elements,** including boron, chloride, and sulfate

- **Micronutrients,** including zinc, manganese, iron, and copper

- **Cation Exchange Capacity and Base Saturations,** including percent base saturation for calcium, magnesium, potassium, sodium, and hydrogen

- **Other Parameters,** including percent moisture, percent saturation, pH, soil salinity, percent limestone, and lime requirement

6.0 ANALYTICAL RESULTS

6.1 Chemical Analyses

The chemical results for all detected compounds are summarized in Tables 1 to 4. Complete laboratory results, including the practical quantitation limits (PQLs) for all compounds, are included in the Zymax laboratory reports (Appendix A).

6.1.1 Organic Compounds

No TPH, VOCs, SVOCs, chlorinated pesticides, or PCBs were detected in the nine sediment samples.

No TPH, SVOCs, chlorinated pesticides, or PCBs were detected in the two surface water samples. One VOC was detected: toluene was reported in the surface water sample collected near the Core Sample #1 location. The toluene concentration in this sample was 0.9 micrograms per liter (μg/l), which was slightly higher than the laboratory detection limit of 0.5 μg/l (Table 4). No other VOCs were detected in the surface water samples.

6.1.2 Metals and General Minerals

The detected metals concentrations for the lake sediment samples are listed in Tables 1 to 3. The wet weight concentrations originally reported by Zymax are shown in Table 1. The calculated dry weight concentrations, derived using the moisture content results, are shown in Table 2. Since the lake sediments had relatively high moisture contents (from 31.8 to 69.3 %), the dry weight concentrations are significantly higher than the wet weight concentrations. Soluble chromium and nickel results are summarized in Table 3.

For many metals, the reported concentrations in the lake sediment samples are high relative to typical statewide natural background values. This is particularly evident for chromium and nickel: the dry weight concentrations of these metals in the samples are, in some cases, more than ten times the statewide mean background levels.

The metals and general minerals detected in the water samples are shown in Table 4. No dissolved metals were detected in the surface water samples, except for barium at concentrations of 0.040 and 0.044 μg/l.

6.2 Geotechnical Analyses

The complete geotechnical results for the sediment samples are included in the ESP report (Appendix B). The eight sediment samples from Laguna Lake all consisted predominantly (82 to 97%) of fine grained material, with relatively high liquid limits and plasticity indices. These samples represent clays or clays with sand (CH/OH) under the Unified Soil Classification System (ASTM, 1999).

The surficial sediments appear to be finest in the northwestern part of the lake, above the Prefumo Creek Inlet. Grab samples GRAB 1,2,3,4 and GRAB 5,6,7,9, from the northwestern part of the lake, contained 94-96% fine-grained sediment and only 4-6% sand. The surficial sediments in the southeastern part of the lake, between the Prefumo Creek Inlet and the outlet, appear to be slightly sandier. Grab samples GRAB 8,10,11 and GRAB 12,14,15,16, from the southeastern part of the lake, both contained 82% fine sediment and 18% sand.

The sediment sample collected from the Prefumo Creek Inlet, GRAB 13, consisted predominantly of sand (58%) with a significant fine-grained component (42%). This sample represents a clayey sand (SC) under the Unified Soil Classification System (ASTM, 1999).

These findings are broadly consistent with those presented previously by CSLO (1982, fig. 6).

6.3 Agricultural Analyses

The complete results of the agricultural suitability analyses are included in the FGL report (Appendix C). Based on these results, the following generalizations can be made:

- The **moisture content** of the samples was typically "very high". This finding is not surprising, since the samples were collected underwater.
- The samples contained "very low" levels of **nitrate-nitrogen**, a primary nutrient. In fact, there was no detectable nitrate-nitrogen in seven of the nine analyzed samples.
- The samples typically contained "very high" levels of **manganese** and **magnesium**.

7.0 DISCUSSION AND INTERPRETATION

7.1 Results of Chemical Analysis

7.1.1 Compounds of Potential Concern

CSLO (1982, p. 31) previously addressed water quality issues in the Southeast Arm of Laguna Lake (see Section 2.3). CSLO concluded that "organic pollutants" were unlikely to cause a "substantial impact"; however, it was also noted, based upon unpublished data, that unspecified heavy metals occurred at "higher concentrations".

The findings of this study are generally similar. No organic compounds of potential concern were detected in any of the sediment samples. In contrast, certain metals, particularly chromium and nickel, were reported at relatively high concentrations in lake sediment. Metals appear to be the only compounds with the potential to affect human or ecological receptors or groundwater quality at the Site.

There were no significant environmental concerns associated with the surface water samples. Barium and toluene were detected in the samples, but at concentrations well below applicable drinking water criteria (Table 4). The iron and manganese concentrations in the samples exceeded applicable Secondary Maximum Contaminant Levels for drinking water (Table 4), but these are aesthetic (taste and odor) standards which are commonly exceeded in untreated natural waters.

7.1.2 Potential Sources of Metals

The highest metals concentrations were consistently in sample GRAB 13, which was collected within the Prefumo Creek Inlet. However, chromium and nickel concentrations in all samples consistently exceeded statewide mean background values (Table 2).

The most likely source of these metals is the natural bedrock exposed in the hills to the northeast and southwest of Laguna Lake. These hills contain extensive exposures of the Franciscan Formation, including chert and serpentinite (Hall et al., 1979, sheet 3). This unit is known to contain relatively high concentrations of many metals, and it was historically mined for metal ore. Mine Hill, to the southwest of Laguna Lake, was historically the site of several small manganese mines and mining prospects (Chipping, 1987, p. VI-4). These include the "Prefumo Canyon Prospects", which likely contribute eroded sediment to Prefumo Creek, which in turn drains into Laguna Lake. Chromite, an ore of chromium, was also historically mined at other nearby locations (Chipping, 1987, p. VI-5). Nickel has not been mined in the San Luis Obispo area, but nickel is known to be associated with serpentine minerals (Deer et al., 1966, p. 246).

The two samples with the highest metals concentrations were tested for magnesium and manganese, in addition to the 17 metals specified in California Title 22. Both of these

metals would be expected at elevated concentrations in the local bedrock: magnesium is associated with serpentinite, while manganese was historically mined nearby, as noted above. Both magnesium and manganese were detected at relatively high concentrations in the two analyzed samples.

The elevated metals concentrations in Prefumo Creek may be related, in part, to the historical mining activities upstream in the Mine Hill area. However, metals also occurred at relatively high concentrations in lake sediment samples that appeared to represent natural background conditions. For example, sample 4 FOOT CORE contained the third-highest concentrations of chromium and nickel reported in this study (Tables 1 and 2). Sample 4 FOOT CORE is a composite of two samples collected at a depth of 4 feet below the sediment surface, at locations Core Sample #1 and Core Sample #2. These sampling points are both in the northern part of the lake, above the Prefumo Creek Inlet (Figure 1). CSLO (1982, fig. 6) calculated an "extremely slow" sedimentation rate of 0.02 feet per year in this area, which implies that the material in sample 4 FOOT CORE may be approximately 200 years old. For comparison, Prefumo Creek was not diverted into Laguna Lake until 1963.

In summary, it is likely that elevated metals concentrations occur naturally in soil in the Laguna Lake area, due to erosion of sediment from the metals-rich Franciscan bedrock in the surrounding hills. It is possible that metals concentrations have been further increased by historical mining activities upstream near Prefumo Creek, which now drains into the lake.

7.1.3 Metals and Hazardous Waste Criteria

The wet-weight total metals concentrations were compared to applicable Federal and California hazardous waste criteria (Table 1), including the Total Threshold Limit Concentration (TTLC; a California criterion), the Toxicity Characteristic Leaching Procedure regulatory level (TCLP; a Federal criterion), and the Solubility Threshold Limit Concentration (STLC; a California criterion). The TCLP and STLC values (in mg/l) apply to leachates produced from 20-fold (TCLP) and 10-fold (STLC) dilutions of solid samples. Thus, values of 20 × TCLP and 10 × STLC (in mg/kg) are commonly used as screening levels for solid samples.

None of the total metals results exceeded the TTLC. For all metals except chromium and nickel, none of the results exceeded 20 × TCLP or 10 × STLC. Thus, chromium and nickel were the only metals of potential concern from a waste classification standpoint.

Most of the total chromium results were greater than 20 × TCLP, and most of the total nickel results were greater than 10 × STLC. Since these screening levels were exceeded, it was necessary to evaluate the soluble concentrations of chromium and nickel to determine the waste classification. The two samples with the highest total chromium and total nickel concentrations (GRAB 13 and 2 FOOT CORE) were selected for soluble metals analysis.

- **Chromium**. Both of the analyzed samples contained non-detectable concentrations of TCLP-soluble chromium (Table 3), so they were non-hazardous for chromium under Federal criteria. If a sample meets the TCLP standard for chromium (as these did), then the applicable STLC is 560 mg/l, and the 10 × STLC screening level for chromium in solid samples is 5,600 mg/kg. None of the solid samples exceeded this screening level, and so they are all non-hazardous for chromium under California criteria.

- **Nickel**. There is no TCLP criterion, or other Federal waste criteria, for nickel. The analyzed samples contained relatively low concentrations (2.5 and 3.7 mg/l) of STLC-soluble nickel. These values are well below the STLC of 20 mg/l, so the samples are non-hazardous for nickel under California criteria.

In summary, the analyzed samples appear to be non-hazardous for waste classification purposes with respect to both Federal and California criteria.

7.1.4 Metals and Human Health Criteria

A comprehensive health risk assessment was beyond the scope of this investigation. However, the dry-weight total metals concentrations (Table 2) were compared to the current (November 2000) Preliminary Remedial Goals (PRGs), promulgated by the U.S. Environmental Protection Agency, Region 9 (USEPA). The PRGs provide standards that are protective of human health for soil in residential areas (RPRGs) and in industrial areas (IPRGs).

None of the sample results exceeded the applicable IPRGs. However, some of the arsenic, hexavalent chromium, and nickel results are comparable to RPRG levels, as discussed below:

- **Arsenic.** Sample GRAB 13 had an arsenic concentration equal to the applicable RPRG of 22 mg/kg. This sample was collected in the Prefumo Creek Inlet, and so it is not necessarily representative of material that would be dredged from the lake. None of the samples collected from Laguna Lake had detectable arsenic concentrations.

  USEPA has developed arsenic PRGs that reflect both cancer and non-cancer risks. However, the arsenic cancer PRGs are so low that their use is impractical; they are actually below the typical background concentration of arsenic in natural soils. USEPA therefore recognizes the use of the higher non-cancer PRGs as a practical alternative. This study uses the non-cancer arsenic PRG.

- **Hexavalent Chromium.** Hexavalent chromium was not detected in the two analyzed samples, which had the highest reported total chromium concentrations. However, the current RPRG for hexavalent chromium (0.20 mg/kg) is lower than the laboratory's PQL (detection limit) for this compound (2.5 mg/kg).

It is unlikely that hexavalent chromium would occur at significant concentrations in lake sediment: hexavalent chromium normally persists only in oxidizing environments, while lake bottom environments are typically reducing environments. More sophisticated hexavalent chromium analyses, such as EPA 7199, may be able to provide lower detection limits for hexavalent chromium if necessary.

- **Nickel.** The RPRG for "Nickel (soluble salts)" is 150 mg/kg. Most of the analyzed samples had higher concentrations of total nickel. However, the nickel in the samples appears to be relatively insoluble, based on the results of the soluble nickel analysis (Table 3). The STLC-soluble nickel concentrations, measured on the samples with the highest total nickel concentrations, were 2.5 and 3.7 mg/l, which represents soluble nickel concentrations in solid samples of 25 and 37 mg/kg. These values are below the applicable RPRG.

In summary, there is no evidence that the metals concentration in the lake sediment samples exceed the applicable RPRGs. However, the reported arsenic concentration in the single sample from Prefumo Creek Inlet was equal to the non-cancer arsenic RPRG.

The metals concentrations in the samples should be compared to the naturally occurring background concentrations in any proposed reuse area when these data become available. If the background metals concentrations are comparable to those in the dredged material, then reuse of the dredged material may not be a significant issue.

7.1.5 Metals and Ecological Criteria

A comprehensive ecological risk assessment was beyond the scope of this study. It is possible that the metals concentrations in the samples would prove to be high relative to common ecological criteria. This may not be a significant issue if the naturally occurring background concentrations in the proposed reuse area are comparable to those in the dredged material.

7.1.6 Metals and Water Resources

The results of the soluble metals analyses (Table 3) suggest that the chromium and nickel in the lake sediment is relatively insoluble. Furthermore, there was no detectable dissolved chromium or nickel in the lake water samples (Table 4). Thus, there is no evidence that the metals concentrations in the sediment pose any threat to groundwater or surface water.

In any event, the proposed dredging operations would remove the sediments from a submerged location (below the water table) and place them in an upland location (above the water table). Thus, the proposed dredging would actually reduce any potential risk to surface water or groundwater resources.

7.2 Results of Geotechnical Analyses

A detailed evaluation of the geotechnical properties of the sediment samples is included as Appendix D. In general, the clayey sediments from the lake bottom have limited value as fill. They may be usable for landscaping purposes or as landfill cover, provided that they can be effectively dried and properly compacted. However, drying these sediments would be time consuming, especially if the sediments are simply stockpiled.

The sandy sediment in the Prefumo Creek Inlet could likely be drained by stockpiling, and could be used as general fill.

7.3 Results of Agricultural Analyses

The agricultural analyses showed several potential concerns with the samples, including a very high moisture content, very high levels of manganese and magnesium, and very low levels of nitrate-nitrogen. Other factors would also have to be considered in any evaluation of agricultural suitability, including the types of vegetation to be planted and the soil amendments (if any) to be applied.

8.0 CONCLUSIONS

The results of this study suggest that several challenges will have to be addressed in any reuse project involving dredged sediment from Laguna Lake. These include the following:

- **High moisture content.** The sediments will have to be dried before they can be reused for landscaping or agricultural purposes. This may be time consuming and difficult, especially for the fine-grained sediments which cover the vast majority of the lake bottom.

- **Limited reuse options.** Most or all of the dredged material will consist of high-plasticity clays. If these sediments can be adequately dried, they will likely be suitable for landscaping or landfill cover purposes. However, they will probably not be suitable as structural fills.

- **High metals content.** The dredged material will contain relatively high concentrations of certain metals, such as chromium, nickel, manganese, and magnesium. These metals concentrations are probably due, at least in part, to naturally elevated metals concentrations in the local bedrock. Historical mining activities in the Prefumo Creek area may have also affected the lake sediment.

  The potential effects of the metals concentrations on human receptors, ecological receptors, or planted vegetation should be considered. However, if the metals are

primarily of natural origin, then any proposed reuse area nearby may already have comparably high metals concentrations. If this is the case, then addition of the dredged sediment should have no significant adverse environmental impact.

9.0 REFERENCES

American Society for Testing and Materials (ASTM). 1999. Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). Standard D2487-98. In 1999 Annual Book of ASTM Standards, volume 4.08, Soil and Rock (I), pp. 220-230.

Central Coast Laboratories. 1980. Evaluation of Soils within the Upper Five Foot Profile of the Laguna Lake Bottom. June 20. [Appendix F in CSLO, 1982].

Chipping, D. 1987. The Geology of San Luis Obispo County, A Brief Description and Field Guide. El Corral Publications.

City of San Luis Obispo (CSLO). 1981. Final EIR, Laguna Lake Management Program. August 5.

City of San Luis Obispo (CSLO). 1982. Laguna Lake Management Program. January.

Deer, W.A., R.A. Howie, and J. Zussman. An Introduction to the Rock-Forming Minerals. Longman Group.

City of San Luis Obispo (CSLO). 1993. Laguna Lake Park Master Plan, Program Elements and Development Guidelines. June.

Earth Systems Consultants (ESC). 1992. Geotechnical Report, Laguna Lake Dredging Project, San Luis Obispo, California. September 23.

Leong, K. and R. Brown. 1982. Physio-Chemical Properties of Laguna Lake Waters. [Appendix B in CSLO, 1982].

U.S. Army Corps of Engineers, San Francisco District (USACE-SF). 1999. Proposed Guidelines for Implementing the Inland Testing Manual within the USACE San Francisco District. Public Notice No. 99-3. June 11.

TABLES

Table 1:
Summary of Analytical Results
Metals in Sediment - Wet Weight Concentrations
Laguna Lake
7743.00

All results reported in milligrams per kilogram (mg/kg)

Sample ID	Date Sampled	Lab	Lab Reference Number	Percent Moisture	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Hexavalent Chromium	Cobalt	Copper	Mercury	Lead	Molybdenum	Magnesium	Manganese	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
			Method:	EPA 160.3	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 7471	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020
GRAB 1,2,3,4	10/4/00-10/5/00	Zymax	21516-1	31.8	<5.0	<5.0	90	<0.5	<0.5	54	na	6.5	23	0.1	5.7	<1.0	na	na	88	<5.0	<1.0	<5.0	18	27
GRAB 5,6,7,9	10/4/00-10/5/00	Zymax	21516-2	41	<5.0	<5.0	150	<0.5	<0.5	92	na	9.2	33	<0.1	7.8	<1.0	na	na	150	<5.0	<1.0	<5.0	28	49
GRAB 8,10,11	10/4/00-10/5/00	Zymax	21516-3	46.7	<5.0	<5.0	240	<0.5	<0.5	**150**	na	15	52	<0.1	12	<1.0	na	na	**280**	<5.0	<1.0	<5.0	36	89
GRAB 12,14,15,16	10/4/00-10/5/00	Zymax	21516-4	33.3	<5.0	<5.0	110	<0.5	<0.5	64	na	7	25	<0.1	5.7	<1.0	na	na	120	<5.0	<1.0	<5.0	17	34
GRAB 13	10/4/00-10/5/00	Zymax	21516-5	69.3	<5.0	6.8	500	<0.5	<0.5	**260**	<2.5	26	94	<0.1	31	1.1	10,000	300	**510**	<5.0	<1.0	<5.0	70	160
1 FOOT CORE	10/4/00-10/5/00	Zymax	21516-6	50.4	<5.0	<5.0	330	<0.5	<0.5	**180**	na	15	82	<0.1	15	<1.0	na	na	**390**	<5.0	<1.0	<5.0	38	130
2 FOOT CORE	10/4/00-10/5/00	Zymax	21516-7	59.4	<5.0	<5.0	350	<0.5	<0.5	**220**	<2.5	15	74	<0.1	17	<1.0	6,300	260	**430**	<5.0	<1.0	<5.0	35	100
3 FOOT CORE	10/4/00-10/5/00	Zymax	21516-8	52.1	<5.0	<5.0	280	<0.5	<0.5	**180**	na	13	58	<0.1	10	<1.0	na	na	**300**	<5.0	<1.0	<5.0	37	74
4 FOOT CORE	10/4/00-10/5/00	Zymax	21516-9	58.2	<5.0	<5.0	330	<0.5	<0.5	**180**	na	17	74	<0.1	11	<1.0	na	na	**350**	<5.0	<1.0	<5.0	40	94
Action Levels			TCLP x 20	na	na	100	2,000	na	20	100	na	na	na	4	100	na	na	na	na	20	100	na	na	na
			TTLC	na	500	500	10,000	75	100	2,500	500	8,000	2,500	20	10,000	3,500	na	na	2,000	100	500	700	2,400	5,000
			STLC x 10	na	150	50	1,000	7.5	10	5,600	50	800	250	2	50	3,500	na	na	200	10	50	70	240	2,500

< = Analyte not detected at indicated practical quantitation limit.
TCLP = Toxicity Characteristic Leaching Procedure Regulatory Level (in mg/l) times 20 (the dilution factor)
TTLC = Total Threshold Limit Concentration
STLC = Soluble Threshold Limit Concentration (in mg/l) times 10 (the dilution factor)
Chromium STLC x 10 assumes that TCLP Chromium < 5.0 mg/l (see Table 3)
na = Not analyzed or not applicable.
Bold values: Total metals result in excess of waste screening level, soluble metals analysis required for waste classification (Table 3)

QA/QC

Table 2:
Summary of Analytical Results
Metals in Sediment - Dry Weight Concentrations
Laguna Lake
7743.00

All results reported in milligrams per kilogram (mg/kg)

Sample ID	Date Sampled	Lab	Lab Reference Number	Percent Moisture	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Hexavalent Chromium	Cobalt	Copper	Mercury	Lead	Molybdenum	Magnesium	Manganese	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
			Method:	EPA 160.3	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 7471	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020	EPA 6020
GRAB 1,2,3,4	10/4/00-10/5/00	Zymax	21516-1	31.6	<5.0	<5.0	130	<0.5	<0.5	79	na	9.5	34	0.15	8.4	<1.0	na	na	130	<5.0	<1.0	<5.0	26	40
GRAB 5,6,7,9	10/4/00-10/5/00	Zymax	21516-2	41	<5.0	<5.0	250	<0.5	<0.5	160	na	16	56	<0.1	13	<1.0	na	na	**250**	<5.0	<1.0	<5.0	44	83
GRAB 6,10,11	10/4/00-10/5/00	Zymax	21516-3	46.7	<5.0	<5.0	450	<0.5	<0.5	280	ne	28	98	<0.1	23	<1.0	na	na	**530**	<5.0	<1.0	<5.0	66	170
GRAB 12,14,15,16	10/4/00-10/5/00	Zymax	21516-4	33.3	<5.0	<5.0	160	<0.5	<0.5	96	na	10	37	<0.1	8.5	<1.0	na	na	**180**	<5.0	<1.0	<5.0	25	51
GRAB 13	10/4/00-10/5/00	Zymax	21516-5	69.3	<5.0	**22**	1,600	<0.5	<0.5	850	<2.5	85	310	<0.1	100	3.6	33,000	960	**1,700**	<5.0	<1.0	<5.0	230	520
1 FOOT CORE	10/4/00-10/5/00	Zymax	21516-6	50.4	<5.0	<5.0	670	<0.5	<0.5	360	na	30	170	<0.1	30	<1.0	na	na	**790**	<5.0	<1.0	<5.0	77	260
2 FOOT CORE	10/4/00-10/5/00	Zymax	21516-7	59.4	<5.0	<5.0	860	<0.5	<0.5	540	<2.5	37	180	<0.1	42	<1.0	16,000	640	**1,100**	<5.0	<1.0	<5.0	86	250
3 FOOT CORE	10/4/00-10/5/00	Zymax	21516-8	52.1	<5.0	<5.0	540	<0.5	<0.5	380	na	27	120	<0.1	21	<1.0	na	na	**630**	<5.0	<1.0	<5.0	77	150
4 FOOT CORE	10/4/00-10/5/00	Zymax	21516-9	58.2	<5.0	<5.0	790	<0.5	<0.5	430	na	41	180	<0.1	26	<1.0	na	na	**840**	<5.0	<1.0	<5.0	96	220
Action Levels			Soil RPRGs	na	31	22	5,400	150	9	100,000	0.2	4,700	2,900	23	400	390	na	1,800	150	390	390	5.2	550	23,000
			Soil IPRGs	na	820	440	100,000	2,200	810	100,000	na	100,000	76,000	610	750	10,000	na	32,000	41,000	10,000	10,000	130	14,000	100,000
			CA Background	na	0.5	2.8	468	1.14	0.26	76	na	12.8	24	0.2	21.7	1	8,492	592	36	0.026	0.41	0.52	101	145

< = Analyte not detected at indicated practical quantitation limit.
CA Background = California geometric mean background concentration (Bradford et al., 1996)
RPRGs = November 2000 Preliminary Remediation Goals for Residential Soil
IPRGs = November 2000 Preliminary Remediation Goals for Industrial Soil
The arsenic PRGs are the noncancer value. EPA recognizes that naturally occurring arsenic in soils frequently exceeds the cancer PRGs, and has eccepted the use of the higher noncancer PRGs as a practical alternative.
The cadmium, hexavalent chromium, and nickel PRGs are "California-modified" values.
The chromium PRGs assumes trivalent chromium
The nickel PRGs are for "soluble salts"
na = Not analyzed or not applicable.
Bold values: Total metals result at or above PRG

QA/QC

Table 3:
Summary of Analytical Results
Metals in Sediment - Soluble Concentrations
Laguna Lake
7743.00

All results reported in milligrams per liter (mg/L)

Sample ID	Date Sampled	Lab	Lab Reference Number	Chromium	Nickel
			Method:	TCLP/6020	WET/6020
GRAB 1,2,3,4	10/4/00-10/5/00	Zymax	21516-1	na	na
GRAB 5,6,7,9	10/4/00-10/5/00	Zymax	21516-2	na	na
GRAB 8,10,11	10/4/00-10/5/00	Zymax	21516-3	na	na
GRAB 12,14,15,16	10/4/00-10/5/00	Zymax	21516-4	na	na
GRAB 13	10/4/00-10/5/00	Zymax	21516-5	<0.02	2.5
1 FOOT CORE	10/4/00-10/5/00	Zymax	21516-6	na	na
2 FOOT CORE	10/4/00-10/5/00	Zymax	21516-7	<0.02	3.7
3 FOOT CORE	10/4/00-10/5/00	Zymax	21516-8	na	na
4 FOOT CORE	10/4/00-10/5/00	Zymax	21516-9	na	na
Action Level			TCLP	5	na
			STLC	na	20

< = Analyte not detected at indicated practical quantitation limit.
TCLP = Toxicity Characteristic Leaching Procedure Regulatory Level (in mg/l)
STLC = Soluble Threshold Limit Concentration (in mg/l)
na = Not analyzed or not applicable.

QA/QC

Table 4:
Summary of Analytical Results
Analytical Results for Aqueous Samples
Laguna Lake
LFR 7743.00

Parameter	Method	*Sample ID:* *Lab #:* *Date Sampled:* *Units:* **PQL**	**Aq(@grab sample 14)** 23049-1 3/2/01 *mg/L*	**Aq(@core sample 1)** 23049-2 3/2/01 *mg/L*	**Primary MCL** *mg/L*	**Secondary MCL** *mg/L*
Dissolved Metals						
Antimony	EPA 6020	0.05	ND	ND		
Arsenic	EPA 6020	0.01	ND	ND		
Barium	EPA 6020	0.005	**0.044**	**0.040**	1	NA
Beryllium	EPA 6020	0.005	ND	ND		
Cadmium	EPA 6020	0.01	ND	ND		
Chromium	EPA 6020	0.01	ND	ND		
Cobalt	EPA 6020	0.01	ND	ND		
Copper	EPA 6020	0.005	ND	ND		
Lead	EPA 6020	0.005	ND	ND		
Molybdenum	EPA 6020	0.01	ND	ND		
Nickel	EPA 6020	0.01	ND	ND		
Selenium	EPA 6020	0.05	ND	ND		
Silver	EPA 6020	0.01	ND	ND		
Thallium	EPA 6020	0.05	ND	ND		
Vanadium	EPA 6020	0.01	ND	ND		
Zinc	EPA 6020	0.01	ND	ND		
Mercury	EPA 7471	0.0002	ND	ND		
General Minerals						
Bicarbonate Alkalinity	EPA 310.1	1	**120**	**120**	NA	NA
Carbonate Alkalinity	EPA 310.1	1	ND	ND		
Hydroxide Alkalinity	EPA 310.1	1	ND	ND		
Total Alkalinity	EPA 310.1	1	**120**	**120**	NA	NA
Calcium	EPA 6020	0.5	**17**	**21**	NA	NA
Chloride	EPA 300.0	1	**29**	**39**	NA	250
Iron	EPA 6020	0.02	**4.7**	**4.2**	NA	0.3
Magnesium	EPA 6020	0.5	**27**	**27**	NA	NA
Manganese	EPA 6020	0.002	**0.17**	**0.18**	NA	0.05
Nitrate as Nitrogen	EPA 300.0	0.5	ND	ND		
Nitrite as Nitrogen	EPA 300.0	0.5	ND	ND		
Potassium	EPA 6020	0.5	**2.8**	**2.9**	NA	NA
Sodium	EPA 6020	0.5	**20**	**25**	NA	NA
Sulfate	EPA 300.0	1	**11**	**13**	500	250
Hardness	SM 2340B	1	**150**	**160**	NA	NA
pH	EPA 150.1	NA	**7.3**	**7.1**	NA	6.5 - 8.5
Specific Conductance	EPA 120.1	1	**270**	**380**	NA	900
Total Dissolved Solids	EPA 160.1	10	**220**	**250**	NA	500
Volatile Organic Compounds						
Toluene	EPA 8260	1	**0.005**	**0.009**	0.15	0.04

PQL = Practical Quantitation Limit
MCL = Maximum Contaminant Level (shown only for detected parameters)
NA = Not available
Alkalinity = Expressed as $CaCO_3$ equivalent
Hardness = Expressed as $CaCO_3$ equivalent
Specific Conductance = Expressed in units of µmhos/cm
pH = Expressed in pH units
MCLs = Shown only for detected parameters
VOCs = Only detected VOCs shown

QA/QC_____

FIGURES

EXPLANATION:

Sampling Locations
- Core Samples
- Grab Samples

Note:
Aqueous samples were collected at locations:
Core Sample #1
Grab Sample #14

N

0 575 1150 Feet

Laguna Lake

Laguna Lake
Sampling Locations

Figure 1

LFR LEVINE•FRICKE

APPENDIX A

Zymax Laboratory Reports

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	See Below
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	See Below
Analyzed:	03/13/01 - 03/14/01
Method:	See Below

TOTAL PETROLEUM HYDROCARBONS

LAB NUMBER	SAMPLE DESCRIPTION	PQL* ug/L	RESULT** ug/L	HYDROCARBON RANGE	SURROGATE RECOVERY
23049-1	Aq (@ grab sample 14)	100.	ND	N/A	63
23049-2	Aq (@ core sample 1)	100.	ND	N/A	79

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Analyzed by GC/MS Combination.
Note: Extracted by EPA 3510 on 03/08/01.
Note: Analytical range is C8-C40.
Note: TPH quantitated against diesel fuel.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #5
23049t.xls
JMM/sw/dz/ss/rl

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/08/01
Method:	EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.5	ND
Bromobenzene	0.5	ND
Bromochloromethane	0.5	ND
Bromodichloromethane	0.5	ND
Bromoform	0.5	ND
Bromomethane	0.5	ND
n-Butylbenzene	0.5	ND
sec-Butylbenzene	0.5	ND
tert-Butylbenzene	0.5	ND
Carbon Tetrachloride	0.5	ND
Chlorobenzene	0.5	ND
Chloroethane	0.5	ND
2-Chloroethylvinyl ether	1.0	ND
Chloroform	0.5	ND
Chloromethane	0.5	ND
a-Chlorotoluene	0.5	ND
4-Chlorotoluene	0.5	ND
1,2-Dibromo-3-Chloropropane	1.0	ND
Dibromochloromethane	0.5	ND
Dibromomethane	0.5	ND
1,2-Dichlorobenzene	0.5	ND
1,3-Dichlorobenzene	0.5	ND
1,4-Dichlorobenzene	0.5	ND
Dichlorodifluoromethane	0.5	ND
1,1-Dichloroethane	0.5	ND
1,2-Dichloroethane (EDC)	0.5	ND
1,1-Dichloroethene	0.5	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #11
23049-1.xls
JMM/sks/wj

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/08/01
Method:	EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.5	ND
trans-1,2-Dichloroethene	0.5	ND
1,2-Dichloropropane	0.5	ND
1,3-Dichloropropane	0.5	ND
2,2-Dichloropropane	0.5	ND
1,1-Dichloropropene	0.5	ND
cis-1,3-Dichloropropene	0.5	ND
trans-1,3-Dichloropropene	0.5	ND
Dichlorotrifluoroethane	0.5	ND
Ethylbenzene	0.5	ND
Ethylene dibromide (EDB)	0.5	ND
Hexachlorobutadiene	0.5	ND
Isopropylbenzene	0.5	ND
4-Isopropyltoluene	0.5	ND
Methylene Chloride	0.5	ND
Naphthalene	0.5	ND
n-Propylbenzene	0.5	ND
Styrene	0.5	ND
1,1,1,2-Tetrachloroethane	0.5	ND
1,1,2,2-Tetrachloroethane	0.5	ND
Tetrachloroethene (PCE)	0.5	ND
Toluene	0.5	ND
1,2,3-Trichlorobenzene	1.0	ND
1,2,4-Trichlorobenzene	1.0	ND
1,1,1-Trichloroethane (TCA)	0.5	ND
1,1,2-Trichloroethane	0.5	ND
Trichloroethene (TCE)	0.5	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #11
23049-1.xls
JMM/sks/wj

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/08/01
Method:	EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.5	ND
1,2,3-Trichloropropane	0.5	ND
1,2,4-Trimethylbenzene	0.5	ND
1,3,5-Trimethylbenzene	0.5	ND
Vinyl Chloride	0.5	ND
Xylenes	0.5	ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		105
Percent Surrogate Recovery (Toluene-d8)		94
Percent Surrogate Recovery (4-Bromofluorobenzene)		92

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VA110308
MSD #11
23049-1.xls
JMM/sks/wj

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/13/01
Method:	EPA 8270

CONSTITUENT	PQL* ug/L	RESULT** ug/L
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
Acenaphthene	10.	ND
Acenaphthylene	10.	ND
Aniline	10.	ND
Anthracene	10.	ND
Azobenzene	10.	ND
Benz (a) anthracene	10.	ND
Benzo (b) fluoranthene	10.	ND
Benzo (k) fluoranthene	10.	ND
Benzo (a) pyrene	10.	ND
Benzo (g,h,i) perylene	10.	ND
Benzoic acid	30.	ND
Benzyl alcohol	10.	ND
Bis (2-chloroethoxy) methane	10.	ND
Bis (2-chloroethyl) ether	10.	ND
Bis (2-chloroisopropyl) ether	10.	ND
Bis(2-ethylhexyl) phthalate	10.	ND
4-Bromophenyl phenyl ether	10.	ND
Butylbenzylphthalate	10.	ND
4-Chloroaniline	10.	ND
2-Chloronaphthalene	10.	ND
4-Chlorophenyl phenyl ether	10.	ND
Chrysene	10.	ND
Dibenz (a,h) anthracene	10.	ND
Dibenzofuran	10.	ND
Di-n-butyl phthalate	10.	ND
1,2-Dichlorobenzene	10.	ND
1,3-Dichlorobenzene	10.	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3510 on 03/08/01.

MSD #5
23049-1b.xls
JMM/sks/dz/rl

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/13/01
Method:	EPA 8270

CONSTITUENT	PQL* ug/L	RESULT** ug/L
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
1,4-Dichlorobenzene	10.	ND
3,3'-Dichlorobenzidine	10.	ND
Diethyl phthalate	10.	ND
Dimethyl phthalate	10.	ND
2,4-Dinitrotoluene	10.	ND
2,6-Dinitrotoluene	10.	ND
Di-n-octyl phthalate	10.	ND
Fluoranthene	10.	ND
Fluorene	10.	ND
Hexachlorobenzene	10.	ND
Hexachlorobutadiene	10.	ND
Hexachlorocyclopentadiene	10.	ND
Hexachloroethane	10.	ND
Indeno (1,2,3-c,d) pyrene	10.	ND
Isophorone	10.	ND
2-Methylnaphthalene	10.	ND
Naphthalene	10.	ND
2-Nitroaniline	10.	ND
3-Nitroaniline	10.	ND
4-Nitroaniline	10.	ND
Nitrobenzene	10.	ND
N-Nitrosodimethylamine	10.	ND
N-Nitroso-di-N-propylamine	10.	ND
N-Nitrosodiphenylamine	10.	ND
Phenanthrene	10.	ND
Pyrene	10.	ND
1,2,4-Trichlorobenzene	10.	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3510 on 03/08/01.

MSD #5
23049-1b.xls
JMM/sks/dz/rl

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/13/01
Method:	EPA 8270

CONSTITUENT	PQL* ug/L	RESULT** ug/L
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	10.	ND
2-Chlorophenol	10.	ND
2,4-Dichlorophenol	10.	ND
2,4-Dimethylphenol	10.	ND
2,4-Dinitrophenol	10.	ND
4,6-Dinitro-2-methylphenol	10.	ND
2-Methylphenol	10.	ND
4-Methylphenol	10.	ND
2-Nitrophenol	10.	ND
4-Nitrophenol	30.	ND
Pentachlorophenol	10.	ND
Phenol	10.	ND
2,4,5-Trichlorophenol	10.	ND
2,4,6-Trichlorophenol	10.	ND
Percent Surrogate Recovery (2-Fluorophenol)		33
Percent Surrogate Recovery (Phenol-d6)		28
Percent Surrogate Recovery (2,4,6-Tribromophenol)		87
Percent Surrogate Recovery (Nitrobenzene-d5)		48
Percent Surrogate Recovery (2-Fluorobiphenyl)		53
Percent Surrogate Recovery (Terphenyl-d14)		84

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3510 on 03/08/01.

Submitted by,
ZymaX envirotechnology, inc.

Jenn MacMurphey
Laboratory Director

SA2156
MSD #5
23049-1b.xls
JMM/sks/dz/rl

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/02/01 - 03/07/01
Method:	See Below

GENERAL MINERAL

CONSTITUENT	METHOD	PQL* mg/L	RESULT** mg/L
Total Alkalinity, CaCO3	EPA 310.1	1.0	120.
Bicarbonate Alkalinity, CaCO3	EPA 310.1	1.0	120.
Carbonate Alkalinity, CaCO3	EPA 310.1	1.0	ND
Hydroxide Alkalinity, CaCO3	EPA 310.1	1.0	ND
Calcium	EPA 6020	0.5	17.
Chloride	EPA 300.0	1.0	29.
Hardness, CaCO3	SM 2340B	1.0	150.
Iron	EPA 6020	0.02	4.7
Magnesium	EPA 6020	0.5	27.
Manganese	EPA 6020	0.002	0.17
Nitrate as Nitrogen (NO3-N)	EPA 300.0	0.5	ND
Nitrite as Nitrogen (NO2-N)	EPA 300.0	0.5	ND
Potassium	EPA 6020	0.5	2.8
Sodium	EPA 6020	0.5	20.
Sulfate	EPA 300.0	1.0	11.
Total Dissolved Solids	EPA 160.1	10.	220.
pH (pH units)	EPA 150.1		7.3
Specific Conductance (umhos/cm)	EPA 120.1	1.0	270.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

23049-1g.xls
JMM/sks/jd/mlm/ji/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/06/01
Method:	EPA 6020

METAL	PQL* mg/L	RESULT** mg/L
DISSOLVED METALS		
Antimony	0.05	ND
Arsenic	0.01	ND
Barium	0.005	0.044
Beryllium	0.005	ND
Cadmium	0.01	ND
Chromium	0.01	ND
Cobalt	0.01	ND
Copper	0.005	ND
Lead	0.005	ND
Molybdenum	0.01	ND
Nickel	0.01	ND
Selenium	0.05	ND
Silver	0.01	ND
Thallium	0.05	ND
Vanadium	0.01	ND
Zinc	0.01	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Digested by EPA 3005 on 03/05/01.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MA760
ICPMS #1
23049-1m.xls
JMM/sks/jd/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/06/01
Method:	EPA 7470

METAL	PQL* mg/L	RESULT** mg/L
DISSOLVED METALS		
Mercury	0.0002	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

HgA333A
HG #1
23049-1H.xls
JMM/sks/jd/mlm

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/14/01
Method:	EPA 8081

CONSTITUENT	PQL* ug/L	RESULT** ug/L
CHLORINATED PESTICIDES		
Aldrin	0.03	ND
Alpha-BHC	0.03	ND
Beta-BHC	0.03	ND
Delta-BHC	0.03	ND
Gamma-BHC (Lindane)	0.03	ND
Chlordane	0.1	ND
4,4'-DDD	0.03	ND
4,4'-DDE	0.03	ND
4,4'-DDT	0.03	ND
Dieldrin	0.03	ND
Endosulfan I	0.03	ND
Endosulfan II	0.03	ND
Endosulfan sulfate	0.03	ND
Endrin	0.03	ND
Endrin aldehyde	0.03	ND
Endrin ketone	0.03	ND
Heptachlor	0.03	ND
Heptachlor epoxide	0.03	ND
Methoxychlor	0.03	ND
Toxaphene	1.0	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		57
Percent Surrogate Recovery (Decachlorobiphenyl)		106

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3510 on 03/07/01.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PA235
GC #2 (ECD)
23049-1p.xls
JMM/sw/dz/rl

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-1
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ grab sample 14)
Analyzed:	03/14/01
Method:	EPA 8081

CONSTITUENT	PQL* ug/L	RESULT** ug/L
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.3	ND
PCB 1221	0.3	ND
PCB 1232	0.3	ND
PCB 1242	0.3	ND
PCB 1248	0.3	ND
PCB 1254	0.3	ND
PCB 1260	0.3	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		57
Percent Surrogate Recovery (Decachlorobiphenyl)		106

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3510 on 03/07/01.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PA235
GC #2 (ECD)
23049-1u.xls
JMM/sw/dz/rl

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454	Lab Number: Collected: Received: Matrix:	23049-2 03/02/01 03/02/01 Aqueous
Project: Project Number: Collected by:	Laguna Lake 7743 G. McGowan	Sample Description: Aq (@ core sample 1) Analyzed: Method:	 03/08/01 EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.5	ND
Bromobenzene	0.5	ND
Bromochloromethane	0.5	ND
Bromodichloromethane	0.5	ND
Bromoform	0.5	ND
Bromomethane	0.5	ND
n-Butylbenzene	0.5	ND
sec-Butylbenzene	0.5	ND
tert-Butylbenzene	0.5	ND
Carbon Tetrachloride	0.5	ND
Chlorobenzene	0.5	ND
Chloroethane	0.5	ND
2-Chloroethylvinyl ether	1.0	ND
Chloroform	0.5	ND
Chloromethane	0.5	ND
a-Chlorotoluene	0.5	ND
4-Chlorotoluene	0.5	ND
1,2-Dibromo-3-Chloropropane	1.0	ND
Dibromochloromethane	0.5	ND
Dibromomethane	0.5	ND
1,2-Dichlorobenzene	0.5	ND
1,3-Dichlorobenzene	0.5	ND
1,4-Dichlorobenzene	0.5	ND
Dichlorodifluoromethane	0.5	ND
1,1-Dichloroethane	0.5	ND
1,2-Dichloroethane (EDC)	0.5	ND
1,1-Dichloroethene	0.5	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #11
23049-2v.xls
JMM/sks/wj

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454	Lab Number: Collected: Received: Matrix:	23049-2 03/02/01 03/02/01 Aqueous
Project: Project Number: Collected by:	Laguna Lake 7743 G. McGowan	Sample Description: Analyzed: Method:	Aq (@ core sample 1) 03/08/01 EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.5	ND
trans-1,2-Dichloroethene	0.5	ND
1,2-Dichloropropane	0.5	ND
1,3-Dichloropropane	0.5	ND
2,2-Dichloropropane	0.5	ND
1,1-Dichloropropene	0.5	ND
cis-1,3-Dichloropropene	0.5	ND
trans-1,3-Dichloropropene	0.5	ND
Dichlorotrifluoroethane	0.5	ND
Ethylbenzene	0.5	ND
Ethylene dibromide (EDB)	0.5	ND
Hexachlorobutadiene	0.5	ND
Isopropylbenzene	0.5	ND
4-Isopropyltoluene	0.5	ND
Methylene Chloride	0.5	ND
Naphthalene	0.5	ND
n-Propylbenzene	0.5	ND
Styrene	0.5	ND
1,1,1,2-Tetrachloroethane	0.5	ND
1,1,2,2-Tetrachloroethane	0.5	ND
Tetrachloroethene (PCE)	0.5	ND
Toluene	0.5	0.9
1,2,3-Trichlorobenzene	1.0	ND
1,2,4-Trichlorobenzene	1.0	ND
1,1,1-Trichloroethane (TCA)	0.5	ND
1,1,2-Trichloroethane	0.5	ND
Trichloroethene (TCE)	0.5	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #11
23049-2v.xls
JMM/sks/wj

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Lab Number:	23049-2
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous
Sample Description:	Aq (@ core sample 1)
Analyzed:	03/08/01
Method:	EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.5	ND
1,2,3-Trichloropropane	0.5	ND
1,2,4-Trimethylbenzene	0.5	ND
1,3,5-Trimethylbenzene	0.5	ND
Vinyl Chloride	0.5	ND
Xylenes	0.5	ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		112
Percent Surrogate Recovery (Toluene-d8)		97
Percent Surrogate Recovery (4-Bromofluorobenzene)		88

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VA110308
MSD #11
23049-2v.xls
JMM/sks/wj

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-2
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ core sample 1)
Analyzed:	03/13/01
Method:	EPA 8270

CONSTITUENT	PQL* ug/L	RESULT** ug/L
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
Acenaphthene	10.	ND
Acenaphthylene	10.	ND
Aniline	10.	ND
Anthracene	10.	ND
Azobenzene	10.	ND
Benz (a) anthracene	10.	ND
Benzo (b) fluoranthene	10.	ND
Benzo (k) fluoranthene	10.	ND
Benzo (a) pyrene	10.	ND
Benzo (g,h,i) perylene	10.	ND
Benzoic acid	30.	ND
Benzyl alcohol	10.	ND
Bis (2-chloroethoxy) methane	10.	ND
Bis (2-chloroethyl) ether	10.	ND
Bis (2-chloroisopropyl) ether	10.	ND
Bis(2-ethylhexyl) phthalate	10.	ND
4-Bromophenyl phenyl ether	10.	ND
Butylbenzylphthalate	10.	ND
4-Chloroaniline	10.	ND
2-Chloronaphthalene	10.	ND
4-Chlorophenyl phenyl ether	10.	ND
Chrysene	10.	ND
Dibenz (a,h) anthracene	10.	ND
Dibenzofuran	10.	ND
Di-n-butyl phthalate	10.	ND
1,2-Dichlorobenzene	10.	ND
1,3-Dichlorobenzene	10.	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 03/08/01.

MSD #5
23049-2b.xls
JMM/sks/dz/rl

ZymaX envirotechnology

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454	Lab Number: 23049-2 Collected: 03/02/01 Received: 03/02/01 Matrix: Aqueous
Project: Laguna Lake Project Number: 7743 Collected by: G. McGowan	Sample Description: Aq (@ core sample 1) Analyzed: 03/13/01 Method: EPA 8270

CONSTITUENT	PQL* ug/L	RESULT** ug/L
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
1,4-Dichlorobenzene	10.	ND
3,3'-Dichlorobenzidine	10.	ND
Diethyl phthalate	10.	ND
Dimethyl phthalate	10.	ND
2,4-Dinitrotoluene	10.	ND
2,6-Dinitrotoluene	10.	ND
Di-n-octyl phthalate	10.	ND
Fluoranthene	10.	ND
Fluorene	10.	ND
Hexachlorobenzene	10.	ND
Hexachlorobutadiene	10.	ND
Hexachlorocyclopentadiene	10.	ND
Hexachloroethane	10.	ND
Indeno (1,2,3-c,d) pyrene	10.	ND
Isophorone	10.	ND
2-Methylnaphthalene	10.	ND
Naphthalene	10.	ND
2-Nitroaniline	10.	ND
3-Nitroaniline	10.	ND
4-Nitroaniline	10.	ND
Nitrobenzene	10.	ND
N-Nitrosodimethylamine	10.	ND
N-Nitroso-di-N-propylamine	10.	ND
N-Nitrosodiphenylamine	10.	ND
Phenanthrene	10.	ND
Pyrene	10.	ND
1,2,4-Trichlorobenzene	10.	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3510 on 03/08/01.

MSD #5
23049-2b.xls
JMM/sks/dz/rl

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454	Lab Number: Collected: Received: Matrix:	23049-2 03/02/01 03/02/01 Aqueous
Project: Project Number: Collected by:	Laguna Lake 7743 G. McGowan	Sample Description: Analyzed: Method:	Aq (@ core sample 1) 03/13/01 EPA 8270

CONSTITUENT	PQL* ug/L	RESULT** ug/L
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	10.	ND
2-Chlorophenol	10.	ND
2,4-Dichlorophenol	10.	ND
2,4-Dimethylphenol	10.	ND
2,4-Dinitrophenol	10.	ND
4,6-Dinitro-2-methylphenol	10.	ND
2-Methylphenol	10.	ND
4-Methylphenol	10.	ND
2-Nitrophenol	10.	ND
4-Nitrophenol	30.	ND
Pentachlorophenol	10.	ND
Phenol	10.	ND
2,4,5-Trichlorophenol	10.	ND
2,4,6-Trichlorophenol	10.	ND
Percent Surrogate Recovery (2-Fluorophenol)		37
Percent Surrogate Recovery (Phenol-d6)		20
Percent Surrogate Recovery (2,4,6-Tribromophenol)		106
Percent Surrogate Recovery (Nitrobenzene-d5)		60
Percent Surrogate Recovery (2-Fluorobiphenyl)		68
Percent Surrogate Recovery (Terphenyl-d14)		95

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3510 on 03/08/01.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

SA2156
MSD #5
23049-2b.xls
JMM/sks/dz/rl

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-2
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ core sample 1)
Analyzed:	03/02/01 - 03/07/01
Method:	See Below

GENERAL MINERAL

CONSTITUENT	METHOD	PQL* mg/L	RESULT** mg/L
Total Alkalinity, CaCO3	EPA 310.1	1.0	120.
Bicarbonate Alkalinity, CaCO3	EPA 310.1	1.0	120.
Carbonate Alkalinity, CaCO3	EPA 310.1	1.0	ND
Hydroxide Alkalinity, CaCO3	EPA 310.1	1.0	ND
Calcium	EPA 6020	0.5	21.
Chloride	EPA 300.0	1.0	39.
Hardness, CaCO3	SM 2340B	1.0	160.
Iron	EPA 6020	0.02	4.2
Magnesium	EPA 6020	0.5	27.
Manganese	EPA 6020	0.002	0.18
Nitrate as Nitrogen (NO3-N)	EPA 300.0	0.5	ND
Nitrite as Nitrogen (NO2-N)	EPA 300.0	0.5	ND
Potassium	EPA 6020	0.5	2.9
Sodium	EPA 6020	0.5	25.
Sulfate	EPA 300.0	1.0	13.
Total Dissolved Solids	EPA 160.1	10.	250.
pH (pH units)	EPA 150.1		7.1
Specific Conductance (umhos/cm)	EPA 120.1	1.0	380.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

23049-2g.xls
JMM/sks/jd/mlm/ji/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-2
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ core sample 1)
Analyzed:	03/06/01
Method:	EPA 6020

METAL	PQL* mg/L	RESULT** mg/L
DISSOLVED METALS		
Antimony	0.05	ND
Arsenic	0.01	ND
Barium	0.005	0.040
Beryllium	0.005	ND
Cadmium	0.01	ND
Chromium	0.01	ND
Cobalt	0.01	ND
Copper	0.005	ND
Lead	0.005	ND
Molybdenum	0.01	ND
Nickel	0.01	ND
Selenium	0.05	ND
Silver	0.01	ND
Thallium	0.05	ND
Vanadium	0.01	ND
Zinc	0.01	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Digested by EPA 3005 on 03/05/01.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MA760
ICPMS #1
23049-2m.xls
JMM/sks/jd/ba

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-2
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ core sample 1)
Analyzed:	03/06/01
Method:	EPA 7470

METAL	PQL* mg/L	RESULT** mg/L
DISSOLVED METALS		
Mercury	0.0002	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

HgA333A
HG #1
23049-2h.xls
JMM/sks/jd/mlm

John MacMurphey
Laboratory Director

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454

Lab Number:	23049-2
Collected:	03/02/01
Received:	03/02/01
Matrix:	Aqueous

Project:	Laguna Lake
Project Number:	7743
Collected by:	G. McGowan

Sample Description:	Aq (@ core sample 1)
Analyzed:	03/14/01
Method:	EPA 8081

CONSTITUENT	PQL* ug/L	RESULT** ug/L
CHLORINATED PESTICIDES		
Aldrin	0.03	ND
Alpha-BHC	0.03	ND
Beta-BHC	0.03	ND
Delta-BHC	0.03	ND
Gamma-BHC (Lindane)	0.03	ND
Chlordane	0.1	ND
4,4'-DDD	0.03	ND
4,4'-DDE	0.03	ND
4,4'-DDT	0.03	ND
Dieldrin	0.03	ND
Endosulfan I	0.03	ND
Endosulfan II	0.03	ND
Endosulfan sulfate	0.03	ND
Endrin	0.03	ND
Endrin aldehyde	0.03	ND
Endrin ketone	0.03	ND
Heptachlor	0.03	ND
Heptachlor epoxide	0.03	ND
Methoxychlor	0.03	ND
Toxaphene	1.0	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		60
Percent Surrogate Recovery (Decachlorobiphenyl)		81

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3510 on 03/07/01.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PA235
GC #2 (ECD)
23049-2p.xls
JMM/sw/dz/rl

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller St., Ste. 210 Santa Maria, CA 93454	Lab Number: 23049-2 Collected: 03/02/01 Received: 03/02/01 Matrix: Aqueous
Project: Laguna Lake Project Number: 7743 Collected by: G. McGowan	Sample Description: Aq (@ core sample 1) Analyzed: 03/14/01 Method: EPA 8081

CONSTITUENT	PQL* ug/L	RESULT** ug/L
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.3	ND
PCB 1221	0.3	ND
PCB 1232	0.3	ND
PCB 1242	0.3	ND
PCB 1248	0.3	ND
PCB 1254	0.3	ND
PCB 1260	0.3	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		60
Percent Surrogate Recovery (Decachlorobiphenyl)		81

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3510 on 03/07/01.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PA235
GC #2 (ECD)
23049-2u.xls
JMM/sw/dz/rl

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	See Below
Collected:	10/04/00 - 10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	See Below
Analyzed:	10/14/00
Method:	See Below

TOTAL PETROLEUM HYDROCARBONS

LAB NUMBER	SAMPLE DESCRIPTION	PQL* mg/kg	RESULT** mg/kg	HYDROCARBON RANGE	SURROGATE RECOVERY
21516-1	GRAB 1,2,3,4	10.	ND	N/A	54
21516-2	GRAB 5,6,7,9	10.	ND	N/A	57
21516-3	GRAB 8,10,11	10.	ND	N/A	54
21516-4	GRAB 12,14,15,16	10.	ND	N/A	62
21516-5	GRAB 13	10.	ND	N/A	53
21516-6	1 FOOT CORE	10.	ND	N/A	62
21516-7	2 FOOT CORE	10.	ND	N/A	57
21516-8	3 FOOT CORE	10.	ND	N/A	66
21516-9	4 FOOT CORE	10.	ND	N/A	61

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Analyzed by GC/MS Combination.
Note: Extracted by EPA 3550 on 10/13/00.
Note: Analytical range is C8-C40.
Note: TPH quantitated against diluent.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #9
21516t1.xls
JMM/sw/dz/bp/ss/rl

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-1
Collected:	10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 1,2,3,4
Analyzed:	10/11/00
Method:	EPA 160.3

CONSTITUENT	RESULT %
Percent Moisture	31.8

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

21516-1a.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-1
Collected:	10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 1,2,3,4
Analyzed:	10/15/00
Method:	EPA 6020

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METALS		
Antimony	5.0	ND
Arsenic	5.0	ND
Barium	0.5	90.
Beryllium	0.5	ND
Cadmium	1.0	ND
Chromium	1.0	54.
Cobalt	1.0	6.5
Copper	0.5	23.
Lead	1.0	5.7
Molybdenum	1.0	ND
Nickel	1.0	88.
Selenium	5.0	ND
Silver	1.0	ND
Thallium	5.0	ND
Vanadium	1.0	18.
Zinc	1.0	27.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Digested by EPA 3050 on 10/11/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MS592
ICPMS #1
21516-1c.xls
JMM/sw/cb/sm

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-1 Collected: 10/05/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: GRAB 1,2,3,4 Analyzed: 10/12/00 Method: EPA 7471

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METAL		
Mercury	0.1	0.1

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

HgS344
HG #1
21516-1h.xls
JMM/sw/ba

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-1
Collected:	10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 1,2,3,4
Analyzed:	10/12/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.005	ND
Bromobenzene	0.005	ND
Bromochloromethane	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane	0.005	ND
n-Butylbenzene	0.005	ND
sec-Butylbenzene	0.005	ND
tert-Butylbenzene	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane	0.005	ND
2-Chloroethylvinyl ether	0.010	ND
Chloroform	0.005	ND
Chloromethane	0.005	ND
a-Chlorotoluene	0.005	ND
4-Chlorotoluene	0.005	ND
1,2-Dibromo-3-Chloropropane	0.010	ND
Dibromochloromethane	0.005	ND
Dibromomethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-1v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-1
Collected:	10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 1,2,3,4
Analyzed:	10/12/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
1,3-Dichloropropane	0.005	ND
2,2-Dichloropropane	0.005	ND
1,1-Dichloropropene	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Dichlorotrifluoroethane	0.005	ND
Ethylbenzene	0.005	ND
Ethylene dibromide (EDB)	0.005	ND
Hexachlorobutadiene	0.005	ND
Isopropylbenzene	0.005	ND
4-Isopropyltoluene	0.005	ND
Methylene Chloride	0.005	ND
Naphthalene	0.005	ND
n-Propylbenzene	0.005	ND
Styrene	0.005	ND
1,1,1,2-Tetrachloroethane	0.005	ND
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,2,3-Trichlorobenzene	0.010	ND
1,2,4-Trichlorobenzene	0.010	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-1v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-1
Collected:	10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 1,2,3,4
Analyzed:	10/12/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.005	ND
1,2,3-Trichloropropane	0.005	ND
1,2,4-Trimethylbenzene	0.005	ND
1,3,5-Trimethylbenzene	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes	0.005	ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		96
Percent Surrogate Recovery (Toluene-d8)		92
Percent Surrogate Recovery (4-Bromofluorobenzene)		106

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VS21012
MSD #2
21516-1v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: Collected: Received: Matrix:	21516-1 10/05/00 10/06/00 Soil
Project:	Laguna Lake	Sample Description:	GRAB 1,2,3,4
Project Number:	7743.00	Analyzed:	10/14/00
Collected by:	MB	Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
Acenaphthene	0.1	ND
Acenaphthylene	0.1	ND
Aniline	0.1	ND
Anthracene	0.1	ND
Azobenzene	0.1	ND
Benz (a) anthracene	0.1	ND
Benzo (b) fluoranthene	0.1	ND
Benzo (k) fluoranthene	0.1	ND
Benzo (a) pyrene	0.1	ND
Benzo (g,h,i) perylene	0.1	ND
Benzoic acid	0.5	ND
Benzyl alcohol	0.1	ND
Bis (2-chloroethoxy) methane	0.1	ND
Bis (2-chloroethyl) ether	0.1	ND
Bis (2-chloroisopropyl) ether	0.1	ND
Bis(2-ethylhexyl) phthalate	0.1	ND
4-Bromophenyl phenyl ether	0.1	ND
Butylbenzylphthalate	0.1	ND
4-Chloroaniline	0.1	ND
2-Chloronaphthalene	0.1	ND
4-Chlorophenyl phenyl ether	0.1	ND
Chrysene	0.1	ND
Dibenz (a,h) anthracene	0.1	ND
Dibenzofuran	0.1	ND
Di-n-butyl phthalate	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-1n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-1 Collected: 10/05/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: GRAB 1,2,3,4 Analyzed: 10/14/00 Method: EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
1,4-Dichlorobenzene	0.1	ND
3,3'-Dichlorobenzidine	0.1	ND
Diethyl phthalate	0.1	ND
Dimethyl phthalate	0.1	ND
2,4-Dinitrotoluene	0.1	ND
2,6-Dinitrotoluene	0.1	ND
Di-n-octyl phthalate	0.1	ND
Fluoranthene	0.1	ND
Fluorene	0.1	ND
Hexachlorobenzene	0.1	ND
Hexachlorobutadiene	0.1	ND
Hexachlorocyclopentadiene	0.1	ND
Hexachloroethane	0.1	ND
Indeno (1,2,3-c,d) pyrene	0.1	ND
Isophorone	0.1	ND
2-Methylnaphthalene	0.1	ND
Naphthalene	0.1	ND
2-Nitroaniline	0.1	ND
3-Nitroaniline	0.1	ND
4-Nitroaniline	0.1	ND
Nitrobenzene	0.1	ND
N-Nitrosodimethylamine	0.1	ND
N-Nitroso-di-N-propylamine	0.1	ND
N-Nitrosodiphenylamine	0.1	ND
Phenanthrene	0.1	ND
Pyrene	0.1	ND
1,2,4-Trichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-1n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-1 Collected: 10/05/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: GRAB 1,2,3,4 Analyzed: 10/14/00 Method: EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	0.1	ND
2-Chlorophenol	0.1	ND
2,4-Dichlorophenol	0.1	ND
2,4-Dimethylphenol	0.1	ND
2,4-Dinitrophenol	0.1	ND
4,6-Dinitro-2-methylphenol	0.1	ND
2-Methylphenol	0.1	ND
4-Methylphenol	0.1	ND
2-Nitrophenol	0.1	ND
4-Nitrophenol	0.5	ND
Pentachlorophenol	0.1	ND
Phenol	0.1	ND
2,4,5-Trichlorophenol	0.1	ND
2,4,6-Trichlorophenol	0.1	ND
Percent Surrogate Recovery (2-Fluorophenol)		39
Percent Surrogate Recovery (Phenol-d6)		61
Percent Surrogate Recovery (2,4,6-Tribromophenol)		71
Percent Surrogate Recovery (Nitrobenzene-d5)		60
Percent Surrogate Recovery (2-Fluorobiphenyl)		49
Percent Surrogate Recovery (Terphenyl-d14)		60

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

SS2743
MSD #9
21516-1n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Lab Number:	21516-1
Collected:	10/05/00
Received:	10/06/00
Matrix:	Soil
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB
Sample Description:	GRAB 1,2,3,4
Analyzed:	10/13/00
Method:	EPA 8081

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
CHLORINATED PESTICIDES		
Aldrin	0.002	ND
Alpha-BHC	0.002	ND
Beta-BHC	0.002	ND
Delta-BHC	0.002	ND
Gamma-BHC (Lindane)	0.002	ND
Chlordane	0.1	ND
4,4'-DDD	0.002	ND
4,4'-DDE	0.002	ND
4,4'-DDT	0.002	ND
Dieldrin	0.002	ND
Endosulfan I	0.002	ND
Endosulfan II	0.002	ND
Endosulfan sulfate	0.002	ND
Endrin	0.002	ND
Endrin aldehyde	0.002	ND
Endrin ketone	0.002	ND
Heptachlor	0.002	ND
Heptachlor epoxide	0.002	ND
Methoxychlor	0.002	ND
Toxaphene	0.1	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		88
Percent Surrogate Recovery (Decachlorobiphenyl)		85

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-1p.xls
JMM/sw/dz/ss

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-1
Collected:	10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 1,2,3,4
Analyzed:	10/13/00
Method:	EPA 8082

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.03	ND
PCB 1221	0.03	ND
PCB 1232	0.03	ND
PCB 1242	0.03	ND
PCB 1248	0.03	ND
PCB 1254	0.03	ND
PCB 1260	0.03	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		88
Percent Surrogate Recovery (Decachlorobiphenyl)		85

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-1u.xls
JMM/sw/dz/ss

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-2
Collected:	10/04/00 - 10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 5,6,7,9
Analyzed:	10/11/00
Method:	EPA 160.3

CONSTITUENT	RESULT %
Percent Moisture	41.0

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

21516-2a.xls
JMM/sw/ba

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-2
Collected:	10/04/00 - 10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 5,6,7,9
Analyzed:	10/15/00
Method:	EPA 6020

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METALS		
Antimony	5.0	ND
Arsenic	5.0	ND
Barium	0.5	150.
Beryllium	0.5	ND
Cadmium	1.0	ND
Chromium	1.0	92.
Cobalt	1.0	9.2
Copper	0.5	33.
Lead	1.0	7.8
Molybdenum	1.0	ND
Nickel	1.0	150.
Selenium	5.0	ND
Silver	1.0	ND
Thallium	5.0	ND
Vanadium	1.0	26.
Zinc	1.0	49.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Digested by EPA 3050 on 10/11/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MS592
ICPMS #1
21516-2c.xls
JMM/sw/cb/sm

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-2 Collected: 10/04/00 - 10/05/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: GRAB 5,6,7,9 Analyzed: 10/12/00 Method: EPA 7471

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METAL		
Mercury	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

HgS344
HG #1
21516-2h.xls
JMM/sw/ba

ZymaX envirotechnology

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-2 Collected: 10/04/00 - 10/05/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: GRAB 5,6,7,9 Analyzed: 10/12/00 Method: EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.005	ND
Bromobenzene	0.005	ND
Bromochloromethane	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane	0.005	ND
n-Butylbenzene	0.005	ND
sec-Butylbenzene	0.005	ND
tert-Butylbenzene	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane	0.005	ND
2-Chloroethylvinyl ether	0.010	ND
Chloroform	0.005	ND
Chloromethane	0.005	ND
a-Chlorotoluene	0.005	ND
4-Chlorotoluene	0.005	ND
1,2-Dibromo-3-Chloropropane	0.010	ND
Dibromochloromethane	0.005	ND
Dibromomethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-2v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-2 Collected: 10/04/00 - 10/05/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: GRAB 5,6,7,9 Analyzed: 10/12/00 Method: EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
1,3-Dichloropropane	0.005	ND
2,2-Dichloropropane	0.005	ND
1,1-Dichloropropene	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Dichlorotrifluoroethane	0.005	ND
Ethylbenzene	0.005	ND
Ethylene dibromide (EDB)	0.005	ND
Hexachlorobutadiene	0.005	ND
Isopropylbenzene	0.005	ND
4-Isopropyltoluene	0.005	ND
Methylene Chloride	0.005	ND
Naphthalene	0.005	ND
n-Propylbenzene	0.005	ND
Styrene	0.005	ND
1,1,1,2-Tetrachloroethane	0.005	ND
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,2,3-Trichlorobenzene	0.010	ND
1,2,4-Trichlorobenzene	0.010	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-2v.xls
JMM/sw/wj/pv/bp

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-2 Collected: 10/04/00 - 10/05/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: GRAB 5,6,7,9 Analyzed: 10/12/00 Method: EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.005	ND
1,2,3-Trichloropropane	0.005	ND
1,2,4-Trimethylbenzene	0.005	ND
1,3,5-Trimethylbenzene	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes	0.005	ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		83
Percent Surrogate Recovery (Toluene-d8)		88
Percent Surrogate Recovery (4-Bromofluorobenzene)		120

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VS21012
MSD #2
21516-2v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-2
Collected:	10/04/00 - 10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 5,6,7,9
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
Acenaphthene	0.1	ND
Acenaphthylene	0.1	ND
Aniline	0.1	ND
Anthracene	0.1	ND
Azobenzene	0.1	ND
Benz (a) anthracene	0.1	ND
Benzo (b) fluoranthene	0.1	ND
Benzo (k) fluoranthene	0.1	ND
Benzo (a) pyrene	0.1	ND
Benzo (g,h,i) perylene	0.1	ND
Benzoic acid	0.5	ND
Benzyl alcohol	0.1	ND
Bis (2-chloroethoxy) methane	0.1	ND
Bis (2-chloroethyl) ether	0.1	ND
Bis (2-chloroisopropyl) ether	0.1	ND
Bis(2-ethylhexyl) phthalate	0.1	ND
4-Bromophenyl phenyl ether	0.1	ND
Butylbenzylphthalate	0.1	ND
4-Chloroaniline	0.1	ND
2-Chloronaphthalene	0.1	ND
4-Chlorophenyl phenyl ether	0.1	ND
Chrysene	0.1	ND
Dibenz (a,h) anthracene	0.1	ND
Dibenzofuran	0.1	ND
Di-n-butyl phthalate	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-2n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-2
Collected:	10/04/00 - 10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 5,6,7,9
Analyzed:	10/14/00
Method:	EPA 8270

SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dichlorobenzene	0.1	ND
3,3'-Dichlorobenzidine	0.1	ND
Diethyl phthalate	0.1	ND
Dimethyl phthalate	0.1	ND
2,4-Dinitrotoluene	0.1	ND
2,6-Dinitrotoluene	0.1	ND
Di-n-octyl phthalate	0.1	ND
Fluoranthene	0.1	ND
Fluorene	0.1	ND
Hexachlorobenzene	0.1	ND
Hexachlorobutadiene	0.1	ND
Hexachlorocyclopentadiene	0.1	ND
Hexachloroethane	0.1	ND
Indeno (1,2,3-c,d) pyrene	0.1	ND
Isophorone	0.1	ND
2-Methylnaphthalene	0.1	ND
Naphthalene	0.1	ND
2-Nitroaniline	0.1	ND
3-Nitroaniline	0.1	ND
4-Nitroaniline	0.1	ND
Nitrobenzene	0.1	ND
N-Nitrosodimethylamine	0.1	ND
N-Nitroso-di-N-propylamine	0.1	ND
N-Nitrosodiphenylamine	0.1	ND
Phenanthrene	0.1	ND
Pyrene	0.1	ND
1,2,4-Trichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-2n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: Collected: Received: Matrix:	21516-2 10/04/00 - 10/05/00 10/06/00 Soil
Project: Project Number: Collected by:	Laguna Lake 7743.00 MB	Sample Description: Analyzed: Method:	GRAB 5,6,7,9 10/14/00 EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	0.1	ND
2-Chlorophenol	0.1	ND
2,4-Dichlorophenol	0.1	ND
2,4-Dimethylphenol	0.1	ND
2,4-Dinitrophenol	0.1	ND
4,6-Dinitro-2-methylphenol	0.1	ND
2-Methylphenol	0.1	ND
4-Methylphenol	0.1	ND
2-Nitrophenol	0.1	ND
4-Nitrophenol	0.5	ND
Pentachlorophenol	0.1	ND
Phenol	0.1	ND
2,4,5-Trichlorophenol	0.1	ND
2,4,6-Trichlorophenol	0.1	ND
Percent Surrogate Recovery (2-Fluorophenol)		35
Percent Surrogate Recovery (Phenol-d6)		57
Percent Surrogate Recovery (2,4,6-Tribromophenol)		55
Percent Surrogate Recovery (Nitrobenzene-d5)		41
Percent Surrogate Recovery (2-Fluorobipheyl)		28
Percent Surrogate Recovery (Terphenyl-d14)		62

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

SS2743
MSD #9
21516-2n.xls
JMM/sw/dz/bp/ss/rb

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-2
Collected:	10/04/00 - 10/05/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	GRAB 5,6,7,9
Analyzed:	10/13/00
Method:	EPA 8081

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
CHLORINATED PESTICIDES		
Aldrin	0.002	ND
Alpha-BHC	0.002	ND
Beta-BHC	0.002	ND
Delta-BHC	0.002	ND
Gamma-BHC (Lindane)	0.002	ND
Chlordane	0.1	ND
4,4'-DDD	0.002	ND
4,4'-DDE	0.002	ND
4,4'-DDT	0.002	ND
Dieldrin	0.002	ND
Endosulfan I	0.002	ND
Endosulfan II	0.002	ND
Endosulfan sulfate	0.002	ND
Endrin	0.002	ND
Endrin aldehyde	0.002	ND
Endrin ketone	0.002	ND
Heptachlor	0.002	ND
Heptachlor epoxide	0.002	ND
Methoxychlor	0.002	ND
Toxaphene	0.1	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		63
Percent Surrogate Recovery (Decachlorobiphenyl)		66

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-2p.xls
JMM/sw/dz/ss

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-2
Collected:	10/04/00 - 10/05/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 5,6,7,9
Analyzed:	10/13/00
Method:	EPA 8082

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.03	ND
PCB 1221	0.03	ND
PCB 1232	0.03	ND
PCB 1242	0.03	ND
PCB 1248	0.03	ND
PCB 1254	0.03	ND
PCB 1260	0.03	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		63
Percent Surrogate Recovery (Decachlorobiphenyl)		66

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/12/00.

PS638
GC #2 (ECD)
21516-2u.xls
JMM/sw/dz/ss

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-3
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 8,10,11
Analyzed:	10/11/00
Method:	EPA 160.3

CONSTITUENT	RESULT %
Percent Moisture	46.7

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

21516-3a.xls
JMM/sw/ba

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-3 Collected: 10/04/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: GRAB 8,10,11 Analyzed: 10/15/00 Method: EPA 6020

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METALS		
Antimony	5.0	ND
Arsenic	5.0	ND
Barium	0.5	240.
Beryllium	0.5	ND
Cadmium	1.0	ND
Chromium	1.0	150.
Cobalt	1.0	15.
Copper	0.5	52.
Lead	1.0	12.
Molybdenum	1.0	ND
Nickel	1.0	280.
Selenium	5.0	ND
Silver	1.0	ND
Thallium	5.0	ND
Vanadium	1.0	36.
Zinc	1.0	89.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Digested by EPA 3050 on 10/11/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MS592
ICPMS #1
21516-3c.xls
JMM/sw/cb/sm

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-3
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 8,10,11
Analyzed:	10/12/00
Method:	EPA 7471

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METAL		
Mercury	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

HgS344
HG #1
21516-3h.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-3
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 8,10,11
Analyzed:	10/12/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.005	ND
Bromobenzene	0.005	ND
Bromochloromethane	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane	0.005	ND
n-Butylbenzene	0.005	ND
sec-Butylbenzene	0.005	ND
tert-Butylbenzene	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane	0.005	ND
2-Chloroethylvinyl ether	0.010	ND
Chloroform	0.005	ND
Chloromethane	0.005	ND
a-Chlorotoluene	0.005	ND
4-Chlorotoluene	0.005	ND
1,2-Dibromo-3-Chloropropane	0.010	ND
Dibromochloromethane	0.005	ND
Dibromomethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-3v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-3
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 8,10,11
Analyzed:	10/12/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
1,3-Dichloropropane	0.005	ND
2,2-Dichloropropane	0.005	ND
1,1-Dichloropropene	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Dichlorotrifluoroethane	0.005	ND
Ethylbenzene	0.005	ND
Ethylene dibromide (EDB)	0.005	ND
Hexachlorobutadiene	0.005	ND
Isopropylbenzene	0.005	ND
4-Isopropyltoluene	0.005	ND
Methylene Chloride	0.005	ND
Naphthalene	0.005	ND
n-Propylbenzene	0.005	ND
Styrene	0.005	ND
1,1,1,2-Tetrachloroethane	0.005	ND
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,2,3-Trichlorobenzene	0.010	ND
1,2,4-Trichlorobenzene	0.010	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-3v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-3
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 8,10,11
Analyzed:	10/12/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.005	ND
1,2,3-Trichloropropane	0.005	ND
1,2,4-Trimethylbenzene	0.005	ND
1,3,5-Trimethylbenzene	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes	0.005	ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		85
Percent Surrogate Recovery (Toluene-d8)		93
Percent Surrogate Recovery (4-Bromofluorobenzene)		114

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VS21012
MSD #2
21516-3v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-3
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	GRAB 8,10,11
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
Acenaphthene	0.1	ND
Acenaphthylene	0.1	ND
Aniline	0.1	ND
Anthracene	0.1	ND
Azobenzene	0.1	ND
Benz (a) anthracene	0.1	ND
Benzo (b) fluoranthene	0.1	ND
Benzo (k) fluoranthene	0.1	ND
Benzo (a) pyrene	0.1	ND
Benzo (g,h,i) perylene	0.1	ND
Benzoic acid	0.5	ND
Benzyl alcohol	0.1	ND
Bis (2-chloroethoxy) methane	0.1	ND
Bis (2-chloroethyl) ether	0.1	ND
Bis (2-chloroisopropyl) ether	0.1	ND
Bis(2-ethylhexyl) phthalate	0.1	ND
4-Bromophenyl phenyl ether	0.1	ND
Butylbenzylphthalate	0.1	ND
4-Chloroaniline	0.1	ND
2-Chloronaphthalene	0.1	ND
4-Chlorophenyl phenyl ether	0.1	ND
Chrysene	0.1	ND
Dibenz (a,h) anthracene	0.1	ND
Dibenzofuran	0.1	ND
Di-n-butyl phthalate	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-3n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: Collected: Received: Matrix:	21516-3 10/04/00 10/06/00 Soil
Project:	Laguna Lake	Sample Description:	GRAB 8,10,11
Project Number:	7743.00	Analyzed:	10/14/00
Collected by:	MB	Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
1,4-Dichlorobenzene	0.1	ND
3,3'-Dichlorobenzidine	0.1	ND
Diethyl phthalate	0.1	ND
Dimethyl phthalate	0.1	ND
2,4-Dinitrotoluene	0.1	ND
2,6-Dinitrotoluene	0.1	ND
Di-n-octyl phthalate	0.1	ND
Fluoranthene	0.1	ND
Fluorene	0.1	ND
Hexachlorobenzene	0.1	ND
Hexachlorobutadiene	0.1	ND
Hexachlorocyclopentadiene	0.1	ND
Hexachloroethane	0.1	ND
Indeno (1,2,3-c,d) pyrene	0.1	ND
Isophorone	0.1	ND
2-Methylnaphthalene	0.1	ND
Naphthalene	0.1	ND
2-Nitroaniline	0.1	ND
3-Nitroaniline	0.1	ND
4-Nitroaniline	0.1	ND
Nitrobenzene	0.1	ND
N-Nitrosodimethylamine	0.1	ND
N-Nitroso-di-N-propylamine	0.1	ND
N-Nitrosodiphenylamine	0.1	ND
Phenanthrene	0.1	ND
Pyrene	0.1	ND
1,2,4-Trichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-3n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-3 Collected: 10/04/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: GRAB 8,10,11 Analyzed: 10/14/00 Method: EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	0.1	ND
2-Chlorophenol	0.1	ND
2,4-Dichlorophenol	0.1	ND
2,4-Dimethylphenol	0.1	ND
2,4-Dinitrophenol	0.1	ND
4,6-Dinitro-2-methylphenol	0.1	ND
2-Methylphenol	0.1	ND
4-Methylphenol	0.1	ND
2-Nitrophenol	0.1	ND
4-Nitrophenol	0.5	ND
Pentachlorophenol	0.1	ND
Phenol	0.1	ND
2,4,5-Trichlorophenol	0.1	ND
2,4,6-Trichlorophenol	0.1	ND
Percent Surrogate Recovery (2-Fluorophenol)		37
Percent Surrogate Recovery (Phenol-d6)		57
Percent Surrogate Recovery (2,4,6-Tribromophenol)		64
Percent Surrogate Recovery (Nitrobenzene-d5)		48
Percent Surrogate Recovery (2-Fluorobiphenyl)		40
Percent Surrogate Recovery (Terphenyl-d14)		56

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

SS2743
MSD #9
21516-3n.xls
JMM/sw/dz/bp/ss/rb

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-3 Collected: 10/04/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: GRAB 8,10,11 Analyzed: 10/13/00 Method: EPA 8081

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
CHLORINATED PESTICIDES		
Aldrin	0.002	ND
Alpha-BHC	0.002	ND
Beta-BHC	0.002	ND
Delta-BHC	0.002	ND
Gamma-BHC (Lindane)	0.002	ND
Chlordane	0.1	ND
4,4'-DDD	0.002	ND
4,4'-DDE	0.002	ND
4,4'-DDT	0.002	ND
Dieldrin	0.002	ND
Endosulfan I	0.002	ND
Endosulfan II	0.002	ND
Endosulfan sulfate	0.002	ND
Endrin	0.002	ND
Endrin aldehyde	0.002	ND
Endrin ketone	0.002	ND
Heptachlor	0.002	ND
Heptachlor epoxide	0.002	ND
Methoxychlor	0.002	ND
Toxaphene	0.1	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		103
Percent Surrogate Recovery (Decachlorobiphenyl)		88

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-3p.xls
JMM/sw/dz/ss

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-3
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 8,10,11
Analyzed:	10/13/00
Method:	EPA 8082

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.03	ND
PCB 1221	0.03	ND
PCB 1232	0.03	ND
PCB 1242	0.03	ND
PCB 1248	0.03	ND
PCB 1254	0.03	ND
PCB 1260	0.03	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		103
Percent Surrogate Recovery (Decachlorobiphenyl)		88

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-3u.xls
JMM/sw/dz/ss

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	**Greg McGowan** **LFR Levine-Fricke** **301 S. Miller, Ste. 210** **Santa Maria, CA 93454**

Lab Number:	**21516-4**
Collected:	**10/04/00**
Received:	**10/06/00**
Matrix:	**Soil**

Project:	**Laguna Lake**
Project Number:	**7743.00**
Collected by:	**MB**

Sample Description:	**GRAB 12,14,15,16**
Analyzed:	**10/11/00**
Method:	**EPA 160.3**

CONSTITUENT	**RESULT** **%**
Percent Moisture	33.3

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

21516-4a.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-4
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 12,14,15,16
Analyzed:	10/15/00
Method:	EPA 6020

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METALS		
Antimony	5.0	ND
Arsenic	5.0	ND
Barium	0.5	110.
Beryllium	0.5	ND
Cadmium	1.0	ND
Chromium	1.0	64.
Cobalt	1.0	7.0
Copper	0.5	25.
Lead	1.0	5.7
Molybdenum	1.0	ND
Nickel	1.0	120.
Selenium	5.0	ND
Silver	1.0	ND
Thallium	5.0	ND
Vanadium	1.0	17.
Zinc	1.0	34.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Digested by EPA 3050 on 10/11/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MS592
ICPMS #1
21516-4c.xls
JMM/sw/cb/sm

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-4
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 12,14,15,16
Analyzed:	10/12/00
Method:	EPA 7471

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METAL		
Mercury	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

HgS344
HG #1
21516-4h.xls
JMM/sw/ba

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-4
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 12,14,15,16
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.005	ND
Bromobenzene	0.005	ND
Bromochloromethane	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane	0.005	ND
n-Butylbenzene	0.005	ND
sec-Butylbenzene	0.005	ND
tert-Butylbenzene	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane	0.005	ND
2-Chloroethylvinyl ether	0.010	ND
Chloroform	0.005	ND
Chloromethane	0.005	ND
a-Chlorotoluene	0.005	ND
4-Chlorotoluene	0.005	ND
1,2-Dibromo-3-Chloropropane	0.010	ND
Dibromochloromethane	0.005	ND
Dibromomethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-4v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-4
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 12,14,15,16
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
1,3-Dichloropropane	0.005	ND
2,2-Dichloropropane	0.005	ND
1,1-Dichloropropene	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Dichlorotrifluoroethane	0.005	ND
Ethylbenzene	0.005	ND
Ethylene dibromide (EDB)	0.005	ND
Hexachlorobutadiene	0.005	ND
Isopropylbenzene	0.005	ND
4-Isopropyltoluene	0.005	ND
Methylene Chloride	0.005	ND
Naphthalene	0.005	ND
n-Propylbenzene	0.005	ND
Styrene	0.005	ND
1,1,1,2-Tetrachloroethane	0.005	ND
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,2,3-Trichlorobenzene	0.010	ND
1,2,4-Trichlorobenzene	0.010	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-4v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-4
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 12,14,15,16
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.005	ND
1,2,3-Trichloropropane	0.005	ND
1,2,4-Trimethylbenzene	0.005	ND
1,3,5-Trimethylbenzene	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes	0.005	ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		91
Percent Surrogate Recovery (Toluene-d8)		91
Percent Surrogate Recovery (4-Bromofluorobenzene)		115

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VS21012
MSD #2
21516-4v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-4
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 12,14,15,16
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
Acenaphthene	0.1	ND
Acenaphthylene	0.1	ND
Aniline	0.1	ND
Anthracene	0.1	ND
Azobenzene	0.1	ND
Benz (a) anthracene	0.1	ND
Benzo (b) fluoranthene	0.1	ND
Benzo (k) fluoranthene	0.1	ND
Benzo (a) pyrene	0.1	ND
Benzo (g,h,i) perylene	0.1	ND
Benzoic acid	0.5	ND
Benzyl alcohol	0.1	ND
Bis (2-chloroethoxy) methane	0.1	ND
Bis (2-chloroethyl) ether	0.1	ND
Bis (2-chloroisopropyl) ether	0.1	ND
Bis(2-ethylhexyl) phthalate	0.1	ND
4-Bromophenyl phenyl ether	0.1	ND
Butylbenzylphthalate	0.1	ND
4-Chloroaniline	0.1	ND
2-Chloronaphthalene	0.1	ND
4-Chlorophenyl phenyl ether	0.1	ND
Chrysene	0.1	ND
Dibenz (a,h) anthracene	0.1	ND
Dibenzofuran	0.1	ND
Di-n-butyl phthalate	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-4n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-4
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 12,14,15,16
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
1,4-Dichlorobenzene	0.1	ND
3,3'-Dichlorobenzidine	0.1	ND
Diethyl phthalate	0.1	ND
Dimethyl phthalate	0.1	ND
2,4-Dinitrotoluene	0.1	ND
2,6-Dinitrotoluene	0.1	ND
Di-n-octyl phthalate	0.1	ND
Fluoranthene	0.1	ND
Fluorene	0.1	ND
Hexachlorobenzene	0.1	ND
Hexachlorobutadiene	0.1	ND
Hexachlorocyclopentadiene	0.1	ND
Hexachloroethane	0.1	ND
Indeno (1,2,3-c,d) pyrene	0.1	ND
Isophorone	0.1	ND
2-Methylnaphthalene	0.1	ND
Naphthalene	0.1	ND
2-Nitroaniline	0.1	ND
3-Nitroaniline	0.1	ND
4-Nitroaniline	0.1	ND
Nitrobenzene	0.1	ND
N-Nitrosodimethylamine	0.1	ND
N-Nitroso-di-N-propylamine	0.1	ND
N-Nitrosodiphenylamine	0.1	ND
Phenanthrene	0.1	ND
Pyrene	0.1	ND
1,2,4-Trichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-4n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-4
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	GRAB 12,14,15,16
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	0.1	ND
2-Chlorophenol	0.1	ND
2,4-Dichlorophenol	0.1	ND
2,4-Dimethylphenol	0.1	ND
2,4-Dinitrophenol	0.1	ND
4,6-Dinitro-2-methylphenol	0.1	ND
2-Methylphenol	0.1	ND
4-Methylphenol	0.1	ND
2-Nitrophenol	0.5	ND
4-Nitrophenol	0.1	ND
Pentachlorophenol	0.1	ND
Phenol	0.1	ND
2,4,5-Trichlorophenol	0.1	ND
2,4,6-Trichlorophenol		ND
Percent Surrogate Recovery (2-Fluorophenol)		42
Percent Surrogate Recovery (Phenol-d6)		66
Percent Surrogate Recovery (2,4,6-Tribromophenol)		72
Percent Surrogate Recovery (Nitrobenzene-d5)		57
Percent Surrogate Recovery (2-Fluorobipheyl)		45
Percent Surrogate Recovery (Terphenyl-d14)		65

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/13/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

SS2743
MSD #9
21516-4n.xls
JMM/sw/dz/bp/ss/rb

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Lab Number:	21516-4
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB
Sample Description:	GRAB 12,14,15,16
Analyzed:	10/13/00
Method:	EPA 8081

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
CHLORINATED PESTICIDES		
Aldrin	0.002	ND
Alpha-BHC	0.002	ND
Beta-BHC	0.002	ND
Delta-BHC	0.002	ND
Gamma-BHC (Lindane)	0.002	ND
Chlordane	0.1	ND
4,4'-DDD	0.002	ND
4,4'-DDE	0.002	ND
4,4'-DDT	0.002	ND
Dieldrin	0.002	ND
Endosulfan I	0.002	ND
Endosulfan II	0.002	ND
Endosulfan sulfate	0.002	ND
Endrin	0.002	ND
Endrin aldehyde	0.002	ND
Endrin ketone	0.002	ND
Heptachlor	0.002	ND
Heptachlor epoxide	0.002	ND
Methoxychlor	0.002	ND
Toxaphene	0.1	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		78
Percent Surrogate Recovery (Decachlorobiphenyl)		67

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-4p.xls
JMM/sw/dz/ss

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Lab Number:	21516-4
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB
Sample Description:	GRAB 12,14,15,16
Analyzed:	10/13/00
Method:	EPA 8082

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.03	ND
PCB 1221	0.03	ND
PCB 1232	0.03	ND
PCB 1242	0.03	ND
PCB 1248	0.03	ND
PCB 1254	0.03	ND
PCB 1260	0.03	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		78
Percent Surrogate Recovery (Decachlorobiphenyl)		67

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-4u.xls
JMM/sw/dz/ss

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

805.544.4696
www.ZymaXusa.com

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	GRAB 13
Analyzed:	10/11/00
Method:	EPA 160.3

CONSTITUENT	RESULT %
Percent Moisture	69.3

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

21516-5a.xls
JMM/sw/ba

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

805.544.4696
www.ZymaXusa.com

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 13
Analyzed:	10/15/00
Method:	EPA 6020

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METALS		
Antimony	5.0	ND
Arsenic	5.0	6.8
Barium	0.5	500.
Beryllium	0.5	ND
Cadmium	1.0	ND
Chromium	1.0	260.
Cobalt	1.0	26.
Copper	0.5	94.
Lead	1.0	31.
Molybdenum	1.0	1.1
Nickel	1.0	510.
Selenium	5.0	ND
Silver	1.0	ND
Thallium	5.0	ND
Vanadium	1.0	70.
Zinc	1.0	160.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Digested by EPA 3050 on 10/11/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MS592
ICPMS #1
21516-5c.xls
JMM/sw/cb/sm

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 13
Analyzed:	10/12/00
Method:	EPA 7471

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METAL		
Mercury	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

HgS344
HG #1
21516-5h.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 13
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.005	ND
Bromobenzene	0.005	ND
Bromochloromethane	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane	0.005	ND
n-Butylbenzene	0.005	ND
sec-Butylbenzene	0.005	ND
tert-Butylbenzene	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane	0.005	ND
2-Chloroethylvinyl ether	0.010	ND
Chloroform	0.005	ND
Chloromethane	0.005	ND
a-Chlorotoluene	0.005	ND
4-Chlorotoluene	0.005	ND
1,2-Dibromo-3-Chloropropane	0.010	ND
Dibromochloromethane	0.005	ND
Dibromomethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-5v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	GRAB 13
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
1,3-Dichloropropane	0.005	ND
2,2-Dichloropropane	0.005	ND
1,1-Dichloropropene	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Dichlorotrifluoroethane	0.005	ND
Ethylbenzene	0.005	ND
Ethylene dibromide (EDB)	0.005	ND
Hexachlorobutadiene	0.005	ND
Isopropylbenzene	0.005	ND
4-Isopropyltoluene	0.005	ND
Methylene Chloride	0.005	ND
Naphthalene	0.005	ND
n-Propylbenzene	0.005	ND
Styrene	0.005	ND
1,1,1,2-Tetrachloroethane	0.005	ND
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,2,3-Trichlorobenzene	0.010	ND
1,2,4-Trichlorobenzene	0.010	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-5v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 13
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.005	ND
1,2,3-Trichloropropane	0.005	ND
1,2,4-Trimethylbenzene	0.005	ND
1,3,5-Trimethylbenzene	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes	0.005	ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		86
Percent Surrogate Recovery (Toluene-d8)		94
Percent Surrogate Recovery (4-Bromofluorobenzene)		102

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VS21012
MSD #2
21516-5v.xls
JMM/sw/wj/pv/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 13
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
Acenaphthene	0.1	ND
Acenaphthylene	0.1	ND
Aniline	0.1	ND
Anthracene	0.1	ND
Azobenzene	0.1	ND
Benz (a) anthracene	0.1	ND
Benzo (b) fluoranthene	0.1	ND
Benzo (k) fluoranthene	0.1	ND
Benzo (a) pyrene	0.1	ND
Benzo (g,h,i) perylene	0.1	ND
Benzoic acid	0.5	ND
Benzyl alcohol	0.1	ND
Bis (2-chloroethoxy) methane	0.1	ND
Bis (2-chloroethyl) ether	0.1	ND
Bis (2-chloroisopropyl) ether	0.1	ND
Bis(2-ethylhexyl) phthalate	0.1	ND
4-Bromophenyl phenyl ether	0.1	ND
Butylbenzylphthalate	0.1	ND
4-Chloroaniline	0.1	ND
2-Chloronaphthalene	0.1	ND
4-Chlorophenyl phenyl ether	0.1	ND
Chrysene	0.1	ND
Dibenz (a,h) anthracene	0.1	ND
Dibenzofuran	0.1	ND
Di-n-butyl phthalate	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-5n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 13
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
1,4-Dichlorobenzene	0.1	ND
3,3'-Dichlorobenzidine	0.1	ND
Diethyl phthalate	0.1	ND
Dimethyl phthalate	0.1	ND
2,4-Dinitrotoluene	0.1	ND
2,6-Dinitrotoluene	0.1	ND
Di-n-octyl phthalate	0.1	ND
Fluoranthene	0.1	ND
Fluorene	0.1	ND
Hexachlorobenzene	0.1	ND
Hexachlorobutadiene	0.1	ND
Hexachlorocyclopentadiene	0.1	ND
Hexachloroethane	0.1	ND
Indeno (1,2,3-c,d) pyrene	0.1	ND
Isophorone	0.1	ND
2-Methylnaphthalene	0.1	ND
Naphthalene	0.1	ND
2-Nitroaniline	0.1	ND
3-Nitroaniline	0.1	ND
4-Nitroaniline	0.1	ND
Nitrobenzene	0.1	ND
N-Nitrosodimethylamine	0.1	ND
N-Nitroso-di-N-propylamine	0.1	ND
N-Nitrosodiphenylamine	0.1	ND
Phenanthrene	0.1	ND
Pyrene	0.1	ND
1,2,4-Trichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-5n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	GRAB 13
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	0.1	ND
2-Chlorophenol	0.1	ND
2,4-Dichlorophenol	0.1	ND
2,4-Dimethylphenol	0.1	ND
2,4-Dinitrophenol	0.1	ND
4,6-Dinitro-2-methylphenol	0.1	ND
2-Methylphenol	0.1	ND
4-Methylphenol	0.1	ND
2-Nitrophenol	0.1	ND
4-Nitrophenol	0.5	ND
Pentachlorophenol	0.1	ND
Phenol	0.1	ND
2,4,5-Trichlorophenol	0.1	ND
2,4,6-Trichlorophenol	0.1	ND
Percent Surrogate Recovery (2-Fluorophenol)		41
Percent Surrogate Recovery (Phenol-d6)		64
Percent Surrogate Recovery (2,4,6-Tribromophenol)		79
Percent Surrogate Recovery (Nitrobenzene-d5)		69
Percent Surrogate Recovery (2-Fluorobiphenyl)		64
Percent Surrogate Recovery (Terphenyl-d14)		78

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/13/00.

SS2743
MSD #9
21516-5n.xls
JMM/sw/dz/bp/ss/rb

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 13
Analyzed:	10/13/00
Method:	EPA 8081

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
CHLORINATED PESTICIDES		
Aldrin	0.002	ND
Alpha-BHC	0.002	ND
Beta-BHC	0.002	ND
Delta-BHC	0.002	ND
Gamma-BHC (Lindane)	0.002	ND
Chlordane	0.1	ND
4,4'-DDD	0.002	ND
4,4'-DDE	0.002	ND
4,4'-DDT	0.002	ND
Dieldrin	0.002	ND
Endosulfan I	0.002	ND
Endosulfan II	0.002	ND
Endosulfan sulfate	0.002	ND
Endrin	0.002	ND
Endrin aldehyde	0.002	ND
Endrin ketone	0.002	ND
Heptachlor	0.002	ND
Heptachlor epoxide	0.002	ND
Methoxychlor	0.002	ND
Toxaphene	0.1	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		87
Percent Surrogate Recovery (Decachlorobiphenyl)		66

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-5p.xls
JMM/sw/dz/ss

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-5
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	GRAB 13
Analyzed:	10/13/00
Method:	EPA 8082

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.03	ND
PCB 1221	0.03	ND
PCB 1232	0.03	ND
PCB 1242	0.03	ND
PCB 1248	0.03	ND
PCB 1254	0.03	ND
PCB 1260	0.03	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		87
Percent Surrogate Recovery (Decachlorobiphenyl)		66

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-5u.xls
JMM/sw/dz/ss

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-6
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	1 FOOT CORE
Analyzed:	10/11/00
Method:	EPA 160.3

CONSTITUENT	RESULT %
Percent Moisture	50.4

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

21516-6a.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-6
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	1 FOOT CORE
Analyzed:	10/15/00
Method:	EPA 6020

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METALS		
Antimony	5.0	ND
Arsenic	5.0	ND
Barium	0.5	330.
Beryllium	0.5	ND
Cadmium	1.0	ND
Chromium	1.0	180.
Cobalt	1.0	15.
Copper	0.5	82.
Lead	1.0	15.
Molybdenum	1.0	ND
Nickel	1.0	390.
Selenium	5.0	ND
Silver	1.0	ND
Thallium	5.0	ND
Vanadium	1.0	38.
Zinc	1.0	130.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Digested by EPA 3050 on 10/11/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MS592
ICPMS #1
21516-6c.xls
JMM/sw/cb/sm

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-6
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	1 FOOT CORE
Analyzed:	10/12/00
Method:	EPA 7471

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METAL		
Mercury	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

HgS344
HG #1
21516-6h.xls
JMM/sw/ba

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-6
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	1 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.005	ND
Bromobenzene	0.005	ND
Bromochloromethane	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane	0.005	ND
n-Butylbenzene	0.005	ND
sec-Butylbenzene	0.005	ND
tert-Butylbenzene	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane	0.005	ND
2-Chloroethylvinyl ether	0.010	ND
Chloroform	0.005	ND
Chloromethane	0.005	ND
a-Chlorotoluene	0.005	ND
4-Chlorotoluene	0.005	ND
1,2-Dibromo-3-Chloropropane	0.010	ND
Dibromochloromethane	0.005	ND
Dibromomethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-6v.xls
JMM/sw/wj/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-6
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	1 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
1,3-Dichloropropane	0.005	ND
2,2-Dichloropropane	0.005	ND
1,1-Dichloropropene	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Dichlorotrifluoroethane	0.005	ND
Ethylbenzene	0.005	ND
Ethylene dibromide (EDB)	0.005	ND
Hexachlorobutadiene	0.005	ND
Isopropylbenzene	0.005	ND
4-Isopropyltoluene	0.005	ND
Methylene Chloride	0.005	ND
Naphthalene	0.005	ND
n-Propylbenzene	0.005	ND
Styrene	0.005	ND
1,1,1,2-Tetrachloroethane	0.005	ND
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,2,3-Trichlorobenzene	0.010	ND
1,2,4-Trichlorobenzene	0.010	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-6v.xls
JMM/sw/wj/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-6
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	1 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.005	ND
1,2,3-Trichloropropane	0.005	ND
1,2,4-Trimethylbenzene	0.005	ND
1,3,5-Trimethylbenzene	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes	0.005	ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		93
Percent Surrogate Recovery (Toluene-d8)		92
Percent Surrogate Recovery (4-Bromofluorobenzene)		97

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VS21013
MSD #2
21516-6v.xls
JMM/sw/wj/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-6
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	1 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
Acenaphthene	0.1	ND
Acenaphthylene	0.1	ND
Aniline	0.1	ND
Anthracene	0.1	ND
Azobenzene	0.1	ND
Benz (a) anthracene	0.1	ND
Benzo (b) fluoranthene	0.1	ND
Benzo (k) fluoranthene	0.1	ND
Benzo (a) pyrene	0.1	ND
Benzo (g,h,i) perylene	0.1	ND
Benzoic acid	0.5	ND
Benzyl alcohol	0.1	ND
Bis (2-chloroethoxy) methane	0.1	ND
Bis (2-chloroethyl) ether	0.1	ND
Bis (2-chloroisopropyl) ether	0.1	ND
Bis(2-ethylhexyl) phthalate	0.1	ND
4-Bromophenyl phenyl ether	0.1	ND
Butylbenzylphthalate	0.1	ND
4-Chloroaniline	0.1	ND
2-Chloronaphthalene	0.1	ND
4-Chlorophenyl phenyl ether	0.1	ND
Chrysene	0.1	ND
Dibenz (a,h) anthracene	0.1	ND
Dibenzofuran	0.1	ND
Di-n-butyl phthalate	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-6n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-6
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	1 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
1,4-Dichlorobenzene	0.1	ND
3,3'-Dichlorobenzidine	0.1	ND
Diethyl phthalate	0.1	ND
Dimethyl phthalate	0.1	ND
2,4-Dinitrotoluene	0.1	ND
2,6-Dinitrotoluene	0.1	ND
Di-n-octyl phthalate	0.1	ND
Fluoranthene	0.1	ND
Fluorene	0.1	ND
Hexachlorobenzene	0.1	ND
Hexachlorobutadiene	0.1	ND
Hexachlorocyclopentadiene	0.1	ND
Hexachloroethane	0.1	ND
Indeno (1,2,3-c,d) pyrene	0.1	ND
Isophorone	0.1	ND
2-Methylnaphthalene	0.1	ND
Naphthalene	0.1	ND
2-Nitroaniline	0.1	ND
3-Nitroaniline	0.1	ND
4-Nitroaniline	0.1	ND
Nitrobenzene	0.1	ND
N-Nitrosodimethylamine	0.1	ND
N-Nitroso-di-N-propylamine	0.1	ND
N-Nitrosodiphenylamine	0.1	ND
Phenanthrene	0.1	ND
Pyrene	0.1	ND
1,2,4-Trichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-6n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-6
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	1 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	0.1	ND
2-Chlorophenol	0.1	ND
2,4-Dichlorophenol	0.1	ND
2,4-Dimethylphenol	0.1	ND
2,4-Dinitrophenol	0.1	ND
4,6-Dinitro-2-methylphenol	0.1	ND
2-Methylphenol	0.1	ND
4-Methylphenol	0.1	ND
2-Nitrophenol	0.1	ND
4-Nitrophenol	0.5	ND
Pentachlorophenol	0.1	ND
Phenol	0.1	ND
2,4,5-Trichlorophenol	0.1	ND
2,4,6-Trichlorophenol	0.1	ND
Percent Surrogate Recovery (2-Fluorophenol)		40
Percent Surrogate Recovery (Phenol-d6)		62
Percent Surrogate Recovery (2,4,6-Tribromophenol)		62
Percent Surrogate Recovery (Nitrobenzene-d5)		53
Percent Surrogate Recovery (2-Fluorobiphenyl)		38
Percent Surrogate Recovery (Terphenyl-d14)		62

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

SS2743
MSD #9
21516-6n.xls
JMM/sw/dz/bp/ss/rb

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-6
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	1 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8081

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
CHLORINATED PESTICIDES		
Aldrin	0.002	ND
Alpha-BHC	0.002	ND
Beta-BHC	0.002	ND
Delta-BHC	0.002	ND
Gamma-BHC (Lindane)	0.002	ND
Chlordane	0.1	ND
4,4'-DDD	0.002	ND
4,4'-DDE	0.002	ND
4,4'-DDT	0.002	ND
Dieldrin	0.002	ND
Endosulfan I	0.002	ND
Endosulfan II	0.002	ND
Endosulfan sulfate	0.002	ND
Endrin	0.002	ND
Endrin aldehyde	0.002	ND
Endrin ketone	0.002	ND
Heptachlor	0.002	ND
Heptachlor epoxide	0.002	ND
Methoxychlor	0.002	ND
Toxaphene	0.1	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		68
Percent Surrogate Recovery (Decachlorobiphenyl)		108

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-6p.xls
JMM/sw/dz/ss

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-6 Collected: 10/04/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: 1 FOOT CORE Analyzed: 10/13/00 Method: EPA 8082

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.03	ND
PCB 1221	0.03	ND
PCB 1232	0.03	ND
PCB 1242	0.03	ND
PCB 1248	0.03	ND
PCB 1254	0.03	ND
PCB 1260	0.03	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		68
Percent Surrogate Recovery (Decachlorobiphenyl)		108

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-6u.xls
JMM/sw/dz/ss

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	2 FOOT CORE
Analyzed:	10/11/00
Method:	EPA 160.3

CONSTITUENT	RESULT %
Percent Moisture	59.4

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

21516-7a.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	2 FOOT CORE
Analyzed:	10/15/00
Method:	EPA 6020

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METALS		
Antimony	5.0	ND
Arsenic	5.0	ND
Barium	0.5	350.
Beryllium	0.5	ND
Cadmium	1.0	ND
Chromium	1.0	220.
Cobalt	1.0	15.
Copper	0.5	74.
Lead	1.0	17.
Molybdenum	1.0	ND
Nickel	1.0	430.
Selenium	5.0	ND
Silver	1.0	ND
Thallium	5.0	ND
Vanadium	1.0	35.
Zinc	1.0	100.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Digested by EPA 3050 on 10/11/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MS592
ICPMS #1
21516-7c.xls
JMM/sw/cb/sm

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-9
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	4 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8082

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.03	ND
PCB 1221	0.03	ND
PCB 1232	0.03	ND
PCB 1242	0.03	ND
PCB 1248	0.03	ND
PCB 1254	0.03	ND
PCB 1260	0.03	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		70
Percent Surrogate Recovery (Decachlorobiphenyl)		69

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-9u.xls
JMM/sw/dz/ss

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	2 FOOT CORE
Analyzed:	10/12/00
Method:	EPA 7471

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METAL		
Mercury	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

HgS344
HG #1
21516-7h.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	2 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.005	ND
Bromobenzene	0.005	ND
Bromochloromethane	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane	0.005	ND
n-Butylbenzene	0.005	ND
sec-Butylbenzene	0.005	ND
tert-Butylbenzene	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane	0.005	ND
2-Chloroethylvinyl ether	0.010	ND
Chloroform	0.005	ND
Chloromethane	0.005	ND
a-Chlorotoluene	0.005	ND
4-Chlorotoluene	0.005	ND
1,2-Dibromo-3-Chloropropane	0.010	ND
Dibromochloromethane	0.005	ND
Dibromomethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-7v.xls
JMM/sw/wj/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	2 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
1,3-Dichloropropane	0.005	ND
2,2-Dichloropropane	0.005	ND
1,1-Dichloropropene	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Dichlorotrifluoroethane	0.005	ND
Ethylbenzene	0.005	ND
Ethylene dibromide (EDB)	0.005	ND
Hexachlorobutadiene	0.005	ND
Isopropylbenzene	0.005	ND
4-Isopropyltoluene	0.005	ND
Methylene Chloride	0.005	ND
Naphthalene	0.005	ND
n-Propylbenzene	0.005	ND
Styrene	0.005	ND
1,1,1,2-Tetrachloroethane	0.005	ND
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,2,3-Trichlorobenzene	0.010	ND
1,2,4-Trichlorobenzene	0.010	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-7v.xls
JMM/sw/wj/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	2 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.005	ND
1,2,3-Trichloropropane	0.005	ND
1,2,4-Trimethylbenzene	0.005	ND
1,3,5-Trimethylbenzene	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes	0.005	ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		91
Percent Surrogate Recovery (Toluene-d8)		96
Percent Surrogate Recovery (4-Bromofluorobenzene)		108

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VS21013
MSD #2
21516-7v.xls
JMM/sw/wj/bp

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	2 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8270

SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
Acenaphthene	0.1	ND
Acenaphthylene	0.1	ND
Aniline	0.1	ND
Anthracene	0.1	ND
Azobenzene	0.1	ND
Benz (a) anthracene	0.1	ND
Benzo (b) fluoranthene	0.1	ND
Benzo (k) fluoranthene	0.1	ND
Benzo (a) pyrene	0.1	ND
Benzo (g,h,i) perylene	0.1	ND
Benzoic acid	0.5	ND
Benzyl alcohol	0.1	ND
Bis (2-chloroethoxy) methane	0.1	ND
Bis (2-chloroethyl) ether	0.1	ND
Bis (2-chloroisopropyl) ether	0.1	ND
Bis(2-ethylhexyl) phthalate	0.1	ND
4-Bromophenyl phenyl ether	0.1	ND
Butylbenzylphthalate	0.1	ND
4-Chloroaniline	0.1	ND
2-Chloronaphthalene	0.1	ND
4-Chlorophenyl phenyl ether	0.1	ND
Chrysene	0.1	ND
Dibenz (a,h) anthracene	0.1	ND
Dibenzofuran	0.1	ND
Di-n-butyl phthalate	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-7n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	2 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8270

SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
1,4-Dichlorobenzene	0.1	ND
3,3'-Dichlorobenzidine	0.1	ND
Diethyl phthalate	0.1	ND
Dimethyl phthalate	0.1	ND
2,4-Dinitrotoluene	0.1	ND
2,6-Dinitrotoluene	0.1	ND
Di-n-octyl phthalate	0.1	ND
Fluoranthene	0.1	ND
Fluorene	0.1	ND
Hexachlorobenzene	0.1	ND
Hexachlorobutadiene	0.1	ND
Hexachlorocyclopentadiene	0.1	ND
Hexachloroethane	0.1	ND
Indeno (1,2,3-c,d) pyrene	0.1	ND
Isophorone	0.1	ND
2-Methylnaphthalene	0.1	ND
Naphthalene	0.1	ND
2-Nitroaniline	0.1	ND
3-Nitroaniline	0.1	ND
4-Nitroaniline	0.1	ND
Nitrobenzene	0.1	ND
N-Nitrosodimethylamine	0.1	ND
N-Nitroso-di-N-propylamine	0.1	ND
N-Nitrosodiphenylamine	0.1	ND
Phenanthrene	0.1	ND
Pyrene	0.1	ND
1,2,4-Trichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-7n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	2 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	0.1	ND
2-Chlorophenol	0.1	ND
2,4-Dichlorophenol	0.1	ND
2,4-Dimethylphenol	0.1	ND
2,4-Dinitrophenol	0.1	ND
4,6-Dinitro-2-methylphenol	0.1	ND
2-Methylphenol	0.1	ND
4-Methylphenol	0.1	ND
2-Nitrophenol	0.1	ND
4-Nitrophenol	0.5	ND
Pentachlorophenol	0.1	ND
Phenol	0.1	ND
2,4,5-Trichlorophenol	0.1	ND
2,4,6-Trichlorophenol	0.1	ND
Percent Surrogate Recovery (2-Fluorophenol)		38
Percent Surrogate Recovery (Phenol-d6)		58
Percent Surrogate Recovery (2,4,6-Tribromophenol)		60
Percent Surrogate Recovery (Nitrobenzene-d5)		52
Percent Surrogate Recovery (2-Fluorobiphenyl)		33
Percent Surrogate Recovery (Terphenyl-d14)		62

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/13/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

SS2743
MSD #9
21516-7n.xls
JMM/sw/dz/bp/ss/rb

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	2 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8081

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
CHLORINATED PESTICIDES		
Aldrin	0.002	ND
Alpha-BHC	0.002	ND
Beta-BHC	0.002	ND
Delta-BHC	0.002	ND
Gamma-BHC (Lindane)	0.002	ND
Chlordane	0.1	ND
4,4'-DDD	0.002	ND
4,4'-DDE	0.002	ND
4,4'-DDT	0.002	ND
Dieldrin	0.002	ND
Endosulfan I	0.002	ND
Endosulfan II	0.002	ND
Endosulfan sulfate	0.002	ND
Endrin	0.002	ND
Endrin aldehyde	0.002	ND
Endrin ketone	0.002	ND
Heptachlor	0.002	ND
Heptachlor epoxide	0.002	ND
Methoxychlor	0.002	ND
Toxaphene	0.1	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		69
Percent Surrogate Recovery (Decachlorobiphenyl)		67

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-7p.xls
JMM/sw/dz/ss

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-7
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	2 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8082

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.03	ND
PCB 1221	0.03	ND
PCB 1232	0.03	ND
PCB 1242	0.03	ND
PCB 1248	0.03	ND
PCB 1254	0.03	ND
PCB 1260	0.03	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		69
Percent Surrogate Recovery (Decachlorobiphenyl)		67

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-7u.xls
JMM/sw/dz/ss

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-8
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	3 FOOT CORE
Analyzed:	10/11/00
Method:	EPA 160.3

CONSTITUENT	RESULT %
Percent Moisture	52.1

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

21516-8a.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-8
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	3 FOOT CORE
Analyzed:	10/15/00
Method:	EPA 6020

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METALS		
Antimony	5.0	ND
Arsenic	5.0	ND
Barium	0.5	260.
Beryllium	0.5	ND
Cadmium	1.0	ND
Chromium	1.0	180.
Cobalt	1.0	13.
Copper	0.5	58.
Lead	1.0	10.
Molybdenum	1.0	ND
Nickel	1.0	300.
Selenium	5.0	ND
Silver	1.0	ND
Thallium	5.0	ND
Vanadium	1.0	37.
Zinc	1.0	74.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Digested by EPA 3050 on 10/11/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MS592
ICPMS #1
21516-8c.xls
JMM/sw/cb/sm

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-8
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	3 FOOT CORE
Analyzed:	10/12/00
Method:	EPA 7471

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METAL		
Mercury	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

HgS344
HG #1
21516-8h.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Lab Number:	21516-8
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB
Sample Description:	3 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.005	ND
Bromobenzene	0.005	ND
Bromochloromethane	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane	0.005	ND
n-Butylbenzene	0.005	ND
sec-Butylbenzene	0.005	ND
tert-Butylbenzene	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane	0.005	ND
2-Chloroethylvinyl ether	0.010	ND
Chloroform	0.005	ND
Chloromethane	0.005	ND
a-Chlorotoluene	0.005	ND
4-Chlorotoluene	0.005	ND
1,2-Dibromo-3-Chloropropane	0.010	ND
Dibromochloromethane	0.005	ND
Dibromomethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-8v.xls
JMM/sw/wj/bp/pv

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-8
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	3 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
1,3-Dichloropropane	0.005	ND
2,2-Dichloropropane	0.005	ND
1,1-Dichloropropene	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Dichlorotrifluoroethane	0.005	ND
Ethylbenzene	0.005	ND
Ethylene dibromide (EDB)	0.005	ND
Hexachlorobutadiene	0.005	ND
Isopropylbenzene	0.005	ND
4-Isopropyltoluene	0.005	ND
Methylene Chloride	0.005	ND
Naphthalene	0.005	ND
n-Propylbenzene	0.005	ND
Styrene	0.005	ND
1,1,1,2-Tetrachloroethane	0.005	ND
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,2,3-Trichlorobenzene	0.010	ND
1,2,4-Trichlorobenzene	0.010	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-8v.xls
JMM/sw/wj/bp/pv

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-8
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	3 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.005	ND
1,2,3-Trichloropropane	0.005	ND
1,2,4-Trimethylbenzene	0.005	ND
1,3,5-Trimethylbenzene	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes		ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		96
Percent Surrogate Recovery (Toluene-d8)		97
Percent Surrogate Recovery (4-Bromofluorobenzene)		114

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VS21013
MSD #2
21516-8v.xls
JMM/sw/wj/bp/pv

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-8
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	3 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
Acenaphthene	0.1	ND
Acenaphthylene	0.1	ND
Aniline	0.1	ND
Anthracene	0.1	ND
Azobenzene	0.1	ND
Benz (a) anthracene	0.1	ND
Benzo (b) fluoranthene	0.1	ND
Benzo (k) fluoranthene	0.1	ND
Benzo (a) pyrene	0.1	ND
Benzo (g,h,i) perylene	0.1	ND
Benzoic acid	0.5	ND
Benzyl alcohol	0.1	ND
Bis (2-chloroethoxy) methane	0.1	ND
Bis (2-chloroethyl) ether	0.1	ND
Bis (2-chloroisopropyl) ether	0.1	ND
Bis(2-ethylhexyl) phthalate	0.1	ND
4-Bromophenyl phenyl ether	0.1	ND
Butylbenzylphthalate	0.1	ND
4-Chloroaniline	0.1	ND
2-Chloronaphthalene	0.1	ND
4-Chlorophenyl phenyl ether	0.1	ND
Chrysene	0.1	ND
Dibenz (a,h) anthracene	0.1	ND
Dibenzofuran	0.1	ND
Di-n-butyl phthalate	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-8n.xls
JMM/sw/dz/bp/ss/rb

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-8
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	3 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
1,4-Dichlorobenzene	0.1	ND
3,3'-Dichlorobenzidine	0.1	ND
Diethyl phthalate	0.1	ND
Dimethyl phthalate	0.1	ND
2,4-Dinitrotoluene	0.1	ND
2,6-Dinitrotoluene	0.1	ND
Di-n-octyl phthalate	0.1	ND
Fluoranthene	0.1	ND
Fluorene	0.1	ND
Hexachlorobenzene	0.1	ND
Hexachlorobutadiene	0.1	ND
Hexachlorocyclopentadiene	0.1	ND
Hexachloroethane	0.1	ND
Indeno (1,2,3-c,d) pyrene	0.1	ND
Isophorone	0.1	ND
2-Methylnaphthalene	0.1	ND
Naphthalene	0.1	ND
2-Nitroaniline	0.1	ND
3-Nitroaniline	0.1	ND
4-Nitroaniline	0.1	ND
Nitrobenzene	0.1	ND
N-Nitrosodimethylamine	0.1	ND
N-Nitroso-di-N-propylamine	0.1	ND
N-Nitrosodiphenylamine	0.1	ND
Phenanthrene	0.1	ND
Pyrene	0.1	ND
1,2,4-Trichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-8n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-8
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	3 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	0.1	ND
2-Chlorophenol	0.1	ND
2,4-Dichlorophenol	0.1	ND
2,4-Dimethylphenol	0.1	ND
2,4-Dinitrophenol	0.1	ND
4,6-Dinitro-2-methylphenol	0.1	ND
2-Methylphenol	0.1	ND
4-Methylphenol	0.1	ND
2-Nitrophenol	0.1	ND
4-Nitrophenol	0.5	ND
Pentachlorophenol	0.1	ND
Phenol	0.1	ND
2,4,5-Trichlorophenol	0.1	ND
2,4,6-Trichlorophenol	0.1	ND
Percent Surrogate Recovery (2-Fluorophenol)		45
Percent Surrogate Recovery (Phenol-d6)		67
Percent Surrogate Recovery (2,4,6-Tribromophenol)		66
Percent Surrogate Recovery (Nitrobenzene-d5)		73
Percent Surrogate Recovery (2-Fluorobiphenyl)		51
Percent Surrogate Recovery (Terphenyl-d14)		64

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

SS2743
MSD #9
21516-8n.xls
JMM/sw/dz/bp/ss/rb

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-8 Collected: 10/04/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: 3 FOOT CORE Analyzed: 10/14/00 Method: EPA 8081

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
CHLORINATED PESTICIDES		
Aldrin	0.002	ND
Alpha-BHC	0.002	ND
Beta-BHC	0.002	ND
Delta-BHC	0.002	ND
Gamma-BHC (Lindane)	0.002	ND
Chlordane	0.1	ND
4,4'-DDD	0.002	ND
4,4'-DDE	0.002	ND
4,4'-DDT	0.002	ND
Dieldrin	0.002	ND
Endosulfan I	0.002	ND
Endosulfan II	0.002	ND
Endosulfan sulfate	0.002	ND
Endrin	0.002	ND
Endrin aldehyde	0.002	ND
Endrin ketone	0.002	ND
Heptachlor	0.002	ND
Heptachlor epoxide	0.002	ND
Methoxychlor	0.002	ND
Toxaphene	0.1	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		85
Percent Surrogate Recovery (Decachlorobiphenyl)		77

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-8p.xls
JMM/sw/dz/ss

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-8
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	3 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8082

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
POLYCHLORINATED BIPHENYLS (PCBs)		
PCB 1016	0.03	ND
PCB 1221	0.03	ND
PCB 1232	0.03	ND
PCB 1242	0.03	ND
PCB 1248	0.03	ND
PCB 1254	0.03	ND
PCB 1260	0.03	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		85
Percent Surrogate Recovery (Decachlorobiphenyl)		77

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-8u.xls
JMM/sw/dz/ss

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454
Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Lab Number:	21516-9
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil
Sample Description:	4 FOOT CORE
Analyzed:	10/11/00
Method:	EPA 160.3

CONSTITUENT	RESULT %
Percent Moisture	58.2

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

21516-9a.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-9 Collected: 10/04/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: 4 FOOT CORE Analyzed: 10/15/00 Method: EPA 6020

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METALS		
Antimony	5.0	ND
Arsenic	5.0	ND
Barium	0.5	330.
Beryllium	0.5	ND
Cadmium	1.0	ND
Chromium	1.0	180.
Cobalt	1.0	17.
Copper	0.5	74.
Lead	1.0	11.
Molybdenum	1.0	ND
Nickel	1.0	350.
Selenium	5.0	ND
Silver	1.0	ND
Thallium	5.0	ND
Vanadium	1.0	40.
Zinc	1.0	94.

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Digested by EPA 3050 on 10/11/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MS592
ICPMS #1
21516-9c.xls
JMM/sw/cb/sm

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-9
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	4 FOOT CORE
Analyzed:	10/12/00
Method:	EPA 7471

METAL	PQL* mg/kg	RESULT** mg/kg
TOTAL METAL		
Mercury	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

HgS344
HG #1
21516-9h.xls
JMM/sw/ba

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: Collected: Received: Matrix:	21516-9 10/04/00 10/06/00 Soil
Project:	Laguna Lake	Sample Description:	4 FOOT CORE
Project Number:	7743.00	Analyzed:	10/13/00
Collected by:	MB	Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Benzene	0.005	ND
Bromobenzene	0.005	ND
Bromochloromethane	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane	0.005	ND
n-Butylbenzene	0.005	ND
sec-Butylbenzene	0.005	ND
tert-Butylbenzene	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane	0.005	ND
2-Chloroethylvinyl ether	0.010	ND
Chloroform	0.005	ND
Chloromethane	0.005	ND
a-Chlorotoluene	0.005	ND
4-Chlorotoluene	0.005	ND
1,2-Dibromo-3-Chloropropane	0.010	ND
Dibromochloromethane	0.005	ND
Dibromomethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-9v.xls
JMM/sw/wj/bp/pv

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-9
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	4 FOOT CORE
Analyzed:	10/13/00
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
1,3-Dichloropropane	0.005	ND
2,2-Dichloropropane	0.005	ND
1,1-Dichloropropene	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Dichlorotrifluoroethane	0.005	ND
Ethylbenzene	0.005	ND
Ethylene dibromide (EDB)	0.005	ND
Hexachlorobutadiene	0.005	ND
Isopropylbenzene	0.005	ND
4-Isopropyltoluene	0.005	ND
Methylene Chloride	0.005	ND
Naphthalene	0.005	ND
n-Propylbenzene	0.005	ND
Styrene	0.005	ND
1,1,1,2-Tetrachloroethane	0.005	ND
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,2,3-Trichlorobenzene	0.010	ND
1,2,4-Trichlorobenzene	0.010	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

MSD #2
21516-9v.xls
JMM/sw/wj/bp/pv

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: Collected: Received: Matrix:	21516-9 10/04/00 10/06/00 Soil
Project: Project Number: Collected by:	Laguna Lake 7743.00 MB	Sample Description: 4 FOOT CORE Analyzed: Method:	 10/13/00 EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
VOLATILE ORGANIC COMPOUNDS		
Trichlorofluoromethane (freon 11)	0.005	ND
1,2,3-Trichloropropane	0.005	ND
1,2,4-Trimethylbenzene	0.005	ND
1,3,5-Trimethylbenzene	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes	0.005	ND
Percent Surrogate Recovery (1,2-Dichloroethane-d4)		89
Percent Surrogate Recovery (Toluene-d8)		92
Percent Surrogate Recovery (4-Bromofluorobenzene)		110

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 5030 (Purge and Trap).

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

VS21013
MSD #2
21516-9v.xls
JMM/sw/wj/bp/pv

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: Collected: Received: Matrix:	21516-9 10/04/00 10/06/00 Soil
Project:	Laguna Lake	Sample Description:	4 FOOT CORE
Project Number:	7743.00	Analyzed:	10/14/00
Collected by:	MB	Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
Acenaphthene	0.1	ND
Acenaphthylene	0.1	ND
Aniline	0.1	ND
Anthracene	0.1	ND
Azobenzene	0.1	ND
Benz (a) anthracene	0.1	ND
Benzo (b) fluoranthene	0.1	ND
Benzo (k) fluoranthene	0.1	ND
Benzo (a) pyrene	0.1	ND
Benzo (g,h,i) perylene	0.1	ND
Benzoic acid	0.5	ND
Benzyl alcohol	0.1	ND
Bis (2-chloroethoxy) methane	0.1	ND
Bis (2-chloroethyl) ether	0.1	ND
Bis (2-chloroisopropyl) ether	0.1	ND
Bis(2-ethylhexyl) phthalate	0.1	ND
4-Bromophenyl phenyl ether	0.1	ND
Butylbenzylphthalate	0.1	ND
4-Chloroaniline	0.1	ND
2-Chloronaphthalene	0.1	ND
4-Chlorophenyl phenyl ether	0.1	ND
Chrysene	0.1	ND
Dibenz (a,h) anthracene	0.1	ND
Dibenzofuran	0.1	ND
Di-n-butyl phthalate	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-9n.xls
JMM/sw/dz/bp/ss/rb

Client: Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454	Lab Number: 21516-9 Collected: 10/04/00 Received: 10/06/00 Matrix: Soil
Project: Laguna Lake Project Number: 7743.00 Collected by: MB	Sample Description: 4 FOOT CORE Analyzed: 10/14/00 Method: EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (BASE/NEUTRAL FRACTION)		
1,4-Dichlorobenzene	0.1	ND
3,3'-Dichlorobenzidine	0.1	ND
Diethyl phthalate	0.1	ND
Dimethyl phthalate	0.1	ND
2,4-Dinitrotoluene	0.1	ND
2,6-Dinitrotoluene	0.1	ND
Di-n-octyl phthalate	0.1	ND
Fluoranthene	0.1	ND
Fluorene	0.1	ND
Hexachlorobenzene	0.1	ND
Hexachlorobutadiene	0.1	ND
Hexachlorocyclopentadiene	0.1	ND
Hexachloroethane	0.1	ND
Indeno (1,2,3-c,d) pyrene	0.1	ND
Isophorone	0.1	ND
2-Methylnaphthalene	0.1	ND
Naphthalene	0.1	ND
2-Nitroaniline	0.1	ND
3-Nitroaniline	0.1	ND
4-Nitroaniline	0.1	ND
Nitrobenzene	0.1	ND
N-Nitrosodimethylamine	0.1	ND
N-Nitroso-di-N-propylamine	0.1	ND
N-Nitrosodiphenylamine	0.1	ND
Phenanthrene	0.1	ND
Pyrene	0.1	ND
1,2,4-Trichlorobenzene	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Extracted by EPA 3550 on 10/13/00.

MSD #9
21516-9n.xls
JMM/sw/dz/bp/ss/rb

ZymaX envirotechnology

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-9
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	4 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8270

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
SEMIVOLATILE ORGANIC COMPOUNDS (ACID FRACTION)		
4-Chloro-3-methylphenol	0.1	ND
2-Chlorophenol	0.1	ND
2,4-Dichlorophenol	0.1	ND
2,4-Dimethylphenol	0.1	ND
2,4-Dinitrophenol	0.1	ND
4,6-Dinitro-2-methylphenol	0.1	ND
2-Methylphenol	0.1	ND
4-Methylphenol	0.1	ND
2-Nitrophenol	0.1	ND
4-Nitrophenol	0.5	ND
Pentachlorophenol	0.1	ND
Phenol	0.1	ND
2,4,5-Trichlorophenol	0.1	ND
2,4,6-Trichlorophenol	0.1	ND
Percent Surrogate Recovery (2-Fluorophenol)		41
Percent Surrogate Recovery (Phenol-d6)		62
Percent Surrogate Recovery (2,4,6-Tribromophenol)		53
Percent Surrogate Recovery (Nitrobenzene-d5)		58
Percent Surrogate Recovery (2-Fluorobiphenyl)		39
Percent Surrogate Recovery (Terphenyl-d14)		65

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/13/00.

SS2743
MSD #9
21516-9n.xls
JMM/sw/dz/bp/ss/rb

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Greg McGowan LFR Levine-Fricke 301 S. Miller, Ste. 210 Santa Maria, CA 93454

Lab Number:	21516-9
Collected:	10/04/00
Received:	10/06/00
Matrix:	Soil

Project:	Laguna Lake
Project Number:	7743.00
Collected by:	MB

Sample Description:	4 FOOT CORE
Analyzed:	10/14/00
Method:	EPA 8081

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
CHLORINATED PESTICIDES		
Aldrin	0.002	ND
Alpha-BHC	0.002	ND
Beta-BHC	0.002	ND
Delta-BHC	0.002	ND
Gamma-BHC (Lindane)	0.002	ND
Chlordane	0.1	ND
4,4'-DDD	0.002	ND
4,4'-DDE	0.002	ND
4,4'-DDT	0.002	ND
Dieldrin	0.002	ND
Endosulfan I	0.002	ND
Endosulfan II	0.002	ND
Endosulfan sulfate	0.002	ND
Endrin	0.002	ND
Endrin aldehyde	0.002	ND
Endrin ketone	0.002	ND
Heptachlor	0.002	ND
Heptachlor epoxide	0.002	ND
Methoxychlor	0.002	ND
Toxaphene	0.1	ND
Percent Surrogate Recovery (2,4,5,6-Tetrachloro-m-xylene)		70
Percent Surrogate Recovery (Decachlorobiphenyl)		69

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Note: Extracted by EPA 3550 on 10/12/00.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

PS638
GC #2 (ECD)
21516-9p.xls
JMM/sw/dz/ss

805.544.4696
www.ZymaXusa.com

71 Zaca Lane
San Luis Obispo CA 93401
fax 805.544.8226

APPENDIX B

ESP Geotechnical Report

Earth Systems Pacific

4378 Santa Fe Road
San Luis Obispo, CA 93401-8116
(805) 544-3276 • FAX (805) 544-1786
E-mail: esc@earthsys.com

Mr. Greg McGowan
Levine-Fricke-Recon
301 South Miller, Suite 210
Santa Maria, CA 93454

October 30, 2000
Revised November 2, 2000
File No.: SL-12464-TA
Doc. No.:0010.009.LAB

PROJECT: LAGUNA LAKE; PROJECT NO. 7743.00

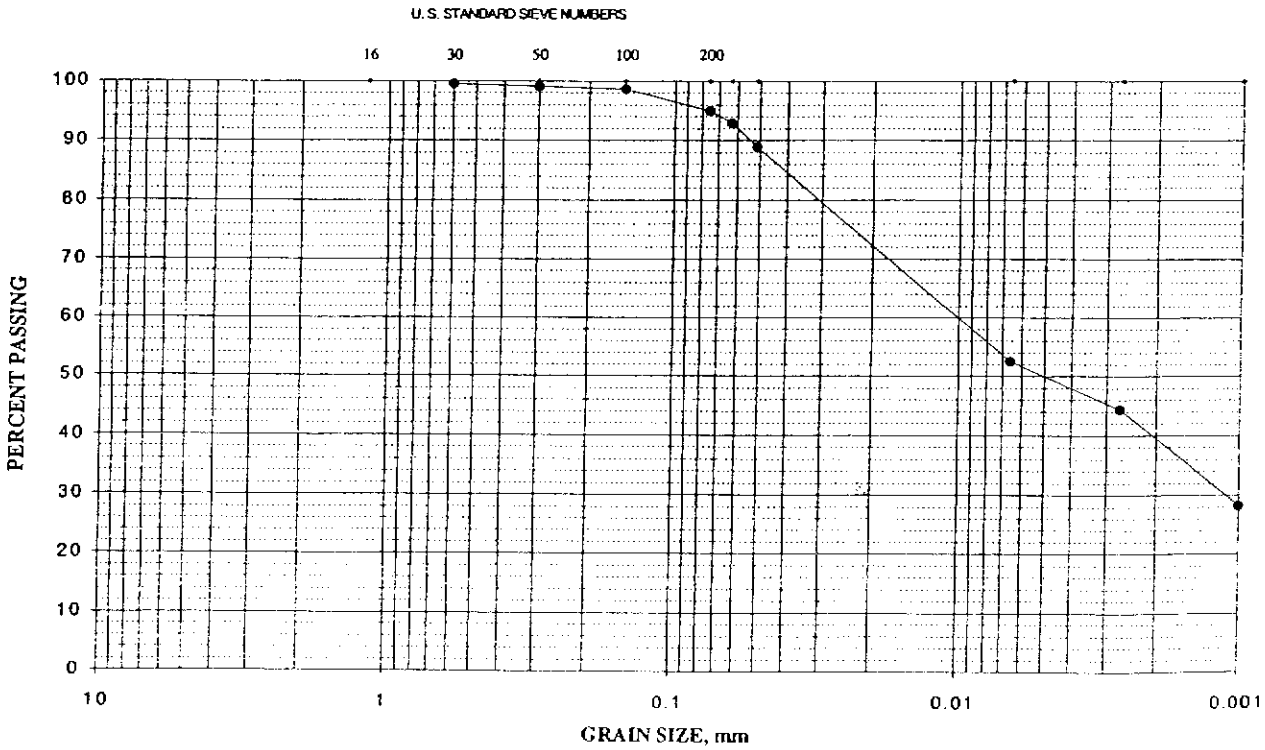
SAMPLE I.D.: 1 Foot Core

PARTICLE SIZE ANALYSIS

ASTM D 422-90

Liquid Limit = 80; Plastic Limit = 25; Plasticity Index = 55

Sieve size	% Retained	% Passing
#30	0	100
#50	1	99
#100	1	99
#200	5	95
63 µm		93
51 µm		89
6.6 µm		53
2.7 µm		44
Colloids		28



Earth Systems Pacific

4378 Santa Fe Road
San Luis Obispo, CA 93401-8116
(805) 544-3276 • FAX (805) 544-1786
E-mail: esc@earthsys.com

Mr. Greg McGowan
Levine-Fricke-Recon
301 South Miller, Suite 210
Santa Maria, CA 93454

October 30, 2000
Revised November 2, 2000
File No.: SL-12464-TA
Doc. No.:0010.010.LAB

PROJECT: LAGUNA LAKE; PROJECT NO. 7743.00

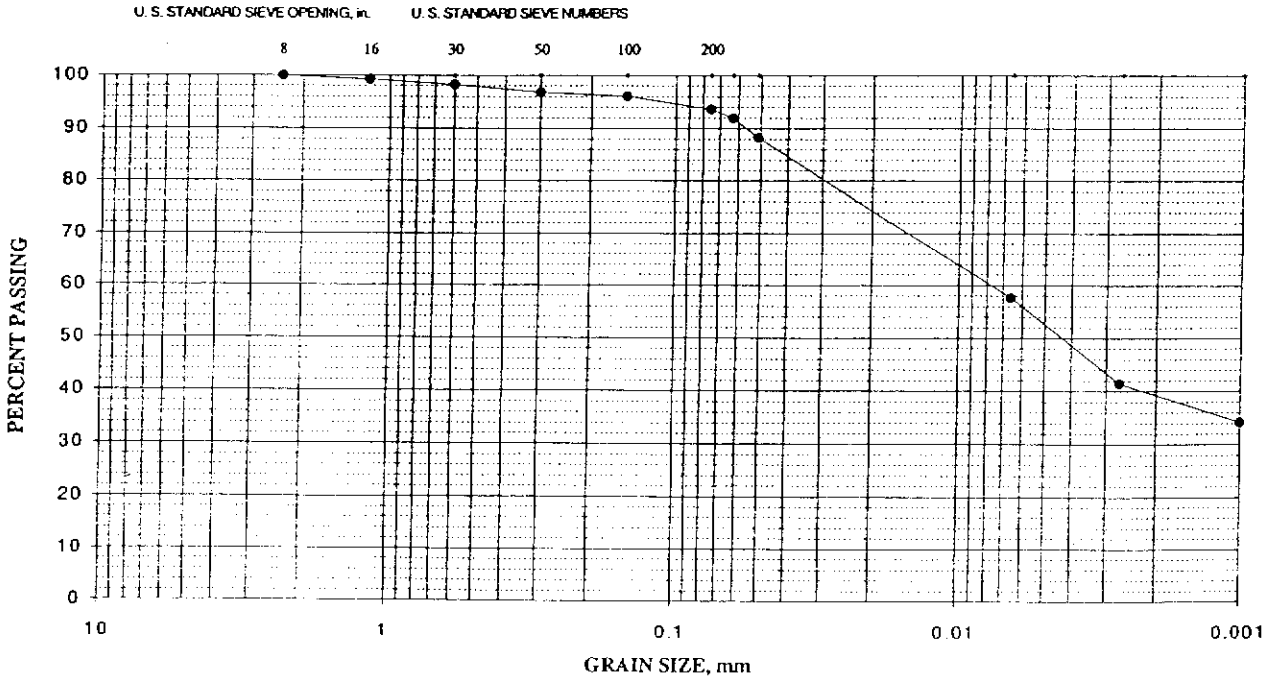
SAMPLE I.D.: 2 Foot Core

PARTICLE SIZE ANALYSIS

ASTM D 422-90

Liquid Limit = 83; Plastic Limit = 22; Plasticity Index = 61

Sieve size	% Retained	% Passing
#8	0	100
#16	1	99
#30	2	98
#50	3	97
#100	4	96
#200	6	94
63 µm		92
51 µm		88
6.6 µm		58
2.7 µm		41
Colloids		34



Earth Systems Pacific

4378 Santa Fe Road
San Luis Obispo, CA 93401-8116
(805) 544-3276 • FAX (805) 544-1786
E-mail: esc@earthsys.com

Mr. Greg McGowan
Levine-Fricke-Recon
301 South Miller, Suite 210
Santa Maria, CA 93454

October 30, 2000
Revised November 2, 2000
File No.: SL-12464-TA
Doc. No.:0010.011.LAB

PROJECT: LAGUNA LAKE; PROJECT NO. 7743.00

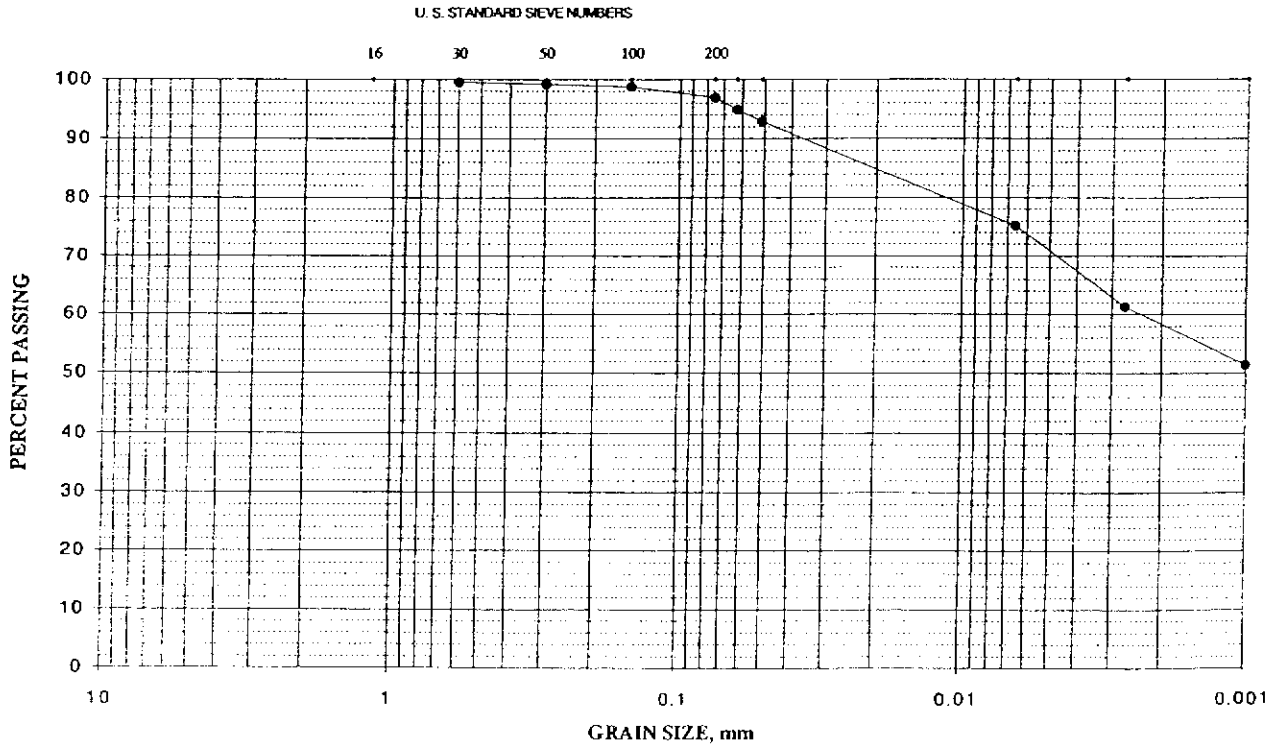
SAMPLE I.D.: 3 Foot Core

PARTICLE SIZE ANALYSIS

ASTM D 422-90

Liquid Limit = 98; Plastic Limit = 29; Plasticity Index = 69

Sieve size	% Retained	% Passing
#30	0	100
#50	1	99
#100	1	99
#200	3	97
63 µm		95
51 µm		93
6.6 µm		75
2.7 µm		61
Colloids		51



Earth Systems Pacific

4378 Santa Fe Road
San Luis Obispo, CA 93401-8116
(805) 544-3276 • FAX (805) 544-1786
E-mail: esc@earthsys.com

Mr. Greg McGowan
Levine-Fricke-Recon
301 South Miller, Suite 210
Santa Maria, CA 93454

October 30, 2000
Revised November 2, 2000
File No.: SL-12464-TA
Doc. No.:0010.012.LAB

PROJECT: LAGUNA LAKE; PROJECT NO. 7743.00

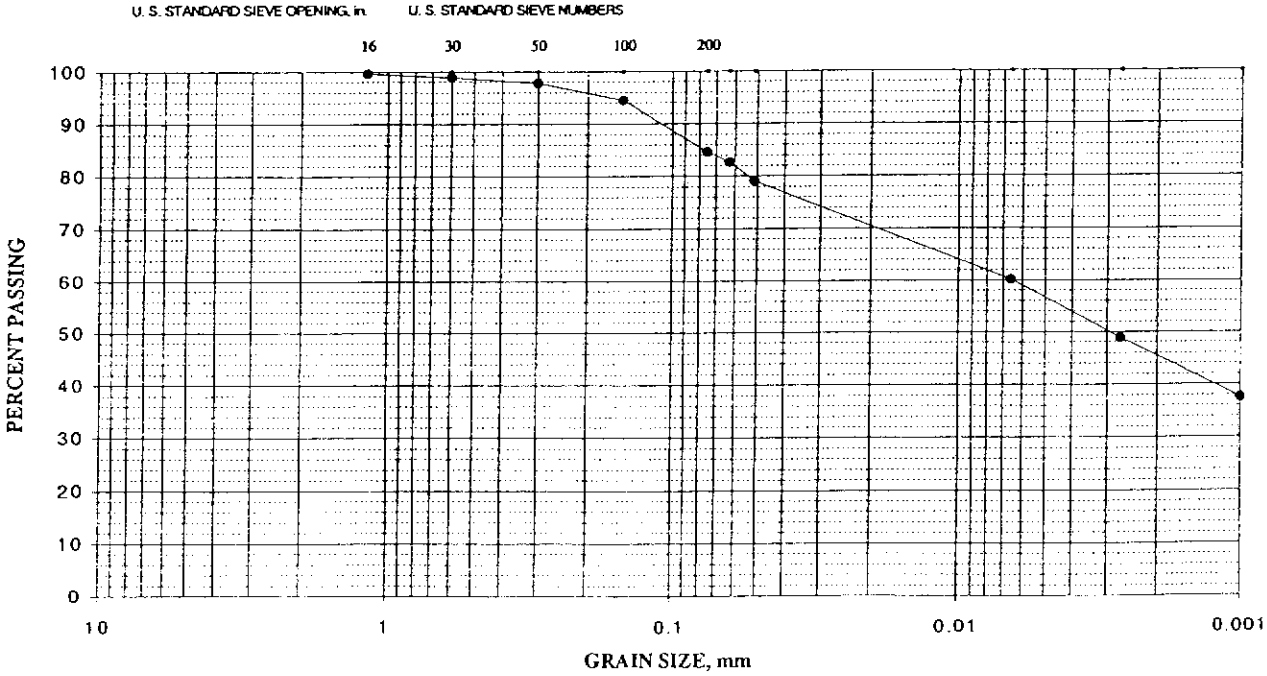
SAMPLE I.D.: 4 Foot Core

PARTICLE SIZE ANALYSIS

ASTM D 422-90

Liquid Limit = 94; Plastic Limit = 23; Plasticity Index = 71

Sieve size	% Retained	% Passing
#16	0	100
#30	1	99
#50	2	98
#100	5	95
#200	15	85
63 µm		83
51 µm		79
6.6 µm		60
2.7 µm		49
Colloids		38



Earth Systems Pacific

4378 Santa Fe Road
San Luis Obispo, CA 93401-8116
(805) 544-3276 • FAX (805) 544-1786
E-mail: esc@earthsys.com

Mr. Greg McGowan
Levine-Fricke-Recon
301 South Miller, Suite 210
Santa Maria, CA 93454

October 30, 2000
Revised November 2, 2000
File No.: SL-12464-TA
Doc. No.:0010.013.LAB

PROJECT: LAGUNA LAKE; PROJECT NO. 7743.00

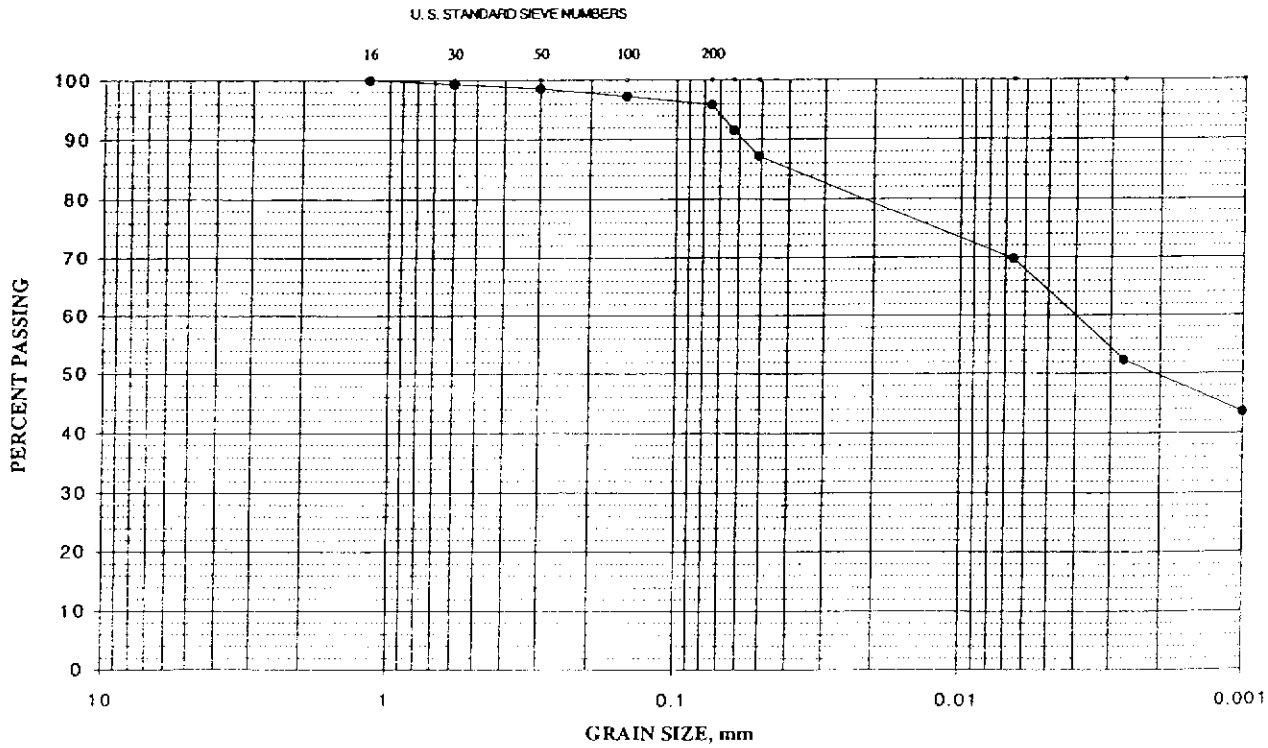
SAMPLE I.D.: Grab 1, 2, 3, 4

PARTICLE SIZE ANALYSIS

ASTM D 422-90

Liquid Limit = 113; Plastic Limit = 27; Plasticity Index = 86

Sieve size	% Retained	% Passing
#30	1	99
#50	1	99
#100	3	97
#200	4	96
63 µm		92
51 µm		87
6.6 µm		70
2.7 µm		52
Colloids		44



Earth Systems Pacific

4378 Santa Fe Road
San Luis Obispo, CA 93401-8116
(805) 544-3276 • FAX (805) 544-1786
E-mail: esc@earthsys.com

Mr. Greg McGowan
Levine-Fricke-Recon
301 South Miller, Suite 210
Santa Maria, CA 93454

October 30, 2000
Revised November 2, 2000
File No.: SL-12464-TA
Doc. No.:0010.014.LAB

PROJECT: LAGUNA LAKE; PROJECT NO. 7743.00

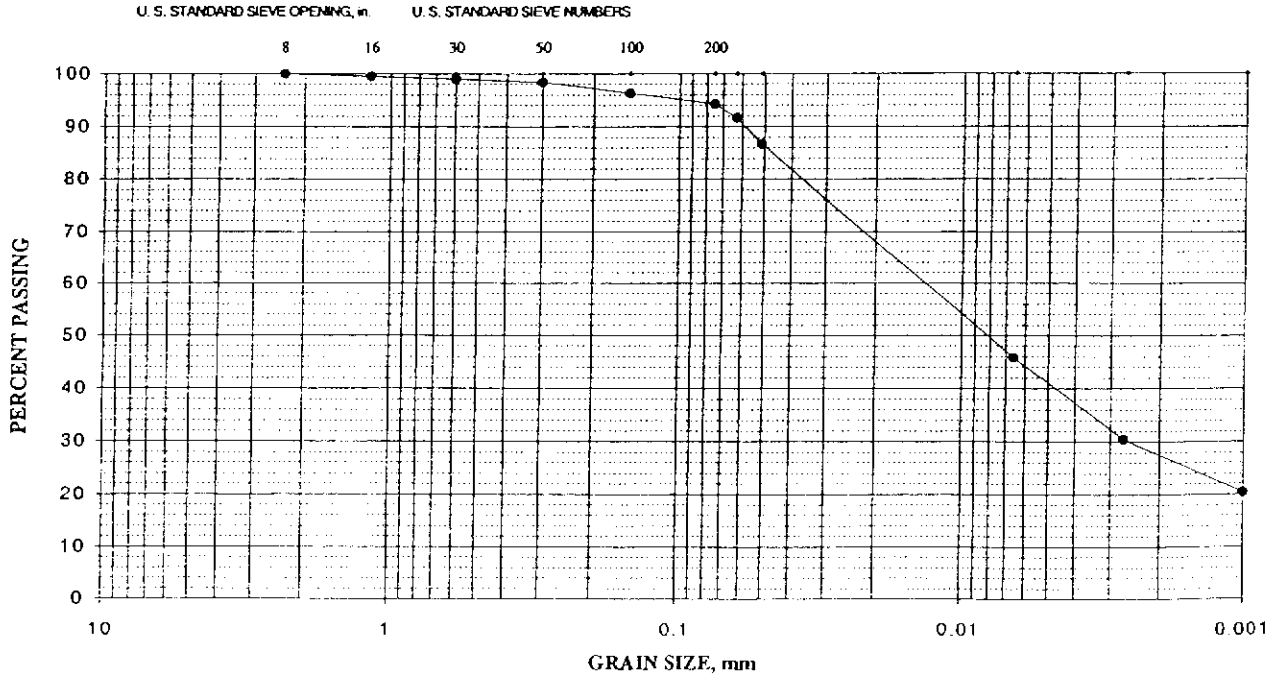
SAMPLE I.D.: Grab 5, 6, 7, 9

PARTICLE SIZE ANALYSIS

ASTM D 422-90

Liquid Limit = 78; Plastic Limit = 20; Plasticity Index = 58

Sieve size	% Retained	% Passing
#8	0	100
#16	1	99
#30	1	99
#50	2	98
#100	4	96
#200	6	94
63 µm		92
51 µm		87
6.6 µm		46
2.7 µm		31
Colloids		20



Earth Systems Pacific

4378 Santa Fe Road
San Luis Obispo, CA 93401-8116
(805) 544-3276 • FAX (805) 544-1786
E-mail: esc@earthsys.com

Mr. Greg McGowan
Levine-Fricke-Recon
301 South Miller, Suite 210
Santa Maria, CA 93454

October 30, 2000
Revised November 2, 2000
File No.: SL-12464-TA
Doc. No.:0010.015.LAB

PROJECT: LAGUNA LAKE; PROJECT NO. 7743.00

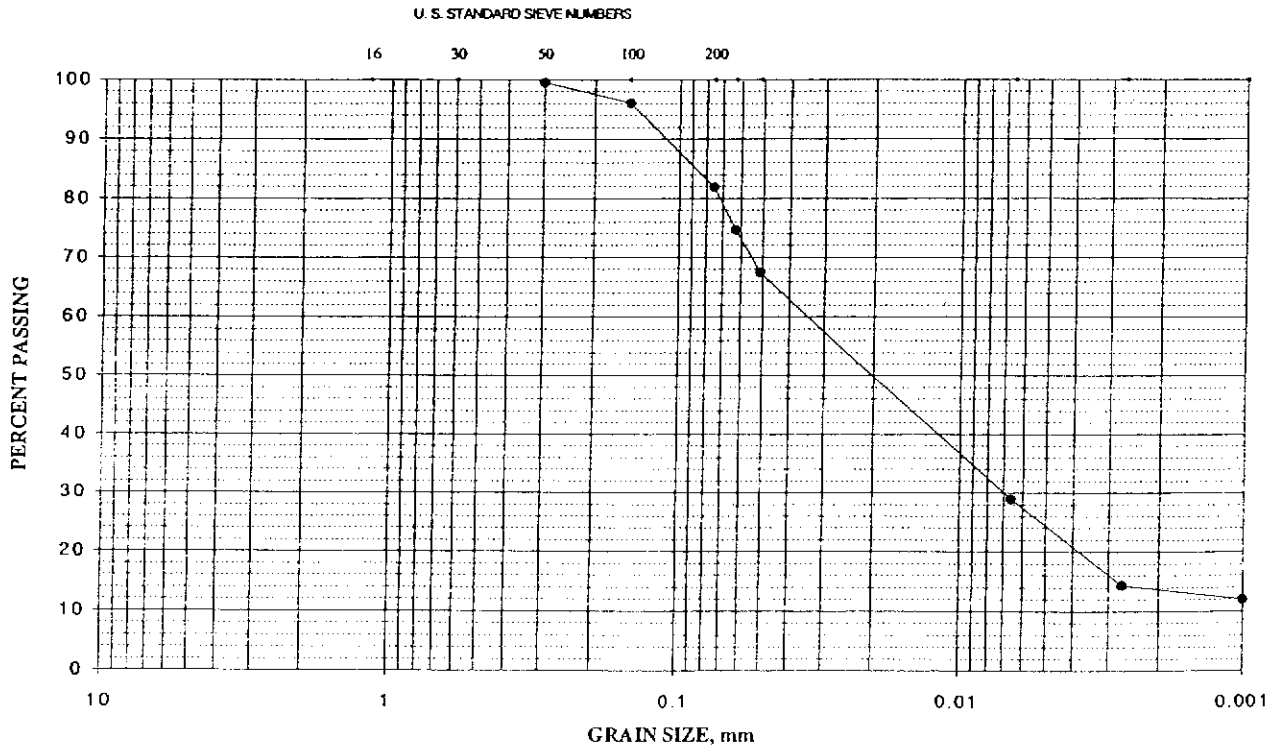
SAMPLE I.D.: Grab 8, 10, 11

PARTICLE SIZE ANALYSIS

ASTM D 422-90

Liquid Limit = 55; Plastic Limit = 20; Plasticity Index = 35

Sieve size	% Retained	% Passing
#50	0	100
#100	4	96
#200	18	82
63 µm		75
51 µm		67
6.6 µm		29
2.7 µm		14
Colloids		12



Earth Systems Pacific

4378 Santa Fe Road
San Luis Obispo, CA 93401-8116
(805) 544-3276 • FAX (805) 544-1786
E-mail: esc@earthsys.com

Mr. Greg McGowan
Levine-Fricke-Recon
301 South Miller, Suite 210
Santa Maria, CA 93454

October 30, 2000
Revised November 2, 2000
File No.: SL-12464-TA
Doc. No.:0010.016.LAB

PROJECT: LAGUNA LAKE; PROJECT NO. 7743.00

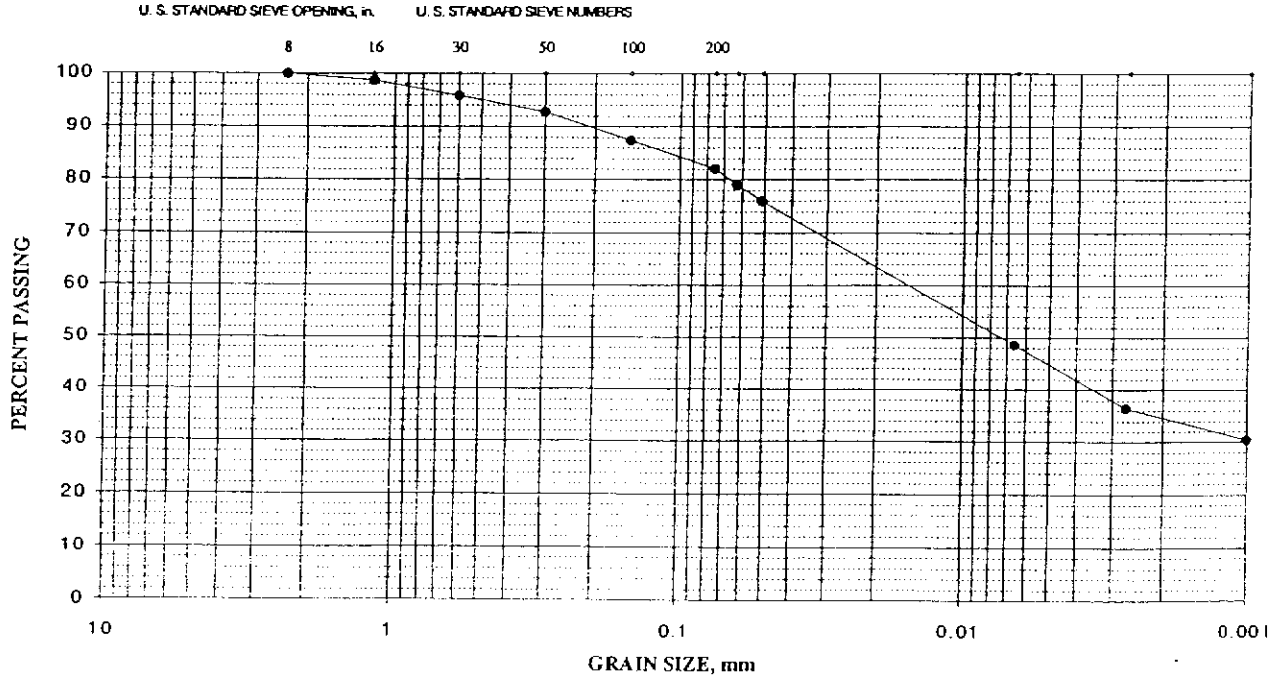
SAMPLE I.D.: Grab 12, 14, 15, 16

PARTICLE SIZE ANALYSIS

ASTM D 422-90

Liquid Limit = 89; Plastic Limit = 26; Plasticity Index = 63

Sieve size	% Retained	% Passing
#8	0	100
#16	1	99
#30	4	96
#50	7	93
#100	12	88
#200	18	82
63 µm		79
51 µm		76
6.6 µm		49
2.7 µm		37
Colloids		30



Earth Systems Pacific

4378 Santa Fe Road
San Luis Obispo, CA 93401-8116
(805) 544-3276 • FAX (805) 544-1786
E-mail: esc@earthsys.com

Mr. Greg McGowan
Levine-Fricke-Recon
301 South Miller, Suite 210
Santa Maria, CA 93454

October 30, 2000
Revised November 2, 2000
File No.: SL-12464-TA
Doc. No.:0010.017.LAB

PROJECT: LAGUNA LAKE; PROJECT NO. 7743.00

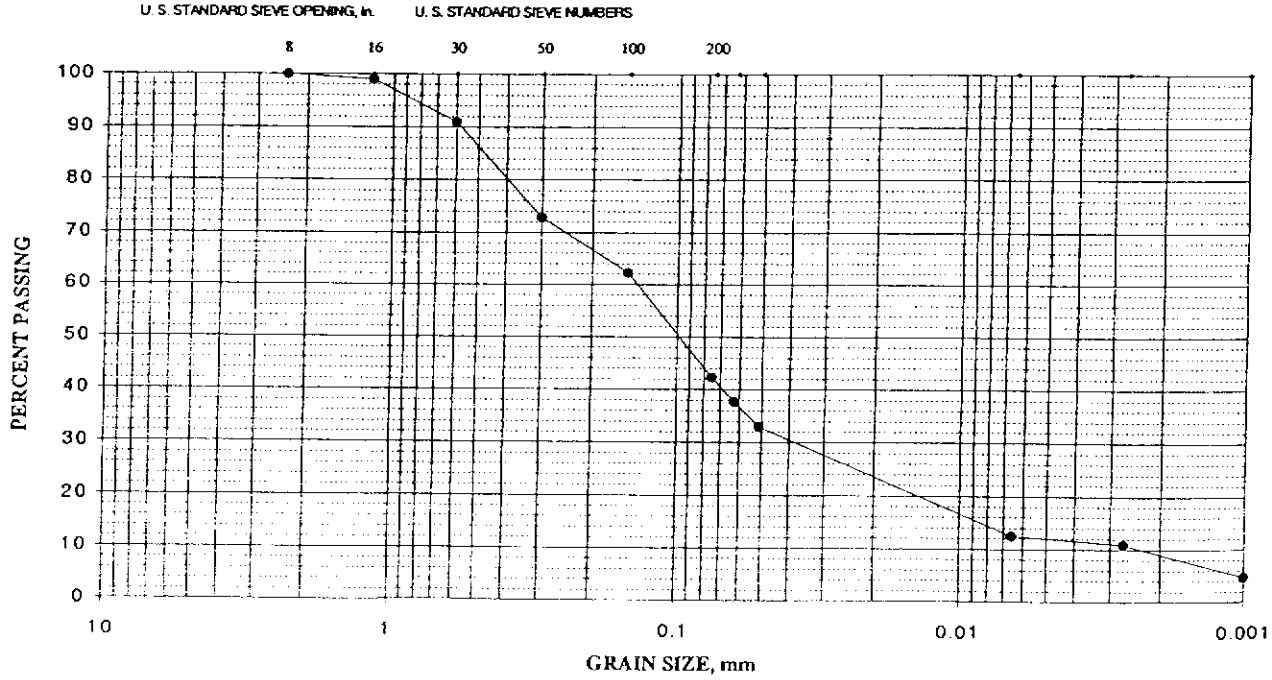
SAMPLE I.D.: Grab 13

PARTICLE SIZE ANALYSIS

ASTM D 422-90

Liquid Limit = 30; Plastic Limit = 22; Plasticity Index = 8

Sieve size	% Retained	% Passing
#8	0	100
#16	1	99
#30	9	91
#50	27	73
#100	38	62
#200	58	42
63 µm		38
51 µm		33
6.6 µm		13
2.7 µm		11
Colloids		5



APPENDIX C

FGL Agricultural Report

FRUIT GROWERS LABORATORY, INC.

ANALYTICAL CHEMISTS

November 7, 2000

NOV 21

Levine-Fricke-Recon
Attn: Greg McGowan
301 South Milller Street
Suite 210
Santa Maria, CA 93454

RE: AMENDED REPORT

Dear Mr. McGowan:

Enclosed are amended soil reports. The table below lists the FGL Lab Number, Sample Description and reasons for amendment.

FGL Lab Number	Sample Description	Reason for Amendment
SP 18644	Laguna Lake, #7743.00	Reprinted with General Optimum Range data.

If you need further clarification, please call me at (805) 659-0910.

Very truly yours,
FRUIT GROWERS LABORATORY, INC.

Darrell H. Nelson
President

DHN:md

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910
FAX: 805/525-4172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181
FAX: 209/942-0423

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435
Mobile 559/737-2399

FRUIT GROWERS LABORATORY, INC. **AMENDED**

ANALYTICAL CHEMISTS

November 11, 2000

Levine-Fricke-Recon
301 South Miller Street
Suite 210
Santa Maria, CA 93454

Lab ID : SP 18644-01
Customer : 2-18999

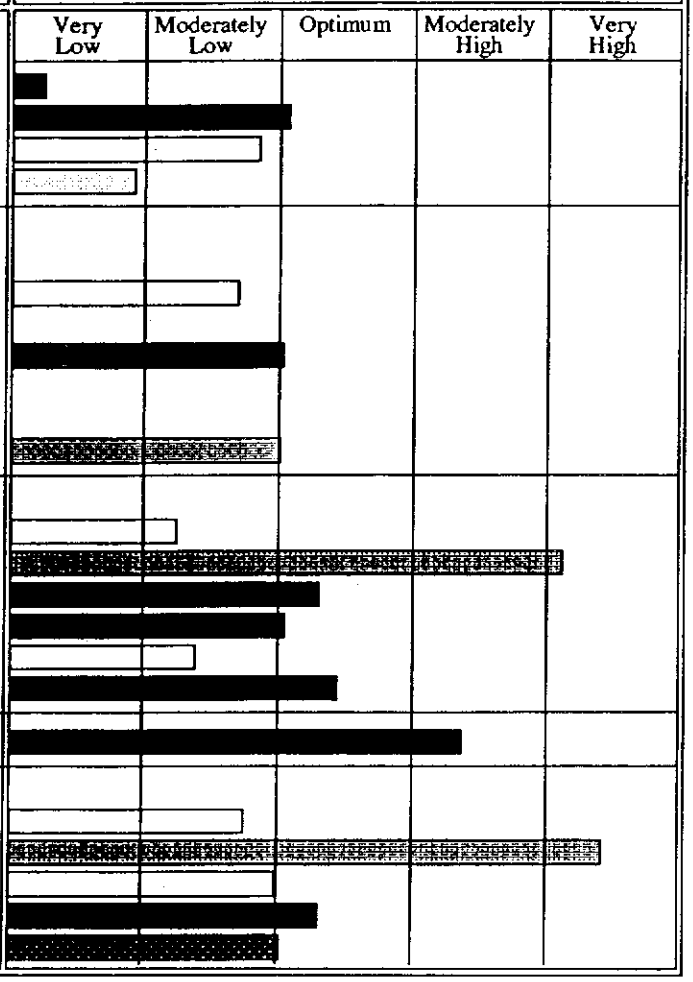
Sampled By: BTW/JWV/MRB
On : October 5, 2000
Received : October 6, 2000
Depth. : 3+4 Feet

Description : Grab 1,2,3,4
Project : Laguna Lake; #7743.00

GENERAL SOIL ANALYSIS

Test Description	Result		Optimum Range
Primary Nutrients			
Nitrate-Nitrogen	ND	PPM	40 - 280
Phosphorus	124	PPM	96 - 480
Potassium (Exch)	310	PPM	325 - 2000
Potassium (Sol)	0.31	meq/L	1.0 - 4.0
Secondary Nutrients			
Calcium (Exch)	3900	PPM	---
Calcium (Sol)	6.8	meq/L	8.0 - 200
Magnesium (Exch)	2400	PPM	---
Magnesium (Sol)	12.5	meq/L	6.0 - 200
Sodium (Exch)	150	PPM	---
Sodium (Sol)	4.1	meq/L	See SAR
Sulfate	3.5	meq/L	2.4 - 80
Micro Nutrients			
Zinc	1.3	PPM	2.8 - 200
Manganese	268	PPM	5.6 - 200
Iron	147	PPM	32 - 400
Copper	9.7	PPM	0.8 - 20
Boron	0.13	PPM	0.3 - 6.0
Chloride	7.44	meq/L	0.4 - 16
CEC	40.6	meq/100g	Variable
% Base Saturation			
CEC - Calcium	48.0	%	60 - 80
CEC - Magnesium	48.5	%	10 - 20
CEC - Potassium	2.0	%	2 - 5
CEC - Sodium	1.6	%	0 - 5
CEC - Hydrogen	0.0	%	0 - 30

Graphical Results Presentation



Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Table continued next page...

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910
FAX: 805/525-4172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181
FAX: 209/942-0423

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435
Mobile: 559/737-2399

November 11, 2000

Levine-Fricke-Recon

Lab ID : SP 18644-01
Customer : 2-18999
Description : Grab 1,2,3,4

GENERAL SOIL ANALYSIS

Test Description	Result	Optimum Range	Graphical Results Presentation
pH	7.5 ---	5.2 - 6.0	Strongly Acidic / Moderately Acidic / Near Neutral / Moderately Alkaline / Strongly Alkaline
Others			Satisfactory / Possible Problem / Moderate Problem / Increasing Problem
Soil Salinity	2.06 mmhos/cm	0.5 - 8.0	
SAR	1.3	0.1 - 6	
Limestone	ND %	0 - 0.1	
Lime Requirement	0.0 Tons/AF	---	0 / 1 / 2 / 3 / 4 / 5 / 6
Moisture	280 %	1/2 Satn. %	Very Low / Moderately Low / Optimum / Moderately High / Very High
Saturation	78.4 %	20 - 60	Loamy Sand / Sandy Loam / Loam / Silt Loam / Clay Loam / Clay / Organic

Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

FRUIT GROWERS LABORATORY, INC.

Darrell H. Nelson, President

DHN:md

FRUIT GROWERS LABORATORY, INC. AMENDED

ANALYTICAL CHEMISTS

November 7, 2000

Levine-Fricke-Recon
301 South Miller Street
Suite 210
Santa Maria, CA 93454

Lab ID : SP 18644-02
Customer : 2-18999

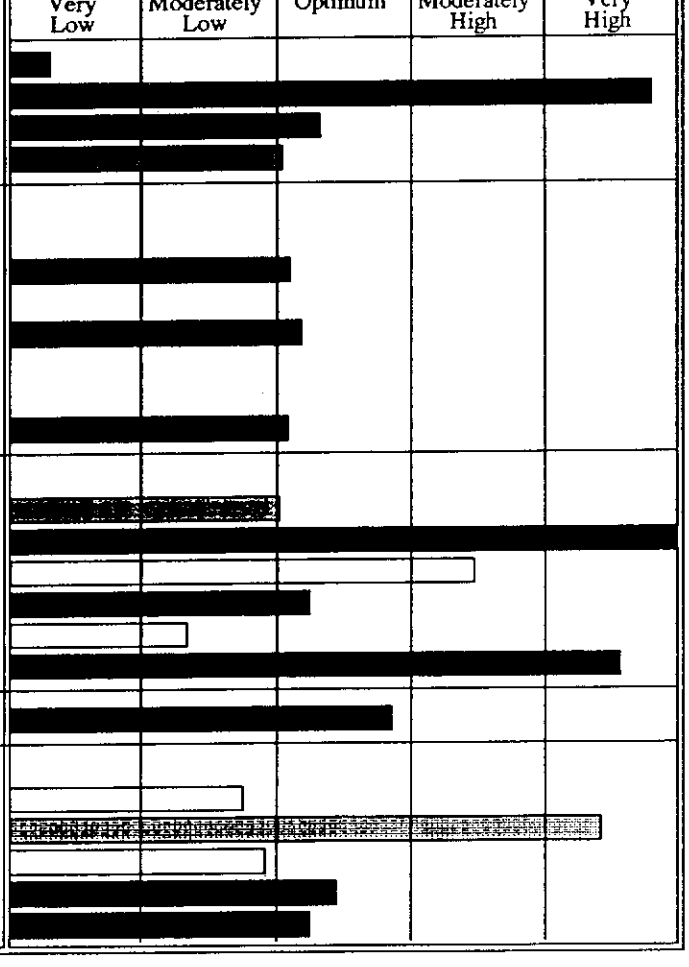
Sampled By: BTW/JWV/MRB
On : October 5, 2000
Received : October 6, 2000
Depth. : 3+4 Feet

Description : Grab 5,6,7,9
Project : Laguna Lake; #7743.00

GENERAL SOIL ANALYSIS

Test Description	Result		Optimum Range
Primary Nutrients			
Nitrate-Nitrogen	ND	PPM	10 - 70
Phosphorus	95	PPM	12 - 60
Potassium (Exch)	220	PPM	81 - 500
Potassium (Sol)	0.28	meq/L	0.25 - 1.0
Secondary Nutrients			
Calcium (Exch)	3000	PPM	---
Calcium (Sol)	6.7	meq/L	2.0 - 50
Magnesium (Exch)	1800	PPM	---
Magnesium (Sol)	12.3	meq/L	1.5 - 60
Sodium (Exch)	120	PPM	---
Sodium (Sol)	4.1	meq/L	See SAR
Sulfate	2.2	meq/L	0.6 - 20
Micro Nutrients			
Zinc	1.8	PPM	0.7 - 50
Manganese	168	PPM	1.4 - 50
Iron	136	PPM	8.0 - 100
Copper	10.0	PPM	0.2 - 40
Boron	0.11	PPM	0.3 - 1.5
Chloride	7.13	meq/L	0.1 - 4.0
CEC	31.2	meq/100g	Variable
% Base Saturation			
CEC - Calcium	48.1	%	60 - 80
CEC - Magnesium	48.4	%	10 - 20
CEC - Potassium	1.8	%	2 - 5
CEC - Sodium	1.7	%	0 - 5
CEC - Hydrogen	0.0	%	0 - 3

Graphical Results Presentation



Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Table continued next page...

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435

November 7, 2000

Levine-Fricke-Recon

Lab ID : SP 18644-02
Customer : 2-18999
Description : Grab 5,6,7,9

GENERAL SOIL ANALYSIS

Test Description	Result	Optimum Range	Graphical Results Presentation
pH	7.7 ---	5.8 - 8.2	Strongly Acidic / Moderately Acidic / Near Neutral / Moderately Alkaline / Strongly Alkaline
Others			Satisfactory / Possible Problem / Moderate Problem / Increasing Problem
Soil Salinity	2.05 mmhos/cm	0.5 - 2.0	
SAR	1.3	0.1 - 6	
Limestone	ND %	0 - 0.1	
Lime Requirement	0.0 Tons/AF	---	0 / 1 / 2 / 3 / 4 / 5 / 6
Moisture	172 %	1/2 Satn. %	Very Low / Moderately Low / Optimum / Moderately High / Very High
Saturation	66.6 %	20 - 60	Loamy Sand / Sandy Loam / Loam / Silt Loam / Clay Loam / Clay / Organic

Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Soil pH & Limestone levels are important to consider when making plant selections. Soil pH levels above 7.0 are not suitable for acid loving plants. Soils containing limestone are not suitable for plants sensitive to Limestone.

FRUIT GROWERS LABORATORY, INC.

Ricardo Sandoval Sr

Darrell H. Nelson, President

DHN:md

FRUIT GROWERS LABORATORY, INC.

AMENDED

ANALYTICAL CHEMISTS

November 7, 2000

Levine-Fricke-Recon
301 South Miller Street
Suite 210
Santa Maria, CA 93454

Lab ID : SP 18644-03
Customer : 2-18999

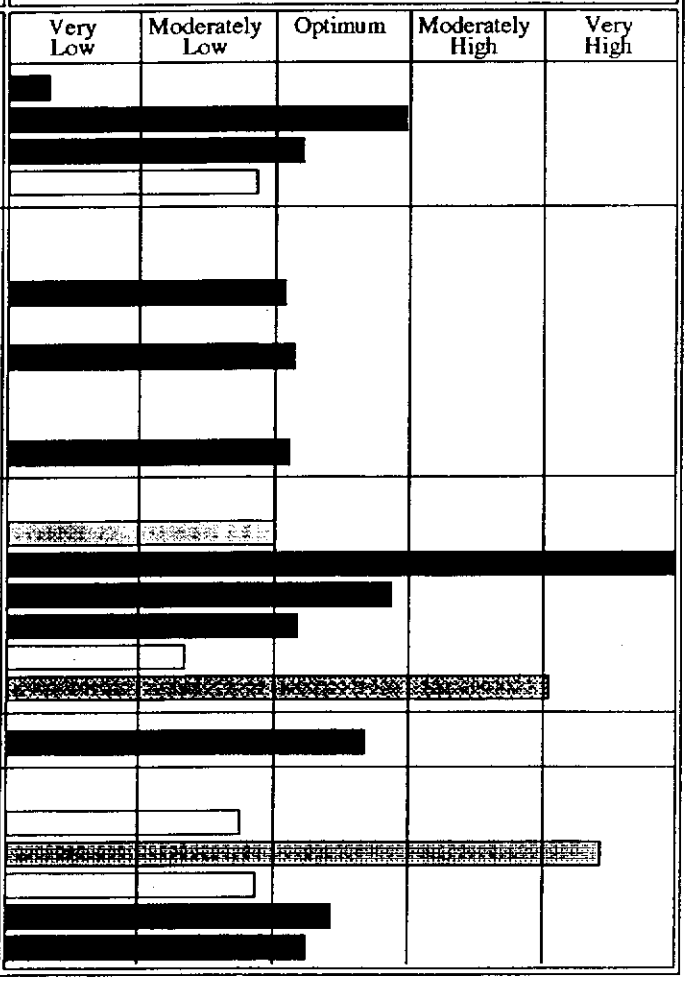
Sampled By: BTW/JWV/MRB
On : October 4, 2000
Received : October 6, 2000
Depth. : 3+4 Feet

Description : Grab 8,10,11
Project : Laguna Lake; #7743.00

GENERAL SOIL ANALYSIS

Test Description	Result		Optimum Range
Primary Nutrients			
Nitrate-Nitrogen	ND	PPM	10 - 70
Phosphorus	59	PPM	12 - 60
Potassium (Exch)	170	PPM	81 - 500
Potassium (Sol)	0.23	meq/L	0.25 - 1.0
Secondary Nutrients			
Calcium (Exch)	2500	PPM	---
Calcium (Sol)	5.7	meq/L	2.0 - 50
Magnesium (Exch)	1600	PPM	---
Magnesium (Sol)	10.0	meq/L	1.5 - 60
Sodium (Exch)	100	PPM	---
Sodium (Sol)	3.7	meq/L	See SAR
Sulfate	2.8	meq/L	0.6 - 20
Micro Nutrients			
Zinc	1.1	PPM	0.7 - 50
Manganese	176	PPM	1.4 - 50
Iron	88.6	PPM	8.0 - 100
Copper	7.1	PPM	0.2 - 40
Boron	0.11	PPM	0.3 - 1.5
Chloride	6.09	meq/L	0.1 - 4.0
CEC	26.5	meq/100g	Variable
% Base Saturation			
CEC - Calcium	47.9	%	60 - 80
CEC - Magnesium	48.7	%	10 - 20
CEC - Potassium	1.6	%	2 - 5
CEC - Sodium	1.6	%	0 - 5
CEC - Hydrogen	0.0	%	0 - 3

Graphical Results Presentation



Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Table continued next page...

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910
FAX: 805/525-4172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181
FAX: [illegible]

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435

November 7, 2000

Levine-Fricke-Recon

Lab ID : SP 18644-03
Customer : 2-18999
Description : Grab 8,10,11

GENERAL SOIL ANALYSIS

Test Description	Result	Optimum Range	Graphical Results Presentation
pH	7.8 ---	5.8 - 8.2	Strongly Acidic / Moderately Acidic / Near Neutral / Moderately Alkaline / Strongly Alkaline
Others			Satisfactory / Possible Problem / Moderate Problem / Increasing Problem
Soil Salinity	1.79 mmhos/cm	0.5 - 2.0	
SAR	1.3	0.1 - 6	
Limestone	ND %	0 - 0.1	
Lime Requirement	0.0 Tons/AF	---	0 / 1 / 2 / 3 / 4 / 5 / 6
Moisture	132 %	1/2 Satn. %	Very Low / Moderately Low / Optimum / Moderately High / Very High
Saturation	53.3 %	20 - 60	Loamy Sand / Sandy Loam / Loam / Silt Loam / Clay Loam / Clay / Organic

Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Soil pH & Limestone levels are important to consider when making plant selections. Soil pH levels above 7.0 are not suitable for acid loving plants. Soils containing limestone are not suitable for plants sensitive to Limestone.

FRUIT GROWERS LABORATORY, INC.

Ricardo Sandoval

Darrell H. Nelson, President

DHN:md

FRUIT GROWERS LABORATORY, INC.

AMENDED

ANALYTICAL CHEMISTS

November 11, 2000

Levine-Fricke-Recon
301 South Miller Street
Suite 210
Santa Maria, CA 93454

Lab ID : SP 18644-04
Customer : 2-18999

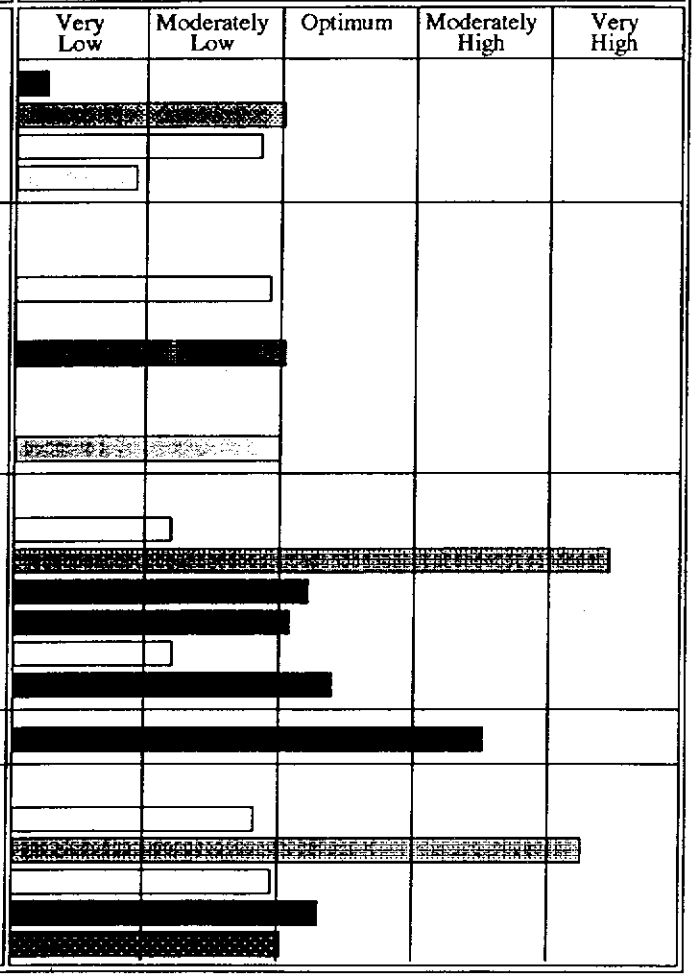
Sampled By: BTW/JWV/MRB
On : October 4, 2000
Received : October 6, 2000
Depth. : 5+6 Feet

Description : Grab 12,14,15,16
Project : Laguna Lake; #7743.00

GENERAL SOIL ANALYSIS

Test Description	Result		Optimum Range
Primary Nutrients			
Nitrate-Nitrogen	ND	PPM	40 - 280
Phosphorus	105	PPM	96 - 480
Potassium (Exch)	310	PPM	325 - 2000
Potassium (Sol)	0.30	meq/L	1.0 - 4.0
Secondary Nutrients			
Calcium (Exch)	4400	PPM	---
Calcium (Sol)	7.7	meq/L	8.0 - 200
Magnesium (Exch)	2400	PPM	---
Magnesium (Sol)	13.7	meq/L	6.0 - 200
Sodium (Exch)	150	PPM	---
Sodium (Sol)	3.9	meq/L	See SAR
Sulfate	3.1	meq/L	2.4 - 80
Micro Nutrients			
Zinc	1.2	PPM	2.8 - 200
Manganese	320	PPM	5.6 - 200
Iron	112	PPM	32 - 400
Copper	13.2	PPM	0.8 - 20
Boron	0.08	PPM	0.3 - 6.0
Chloride	6.60	meq/L	0.4 - 16
CEC	42.9	meq/100g	Variable
% Base Saturation			
CEC - Calcium	51.3	%	60 - 80
CEC - Magnesium	45.2	%	10 - 20
CEC - Potassium	1.9	%	2 - 5
CEC - Sodium	1.5	%	0 - 5
CEC - Hydrogen	0.0	%	0 - 30

Graphical Results Presentation



Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Table continued next page...

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910
FAX: 805/525-4172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435

November 11, 2000

Levine-Fricke-Recon

Lab ID : SP 18644-04
Customer : 2-18999
Description : Grab 12,14,15,16

GENERAL SOIL ANALYSIS

Test Description	Result	Optimum Range	Graphical Results Presentation
pH	7.8 ---	5.2 - 6.0	Strongly Acidic / Moderately Acidic / Near Neutral / Moderately Alkaline / Strongly Alkaline
Others			Satisfactory / Possible Problem / Moderate Problem / Increasing Problem
Soil Salinity	2.18 mmhos/cm	0.5 - 8.0	
SAR	1.2	0.1 - 6	
Limestone	ND %	0 - 0.1	
Lime Requirement	0.0 Tons/AF	---	0 / 1 / 2 / 3 / 4 / 5 / 6
Moisture	179 %	1/2 Satn. %	Very Low / Moderately Low / Optimum / Moderately High / Very High
Saturation	76.2 %	20 - 60	Loamy Sand / Sandy Loam / Loam / Silt Loam / Clay Loam / Clay / Organic

Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

FRUIT GROWERS LABORATORY, INC.

Darrell H. Nelson, President

DHN:md

FRUIT GROWERS LABORATORY, INC.

AMENDED

ANALYTICAL CHEMISTS

November 7, 2000

Levine-Fricke-Recon
301 South Miller Street
Suite 210
Santa Maria, CA 93454

Lab ID : SP 18644-05
Customer : 2-18999

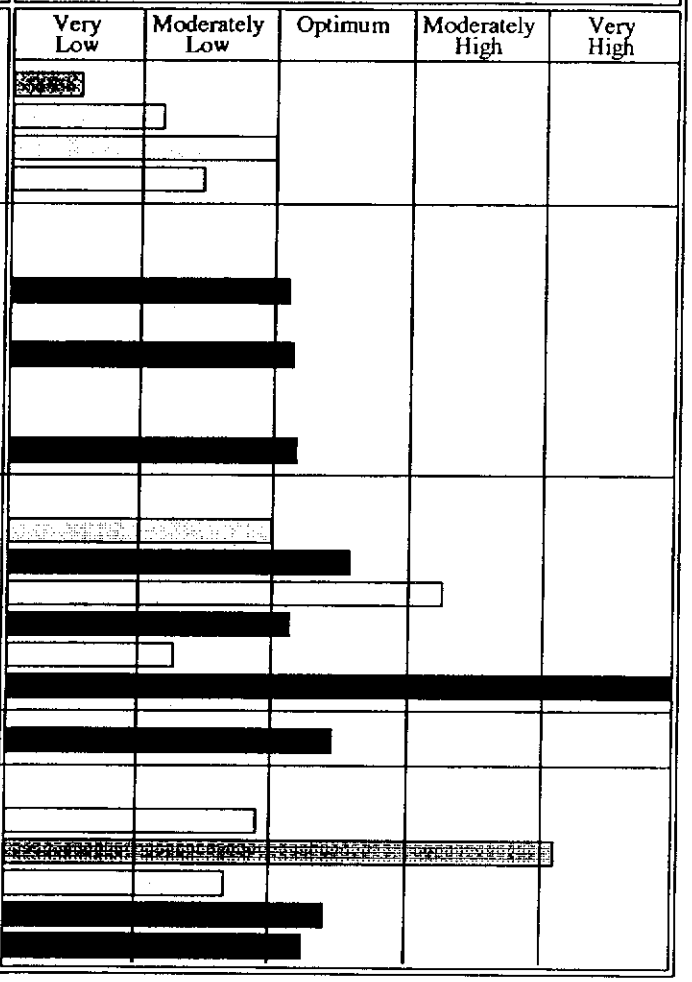
Sampled By: BTW/JWV/MRB
On : October 4, 2000
Received : October 6, 2000
Depth. : 1 Foot

Description : Grab 13
Project : Laguna Lake; #7743.00

GENERAL SOIL ANALYSIS

Test Description	Result		Optimum Range
Primary Nutrients			
Nitrate-Nitrogen	1.6	PPM	10 - 70
Phosphorus	7	PPM	12 - 60
Potassium (Exch)	80	PPM	81 - 500
Potassium (Sol)	0.17	meq/L	0.25 - 1.0
Secondary Nutrients			
Calcium (Exch)	2300	PPM	---
Calcium (Sol)	7.2	meq/L	2.0 - 50
Magnesium (Exch)	1000	PPM	---
Magnesium (Sol)	10.0	meq/L	1.5 - 60
Sodium (Exch)	70	PPM	---
Sodium (Sol)	3.34	meq/L	See SAR
Sulfate	4.0	meq/L	0.6 - 20
Micro Nutrients			
Zinc	0.9	PPM	0.7 - 50
Manganese	29.3	PPM	1.4 - 50
Iron	119	PPM	8.0 - 100
Copper	5.6	PPM	0.2 - 40
Boron	0.09	PPM	0.3 - 1.5
Chloride	11.4	meq/L	0.1 - 4.0
CEC	20.4	meq/100g	Variable
% Base Saturation			
CEC - Calcium	55.4	%	60 - 80
CEC - Magnesium	42.2	%	10 - 20
CEC - Potassium	1.0	%	2 - 5
CEC - Sodium	1.5	%	0 - 5
CEC - Hydrogen	0.0	%	0 - 3

Graphical Results Presentation



Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Table continued next page...

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435

November 7, 2000

Levine-Fricke-Recon

Lab ID : SP 18644-05
Customer : 2-18999
Description : Grab 13

GENERAL SOIL ANALYSIS

Test Description	Result	Optimum Range	Graphical Results Presentation
pH	7.4 ---	5.8 - 8.2	Strongly Acidic / Moderately Acidic / Near Neutral / Moderately Alkaline / Strongly Alkaline
Others			Satisfactory / Possible Problem / Moderate Problem / Increasing Problem
Soil Salinity	2.10 mmhos/cm	0.5 - 2.0	
SAR	1.1	0.1 - 6	
Limestone	ND %	0 - 0.1	
Lime Requirement	0.0 Tons/AF	---	0 / 1 / 2 / 3 / 4 / 5 / 6
Moisture	42.3 %	1/2 Satn. %	Very Low / Moderately Low / Optimum / Moderately High / Very High
Saturation	46.6 %	20 - 60	Loamy Sand / Sandy Loam / Loam / Silt Loam / Clay Loam / Clay / Organic

Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Soil pH & Limestone levels are important to consider when making plant selections. Soil pH levels above 7.0 are not suitable for acid loving plants. Soils containing limestone are not suitable for plants sensitive to Limestone.

FRUIT GROWERS LABORATORY, INC.

Darrell H. Nelson, President

DHN:md

FRUIT GROWERS LABORATORY, INC.

AMENDED

ANALYTICAL CHEMISTS

November 7, 2000

Levine-Fricke-Recon
301 South Miller Street
Suite 210
Santa Maria, CA 93454

Lab ID : SP 18644-06
Customer : 2-18999

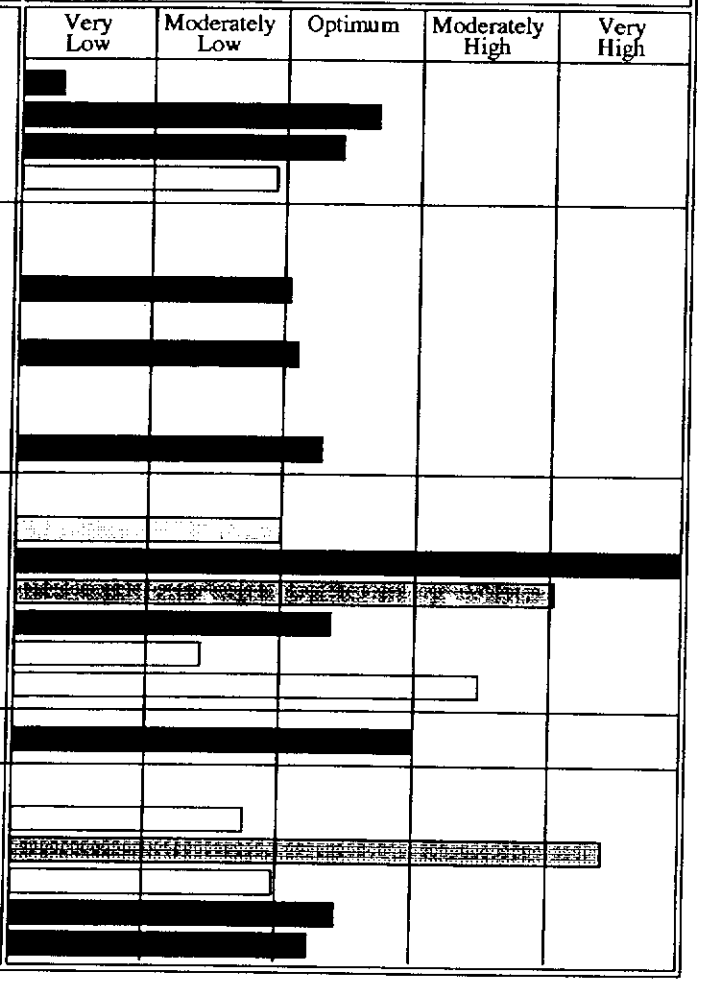
Sampled By: BTW/JWV/MRB
On : October 4, 2000
Received : October 6, 2000
Depth. : 1 Foot

Description : 1 Foot Core
Project : Laguna Lake; #7743.00

GENERAL SOIL ANALYSIS

Test Description	Result		Optimum Range
Primary Nutrients			
Nitrate-Nitrogen	ND	PPM	10 - 70
Phosphorus	45	PPM	12 - 60
Potassium (Exch)	260	PPM	81 - 500
Potassium (Sol)	0.24	meq/L	0.25 - 1.0
Secondary Nutrients			
Calcium (Exch)	3300	PPM	---
Calcium (Sol)	4.4	meq/L	2.0 - 50
Magnesium (Exch)	2000	PPM	---
Magnesium (Sol)	8.2	meq/L	1.5 - 60
Sodium (Exch)	140	PPM	---
Sodium (Sol)	3.60	meq/L	See SAR
Sulfate	6.5	meq/L	0.6 - 20
Micro Nutrients			
Zinc	0.9	PPM	0.7 - 50
Manganese	197	PPM	1.4 - 50
Iron	183	PPM	8.0 - 100
Copper	15.6	PPM	0.2 - 40
Boron	0.13	PPM	0.3 - 1.5
Chloride	4.97	meq/L	0.1 - 4.0
CEC	34.7	meq/100g	Variable
% Base Saturation			
CEC - Calcium	47.8	%	60 - 80
CEC - Magnesium	48.4	%	10 - 20
CEC - Potassium	1.9	%	2 - 5
CEC - Sodium	1.7	%	0 - 5
CEC - Hydrogen	0.0	%	0 - 3

Graphical Results Presentation



Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Table continued next page...

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910
FAX: 805/525-4172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181
FAX: 209/942-0423

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435

November 7, 2000

Levine-Fricke-Recon

Lab ID : SP 18644-06
Customer : 2-18999
Description : 1 Foot Core

GENERAL SOIL ANALYSIS

Test Description	Result	Optimum Range	Graphical Results Presentation
pH	7.6 ---	5.8 - 8.2	Strongly Acidic / Moderately Acidic / Near Neutral / Moderately Alkaline / Strongly Alkaline
Others			Satisfactory / Possible Problem / Moderate Problem / Increasing Problem
Soil Salinity	1.47 mmhos/cm	0.5 - 2.0	
SAR	1.4	0.1 - 6	
Limestone	ND %	0 - 0.1	
Lime Requirement	0.0 Tons/AF	---	0 / 1 / 2 / 3 / 4 / 5 / 6
Moisture	88.4 %	1/2 Satn. %	Very Low / Moderately Low / Optimum / Moderately High / Very High
Saturation	71.4 %	20 - 60	Loamy Sand / Sandy Loam / Loam / Silt Loam / Clay Loam / Clay / Organic

Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Soil pH & Limestone levels are important to consider when making plant selections. Soil pH levels above 7.0 are not suitable for acid loving plants. Soils containing limestone are not suitable for plants sensitive to Limestone.

FRUIT GROWERS LABORATORY, INC.

Darrell H. Nelson, President

DHN:md

FRUIT GROWERS LABORATORY, INC.

AMENDED

ANALYTICAL CHEMISTS

November 7, 2000

Levine-Fricke-Recon
301 South Miller Street
Suite 210
Santa Maria, CA 93454

Description : 2 Foot Core
Project : Laguna Lake; #7743.00

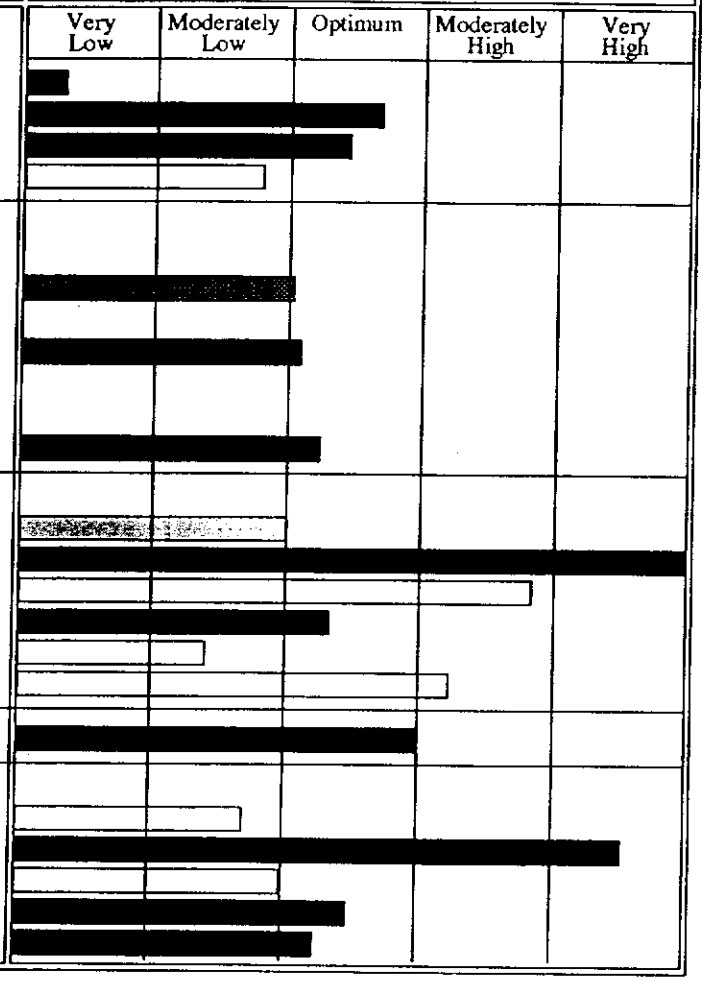
Lab ID : SP I8644-07
Customer : 2-18999

Sampled By: BTW/JWV/MRB
On : October 4, 2000
Received : October 6, 2000
Depth. : 2 Feet

GENERAL SOIL ANALYSIS

Test Description	Result		Optimum Range
Primary Nutrients			
Nitrate-Nitrogen	ND	PPM	10 - 70
Phosphorus	45	PPM	12 - 60
Potassium (Exch)	270	PPM	81 - 500
Potassium (Sol)	0.22	meq/L	0.25 - 1.0
Secondary Nutrients			
Calcium (Exch)	3200	PPM	---
Calcium (Sol)	4.0	meq/L	2.0 - 50
Magnesium (Exch)	2100	PPM	---
Magnesium (Sol)	7.3	meq/L	1.5 - 60
Sodium (Exch)	160	PPM	---
Sodium (Sol)	3.64	meq/L	See SAR
Sulfate	5.4	meq/L	0.6 - 20
Micro Nutrients			
Zinc	1.2	PPM	0.7 - 50
Manganese	199	PPM	1.4 - 50
Iron	163	PPM	8.0 - 100
Copper	13.8	PPM	0.2 - 40
Boron	0.13	PPM	0.3 - 1.5
Chloride	4.46	meq/L	0.1 - 4.0
CEC	34.8	meq/100g	Variable
% Base Saturation			
CEC - Calcium	45.4	%	60 - 80
CEC - Magnesium	50.6	%	10 - 20
CEC - Potassium	2.0	%	2 - 5
CEC - Sodium	2.0	%	0 - 5
CEC - Hydrogen	0.0	%	0 - 3

Graphical Results Presentation



Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Table continued next page...

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910
FAX: 805/525-4172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181
FAX: 209/942-0423

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435
Mobile: 559/737-2399

November 7, 2000

Levine-Fricke-Recon

Lab ID : SP 18644-07
Customer : 2-18999
Description : 2 Foot Core

GENERAL SOIL ANALYSIS

Test Description	Result	Optimum Range	Graphical Results Presentation
pH	7.6 ---	5.8 - 8.2	Strongly Acidic / Moderately Acidic / Near Neutral / Moderately Alkaline / Strongly Alkaline
Others			Satisfactory / Possible Problem / Moderate Problem / Increasing Problem
Soil Salinity	1.43 mmhos/cm	0.5 - 2.0	
SAR	1.5	0.1 - 6	
Limestone	ND %	0 - 0.1	
Lime Requirement	0.0 Tons/AF	---	0 / 1 / 2 / 3 / 4 / 5 / 6
Moisture	59.6 %	1/2 Satn. %	Very Low / Moderately Low / Optimum / Moderately High / Very High
Saturation	64.9 %	20 - 60	Loamy Sand / Sandy Loam / Loam / Silt Loam / Clay Loam / Clay / Organic

Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Soil pH & Limestone levels are important to consider when making plant selections. Soil pH levels above 7.0 are not suitable for acid loving plants. Soils containing limestone are not suitable for plants sensitive to Limestone.

FRUIT GROWERS LABORATORY, INC.

Ricardo Sandoval

Darrell H. Nelson, President

DHN:md

FRUIT GROWERS LABORATORY, INC.

AMENDED

ANALYTICAL CHEMISTS

November 11, 2000

Levine-Fricke-Recon
301 South Miller Street
Suite 210
Santa Maria, CA 93454

Lab ID : SP 18644-08
Customer : 2-18999

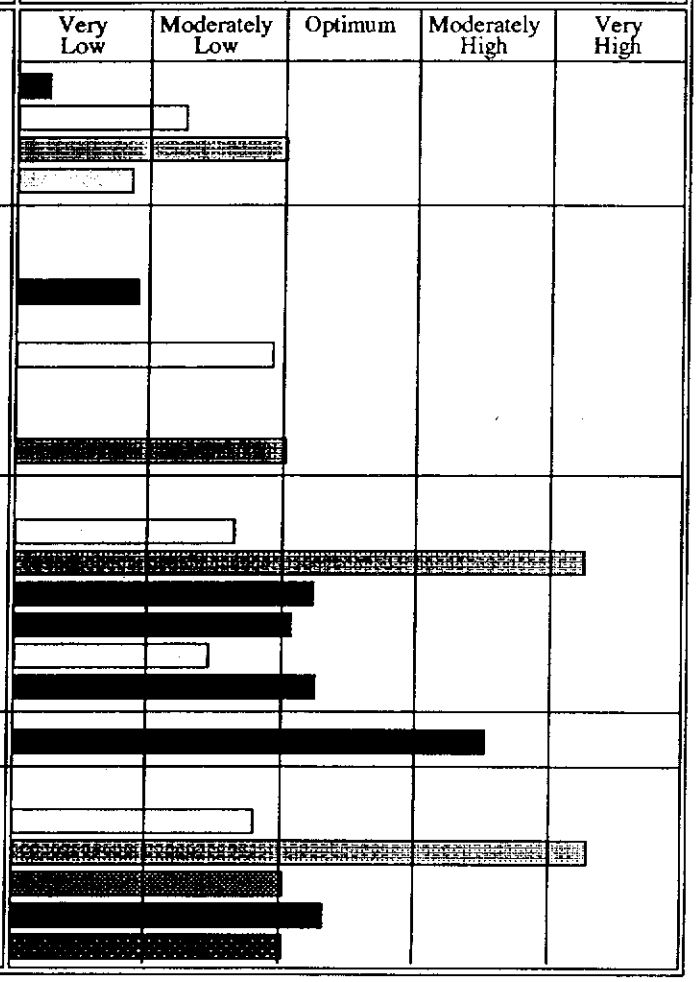
Sampled By: BTW/JWV/MRB
On : October 4, 2000
Received : October 6, 2000
Depth. : 3 Feet

Description : 3 Foot Core
Project : Laguna Lake; #7743.00

GENERAL SOIL ANALYSIS

Test Description	Result		Optimum Range
Primary Nutrients			
Nitrate-Nitrogen	1.9	PPM	40 - 280
Phosphorus	61	PPM	96 - 480
Potassium (Exch)	350	PPM	325 - 2000
Potassium (Sol)	0.23	meq/L	1.0 - 4.0
Secondary Nutrients			
Calcium (Exch)	4300	PPM	---
Calcium (Sol)	3.7	meq/L	8.0 - 200
Magnesium (Exch)	2400	PPM	---
Magnesium (Sol)	5.7	meq/L	6.0 - 200
Sodium (Exch)	160	PPM	---
Sodium (Sol)	3.25	meq/L	See SAR
Sulfate	4.3	meq/L	2.4 - 80
Micro Nutrients			
Zinc	2.1	PPM	2.8 - 200
Manganese	289	PPM	5.6 - 200
Iron	120	PPM	32 - 400
Copper	12.5	PPM	0.8 - 20
Boron	0.15	PPM	0.3 - 6.0
Chloride	4.48	meq/L	0.4 - 16
CEC	43.0	meq/100g	Variable
% Base Saturation			
CEC - Calcium	50.5	%	60 - 80
CEC - Magnesium	45.8	%	10 - 20
CEC - Potassium	2.1	%	2 - 5
CEC - Sodium	1.7	%	0 - 5
CEC - Hydrogen	0.0	%	0 - 30

Graphical Results Presentation



Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Table continued next page...

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910
FAX: 805/525-4172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181
FAX: 209/942-0423

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435

November 11, 2000

Levine-Fricke-Recon

Lab ID : SP 18644-08
Customer : 2-18999
Description : 3 Foot Core

GENERAL SOIL ANALYSIS

Test Description	Result	Optimum Range	Graphical Results Presentation
pH	7.6 ---	5.2 - 6.0	Strongly Acidic / Moderately Acidic / Near Neutral / Moderately Alkaline / Strongly Alkaline
Others			Satisfactory / Possible Problem / Moderate Problem / Increasing Problem
Soil Salinity	1.25 mmhos/cm	0.5 - 8.0	
SAR	1.5	0.1 - 6	
Limestone	ND %	0 - 0.1	
Lime Requirement	0.0 Tons/AF	---	0 / 1 / 2 / 3 / 4 / 5 / 6
Moisture	85.0 %	1/2 Satn. %	Very Low / Moderately Low / Optimum / Moderately High / Very High
Saturation	85.8 %	20 - 60	Loamy Sand / Sandy Loam / Loam / Silt Loam / Clay Loam / Clay / Organic

Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

FRUIT GROWERS LABORATORY, INC.

Darrell H. Nelson, President

DHN:md

FRUIT GROWERS LABORATORY, INC.

AMENDED

ANALYTICAL CHEMISTS

November 11, 2000

Levine-Fricke-Recon
301 South Miller Street
Suite 210
Santa Maria, CA 93454

Description : 4 Foot Core
Project : Laguna Lake; #7743.00

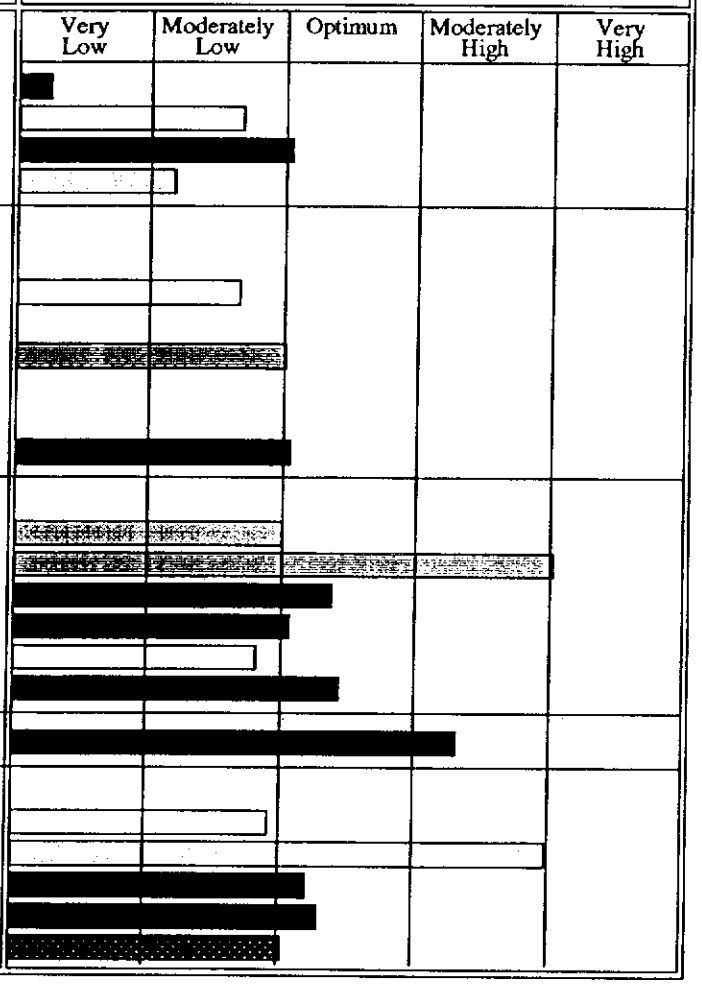
Lab ID : SP 18644-09
Customer : 2-18999

Sampled By: BTW/JWV/MRB
On : October 4, 2000
Received : October 6, 2000
Depth. : 4 Feet

GENERAL SOIL ANALYSIS

Test Description	Result		Optimum Range
Primary Nutrients			
Nitrate-Nitrogen	ND	PPM	40 - 280
Phosphorus	81	PPM	96 - 480
Potassium (Exch)	410	PPM	325 - 2000
Potassium (Sol)	0.51	meq/L	1.0 - 4.0
Secondary Nutrients			
Calcium (Exch)	4500	PPM	---
Calcium (Sol)	6.7	meq/L	8.0 - 200
Magnesium (Exch)	1900	PPM	---
Magnesium (Sol)	9.0	meq/L	6.0 - 200
Sodium (Exch)	140	PPM	---
Sodium (Sol)	4.8	meq/L	See SAR
Sulfate	6.9	meq/L	2.4 - 80
Micro Nutrients			
Zinc	4.4	PPM	2.8 - 200
Manganese	254	PPM	5.6 - 200
Iron	173	PPM	32 - 400
Copper	11.6	PPM	0.8 - 20
Boron	0.25	PPM	0.3 - 6.0
Chloride	7.24	meq/L	0.4 - 16
CEC	39.8	meq/100g	Variable
% Base Saturation			
CEC - Calcium	56.3	%	60 - 80
CEC - Magnesium	39.7	%	10 - 20
CEC - Potassium	2.6	%	2 - 5
CEC - Sodium	1.5	%	0 - 5
CEC - Hydrogen	0.0	%	0 - 30

Graphical Results Presentation



Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Table continued next page...

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910
FAX: 805/525-4172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181
FAX: 209/942-0423

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435

November 11, 2000

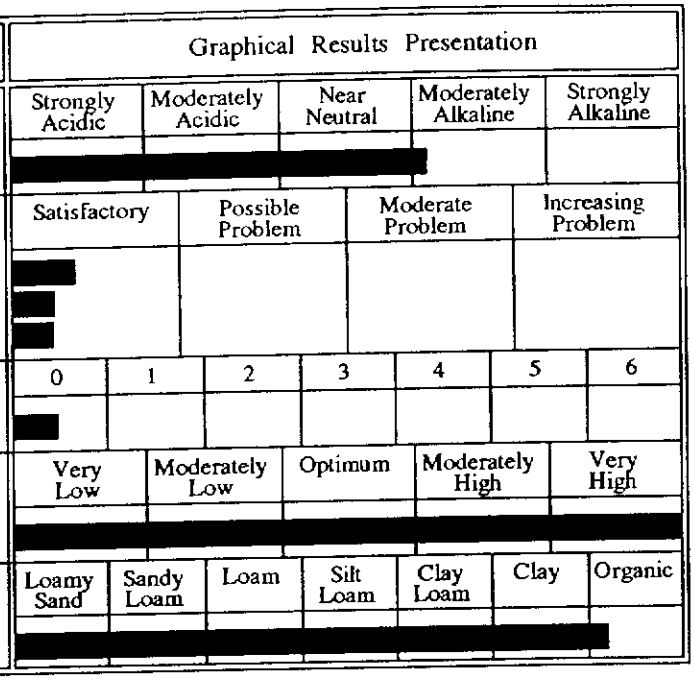
Levine-Fricke-Recon

Lab ID : SP 18644-09
Customer : 2-18999
Description : 4 Foot Core

GENERAL SOIL ANALYSIS

Test Description	Result	Optimum Range
pH	7.6 ---	5.2 - 6.0
Others		
Soil Salinity	1.88 mmhos/em	0.5 - 8.0
SAR	1.7	0.1 - 6
Limestone	ND %	0 - 0.1
Lime Requirement	0.0 Tons/AF	---
Moisture	68.1 %	1/2 Satn. %
Saturation	82.8 %	20 - 60

Graphical Results Presentation



Good Problem

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

FRUIT GROWERS LABORATORY, INC.

Darrell H. Nelson, President

DHN:md

FRUIT GROWERS LABORATORY, INC.

ANALYTICAL CHEMISTS

SOIL ANALYSES TERMS

Primary Nutrients

Nitrogen
Nitrogen is essential to plant growth and is usually available in two forms:

a) Nitrate-Nitrogen - D.I. (de-ionized) water extractable
This is a water soluble form of nitrogen which is most readily available to plants but is also vulnerable to leaching.

b) Ammonium Nitrogen - potassium chloride extractable
The ammonium nitrogen found in soil is usually derived from decomposing organic matter and is readily absorbed by plants.

Phosphorus
Phosphorus is essential to plant growth. The sodium bicarbonate method is used to measure the available phosphorus in calcareous soils. The weak Bray is the more appropriate method to measure available phosphorus in soils having a pH of less than 6.

Potassium - Ammonium acetate (exchangeable) and saturated paste (water soluble) extractable.
Potassium is essential to plant growth. Ample levels of exchangeable potassium do not always result in optimum plant uptake. The rate at which exchangeable potassium becomes available to plants is influenced by soil type, pH, temperature and moisture content. The soluble potassium found in a soil is readily available for plant uptake.

Secondary Nutrients

Calcium, Magnesium - Ammonium acetate (exchangeable) and saturated paste (water soluble) extractable.
These elements are essential to plant growth and also influence soil structure. See SAR.

Sodium - Ammonium acetate (exchangeable) and saturated paste (water soluble) extractable.
This element is not generally believed to be essential to plant growth. A high level of sodium in relation to calcium and magnesium will result in poor soil structure. See SAR.

Sulfate - Saturated paste (water soluble) extractable
Sulfur is an essential plant nutrient. Sulfate is a readily available form of sulfur in soil.

Micronutrients

Zinc, Manganese, Iron, Copper - DTPA extractable
These elements are essential to plant growth but are required in very small quantities.

Boron - Saturated paste (water soluble) extractable. A hot water extraction is used in the analysis of soils with very low levels of boron to determine deficiency potential.
Boron is an essential plant nutrient. Boron is required in very small quantities and can also be very toxic when present, even in slightly higher than needed levels.

Chloride - Saturated paste (water soluble) extractable
Chloride is essential to plant growth in quantities ranging from less than 150 ppm (0.015%) to over 1000ppm (0.1%), depending upon specific plant requirements. Actual chloride deficiencies are rare.

Cation Exchange Capacity (CEC)

The CEC is a measure of a soil's capacity to hold the positively charged ions of calcium, magnesium, potassium, sodium and hydrogen. The proper balance (ratio) of these elements has an important impact on soil structure and affects their availability for plant uptake.

Conversion Factors

* 1 acre foot of soil = 4,000,000 (approx.)
* PPM x 4 ~ lbs./acre ft
* Meq/l x eq. wt. = ppm
* SO_4 x 0.33 = S
* P x 2.3 = P_2O_5
* K x 1.2 = K_2O
* NO_3 x 0.23 = N

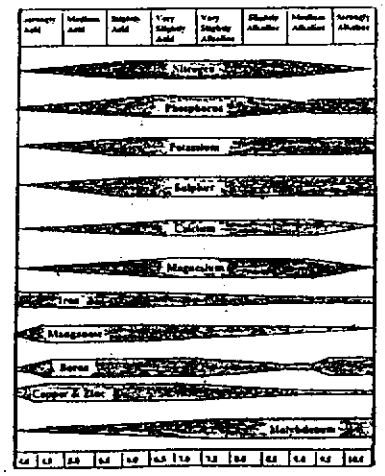
Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272
TEL: 805/659-0910
FAX: 805/525-4172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181
FAX: 209/942-0423

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435
Mobile: 559/737-2399

Soil pH - Measured on a saturated (water soluble) paste

Soil pH is a measure of a soil's relative acidity or alkalinity. A pH of 5.8 to 8.2 is suitable for a wide range of crops. How soil pH affects availability of plant nutrients and activity of micro- nutrients is outlined in the following table:



Other Analyses

Soil Salinity (ECe) - Measured on a saturated paste (water soluble) extract
Salinity is a measure of the total water soluble salt content of the soil.

SAR - Sodium Adsorption Ratio
A calculated ratio of soluble calcium and magnesium to sodium. This ratio is used to identify soil structural problems.

Limestone
This is a quantitative measure of the amount of calcium carbonate present in a soil. Many plants, especially perennials, are highly sensitive to low levels of limestone.

Lime Requirement
A quantitative measure made on soils with pH levels below 5.8. This determines the amount of limestone needed to adjust the soil pH to 6.5. The chemical reaction that takes place when lime is added to soil is as follows -:

$$2H^+ + CaCO_3 \rightleftharpoons Ca^{++} + CO_2\uparrow + H_2O$$

Soil Moisture
This is a measurement of the amount of moisture present in a soil sample when received at the laboratory. The ample soil moisture % is in a range of ± 20% of ½ saturation.

Saturation %
The amount of water required to saturate 100 grams of soil. This value is approximately twice the field capacity of the soil. Soil saturation % serves as an approximation of soil texture and nutrient retention potential, in addition to its water holding capability

Gypsum Requirement
A measurement of the amount of pure (100%) gypsum needed to improve the rate of water infiltration into a soil. A gypsum requirement recommendation does not necessarily indicate a serious problem but indicates the amount required to maximize the water infiltration rate. The chemical reaction that takes place when gypsum is added to soil is as follows -:

$$2Na^+ + CaSO_4 + 2H_2O \rightleftharpoons Ca^{++} + Na_2SO_4\downarrow + 2\,H_2O$$

Organic Matter
A quantitative measure of the organic content of a soil. Accurate measurement of low organic matter soils can be critical in the use of herbicides.

APPENDIX D

Geotechnical Evaluation by John Ho, CE, GE

LFR Levine Fricke

Memo

To: Steve Beadle

From: John Ho

CC: Greg McGowan

Date: 02/06/01

Re: Laguna Lake Dredged Materials, Project No. 7743.00-002

1.0 INTRODUCTION

This memorandum presents the results of a preliminary evaluation of potential usage and anticipated engineering behavior of dredged sediments from Laguna Lake in the City of San Luis Obispo, California.

Based on a review of limited laboratory data, it appears that there are two types of materials. Samples of the Laguna Lake sediments collected at some distance away from the principal inlet appear to be a clayey material (CH/OH, referred to as Material Type I). Samples collected near the principal inlet are sandy in nature (SC, and ML, referred to as Material Type II).

These materials will likely be in a slurry form (fully saturated with excess water) when they are first retrieved from the proposed dredging operations. Handling of this slurry will probably involve transportation (by barge) to the shore, off-loading from the barge, and moving to the disposal site (say by trucks or dozer). Alternatively, these materials may be pumped through a pipeline directly to a processing site if mixed with sufficient "carrier" water. A drying process will then be required to allow dewatering of the dredged materials before they can used for any engineering or landscaping purposes.

2.0 LABORATORY TEST RESULTS

The following reports and data are reviewed:

1. Laguna Lake Study Commettee, City of San Luis Obispo, 1982, Laguna Lake Management Program, Appendices E and F, Januray, 1982.
2. Earth Systems Consultants, 1992, Geotechnical Report, Laguna Lake Dredging Project, San Luis Obispo, California, September 23, 1992.

3. LFR Levine Fricke, 2000, Laboratory Test Results of Core Samples, October 30, 2000.

A summary of available laboratory data is presented in Table 1. Reference 2 reported a dry densities of Shelby tube samples were ranging from 32.1 to 92.0 pcf with a moisture content ranging from 31.2 to 125.7 percent. Very little organic content data were available. Shear strength data reported in the previous investigation were generally insufficient and inadequate for slope stability evaluation. Because of the limited data, only qualitative comments can be made regarding the engineering properties and characteristics of the dredged materials.

Table 1 Summary of Available Laboratory Data

Sample ID	Percent passing the No. 200 Sieve	Percent passing two micron (0.002 mm)	Liquid Limit (%)	Plasticity Index (%)	Activity	USCS Classification	Organic Content	Approx. Sample Location	Reference
2D @4-5'	3	75	111	63		CH/OH	--	South Shore	Laguna Lake Study Committee, City of San Luis Obispo, 1982
4 @ 0-1'	50	6	--	--	--	SM	--	Near River Mouth	Laguna Lake Study Committee, City of San Luis Obispo, 1982
5 @ 0-1'	46	7	--	--	--	ML	--	Near River Mouth	Laguna Lake Study Committee, City of San Luis Obispo, 1982
6 @ 0-1'	18	10	--	--	--	ML	--	Near River Mouth	Laguna Lake Study Committee, City of San Luis Obispo, 1982
7 @ 0-1'	25	8	--	--	--	ML	--	Near River Mouth	Laguna Lake Study Committee, City of San Luis Obispo, 1982
10 @ 0-1'	31	9	35	8	--	ML	--	Near River Mouth	Laguna Lake Study Committee, City of San Luis Obispo, 1982
Composite without dispersing agent	28	1	--	--	--	SC	5.5	Near Shore and Principal Inlet	Earth Systems Consultants, 1992
1' Core	95	40	80	55		CH/OH	--	Away from Inlet	LFR Levine Fricke, 2000
2' Core	94	39	83	61		CH/OH	--	Away from Inlet	LFR Levine Fricke, 2000
3' Core	97	58	98	69		CH/OH	--	Away from Inlet	LFR Levine Fricke, 2000
4' Core	85	46	94	71		CH/OH	--	Away from Inlet	LFR Levine Fricke, 2000
Grab 1, 2, 3, 4	96	50	113	86		CH/OH	--	Away from Inlet	LFR Levine Fricke, 2000

Grab 5, 6, 7, 9	94	28	78	58		CH/OH	--	Away from Inlet	LFR Levine Fricke, 2000
Grab 8, 10, 11	82	14	55	35		CH/OH with Sand	--	Away from Inlet	LFR Levine Fricke, 2000
Grab 12, 14, 15, 16	82	34	89	63		CH/OH with Sand	--	Away from Inlet	LFR Levine Fricke, 2000
Grab 13	42	9	30	8		SC/SM	--	Near Principal Inlet	LFR Levine Fricke, 2000

3.0 LITERATURE REVIEW

A number of publications were reviewed as part of this evaluation to acquire further data regarding engineering properties and behavior of dredged harbor/water way materials.

Placement Techniques

Early attempts in using dredged materials were reported during the construction of earthdams in the first half of 1900s. During the construction of the Turtle Creek Dam (Sherard, et. al., 1963), the original plan was to build a compacted earthfill structure which involved using materials excavated by draglines from a borrow pit below the water table, then loaded on trucks and subsequently compacted by either tractors or vibratory rollers. This proved to be impractical because the trucks were bogged down and the sand fill was too wet for conventional compaction by either tractor or vibratory rollers. This project was later successfully completed by switching to hydraulic fill techniques (Morgenstem and Kupper, 1988).

Experience gained in the management of San Diego Bay (Muslin, 1994) sediments disposal to landfills using the truck-in/compacted fill approach also confirmed that the requirement to dewater dredged material prior to placement into or onto landfills may be the most important practical limitation for this disposal alternative. On the other hand, success has attained by the hydraulic fill placement techniques. Hydraulic fill techniques were also used successfully for disposal of dredged materials in the San Francisco Bay (Wakeman and Harari, 1994).

Organic Content

Qualitative effect of organic content was reported (Krizek et. al., 1974) based on test results on typical materials from harbor maintenance dredgings. Materials tested were primarily well-graded fine-grained organic silt (OH) with very fine sand and 4 to 8% organic content. These materials were characterized by slow drainage, low permeability, high compressibility and low density. The presence of organic materials were reportedly cause a general increase in Atterberg limits and a reduction in shear strength.

Consolidation Characteristics

The consolidation characteristics of dredged harbor sediments were reported (Salem et. al., 1975; Salem and Krizek, 1975) based on a statistical analysis of data from 64 laboratory consolidation tests conducted on undisturbed samples of hydraulically-placed maintenance dredgings taken from hydraulic fills. The compression index was found to increase linearly with the natural water content and the liquid limit. The reported compression index ranged from 0.3 to 0.7. The coefficient of secondary compression ranged from 0.002 to 0.013 for a natural water content range from 45 to 65 percent, and increase with consolidation pressure. The average coefficient of consolidation varied with the logarithm of the consolidation pressure in a nonlinear

manner, and was generally around 0.0006 to 0.0001 cm^2/sec. The reported coefficient of permeability ranged from 10^{-6} to 10^{-8} cm/sec.

Lime Treatment

Certain clays can be effectively treated with lime to reduce water content. Reported factors affecting a soil's lime reactivity (Thompson, 1966) are listed below:

- A soil pH greater than about 7 indicates good reactivity.
- Organic carbon greater retards lime-soil reactions.
- Sulfate and some iron compounds inhibit the lime reaction (Currin et. al., 1976).Sulfate content over 5000 ppm can cause swelling in soils when mixed with lime.
- The presence of gypsum or ammonium fertilizers may increase the amount of lime required (O'Neil and Poormoayed, 1980).
- Temperature less than 55 to 60° F retards the reaction (Transportation Research, 1976).

Reported data showed that for wet fine-grained soils with a Plastic Limit (PL) of 40 or less and a Liquid Limit (LL) of 60 or less, containing no appreciable organic or sulfate constituents, would generally require 3 to 8% of lime to improve constructability (Transportation Research, 1976). Soils with higher PL and LL would generally require more lime for treatment. Thorough mixing of soil and lime is key to success or lime treatment. A curing time on the order of two weeks at a temperature no less than 70 degrees would generally be required prior to allow travelling of heavy construction equipment on the treated materials.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions were arrived based on the results of this evaluation:

Type I Materials (CH/OH)

1. It appears that a majority of the dredged sediments from the Laguna Lake the will likely be highly plasticity clays (Material Type I, CH/OH) with high moisture content, especially after dredging activities. With such high water contents, it is unlikely that this material can be efficiently placed by spreading and compacting using conventional earthwork equipment, unless it is properly drained to near a moisture content of roughly 50 percent.
2. It may be time consuming and ineffective to drain Material Type I by stockpiling the material and allow time for excess water to come out by consolidation (under self weight or surcharge load).
3. This material may be used for vegetative layer in a landscape area or landfill daily cover or final caps, provided it can be effectively dried and properly compacted to project specifications.
4. One of the methods used by the City of San Leandro (Dates, Silva, and Mailho, 1994) may be effective for treatment of the Type I Materials in Laguna Lake. The City of San Leandro is a small municipality along the eastern shoreline of San Francisco Bay, and has historically used a 114-acre onshore disposal site to store dredged materials. Approximately 100 acres of the land was managed as an open space seasonal habitat for shorebirds. It is also used as a large evaporation pond with decant weirs. The pond was surrounded by 4-foot-high embankments. Dredged materials were pumped into the pond to a depth of approximately two

feet with a free board of approximately two feet to allow the excess carrier water to escape from the weirs and the dredged materials air-dried. Dredged material is actively turned during the dry summer season. Once the material is dried to a moisture content of approximately 50%, it is removed and transported to reuse sites. Raised islands were constructed so that during the wet seasons, this pond can be used for winter migration birds. The key of this design is to control the total suspended solids with the weir structures so that they are below allowable limits.

Type II Materials (SM/ML)

5. We understand that smaller quantities of dredged materials were classified as Silty Sand (SM) to Sandy Silty (ML). Excess water in this material can probably be drained by stockpiling. However, considering the amount of fines content (28 to 50% passing the No. 200 Sieve) in this material, it may take roughly several months before it can be used as general fill. It is important to effectively separate this material from the fine-grained sediments.
6. If desired, lime or cement treatment may be used to improve the workability and shorten drying time of this material provided the organic content is relatively low as reported. Cost for lime treatment (Means, 1995) for soils without high organic content was reported to be on the order of $9.55/square yard for 6% lime mixed in 12-inch lifts.
7. Cement treatment is generally effective for sandy soils. Cost for cement treatment was reported (Means, 1995) to be on the order of $8.30/square yard mixed in 12-inch lifts. The determination of actual effectiveness of cement treatment will require further testing.

Data Required for Slope Stability Evaluation

8. Further undisturbed sampling with piston sampler may be required to collect representative dredged materials for compaction characteristics, shear strength, consolidation, specific gravity, sulfate content, permeability and pH. These data are required before final recommendations can be made regarding the potential usage on site, and potential impact of dredging activities to the existing shorelines.
9. Design parameters for Type I and Type II materials should be well established before slope stability calculations can be conducted. The use of pocket penetrometer data (as was presented in a previous report) for slope stability evaluation is generally not appropriate.
10. If required, slope stabilization methods should be proposed.
11. Long term settlement and bearing capacity should be evaluated if this material is stored at disposal site in a wet state without drying or proper compaction.

Any dewatering process would likely require a designated area with sufficient space to spread out the materials. The rate of drying has to be sufficiently fast to accommodate the rate of sediment shipment to site.

5.0 REFERENCES

1. Anchor Environmental, January 7, 1998, Beneficial Reuse of Dredged Sediments at Prospective Upland Disposal Sites, Bellingham Bay Demonstration Pilot Project, J-4908-03.
2. Sherard, J.L., et. al., Earth and Earth-rock Dams, John Wiley and Sons, New York.

3. Morgenstern, N.R. and Kupper, A.A.G., 1988, Hydraulic Fill Structures - A Prospective, Hydraulic Fill Structures, ASCE Special Publication No. 21.
4. Muslin, D., 1994, Management of San Diego Bay Dredged Material Disposal, Dredging '94, Proceedings of the Second International Conference on Dredging and Dredged Material Placement, ASCE.
5. Wakeman, T.H. and Harari, J., Management of Dredged Material Disposal for San Francisco Bay Projects, Dredging '94, Proceedings of the Second International Conference on Dredging and Dredged Material Placement.
6. Krizek, R.J., Giger, M.W., and Hummel, P.L., 1974, Organic Content and Engineering Behavior of Typical Maintenance Dredgings.
7. Salem, A.M., Krizek, R.J., and Azzouz, A.S., 1975, Primary Consolidation and Compressibility of Dredgings.
8. Salem, A.M. and Krizek, R.J., 1975, Stress-Deformation-Time Behavior of Maintenance Dredgings.
9. Thompson, M.R., 1966, Lime Reactivity of Illinois Soils, ASCE J. Soil Mechanics and Foundation Division, 92 (SM5):67-92.
10. Transportation Research, 1976, State of the Art: Lime Stabilization, No. 180, September, 1976.
11. Currin, D.D., Allen, J.J., and Little, D.N., 1976, Validation of Soil Stabilization Index System with Manual Development. U.S. Air Force Tech. Rep. SRL-TR-76-0006.
12. O'Neil, M.W., and Poormoayed, N., 1980. Methodology for Foundations on Expansive Soils. J. Geotech. Eng. Div. ASCE, 106, (GT-12, December):1345-1367.
13. Oates, Silva, and Mailho, 1994, Enhancing Habitat at an Onshore Dredge Disposal Site, Dredging '94, Volume 2, Proceedings of the Second International Conference on Dredging and Dredged Material Placement, ASCE.

PHYSIO-CHEMICAL PROPERTIES

OF LAGUNA LAKE WATERS

by:

Dr. Kingston Leong
Dr. Robert Brown

TABLE OF CONTENTS

Page

Introduction

Methods and Materials

Results and Discussion

I. Description of Laguna Lake's annual limnological cycle

II. Discussion of Laguna Lake's water quality parameters measured from November, 1979 to June 1980

A. Turbidity
B. Temperature
C. Conductivity
D. pH
E. Dissolved Oxygen
F. Nutrients - ammonia, nitrate and total phosphorous

III. Distribution and kinds of midges in Laguna Lake

IV. Biological interactions among Laguna Lake's water quality, insect and phytoplankton populations

Conclusions

Recommendations

Reference cited

LIST OF FIGURES

Page

Figure 1 Canonical graph showing the grouping of samples into discrete groups; Fall (A-B); Winter (C-F); and Spring (G-I). The vectors extending from a central point (grand centroid) depicts how variables influence each time period.

Figure 2 Measurements of water turbidity (NTU) for Laguna Lake from November 1979 to June 1980.

Figure 3 Measurements of water temperature (degrees Centigrade) for Laguna Lake from November 1979 to June 1980.

Figure 4 Measurements of water conductance for Laguna Lake from November 1979 to June 1980.

Figure 5 Measurements of pH for Laguna Lake from November 1979 to June 1980.

Figure 6 Measurements of dissolved oxygen for Laguna Lake November 1979 to June 1980.

Figure 7 Measurements of ammonia levels for Laguna Lake from November 1979 to June 1980.

Figure 8 Measurements of nitrate levels for Laguna Lake from November 1979 to June 1980.

Figure 9 Measurements of phosphorus levels for Laguna Lake from November 1979 to June 1980.

LIST OF TABLES

Page

Table 1 The 1972 distribution of 15 midge genera recovered from four habitats in Laguna Lake, San Luis Obipso, CA.

Table 2 Summary of ranges, means and standard errors of samples for 12 ecological variables measured during the period of June-October 1973. Sample size n = 48 for each factor within each habitat.

INTRODUCTION

Many lake shores in California are being developed into urban communities. These communities take advantage of the lake's natural beauty and recreation such as fishing and sailing as well as the added enjoyment of resident and migratory wildlife that may frequent these lakes. Laguna Lake in San Luis Obispo, California is such a lake whose shores were and are presently being developed for residential homes. This lake is a small shallow eutrophic body of water (ca. 76 hectares) that is enjoyed by the community for many of the aforementioned advantages.

Since residential homes are situated along the shoreline of Laguna Lake, it is not surprising that these homes have had previous insect problems. In 1966 and 1968 midges (non-biting flies) emerging from the lake were so abundant that they caused considerable annoyance to the lake's residents by getting into their eyes, nose, mouth and homes. The County Health Department declared the midge a health nuisance and chemical control was implemented to supress the emerging flies (Stimac and Leong 1977). The insect problem associated with Laguna Lake is not unique but rather, a common occurrence of lake communities (Ali 1978, Anderson et al. 1965, Mulla and Khasawinah 1969, Mulla 1974, Maggy 1968). In addition to annoying insect problems, other lake communities have experienced algal blooms which have resulted in unpleasant odors and fish kills.

The purpose of this report is to describe some of the physiochemical properties of Laguna Lake waters and the influence they have on the biotic community, namely the insect and phytoplankton populations.

METHODS AND MATERIALS

Data used for the analyses are from various studies conducted in Laguna Lake. The physio-chemical parameters of the lake's water during the period of November 1979 to June 1980 were collected and analyzed by Dr. Dieter Heinz and his staff, employed by the City of San Luis Obispo.

Data concerning the interactions among the midge, phytoplankton and water quality were from previous research projects on Laguna Lake (Leong et. al. 1973, Stimac and Leong 1977, Althouse et al. 1978).

The data analyzed using both univariate and multivariate statistical analyses available at the California Polytechnic State University, San Luis Obispo, CA. The multivariate statistical programs, DISANAL and CORANAL used for the analyses were developed by R.A. Pimentel (1979).

RESULTS AND DISCUSSION

The results are presented in four parts. The first is an overall graphic description of Laguna Lake's annual limnological cycle. The second concerns an indepth description and discussion of the water parameters measured and their importance to lake management. The third is the distribution and kinds of midge populations in Laguna Lake and lastly, a discussion of water quality, phytoplankton and insect populations interactions.

I. Description of Laguna Lake's Annual Limnological Cycle

The annual limnological cycle of Laguna Lake is graphically summarized in Figure 1. Figure 1 is a canonical discriminate analysis graph showing that the samples, taken from November 1979 to June 1980, tended to group into three rather discrete groups: fall (A-B); winter (C-F); spring (G-I). The lines extending from a central point (grand centroid) are vectors of individual variables. The vector of a variable in canonical space indicates the direction in magnitude of how a particular variable increases. The pH variable vector, for example, is a long vector directed toward the fall samples. This indicates that the fall samples were more alkaline or another way of phrasing it, as fall approaches, the waters of Laguna Lake become more alkaline.

Referring to Figure 1, therefore, the following is a brief discussion of the lake's water quality cycle. It should be noted, however, that only variables that have significantly large vectors or variation for a time period will be discussed.

As fall approaches, the sago pondweed dies off rapidly and by November much of the vegetative portions of this plant are completely decomposed, resulting in a high concentration of nutrients such as ammonia, nitrate and phosphorus in the lake's waters. The pH and phosphorus variables during fall show the greatest changes in values and therefore are depicted by large vectors.

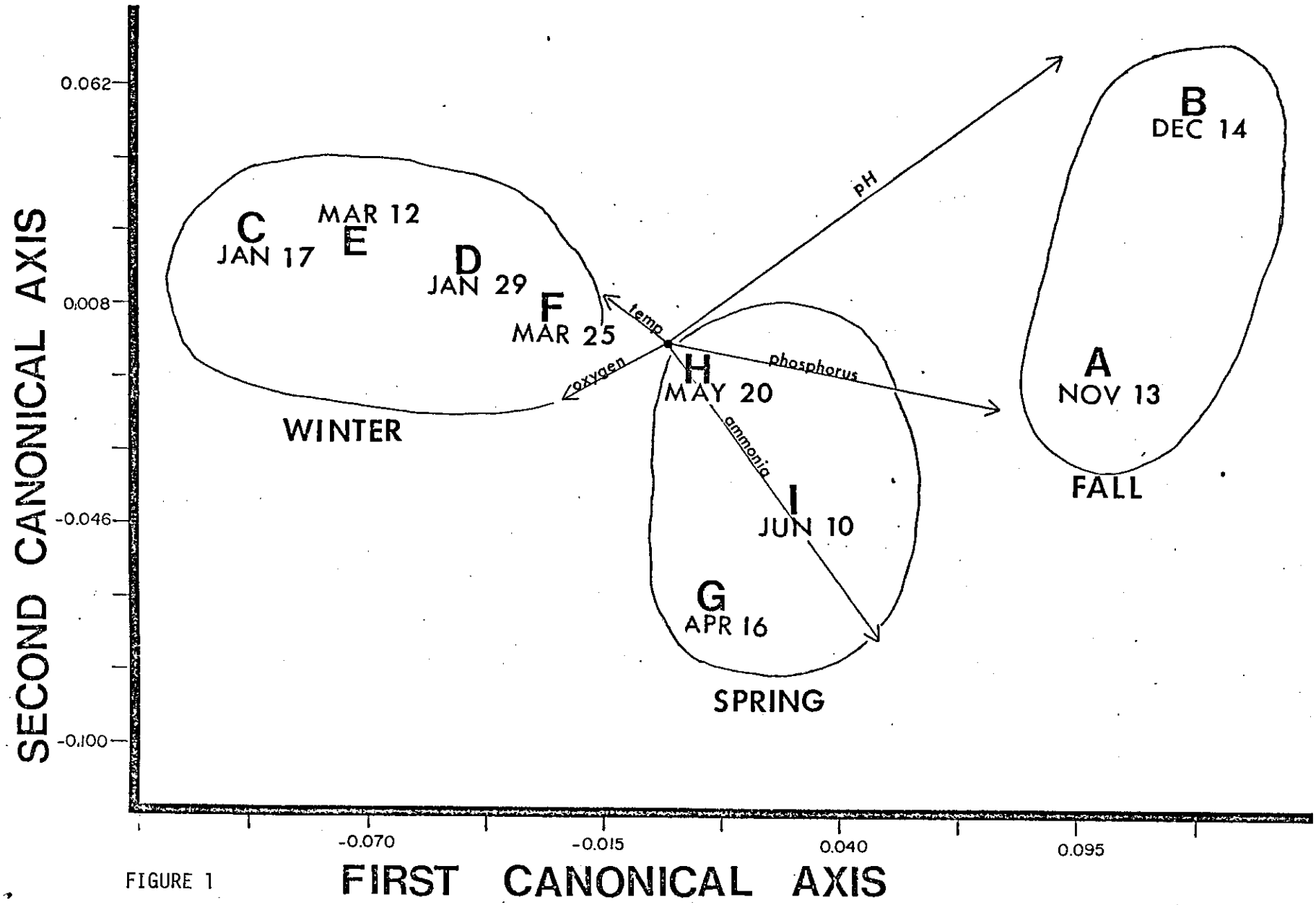


FIGURE 1

Canonical graph showing the grouping of samples into discrete groups; Fall (A-B); Winter (C-F); and Spring (G-I). The vectors extending from a central point (grand centroid) depicts how veri-ables influence each time period.

When the winter rains occur in January through March, the lake's water level is increased through surface run off and through the emptying of Perfumo creek waters into the lake. Along with the increase in lake depth, there is an increase in oxygen levels, temperatures and turbidity. The oxygen and temperature levels are the main variables separating the winter from the fall and summer groups.

In spring, there is a general warming and clearing of the lake's waters, along with the marked decrease in the lake's free ammonia and nitrate levels. The decrease in the ammonia levels (large vector) reflects the utilization of inorganic nitrogen by green plants, namely phytoplankton and the emerging submerged sago pondweed.

Although samples were not taken during the summer months (mid-June to October) 1980, previous research (Leong et al. 1972; Stimac and Leong 1977) indicates the following trends: the summer months show an increase in temperature, clarity, depth, and depletion of available inorganic nutrients. During these months, the biotic community, such as the pondweed, phytoplankton and insect populations increases almost geometrically through July, reaching a peak in mid-August and slowly decreasing in abundance as summer approaches fall.

II. Discussion of Laguna Lake's Water Quality Parameters Measured from November 1979 to June 1980.

A. Turbidity

Turbidity is the measurement of water clarity, taking into account the amount of suspended material, both organic and inorganic, found in the water column. As turbidity is essentially a measure of light penetration into the lake, it provides an index of the general productivity of phytoplankton species and indicates the depths at which rooted aquatic macrophytes can germinate and grow. Turbidity also indicates the amount of suspended clays and silts in the water; these substances affect the ability of predatory fish to find forage and can also clog their gills.

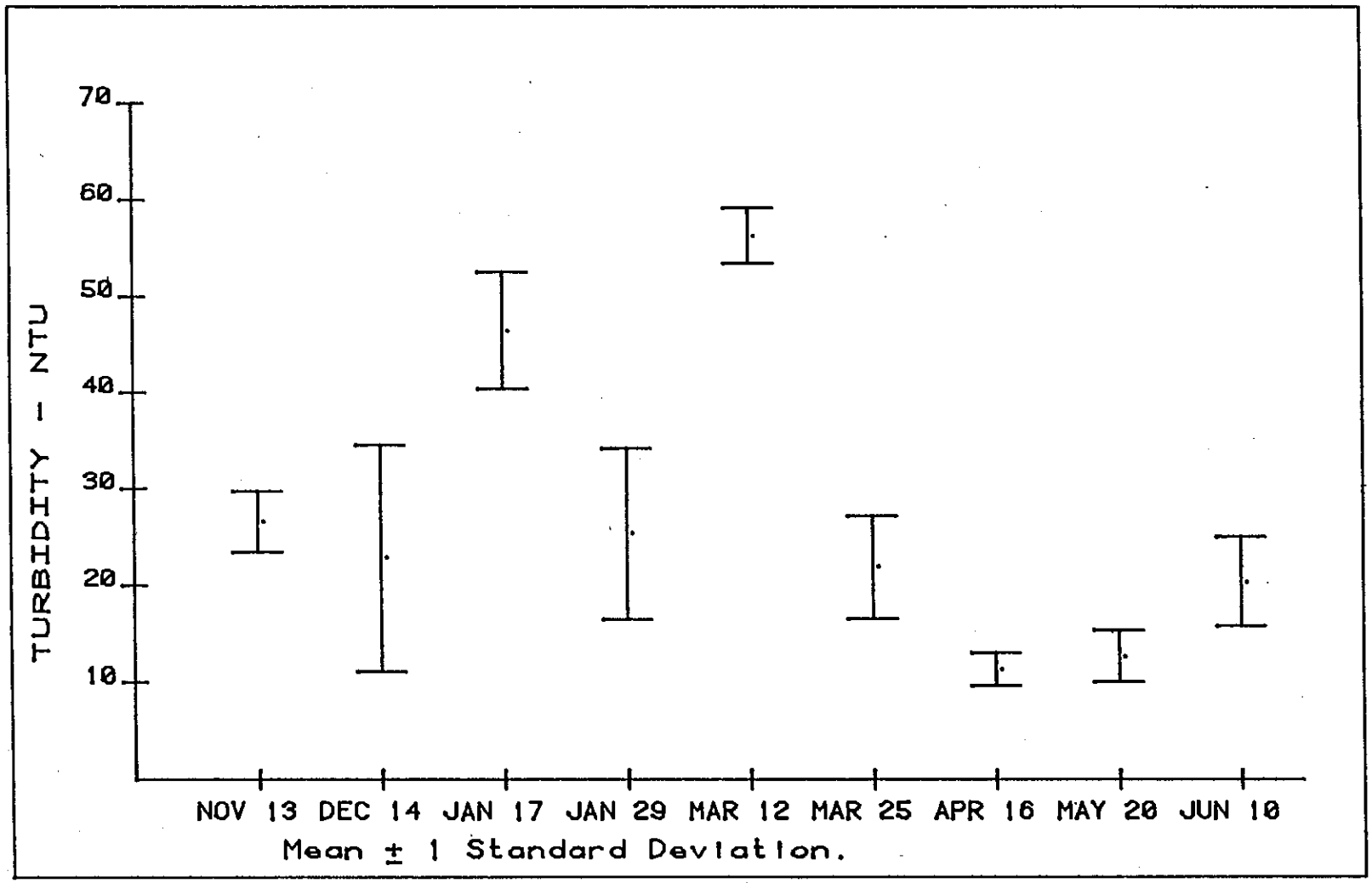


FIGURE 2

Measurements of water turbidity (NTU) for Laguna Lake from November 1979 to June 1980.

NTU=National Turbidity Units

Turbidity is measured in National Turbidity Units (ntu), an index that means that a unit of 1 corresponds to naturally clear water, 10 units indicates light penetration to ten to twenty feet, and 50 units indicates virtually no light penetration (muddy water). As can be seen in Figure 2, turbidity varies widely throughout the year, being greatest after periods of rainfall and windy conditions. During the spring months turbidity drops, particularly on calm mornings, and light penetration is virtually to the bottom of the lake. However, when the wind begins to stir up the water, turbidity increases noticeably as fine clays are resuspended from the bottom into the water column.

B. Temperature

Temperature is an important limiting factor in freshwater systems because many aquatic organisms have narrow tolerance limits to this parameter. In particular, warm water fish can breed only in water that is warm enough for embryo development within the eggs. Trout on the other hand are cold water fish that reach maximum growth at temperatures between 18 and 10 degrees Centigrade, but prefer water temperatures around 15 degrees C. Temperature changes also produce characteristic patterns of circulation and stratification that greatly influence the type and abundance of aquatic life.

Temperature data collected in the water analysis (Figure 3) indicate that Laguna Lake does not have a thermal stratification. This illustrates that wind mixing of the lake waters prevents the formation of a hypolimnion. The data also show a typical response to increasing air temperature characteristic of shallow ponds. While temperatures are optimal for the propagation of warm water fishes, the spring and summer temperature ranges are not optimal for cold water game species, such as trout.

C. Conductivity

Electrical conductivity is the measurement of the water's ability to carry an electrical charge, or conversely, its resistance to an electrical

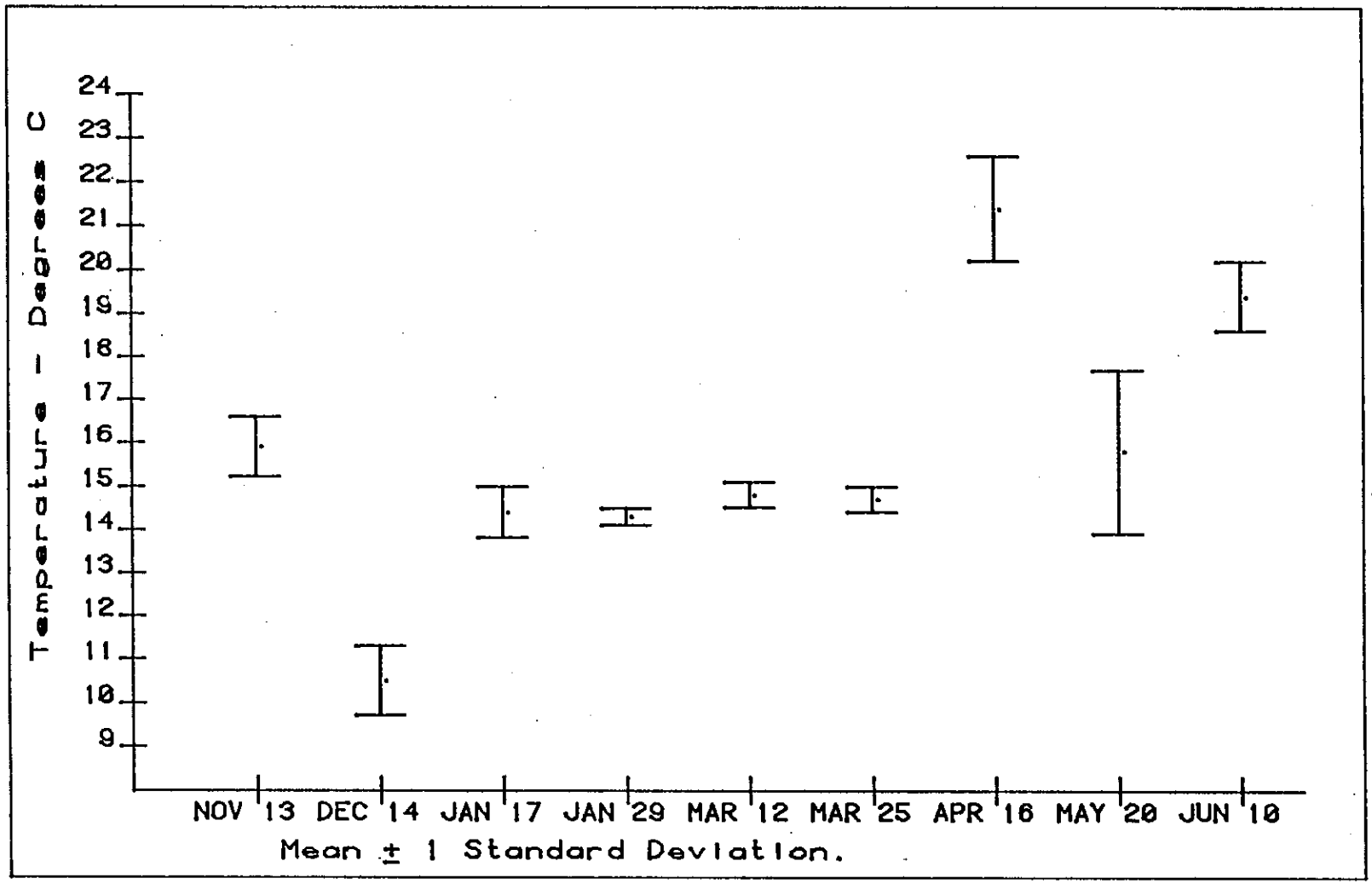


FIGURE 3

Measurements of water temperature (degrees centigrade) for Laguna Lake from November 1979 to June 1980

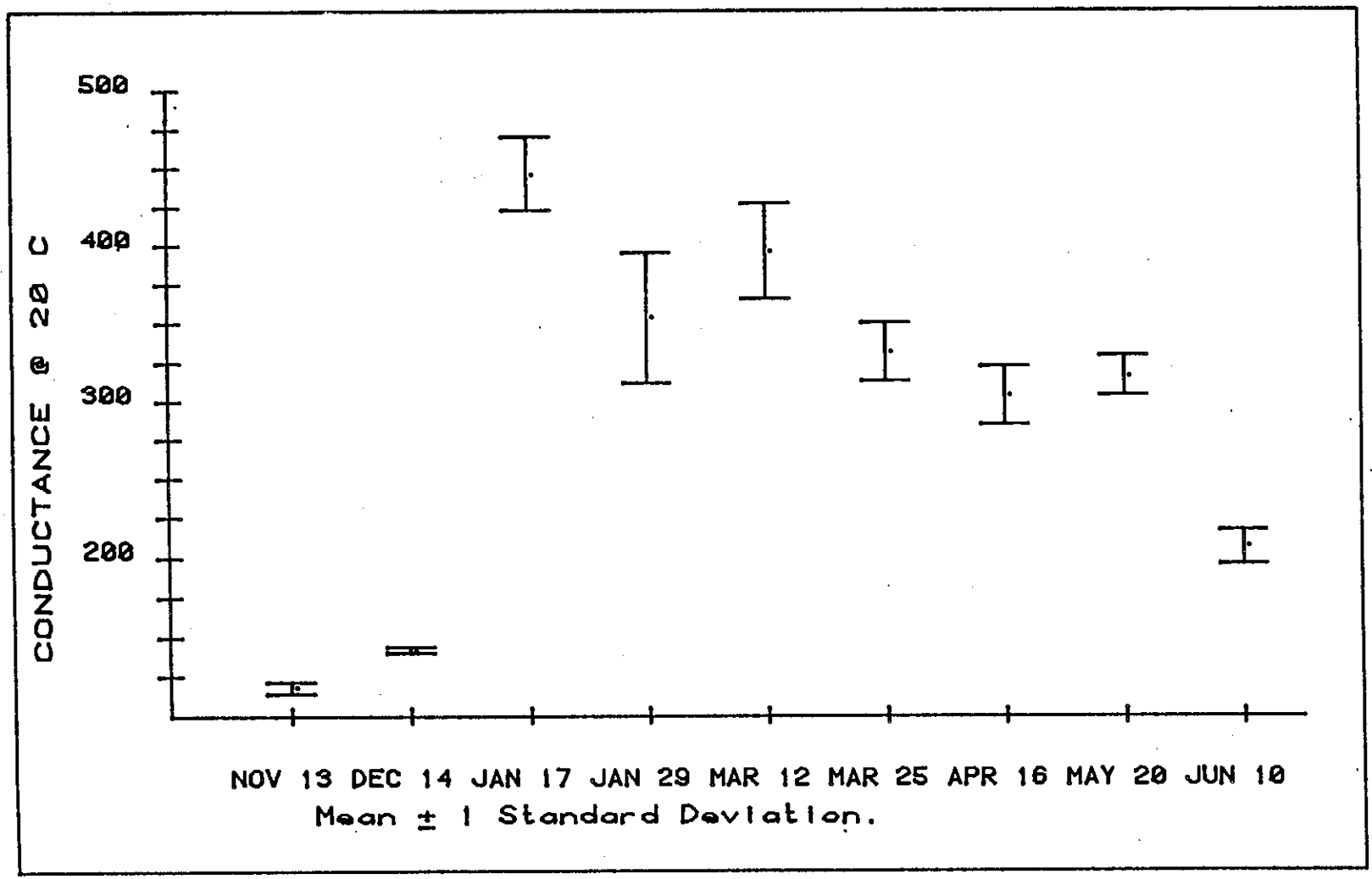


FIGURE 4

Measurements of water conductance for Laguna Lake from November 1979 to June 1980

current. Since only dissolved ions take part in the conduction of electrical current, conductivity is a measure of salinity, total dissolved solids and the general salinity of the water.

Conductivity at Laguna Lake (Figure 4) exhibits a classical pattern of solids and ion inflow during the rainy season, followed by decreasing levels over the spring and summer as materials are used by the biotic community of the lake and become bound to the sediment.

D. pH

This parameter measures the degree of alkalinity or acidity of the lake water. The acidity of the lake determines the reaction rate at which various chemical reactions occur in the lake. Because of this, it determines in part what concentrations of various nutrients will be available for plant growth. In addition, acidity has a direct effect on aquatic organisms, all of which have varying tolerances to different pH levels. The abundance of midge larvae in Laguna Lake, for example, has been strongly associated with pH levels (Stimac and Leong 1977).

The pH of Laguna Lake is slightly alkaline, as is typical of eutrophic and highly productive water bodies. Figure 5 shows that with the onset of rainfall, which is mildly acidic due to dissolved carbon dioxide and nitrates, the pH value of the lake drops to slightly below neutral. As inputs of nutrients and the biological activity of the lake increases during the spring, the pH increases, with stabilized levels occurring in the summer.

The pH values found for the lake are strong indicators of the overall annual cycling of the lake. The multivariate analysis of the various parameters shows that the lake has distinct seasons correlated to the time of year (Figure 1), with the regular change in pH being one of the most important parameters. This change in seasons will dictate the timing of physical alterations and water inputs to the lake.

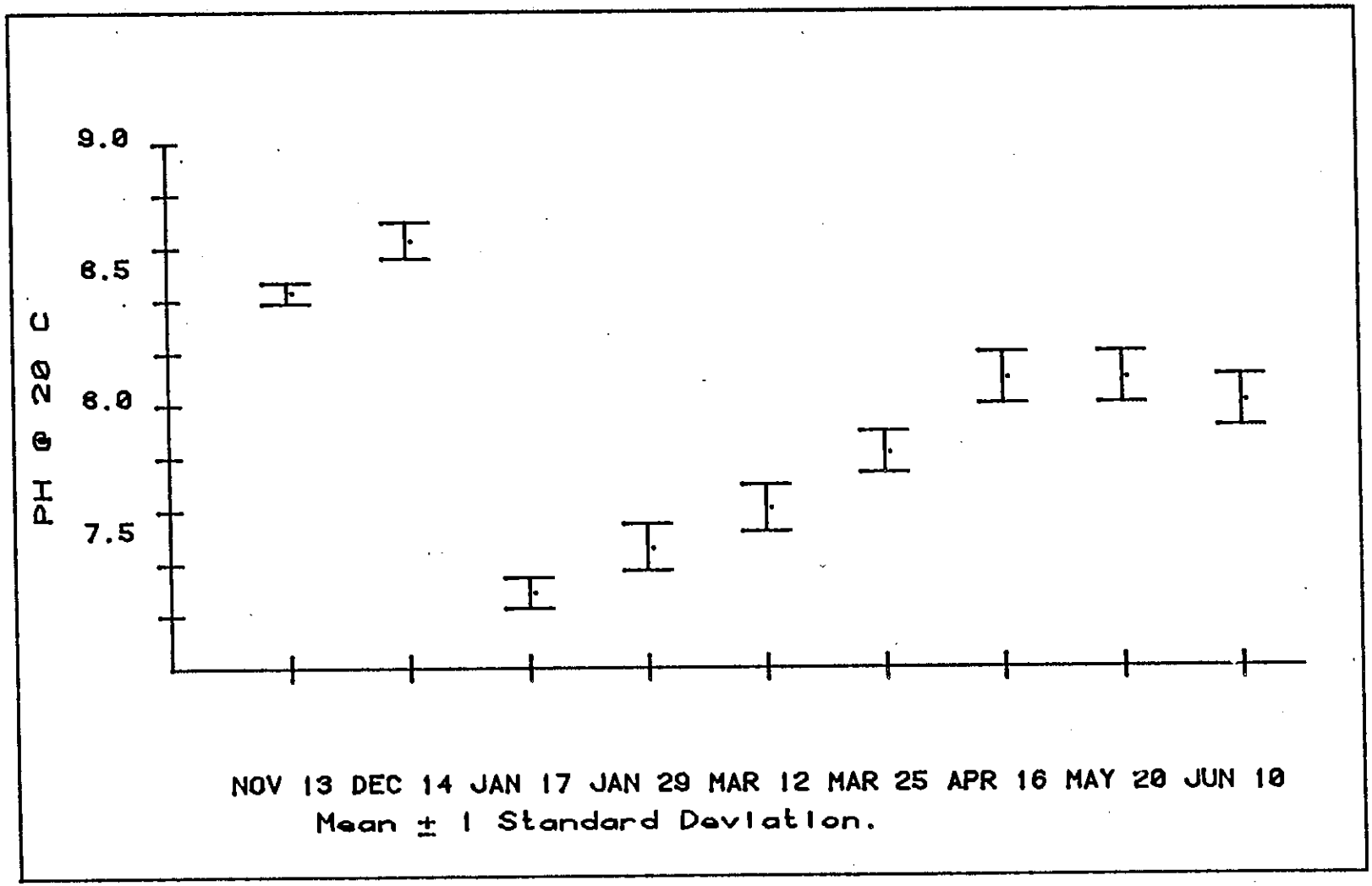


FIGURE 5

Measurements of pH for Laguna Lake from November 1979 to June 1980

E. Dissolved Oxygen

Oxygen is necessary for the respiration of organisms as they metabolize food to obtain energy. In an open air or running stream habitat, oxygen is generally not limiting to the growth and existence or organisms, but in soil and lake environments, it is particularly important in its relationship to the decomposition of organic material; high oxygen supplies enhance aerobic organisms to breakdown organic materials while low oxygen supplies retards or kill these organisms.

At Laguna Lake, oxygen levels are maintained by the constant mixing action of the prevailing winds, particularly during the spring and summer months. Data indicate that oxygen levels are also on a yearly season cycle like pH and conductivity (Figure 6). While levels are generally adequate for the maintenance of animal populations, there is a noticeable decrease in oxygen levels during the late fall. This oxygen depletion is probably related to the decompositon of vegetation and consequent oxygen depletions caused by the growth of bacteria.

Analysis of the oxygen data indicates that Laguna Lake forms a stratified oxygen layer at the bottom during exceptionally calm mornings. This stratification appears to be a temporary phenomena that disappears as breezes increase and promote mixing of the lake. If this condition were to persist for a longer period of time, stratification of the lake bottom waters could create a stagnant hypolimnion.

F. Nutrients - Ammonia, Nitrate, and Total Phosphorus

Inorganic nutrients are the key limiting factors to the growth of plants, with nitrogen and phosphorus generally being the key substances. Variations in the concentration of these parameters within the lake (often changing with seasons) determines the amount and spatial location of plant growth.

In Laguna Lake, nutrient values are generally high, as is typical of eutrophic, highly productive lakes and ponds. The lake area acts as a

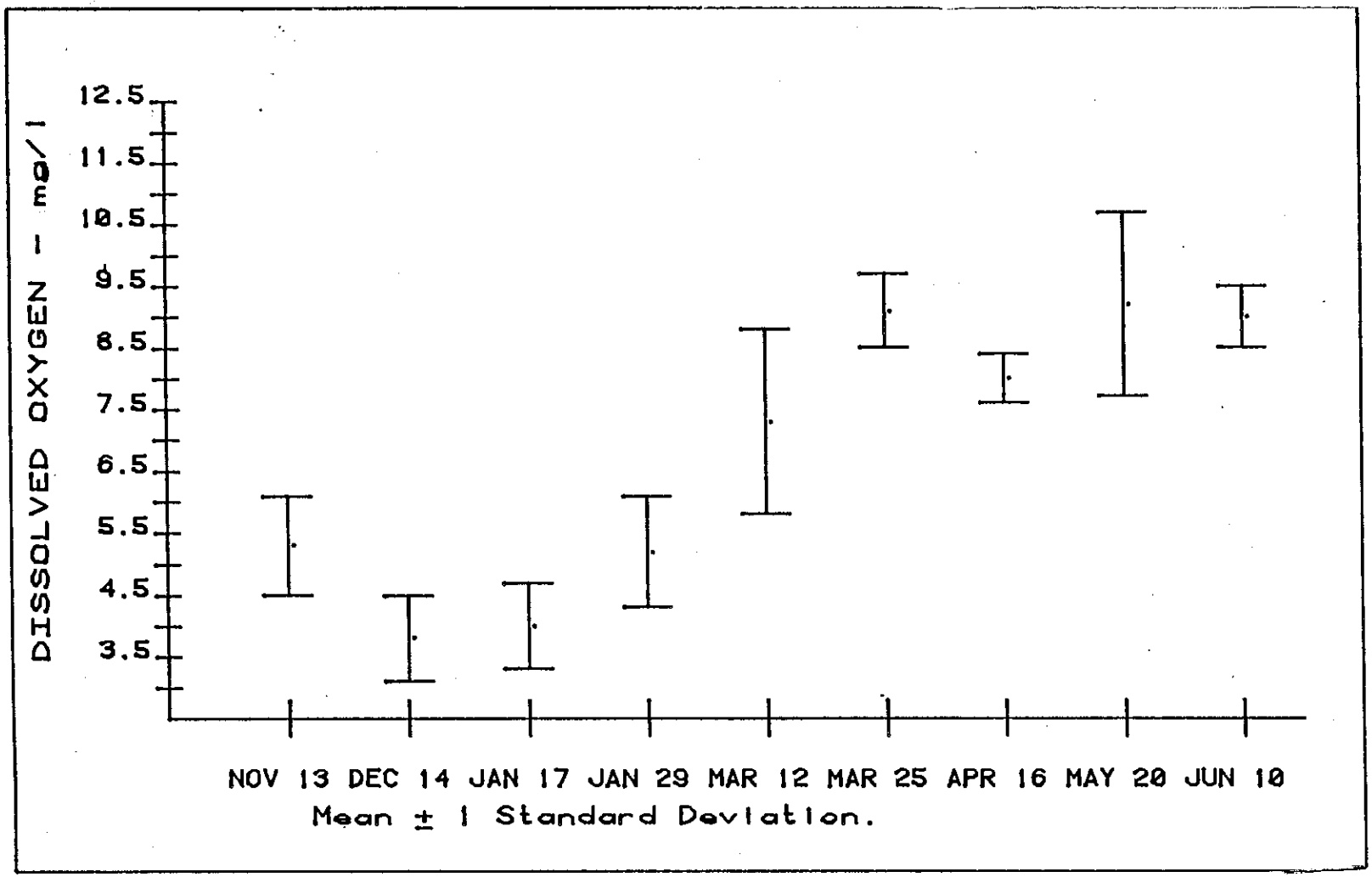


FIGURE 6

Measurements of dissolved oxygen for Laguna Lake
November 1979 to June 1980

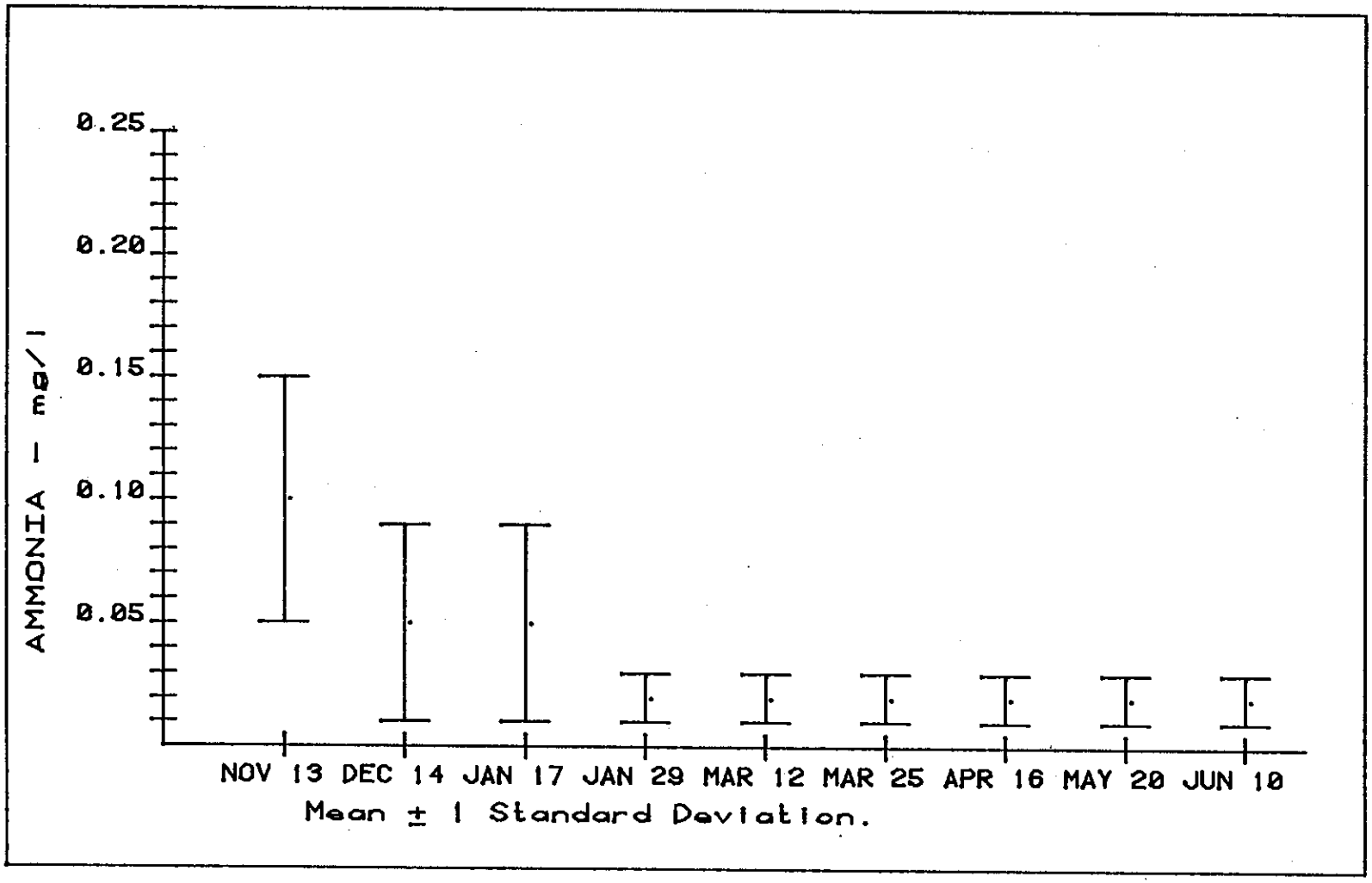


FIGURE 7

Measurements of ammonia levels for Laguna Lake from November 1979 to June 1980

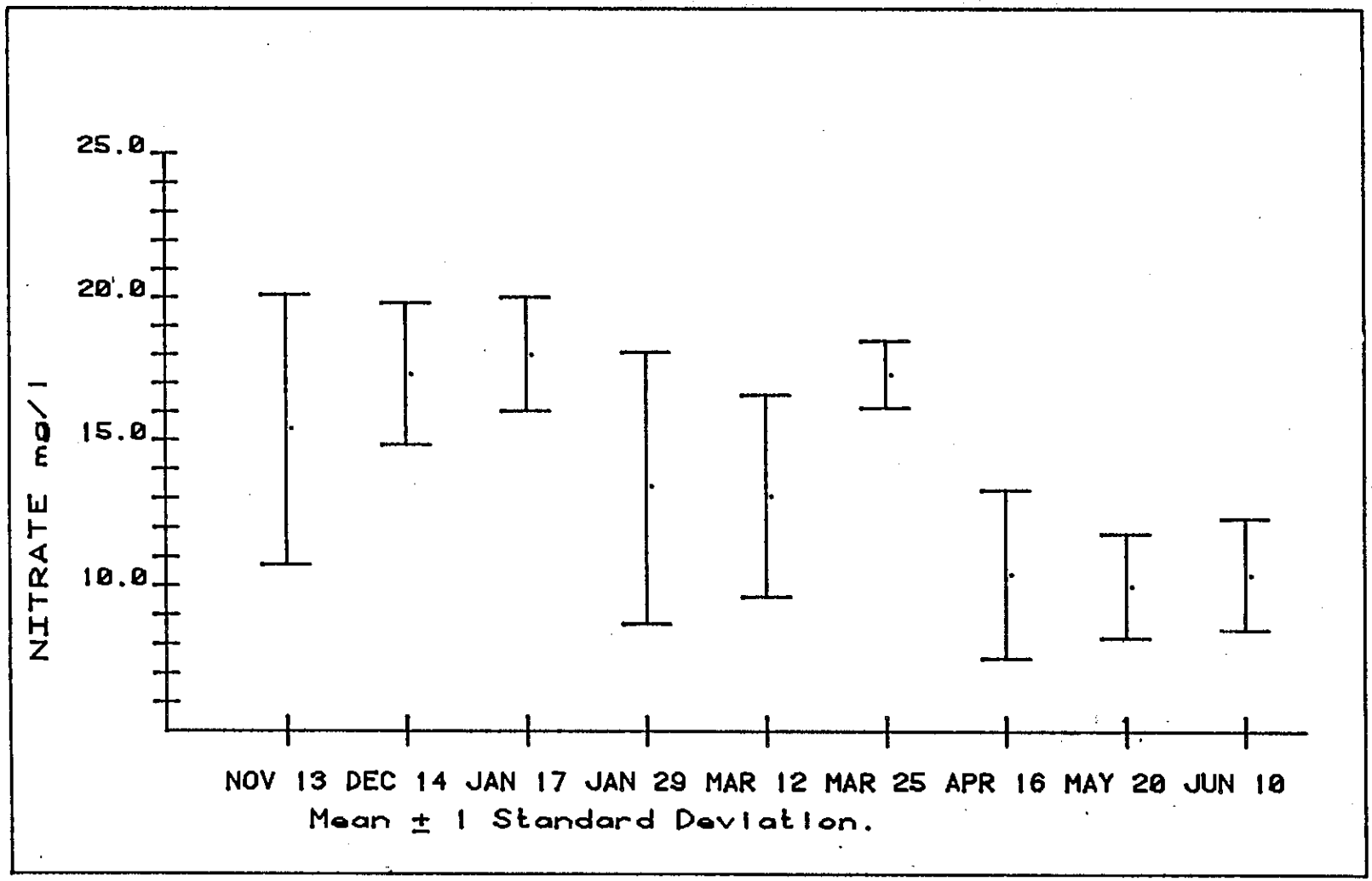


FIGURE 8 Measurements of nitrate levels for Laguna Lake from November 1979 to June 1980

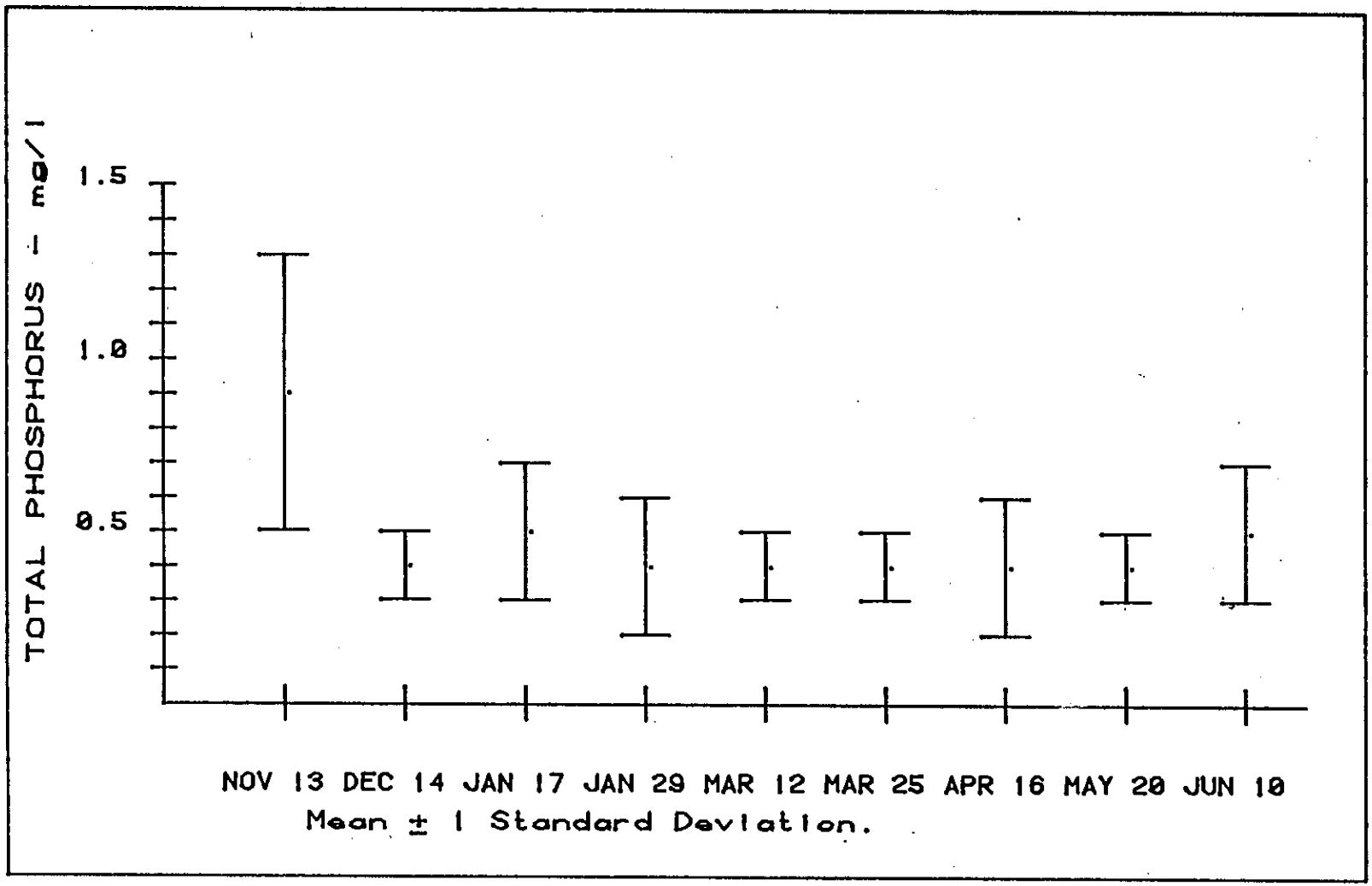


FIGURE 9 Measurements of phosphorus levels for Laguna Lake from November 1979 to June 1980

nutrient trap to material washed out of the watershed, with particularly high nutrient sources occurring on the grazing and agricultural lands. Figures 7, 8, 9 indicate that nutrient levels vary considerably within the lake, but the mean is approximately stable. An exception to this is the high concentration of ammonia and similarly somewhat increased levels of nitrate and phosphorus during the late fall. This appears to be the result of annual vegetation die off, which returns nutrients to the lake waters at a time when they cannot be utilized effectively. An important proportion of this material is probably carried out of the lake during overflow conditions and other portions are probably tightly bound to the clay and silt sedimentation accumulating on the bottom of the lake.

Inputs of additional nutrients, particularly large amounts of phosphorus and nitrates from effluent water, may cause accelerated eutrophication.

APPENDIX B
FIELD EXPLORATION

APPENDIX B

FIELD EXPLORATION

Field exploration was conducted during the weeks March 21 and 28, 2016 and consisted of Field Reconnaissance, surface soil sampling and sampling of lake sediments. On March 21, 2016 a field reconnaissance was conducted around the site and surrounding area. Surface soil samples were collected at this time. On March 30 and 31, vibracoring was conducted within the lake itself by Kinnetic Laboratories, Inc, Leighton specialty subcontract. Field exploration personnel included KLI staff to supervise and coordinate field logistics, perform vibracoring, and environmental sampling, and a Leighton staff engineer to perform discrete environmental sampling and log the cores.

Vibracores VC-01, VC-03, VC-04, VC-07 through VC-14 were performed as planned. VC-02, VC-05, and VC-6 represent shallow water or Prefumo Creek sampling locations and were not performed as vibracores.

VIBRACORE EQUIPMENT AND PROCEDURES

The vibracore system was deployed from a floating barge deployed on the lake, and moved around suing a Boston Whaler. Vibracoring was performed with a sample barrel attached to a vibrahead. The system consists of a 4-inch-diameter aluminum coring tube, a stainless steel cutting tip, and a stainless steel core catcher. Inserted into the core tubes were clean polyethylene liners. The vibrahead has two counter-rotating motors encased in a waterproof aluminum housing. A three-phase, 240- volt generator powers the motors.

Frame-mounted Deployment

Vibracores with a target penetration depth of approximately 10 feet were deployed in a In this configuration, the vibrahead and sample barrel were suspended on cable mounted to the A-frame and lowered overboard to the mudline. The barrel penetrated the surficial materials under the weight of the assembly and was then vibrated to reach the final penetration depth.

When penetration at a location was complete, power was shut off to the vibrahead, and the vibracore was slowly brought aboard the vessel. A check valve located on top of the core tube reduces or prevents sediment loss during recovery. Once on deck, the core cutter and catcher were removed. The core liner and sample were then removed and given to the Leighton engineer for processing.

A Leighton engineer photographed, described, and logged the conditions encountered in each vibracore. In addition, they collected discrete environmental samples from the top of the core, the middle of the core and the bottom of the core. If observed, a pocket penetrometer was used to estimate the shear strength of fine-grained soil

layers. These values are listed on the vibracore logs and on the Summary of Laboratory Test Results table in Appendix C. Representative samples from each soil layer were obtained and sealed in plastic bags for transport to a laboratory for additional testing. Material that was not selected for laboratory testing was discarded.

At completion, the coreholes were not backfilled and may eventually infill with native materials.

RESULTS

Table B-1 following presents the locations and depths of the explorations performed. Logs for vibracores LCI16-1 through LCI16-14 are presented in this appendix. Table B-2 summarizes the sample and geotechnical testing performed.

Table B-1 Exploration Summary

ID	Method	Location/Type	Depth, feet	Date Sampled	WGS 1984 Latitude	WGS 1984 Longitude
LCI16-1	Vibracore	Lake sediment	12.5	3/31/2016	35.26955506	-120.6979688
LCI16-3	Vibracore	Lake sediment	13	3/31/2016	35.2680576	-120.6937044
LCI16-4	Vibracore	Lake sediment	11.5	3/31/2016	34.26607416	-120.6938761
LCI16-7	Vibracore	Lake sediment	15.5	3/31/2016	35.26492708	-120.6917929
LCI16-8	Vibracore	Lake sediment	15	3/30/2016	35.26428813	-120.6906741
LCI16-9	Vibracore	Lake sediment	12	3/30/2016	35.26637555	-120.6916667
LCI16-10	Vibracore	Lake sediment	13	3/30/2016	35.26549635	-120.6896212
LCI16-11	Vibracore	Lake sediment	13	3/30/2016	35.26592849	-120.6880595
LCI16-12	Vibracore	Lake sediment	12	3/30/2016	35.26490027	-120.687147
LCI16-13	Vibracore	Lake sediment	6	3/30/2016	35.26268758	-120.6852516
LCI16-14	Vibracore	Lake sediment	10	3/30/2016	35.2605703	-120.6837047
LCI16-LS1	Surface Sample	drainage sediment	0.25	3/21/2016	35.266305	-120.686842
LCI16-LS2	Surface Sample	soil	0.25	3/21/2016	35.271859	-120.690254
LCI16-LS3	Surface Sample	soil	0.25	3/21/2016	35.271193	-120.688516
LCI16-LS4	Surface Sample	soil	0.25	3/21/2016	35.269039	-120.686606
LCI16-LS5	Surface Sample	creek sediment	0.25	3/21/2016	35.260804	-120.69564

LOG OF VIBRACORE NO. VC-01

Project No.	11254.001	**Date Drilled**	3-31-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	35.26955506, -120.6979688	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0			B-1	FAT CLAY (CH) - saturated, brown, cohesive, plastic fines @ 0' to 5' - becomes dark olive gray, clumpy, contains air pockets							
5											
				@ 9' - becomes very stiff							
10											
				Water depth of 4.1 feet Refusal of 12.5 feet Recovery of 10.5 feet							
15											
20											
25											
30											

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

LOG OF VIBRACORE NO. VC-03

Project No.	11254.001	**Date Drilled**	3-31-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	35.26805760, -120.69370439	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0			B-1 S-1	Lean CLAY (CL) - Dark grayish brown, saturated, plastic fines, cohesive @ 0 to 2' - soil is clumpy and contains air pockets @ 3' - becomes dark gray							
5			S-2								
10			S-3								
				Water depth of 5.9 feet Penetration of 13 feet Recovery of 12 feet							
15											
20											
25											
30											

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

LOG OF VIBRACORE NO. VC-04

Project No.	11254.001	**Date Drilled**	3-31-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	34.26607416, -120.69387605	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0			B-1 B-2	FAT CLAY (CH) with silt - dark brown, plastic fines, cohesive							
				@ 2' - becomes dark brownish gray							
5				@ 4.5' to 7.5' - becomes clumpy and contains airvoids							
10											
				Water depth of 6.6 feet Penetration of 11.5 feet Recovery of 10.5 feet							
15											
20											
25											
30											

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

LOG OF VIBRACORE NO. VC-07

Project No.	11254.001	**Date Drilled**	3-31-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	35.26492708, -120.6917929	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0			B-1	SILTY SAND (SM) - dark grayish brown, saturated, fine-grained sand							
			B-2								
				~ 2' - becomes dark brown							
				@ 3' FAT CLAY (CH) - dark gray, plastic, cohesive, trace fine-grained sand							
			B-3								
5											
10											
			R-1	@ 11' - ELASTIC SILT (MH) - dark olive gray				84	43		
15											
				Water depth of 4.15 feet Penetration of 15.5 feet Recovery of 14 feet							
20											
25											
30											

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

LOG OF VIBRACORE NO. VC-08

Project No.	11254.001	**Date Drilled**	3-30-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	35.26428813, -120.69067407	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0				FAT CLAY (CH) - dark brown, plastic fines, cohesive							
				@ 1.5' - becomes dark gray almost black							
5											
			B-1	@ 5.5' - lean CLAY (CL) with sand - dark olive gray, saturated, semi-plastic fines with fine-grained sand				33			
			B-2	@ 7' - FAT CLAY, saturated, plastic, cohesive							
10											
15				Water depth of 4.75 feet Penetration of 15 feet Recovery of 12 feet							
20											
25											
30											

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

LOG OF VIBRACORE NO. VC-09

Project No.	11254.001	**Date Drilled**	3-30-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	35.26637555, -120.69166671	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0				FAT CLAY (CH) - dark gray, with fine sand							
			B-1								
5											
10											
				Water depth of 5 feet Penetration of 12 feet Recovery of 10 feet							
15											
20											
25											
30											

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

LOG OF VIBRACORE NO. VC-10

Project No.	11254.001	**Date Drilled**	3-30-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	35.26549635, -120.68962122	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0			B-1	Elastic SILT (MH) - dark olive gray, semi-plastic fines, cohesive				83	40		
5				@ 5' to 7.5' - becomes clumpy with more plastic fines, contains voids							
			B-2	@ 7.5' FAT CLAY (CH) dark olive, voids no longer present							
10											
				Water depth of 5.3 feet Penetration of 13 feet Recovery of 10 feet							
15											
20											
25											
30											

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

LOG OF VIBRACORE NO. VC-11

Project No.	11254.001	**Date Drilled**	3-30-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	35.26592849, -120.68805951	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0			B-1 V-11-S-1	FAT CLAY (CH) - dark gray with dark brown mottling, saturated, plastic and cohesive fines							
5			V-11-S-2	@ 7' - becomes dark gray							
10			B-2								
			V-11-S-3	Water depth of 4.9 feet Penetration of 13 feet Recovery of 12.5 feet							
15											
20											
25											
30											

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

LOG OF VIBRACORE NO. VC-12

Project No.	11254.001	**Date Drilled**	3-30-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	35.26490027, -120.68714703	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0			B-1	FAT CLAY (CH) - Dark gray, cohesive, plastic fines, clumpy, contains voids				103	66		
5											
10											
				Water depth of 6 feet Penetration of 12 feet Recovery of 11.5 feet							
15											
20											
25											
30											

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

LOG OF VIBRACORE NO. VC-13

Project No.	11254.001	**Date Drilled**	3-30-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	35.26268758, -120.68525162	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0			B-1	Lean CLAY (CH) - Dark grayish olive, plastic fines, saturated, cohesive							
			B-2	@ 1' to 2.5' - trace fine- to coarse-grained sand							
			B-3	@ 2.5' - becomes dark gray and green, very stiff, cohesive, with pieces of shell							
5			R-1					58	39		
			B-4								
				Water depth of 7.8 feet Penetration of 6 feet Recovery of 6 feet							
10											
15											
20											
25											
30											

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

LOG OF VIBRACORE NO. VC-14

Project No.	11254.001	**Date Drilled**	3-30-16
Project	Laguna Lake Dredging and Sediment Management	**Logged By**	Rincon, Luis J
Drilling Co.	Kinnetic Laboratories	**Hole Diameter**	3"
Drilling Method	Direct Push - Vibracore	**Ground Elevation**	'
Location	35.2605703, -120.68370468	**Sampled By**	Rincon, Luis J

Depth ft.	Material Symbol (N / S)	Sampler Type	Sample Number	MATERIAL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Moisture Content, %	% Passing #200 Sieve	% Passing #270 Sieve	Liquid Limit, %	Plasticity Index	Undrained Shear Strength S_u, ksf	Electrical Resistivity, ohn-cm
0			B-1	FAT CLAY (CH) - Grayish brown, semi-plastic fines							
			V-14-S-1	Pocket penetrometer with boot: 0.5							
			B-2								
5			V-14-S-2								
			B-3	@ 5' to 5.5' contains more plastic fines becomes brown, stiff, Pocket penetrometer: 2.0				67	43		
			V-14-S-3								
10				Water depth of 7.8 feet Penetration of 10 feet Recovery of 9.25 feet							
15											
20											
25											
30											

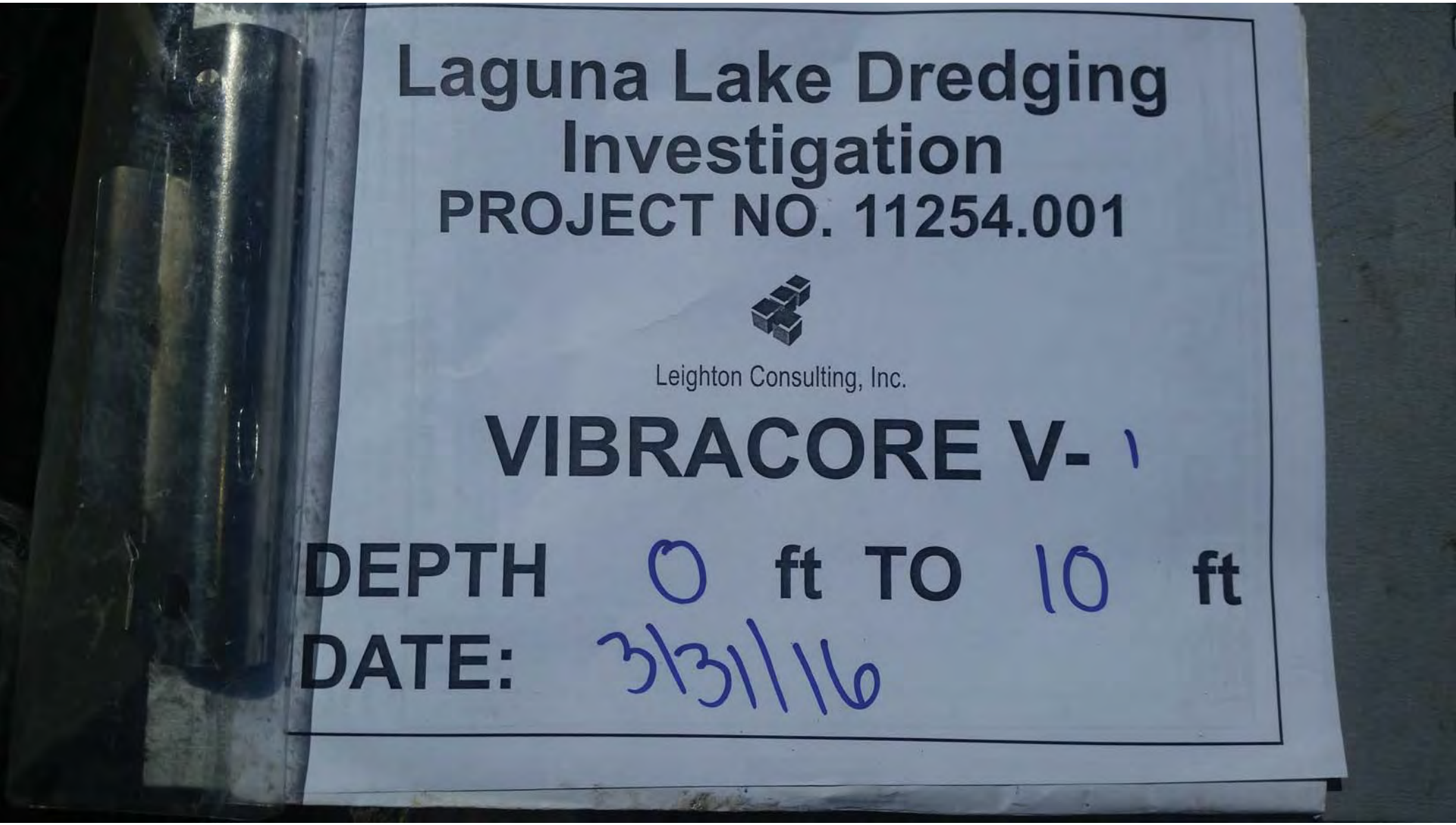
SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER	UU	UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***


Laguna Lake Dredging
Investigation
PROJECT NO. 11254.001
Leighton Consulting, Inc.
VIBRACORE V- 1
DEPTH 0 ft TO 10 ft
DATE: 3/31/16

Leighton

Leighton

Leighton

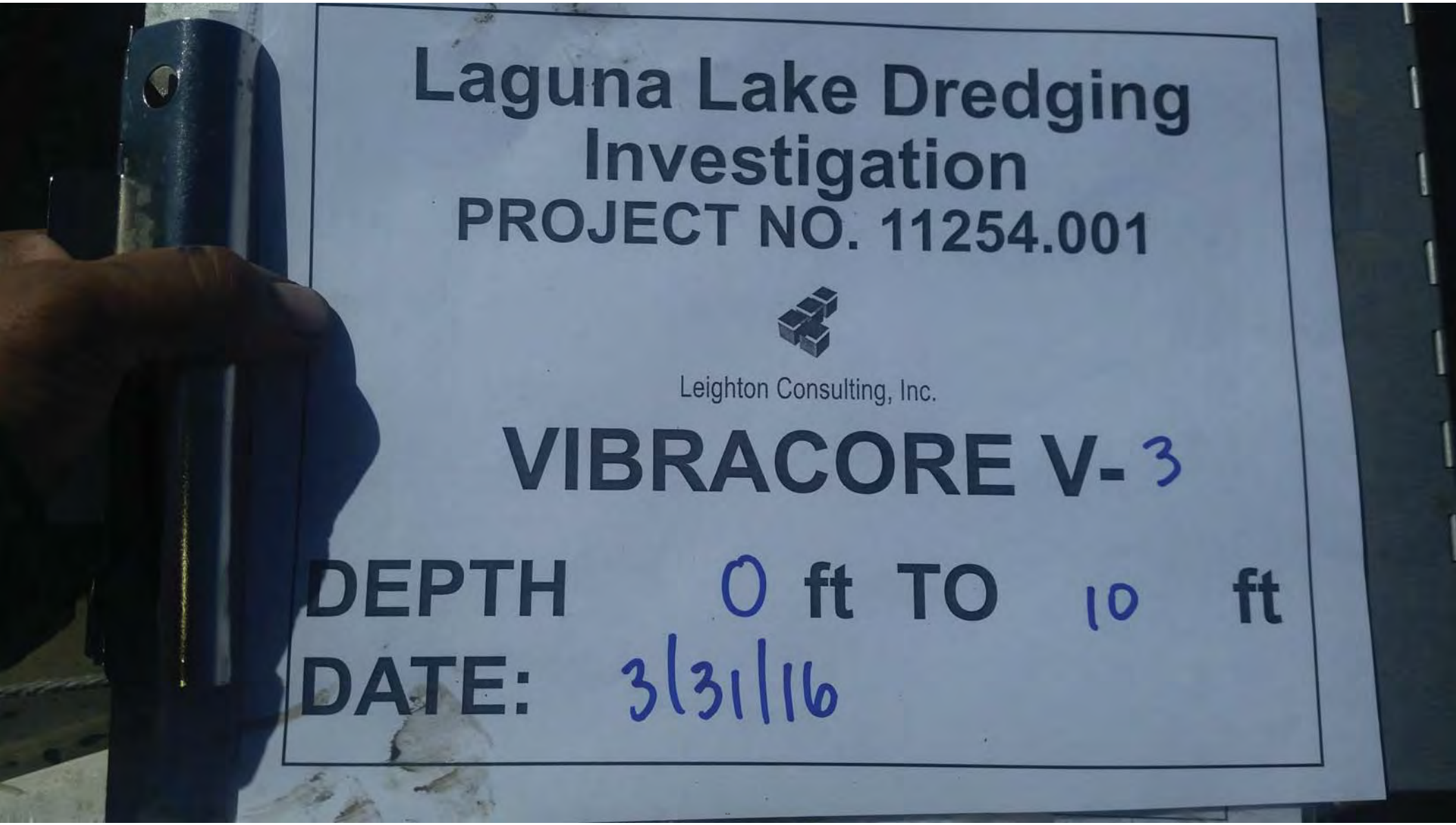
Leighton

Leighton

Leighton

100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118

Leighton


Laguna Lake Dredging
Investigation
PROJECT NO. 11254.001
Leighton Consulting, Inc.
VIBRACORE V-3
DEPTH 0 ft TO 10 ft
DATE: 3/31/16

Leighton

Leighton

Leighton

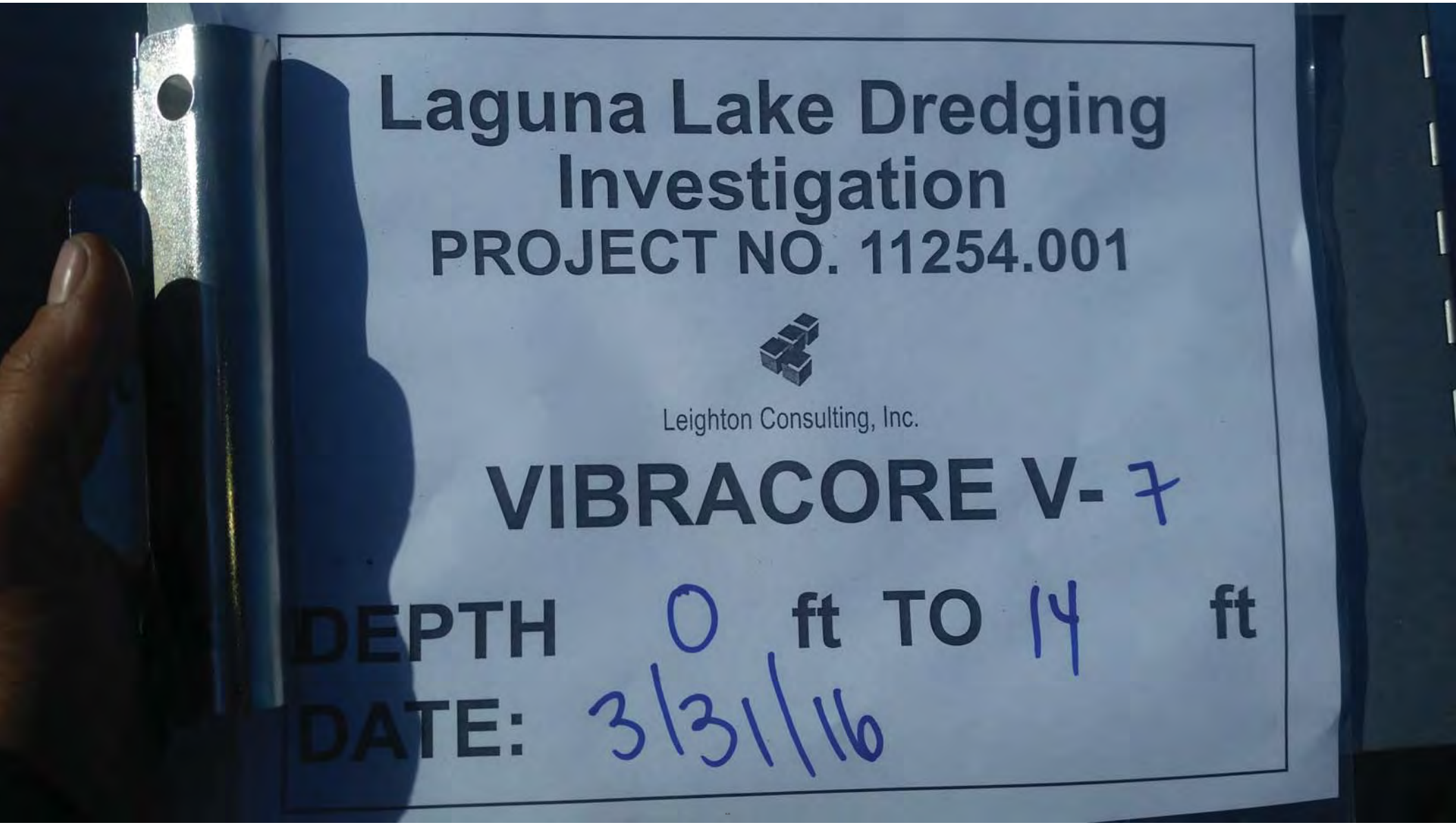
Leighton

Leighton

Leighton

Leighton

Leighton


Laguna Lake Dredging
Investigation
PROJECT NO. 11254.001
Leighton Consulting, Inc.
VIBRACORE V- 7
DEPTH 0 ft TO 14 ft
DATE: 3/31/16

Leighton

Leighton

Leighton

Leighton

Leighton

Leighton

Leighton

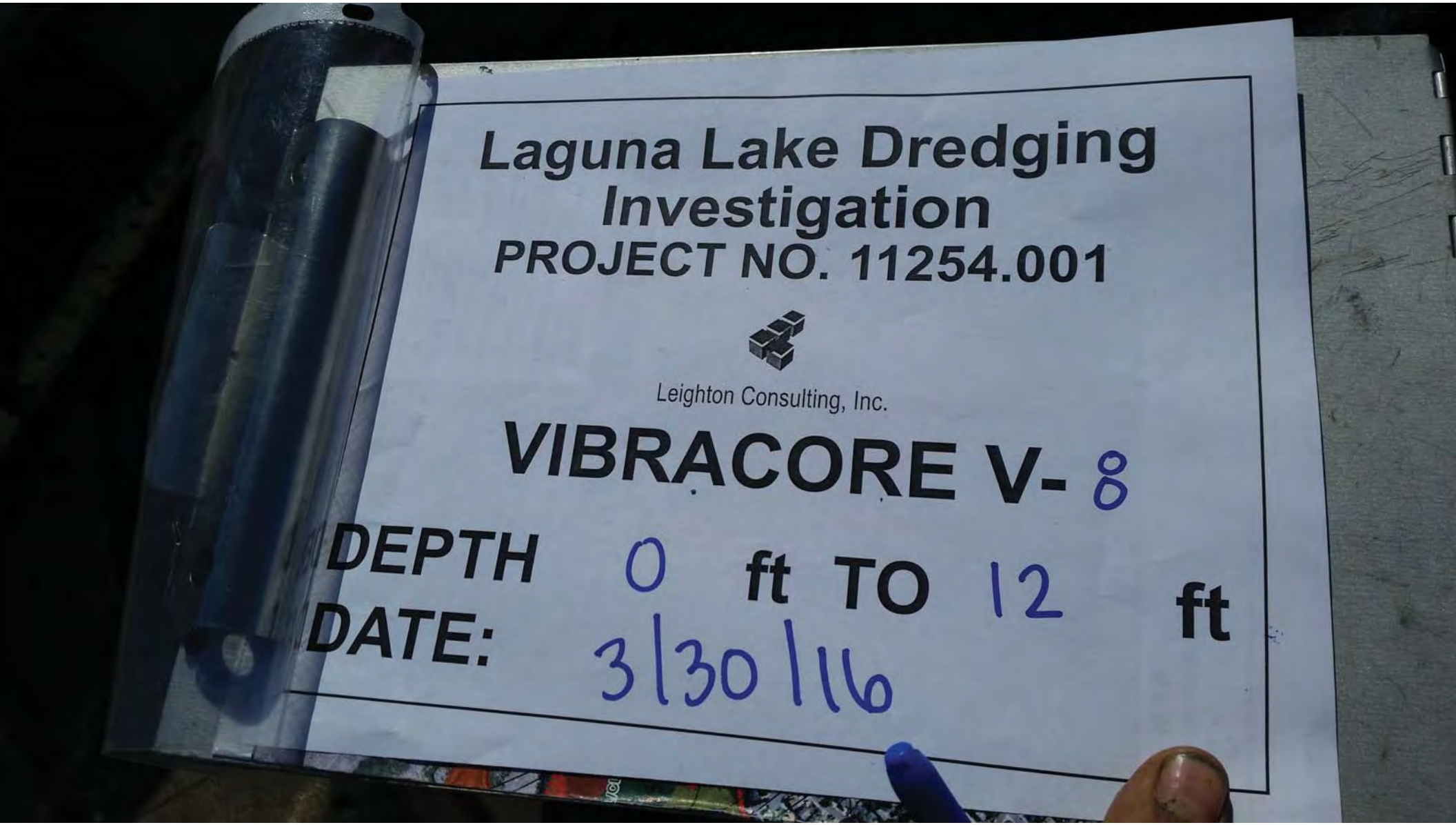
Leighton

Leighton

Leighton

Leighton

Leighton


Laguna Lake Dredging
Investigation
PROJECT NO. 11254.001
Leighton Consulting, Inc.
VIBRACORE V- 8
DEPTH 0 ft TO 12 ft
DATE: 3/30/16

Leighton

Leighton

Leighton

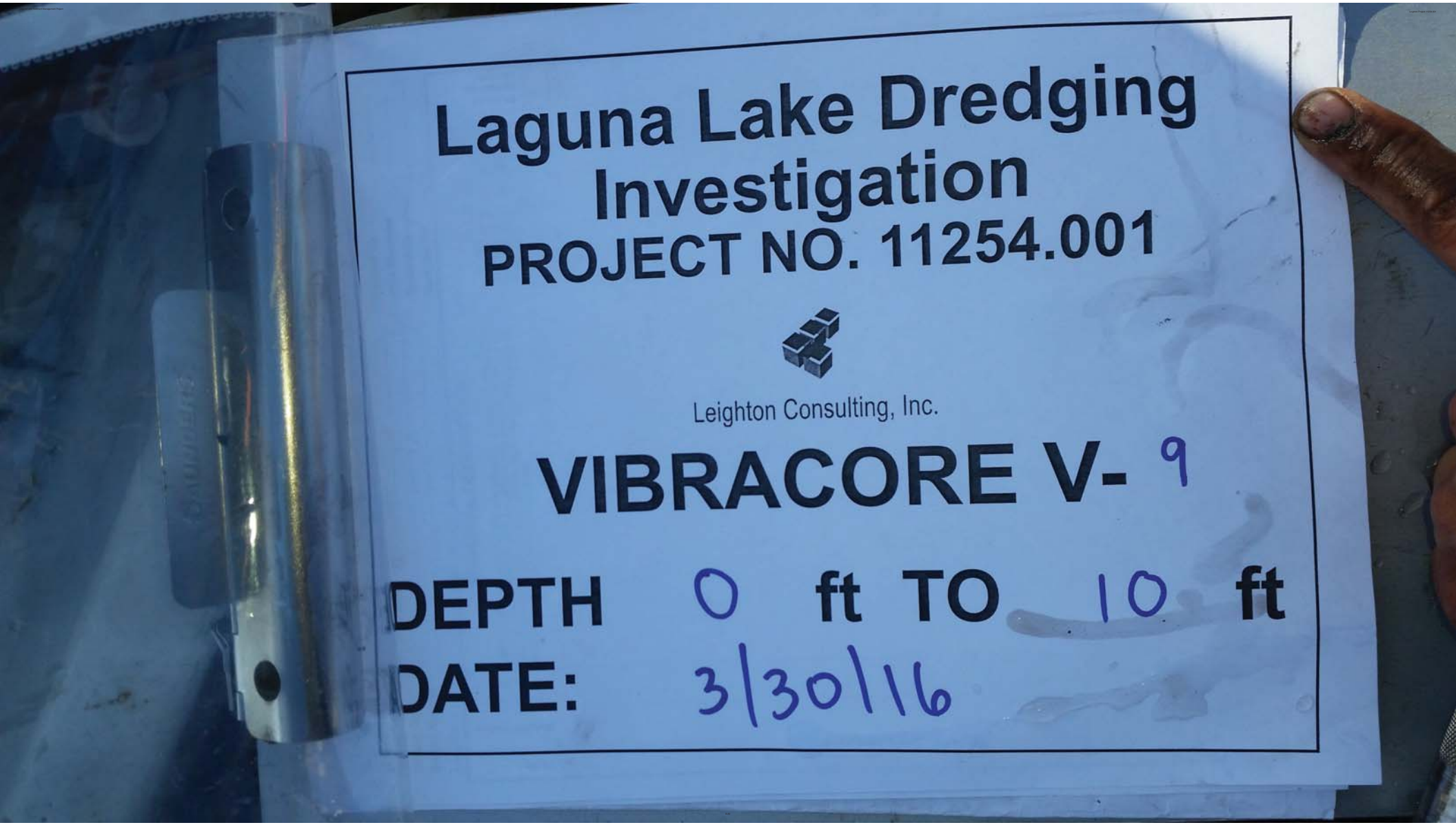
Leighton

107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128

Leighton

10 11 1 2 3 4 5 6 7 8 9 10 11
130 131 132 133 134 135 136 137 138 139 140 141 142

Leighton


Laguna Lake Dredging
Investigation
PROJECT NO. 11254.001
Leighton Consulting, Inc.
VIBRACORE V- 9
DEPTH 0 ft TO 10 ft
DATE: 3/30/16

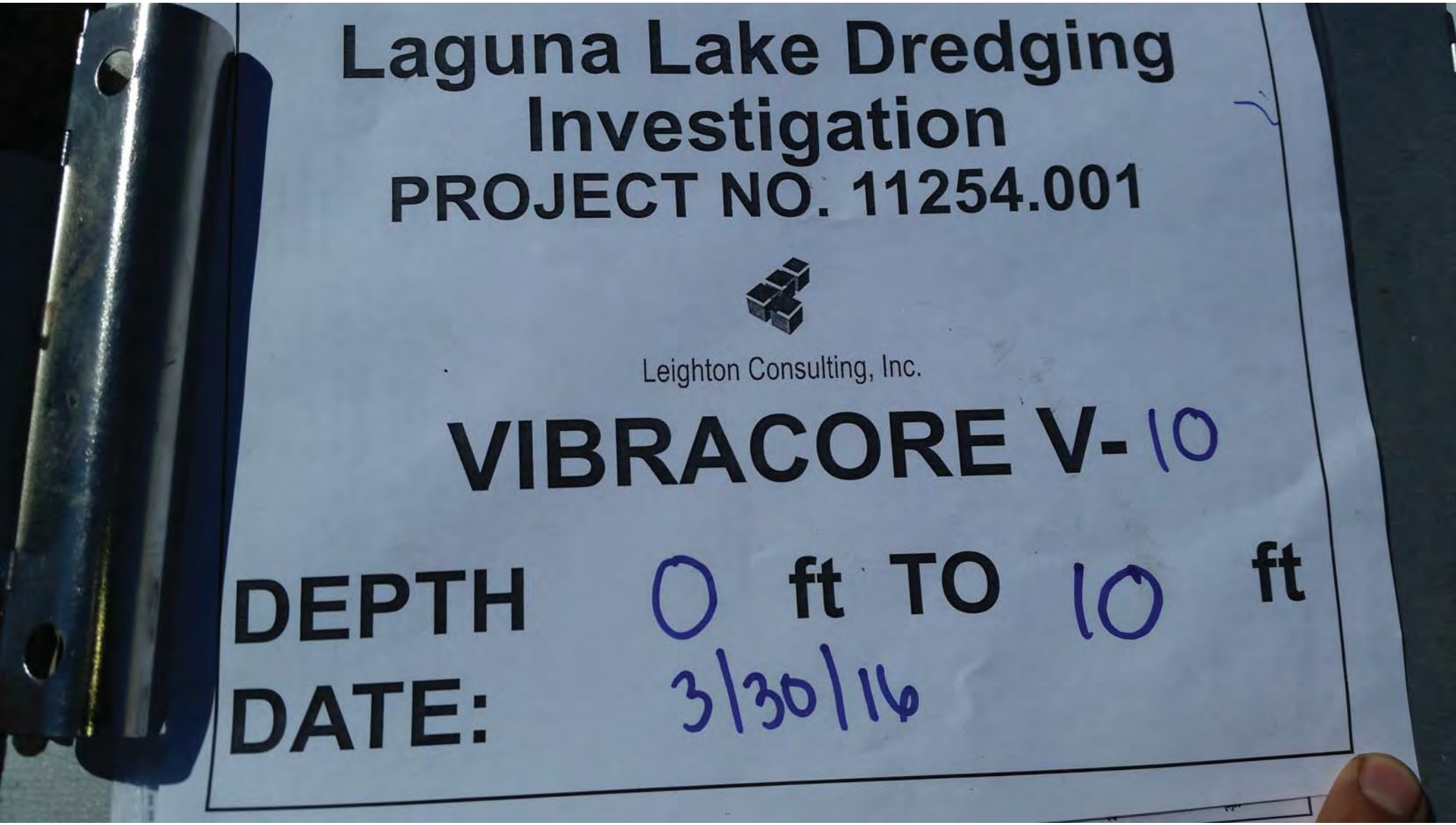
Leighton

Leighton

10 11 8F 1 2 3 4 5 6 7 8 9 10 11 9F
94 95 96 97 98 99 100 101 102 103 104 105 106 107 108

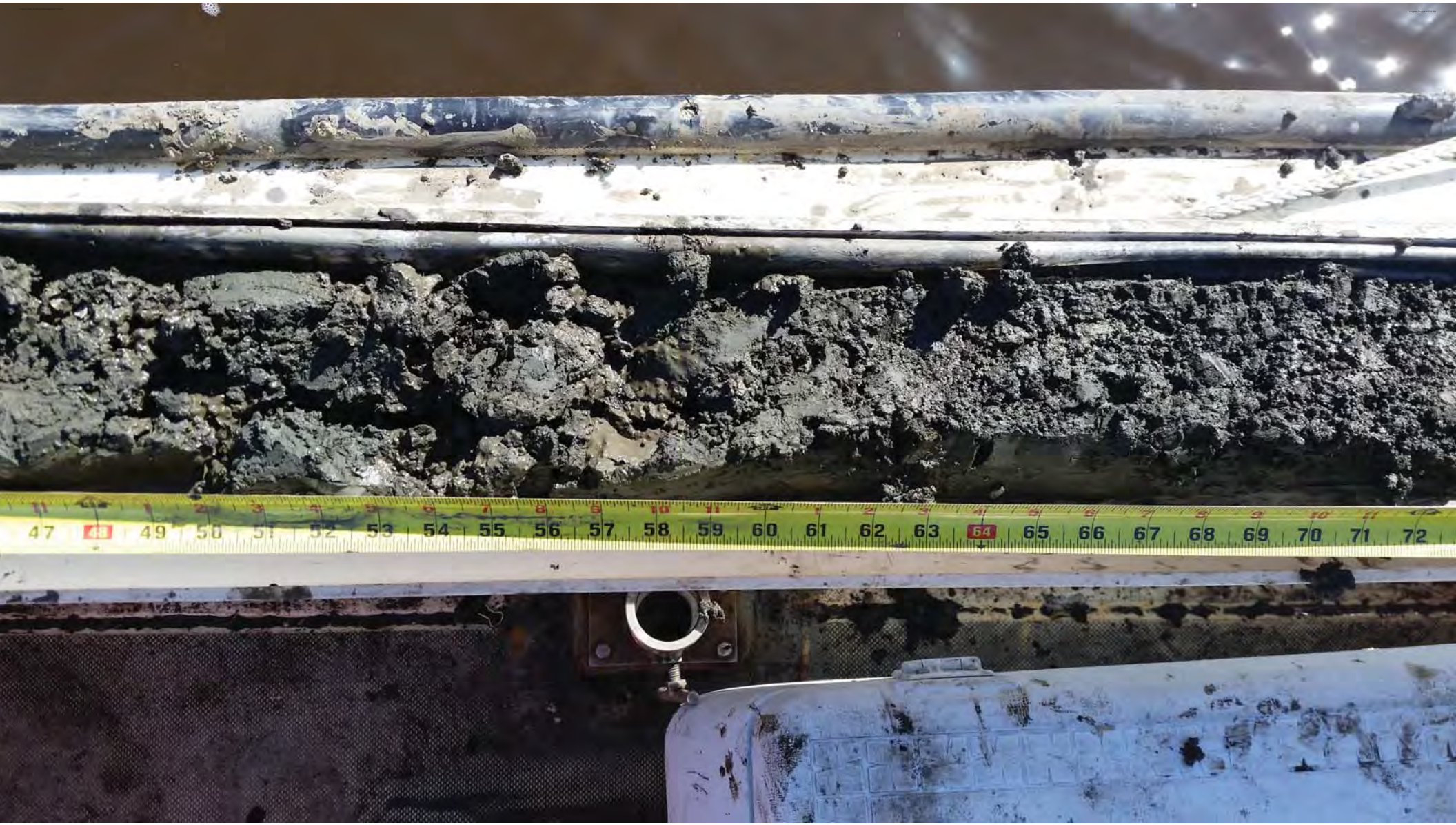
Leighton

Leighton

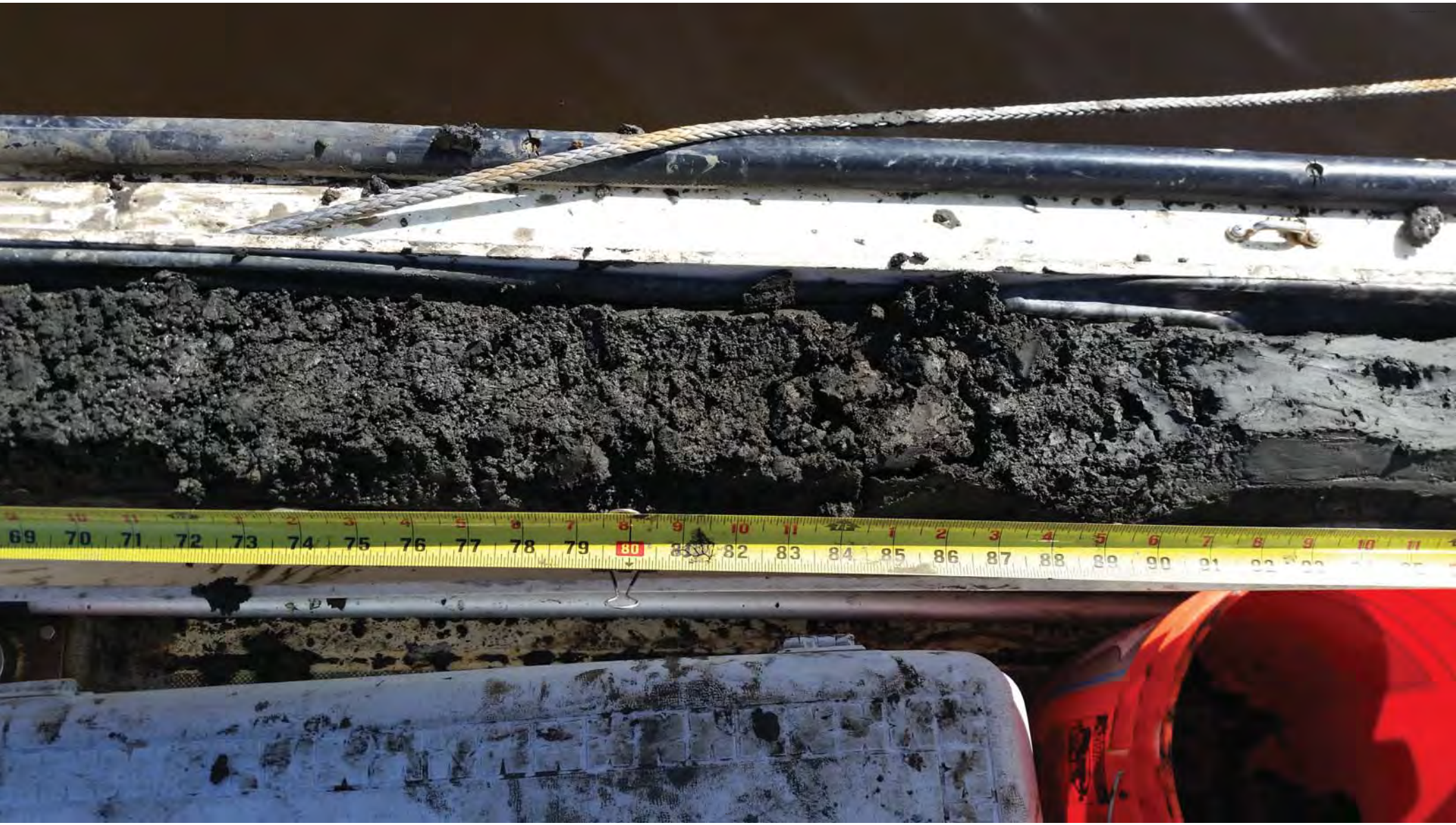

Laguna Lake Dredging
Investigation
PROJECT NO. 11254.001
Leighton Consulting, Inc.
VIBRACORE V-10
DEPTH 0 ft TO 10 ft
DATE: 3/30/16

Leighton

Leighton

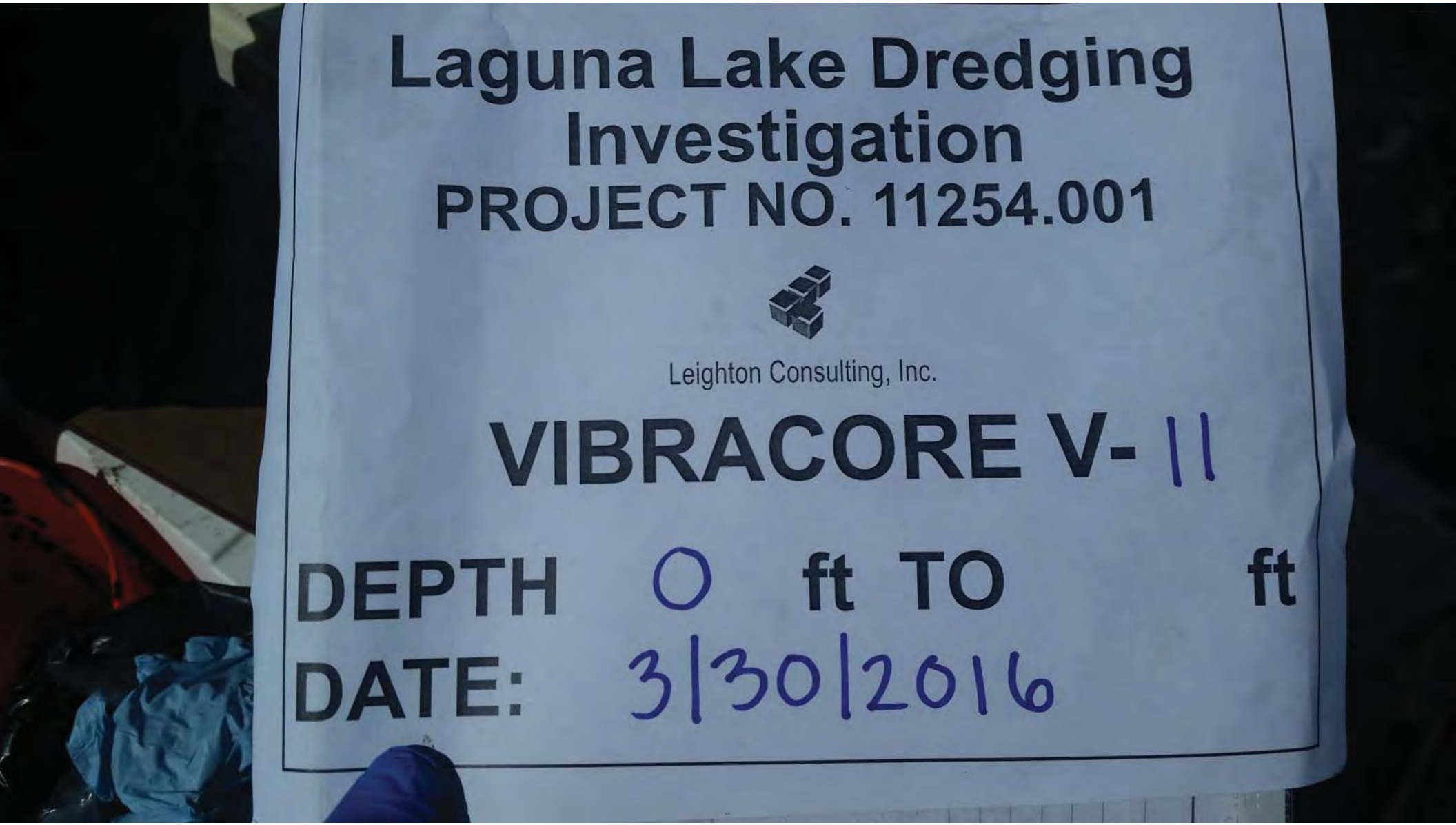

47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72

Leighton



Leighton

Leighton


Laguna Lake Dredging
Investigation
PROJECT NO. 11254.001
Leighton Consulting, Inc.
VIBRACORE V- 11
DEPTH 0 ft TO ft
DATE: 3/30/2016

Leighton

Leighton

Leighton

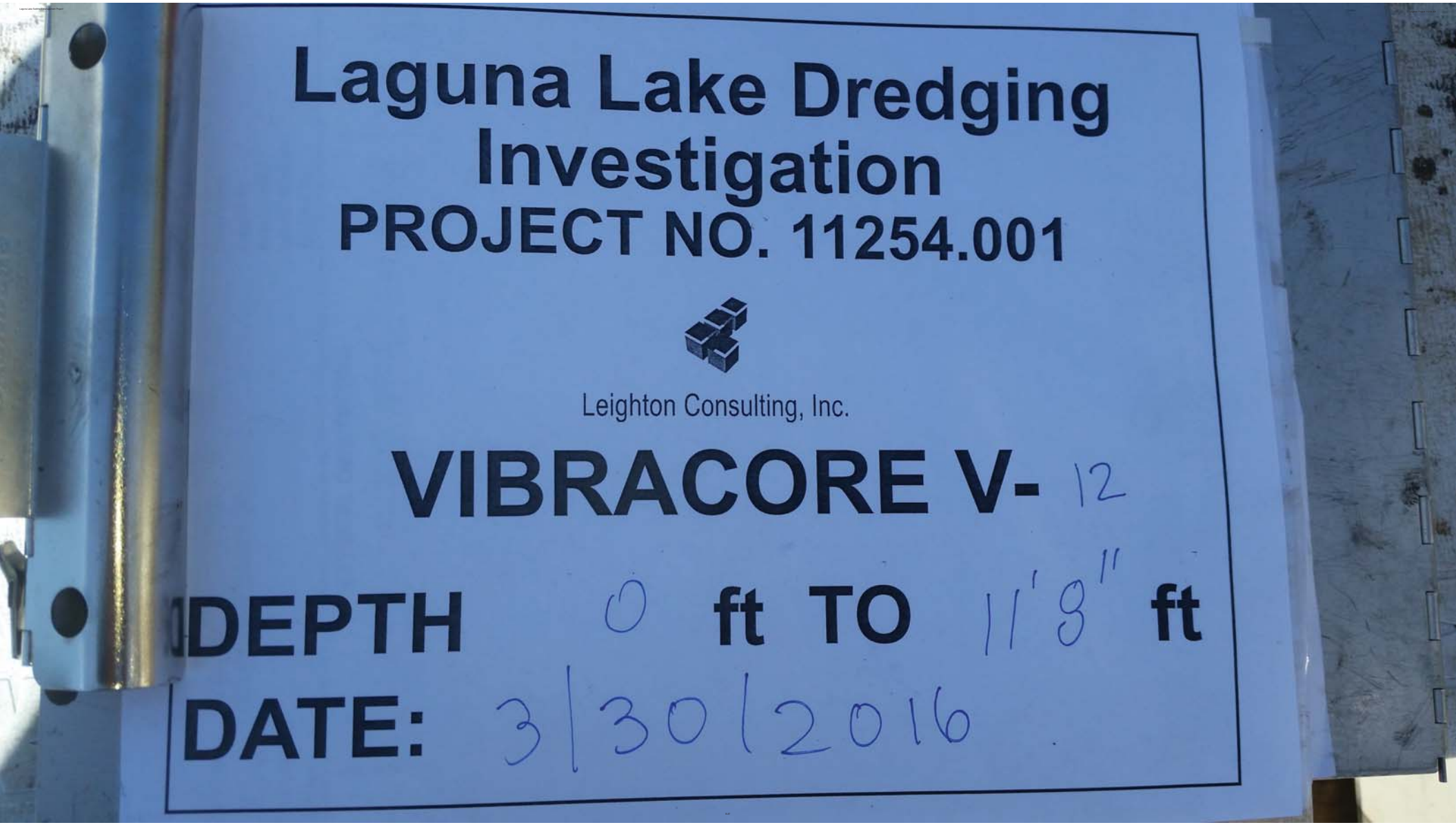
Leighton

Leighton

Leighton

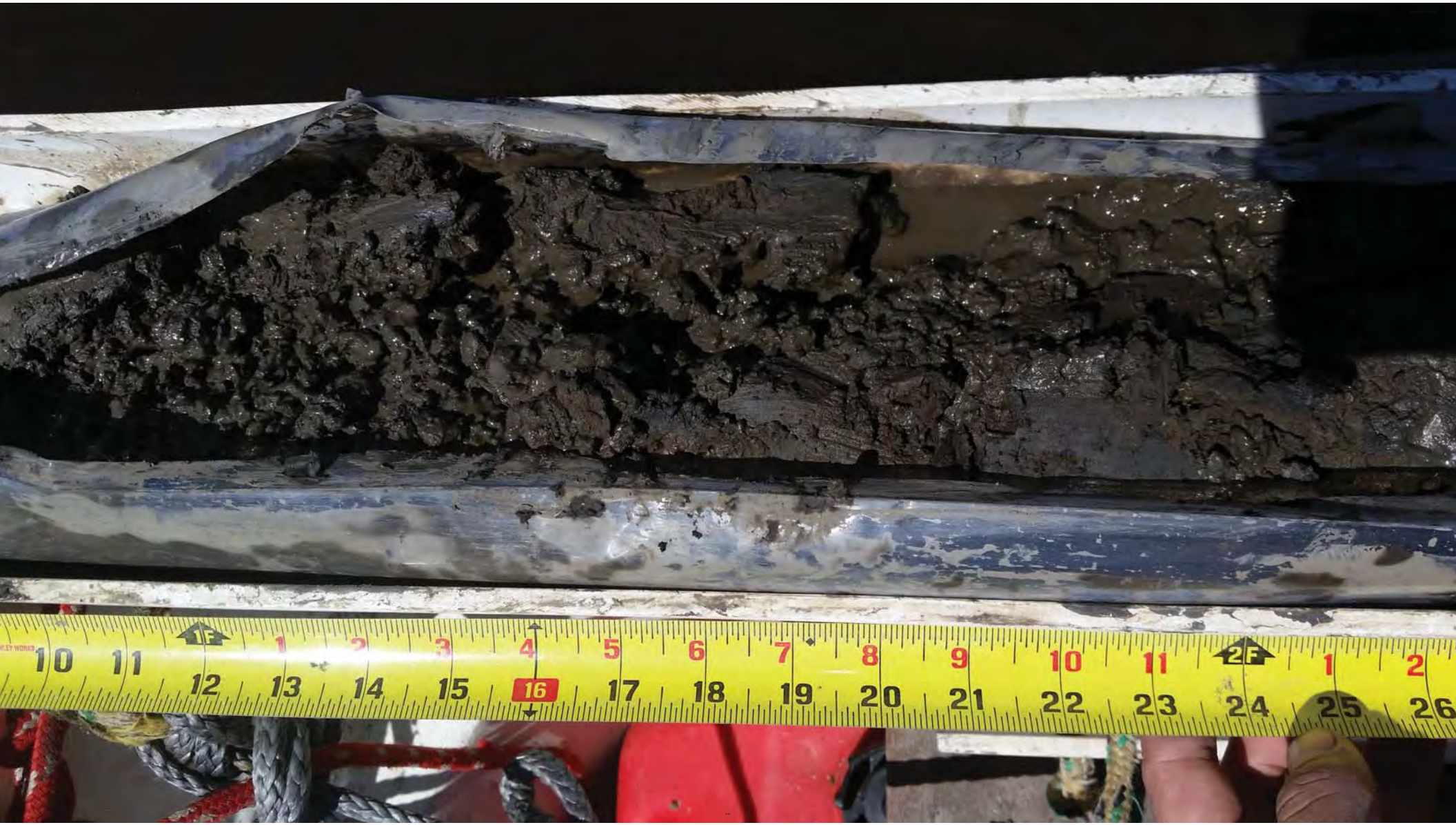
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115

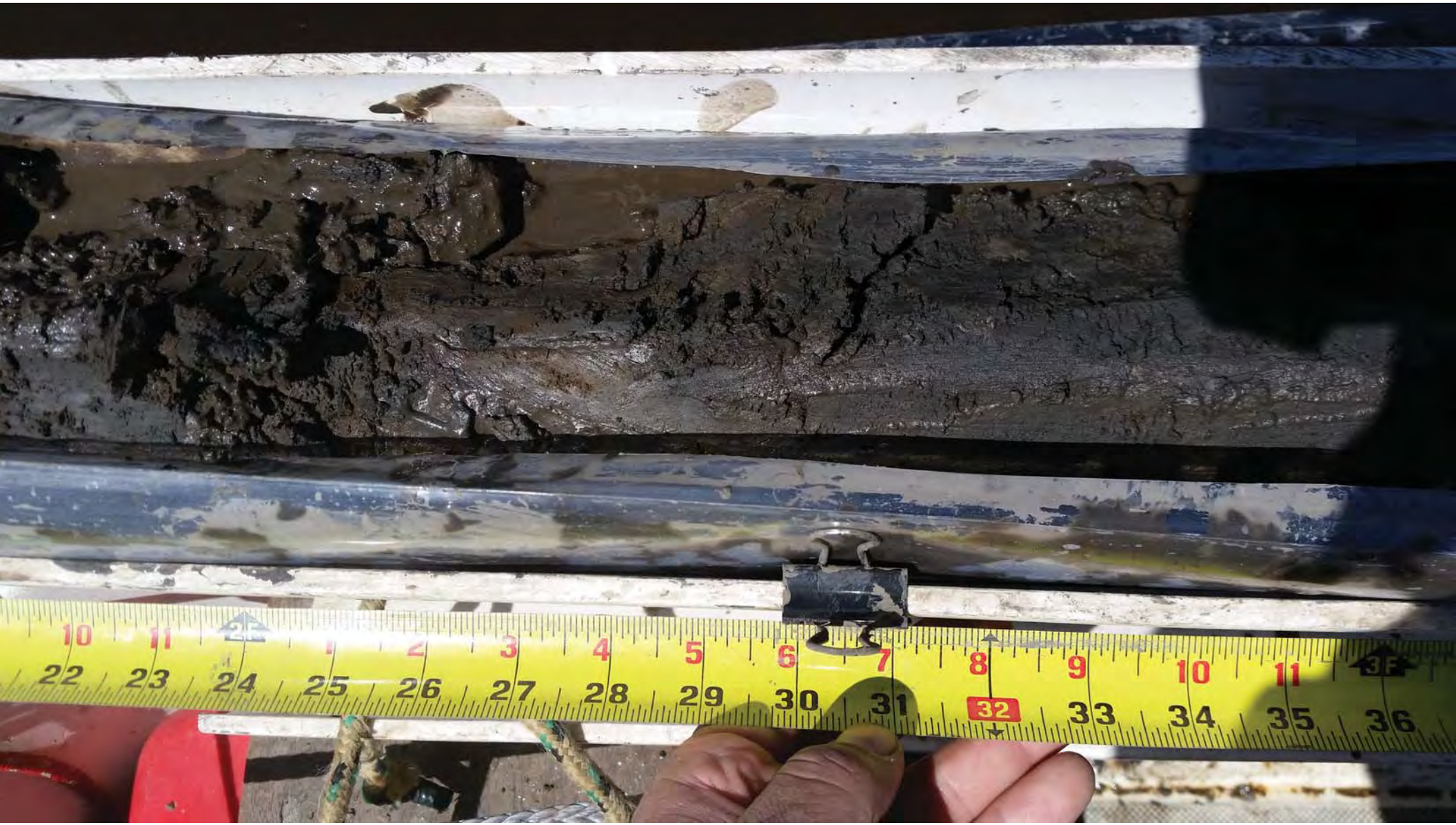
Leighton

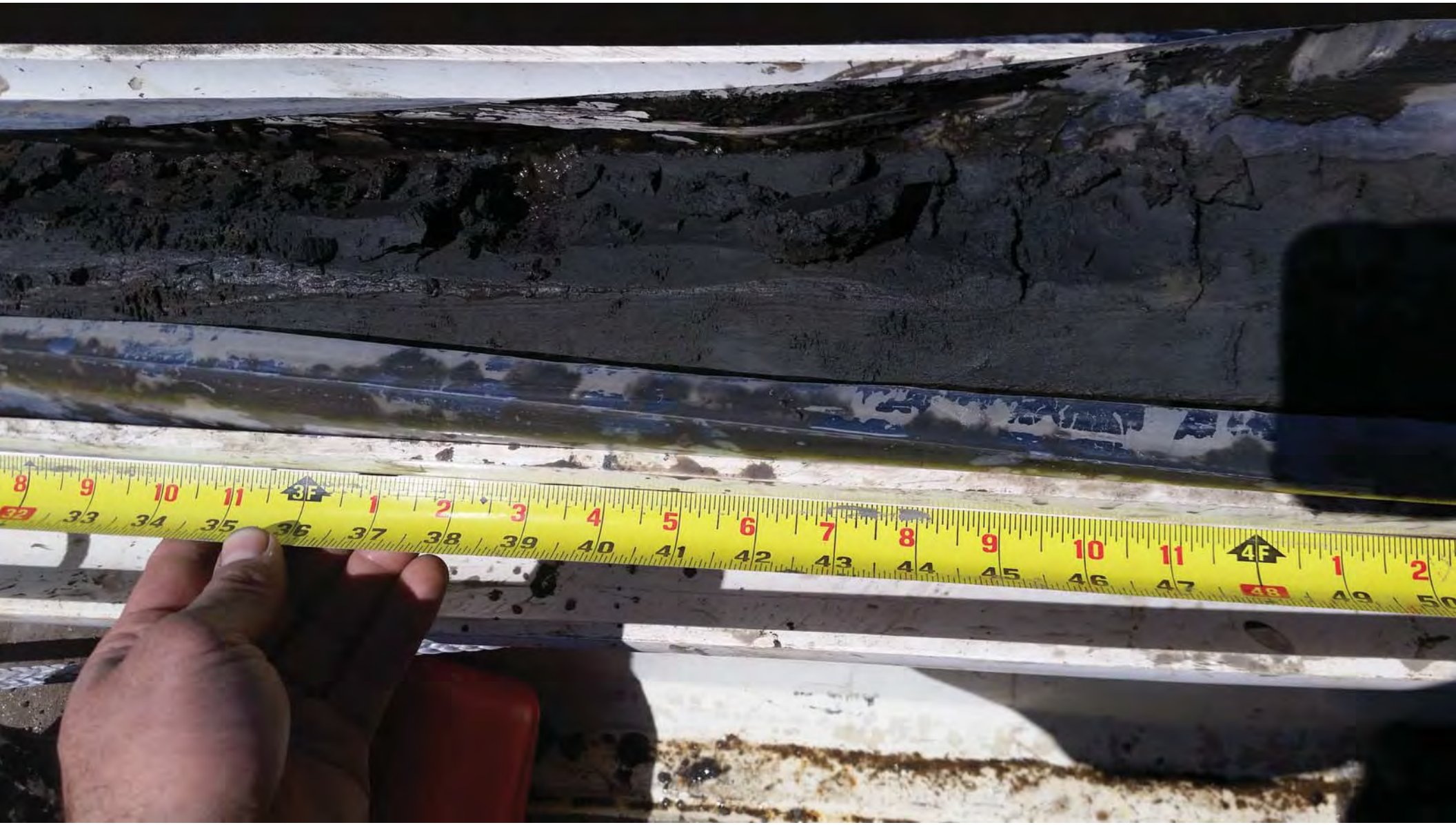

Laguna Lake Dredging
Investigation
PROJECT NO. 11254.001
Leighton Consulting, Inc.
VIBRACORE V- 12
DEPTH 0 ft TO 11'8" ft
DATE: 3/30/2016

Leighton

Leighton







Leighton

Leighton

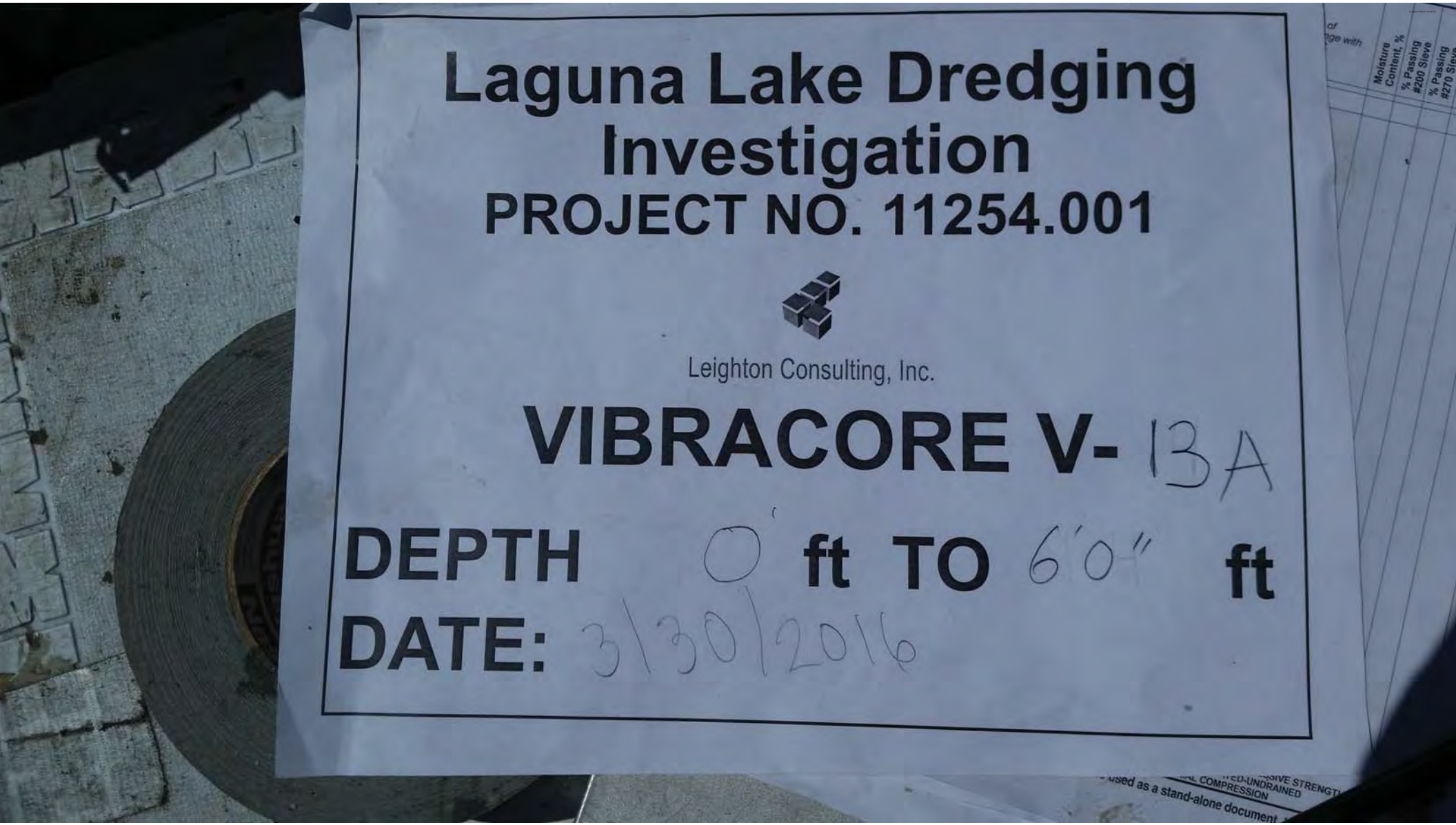
Leighton

Leighton

102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120

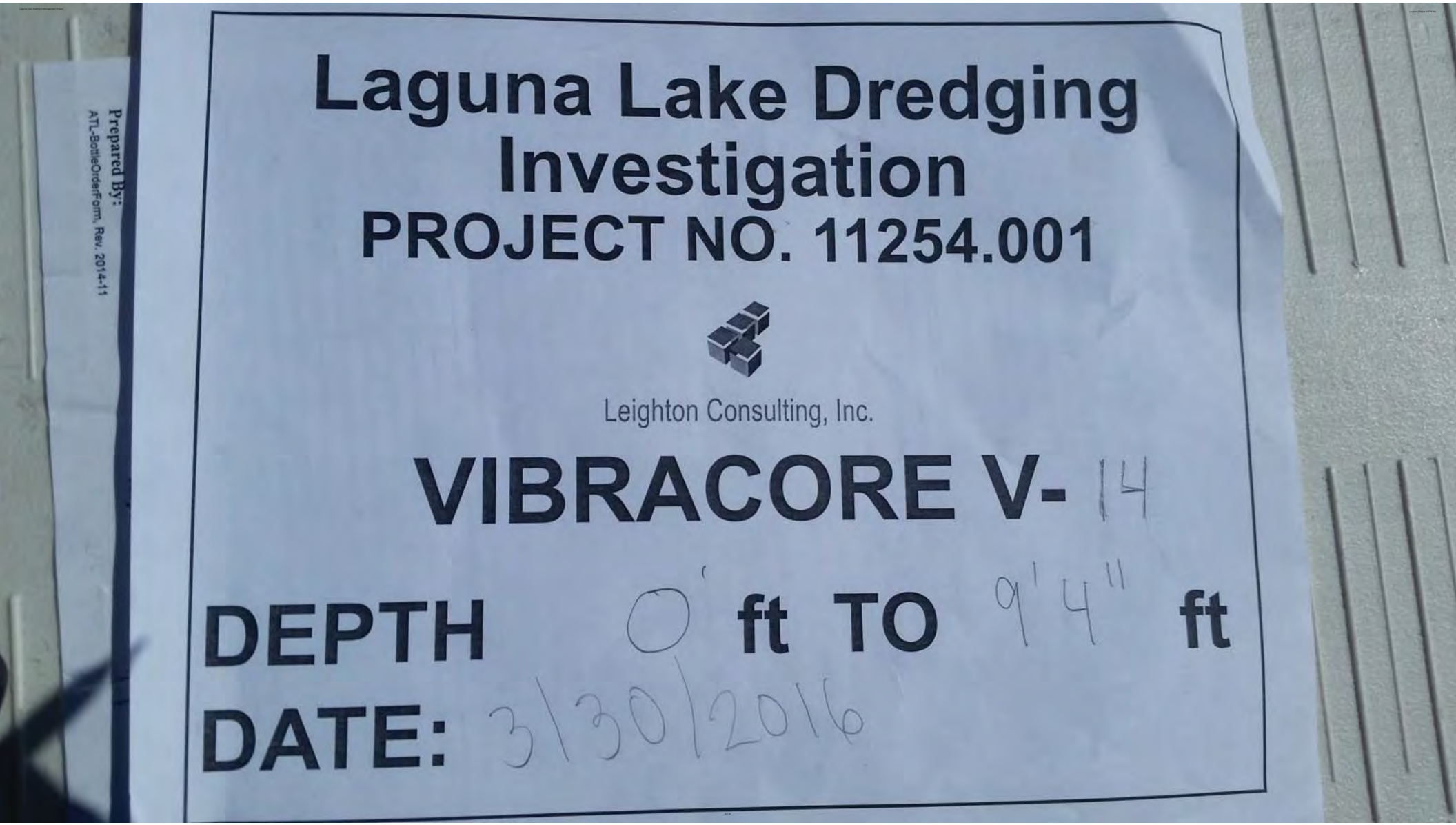
Leighton

Leighton


Laguna Lake Dredging
Investigation
PROJECT NO. 11254.001
Leighton Consulting, Inc.
VIBRACORE V- 13A
DEPTH 0' ft TO 6'0" ft
DATE: 3/30/2016

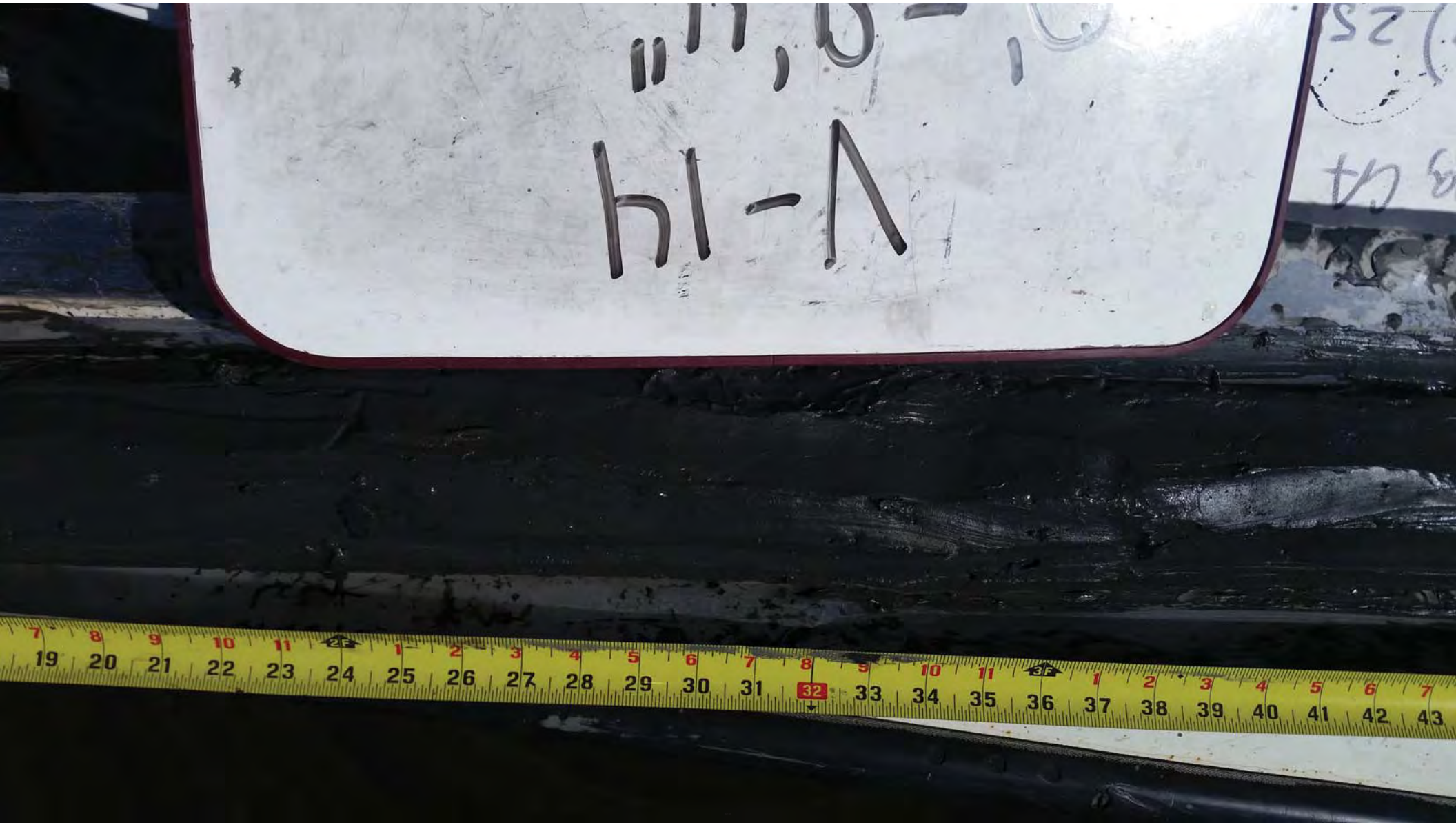
Leighton

Leighton


Prepared By:
ATL-BottleOrderForm, Rev. 2014-11
Laguna Lake Dredging Investigation
PROJECT NO. 11254.001
Leighton Consulting, Inc.
VIBRACORE V- 14
DEPTH 0' ft TO 9'4" ft
DATE: 3/30/2016

Leighton

Leighton



Leighton

1885 N. Kelly Rd.
Napa, CA 94558
(707) 258-4022

V-14
0'-9'4"

APPENDIX C
GEOTECHNICAL LABORATORY TESTING

APPENDIX C

GEOTECHNICAL LABORATORY TESTING

Our geotechnical laboratory testing program was directed toward a quantitative and qualitative evaluation of physical and mechanical properties of sampled soils at this site, and to aid in verifying soil classification. Table C-1 summarizes the number and type of tests performed, table C-2 presents tabulated results and plots of test results follow. The following tests were performed at our in-house geotechnical laboratory.

Moisture and Density Determination Tests (ASTM D2216 and D2937): Moisture content and density determinations were performed, in general accordance with ASTM Test Methods, on select disturbed samples obtained from our exploration. Select samples were tested for moisture and density. Results of these tests are presented on boring logs in Appendix B. Due to the nature of the sampling method (vibracoring), samples may be disturbed, but were judged to be intact enough to provide useful data.

Sieve Analyses and Hydrometer (ASTM D 422 and D6913): Sieve and hydrometer form gravel size down to clay size (0.0013mm) were performed on selected samples in accordance with ASTM D 6913 Standard test method. The results are plotted on particle-size graphs presented in this appendix titled “Particle-Size Distribution.” Sieve analyses results were used for soil classification, to adjust the field log classification and as an index test for correlation to various geotechnical properties.

Atterberg Limits (ASTM D4318): The Atterberg Limits were determined in accordance with ASTM Test Method D4318 for engineering classification of the fine-grained materials.

Direct Shear (ASTM D3080): Direct shear test was performed on two samples taken by inserting rings into the relatively intact sections of the vibracore judged to approximate in-situ conditions. The shear strength of an earth material is obtained by successively shearing separate specimens partially contained within rings, utilizing a direct-shear machine. Varying normal pressures are applied, and the perpendicularly applied stress required to shear the specimen is recorded. The cohesion (c, in lb/ft2) and angle of internal friction (ϕ, in degrees) are then calculated: these constitute the shear strength characteristics of the material. The shearing stress is applied at a constant rate of strain. In order to simulate possibly adverse moisture conditions, the specimens are soaked prior to the test, and are sheared under water. The test results are attached to this Appendix. .

Table C-1 Laboratory Testing Summary

Laboratory Test	Quantity	Testing Standard
Moisture Content	16	ASTM D2216
Moisture and Density	2	ASTM D2216/D2937
Grain Size Distribution (Sieve + Hydrometer)	10	ASTM D6913/D422
Atterberg Limits (evaluated)	6	ASTM D4318
Direct Shear Tests	2	ASTM D3080

Leighton

MOISTURE CONTENT

ASTM D 2216

Project Name: **Laguna Lake**
Project No.: **11254.001**

Tested By: A. Santos
Date: 04/20/16
Checked By: J. Ward
Date: 04/29/16

Boring No.	V-1	V-3	V-4	V-7	V-7
Sample No.	B-1	B-1	B-1	B-2	B-3
Depth (ft)	0-10	0-11.5	0-2	1-1.5	4-13
Sample Type	Bulk	Bulk	SPT	SPT	Bulk
Sample Description	Dark olive gray fat clay (CH)	Dark olive gray fat clay (CH)	Olive lean clay (CL)	Olive silty sand (SM)	Dark olive gray fat clay (CH)
Wt. wet soil + container (g)	590.7	680.0	423.8	882.6	1015.6
Wt. dry soil + container (g)	368.6	414.7	304.7	680.4	640.9
Weight of container (g)	79.3	77.3	39.5	108.7	109.1
Moisture Content (%)	**77**	**79**	**45**	**35**	**70**

Boring No.	V-8	V-9	V-10	V-10	V-10
Sample No.	B-1	B-1	B-1A	B-1B	B-2
Depth (ft)	5-5.6	4-10	0-7.5	0-7.5	7.5-10
Sample Type	SPT	Bulk	SPT	SPT	SPT
Sample Description	Dark olive sandy lean clay s(CL)	Dark olive fat clay with sand (CH)s	Dark olive elastic silt with sand (MH)s	Dark olive elastic silt with sand (MH)s	Dark olive fat clay (CH)
Wt. wet soil + container (g)	1551.4	1039.3	886.5	624.2	378.7
Wt. dry soil + container (g)	1182.4	617.0	589.4	399.6	253.5
Weight of container (g)	273.2	110.9	220.6	39.4	39.0
Moisture Content (%)	**41**	**83**	**81**	**62**	**58**

Leighton

MOISTURE CONTENT

ASTM D 2216

Project Name: **Laguna Lake**
Project No.: **11254.001**

Tested By: A. Santos
Date: 04/20/16
Checked By: J. Ward
Date: 04/29/16

Boring No.	V-11	V-11	V-13	V-13	V-14
Sample No.	B-1	B-2	B-2	B-4	B-2
Depth (ft)	0-7	10-12.5	1.5-3	6-6.5	2-4
Sample Type	SPT	SPT	SPT	SPT	SPT
Sample Description	Dark grayish olive fat clay (CH)	Dark olive fat clay (CH)	Dark grayish olive lean clay (CL)	Grayish olive lean clay (CL)	Olive fat clay (CH)
Wt. wet soil + container (g)	730.1	814.5	367.0	338.0	1043.6
Wt. dry soil + container (g)	543.6	591.0	302.4	260.2	627.5
Weight of container (g)	251.2	250.0	39.3	39.3	252.3
Moisture Content (%)	**64**	**66**	**25**	**35**	**111**

Boring No.	V-14				
Sample No.	B-3				
Depth (ft)	6-9				
Sample Type	SPT				
Sample Description	Brown fat clay (CH)				
Wt. wet soil + container (g)	425.9				
Wt. dry soil + container (g)	323.5				
Weight of container (g)	39.5				
Moisture Content (%)	**36**				

Boring No.	V-7	V-13						
Sample No.	R-1	R-1						
Depth (ft.)	11.0	5.5						
Sample Type	Ring	Ring						
Soil Identification	Dark olive gray elastic silt (MH)	Olive fat clay with sand (CH)s, shells noted						
Pocket Penetrometer (tons/ft^2)	<0.25/0.25	1.50						
Weight Soil + Rings / Tube (g)	750.32	716.80						
Weight of Rings / Tube (g)	222.0	177.6						
Average Length (in.)	5.0	4.0						
Average Diameter (in.)	2.415	2.415						
Wet. Wt. of Soil + Cont. (g)	239.17	303.81						
Dry Wt. of Soil + Cont. (g)	149.12	273.31						
Weight of Container (g)	59.21	154.46						
Container No.								
Wet Density	88	112						
Moisture Content (%)	**100**	**26**						
Dry Density (pcf)	**44**	**89**						
Degree of Saturation (%)	95	78						

Leighton

MOISTURE & DENSITY of SOILS

ASTM D 2216 & ASTM D 2937

Project Name: Laguna Lake
Project No.: 11254.001
Client Name: MNS Engineers, Inc.
Tested By: G. Bathala Date: 04/22/16

Leighton

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Laguna Lake	Tested By:	A. Santos	Date:	04/27/16
Project No. :	11254.001	Input By:	J. Ward	Date:	04/28/16
Boring No.:	V-7	Checked By:	J. Ward		
Sample No.:	R-1	Depth (ft.)	11.0		
Soil Identification:	Dark olive gray elastic silt (MH)				

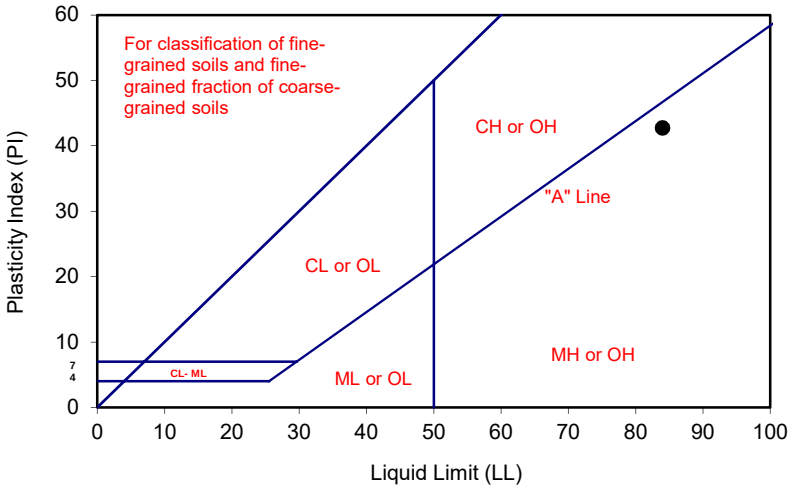
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			31	25	17	
Wet Wt. of Soil + Cont. (g)	10.50	9.74	22.10	20.90	21.81	
Dry Wt. of Soil + Cont. (g)	7.73	7.21	12.61	11.83	12.13	
Wt. of Container (g)	1.04	1.06	1.04	1.06	1.08	
Moisture Content (%) [Wn]	41.41	41.14	82.02	84.22	87.60	

Liquid Limit	**84**
Plastic Limit	**41**
Plasticity Index	**43**
Classification	**MH**

PI at "A" - Line = 0.73(LL-20) 46.72

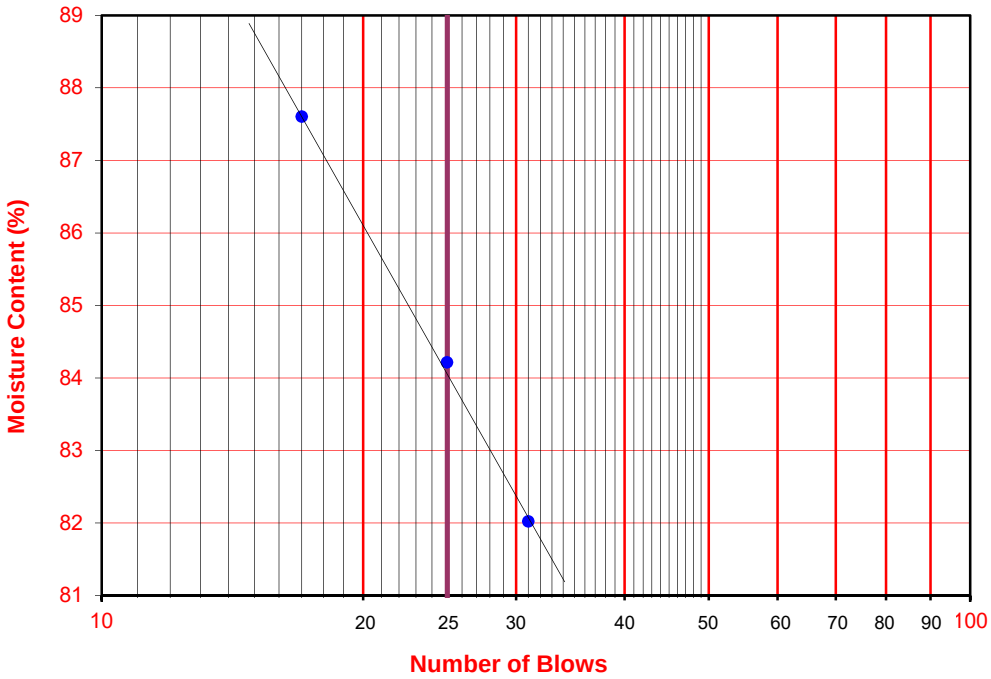
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



Leighton

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Laguna Lake	Tested By:	A. Santos	Date:	04/28/16
Project No. :	11254.001	Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-8	Checked By:	J. Ward		
Sample No.:	B-1	Depth (ft.)	5.5-6		
Soil Identification:	Dark olive sandy lean clay s(CL)				

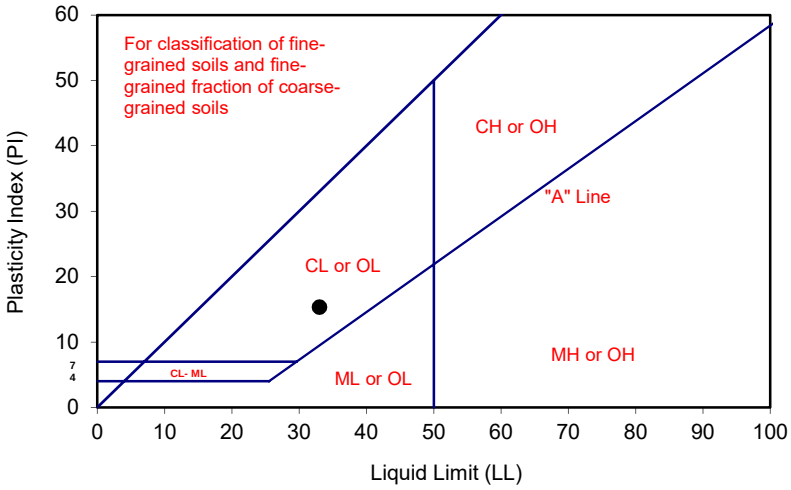
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			31	26	19	
Wet Wt. of Soil + Cont. (g)	9.53	9.31	25.43	22.51	24.62	
Dry Wt. of Soil + Cont. (g)	8.26	8.07	19.47	17.18	18.65	
Wt. of Container (g)	1.11	1.03	1.06	1.02	1.07	
Moisture Content (%) [Wn]	17.76	17.61	32.37	32.98	33.96	

Liquid Limit	**33**
Plastic Limit	**18**
Plasticity Index	**15**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 9.49

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



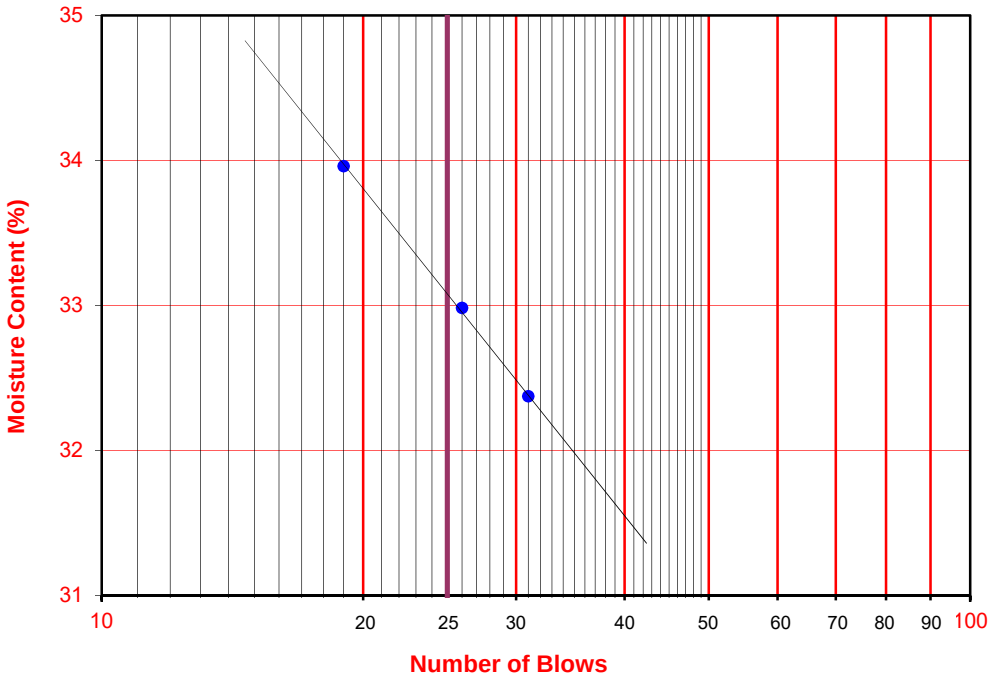
PROCEDURES USED

[ ] Wet Preparation
Multipoint - Wet

[X] Dry Preparation
Multipoint - Dry

[X] Procedure A
Multipoint Test

[ ] Procedure B
One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	Laguna Lake	Tested By:	A. Santos	Date:	04/25/16
Project No. :	11254.001	Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-10	Checked By:	J. Ward		
Sample No.:	B-1B	Depth (ft.)	0-7.5		
Soil Identification:	Dark olive elastic silt with sand (MH)s				

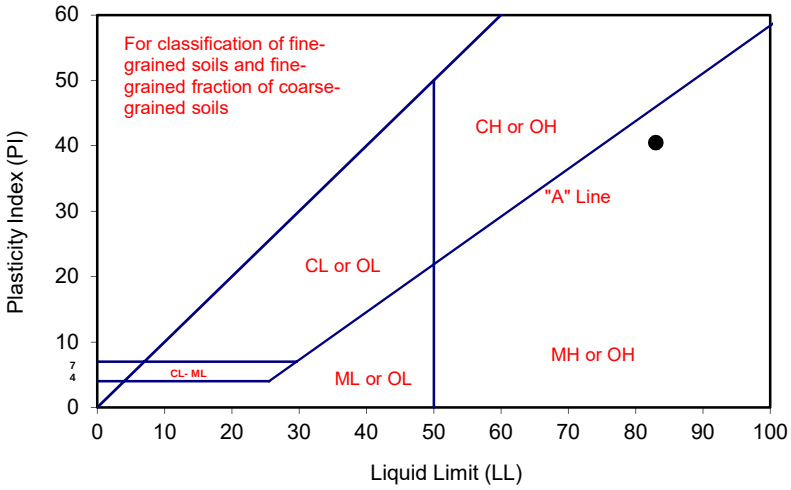
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			30	24	16	
Wet Wt. of Soil + Cont. (g)	9.25	9.76	22.44	23.60	21.03	
Dry Wt. of Soil + Cont. (g)	6.80	7.17	12.93	13.33	11.64	
Wt. of Container (g)	1.06	1.05	1.10	1.05	1.04	
Moisture Content (%) [Wn]	42.68	42.32	80.39	83.63	88.58	

Liquid Limit	**83**
Plastic Limit	**43**
Plasticity Index	**40**
Classification	**MH**

PI at "A" - Line = 0.73(LL-20) 45.99

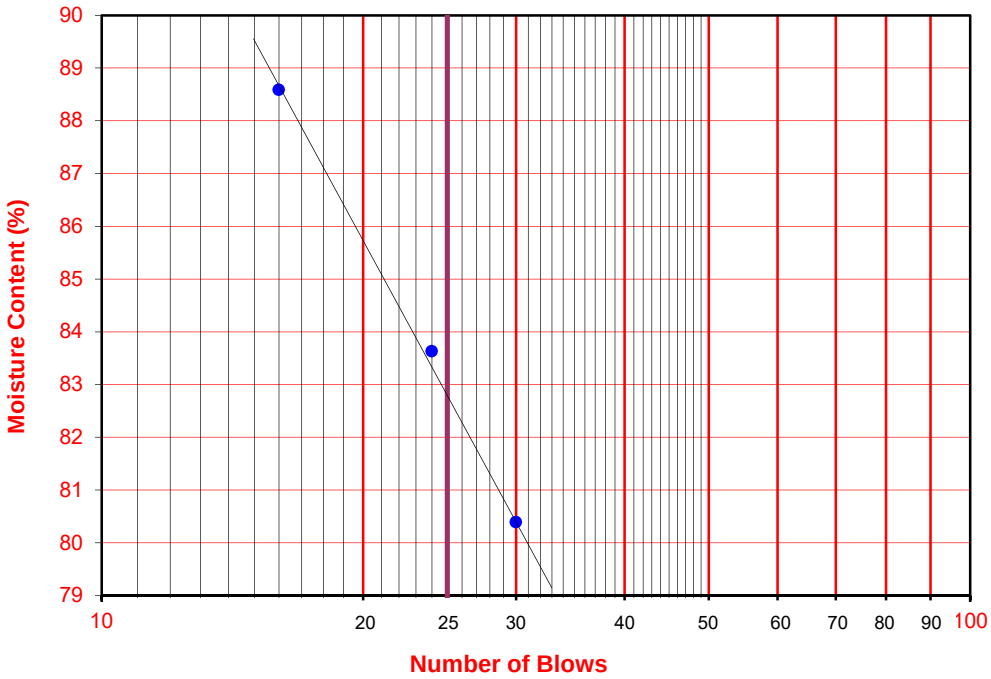
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	Laguna Lake	Tested By:	A. Santos	Date:	04/26/16
Project No. :	11254.001	Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-12	Checked By:	J. Ward		
Sample No.:	B-1	Depth (ft.)	0-11		
Soil Identification:	Dark olive fat clay (CH)				

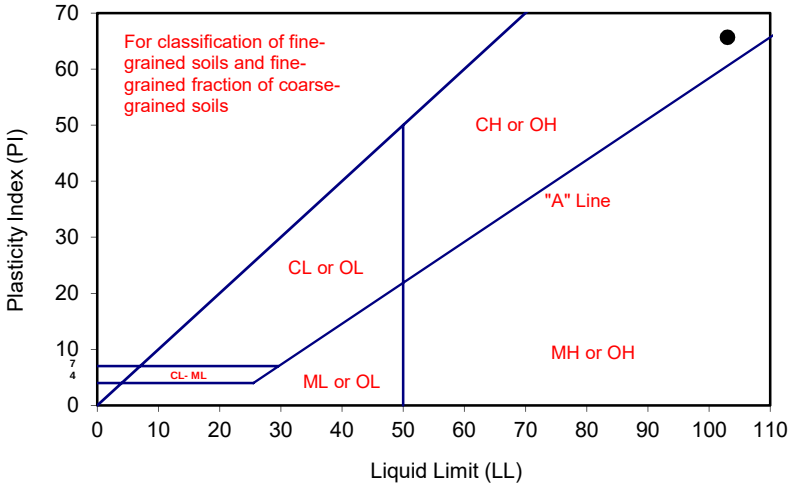
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			28	24	19	
Wet Wt. of Soil + Cont. (g)	7.94	8.32	20.35	22.23	24.45	
Dry Wt. of Soil + Cont. (g)	6.05	6.33	10.59	11.45	12.45	
Wt. of Container (g)	1.01	0.98	1.00	1.01	1.03	
Moisture Content (%) [Wn]	37.50	37.20	101.77	103.26	105.08	

Liquid Limit	**103**
Plastic Limit	**37**
Plasticity Index	**66**
Classification	**CH**

PI at "A" - Line = 0.73(LL-20) 60.59

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



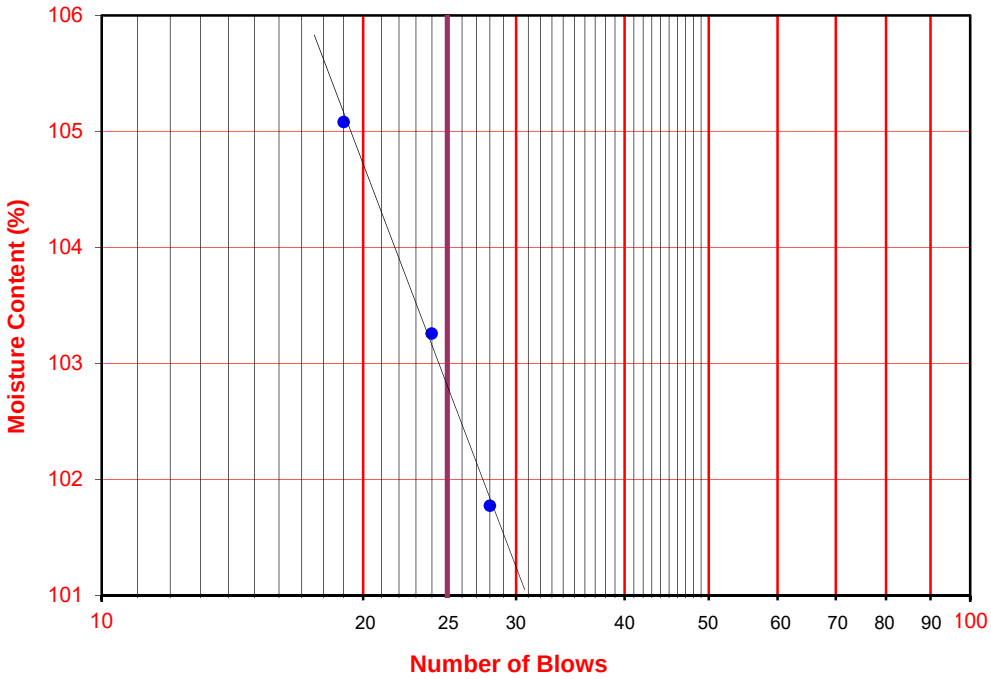
PROCEDURES USED

[ ] Wet Preparation
Multipoint - Wet

[X] Dry Preparation
Multipoint - Dry

[X] Procedure A
Multipoint Test

[ ] Procedure B
One-point Test



Leighton

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Laguna Lake	Tested By:	A. Santos	Date:	04/27/16
Project No. :	11254.001	Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-13	Checked By:	J. Ward		
Sample No.:	R-1	Depth (ft.)	5.5		
Soil Identification:	Olive fat clay with sand (CH)s, shells noted				

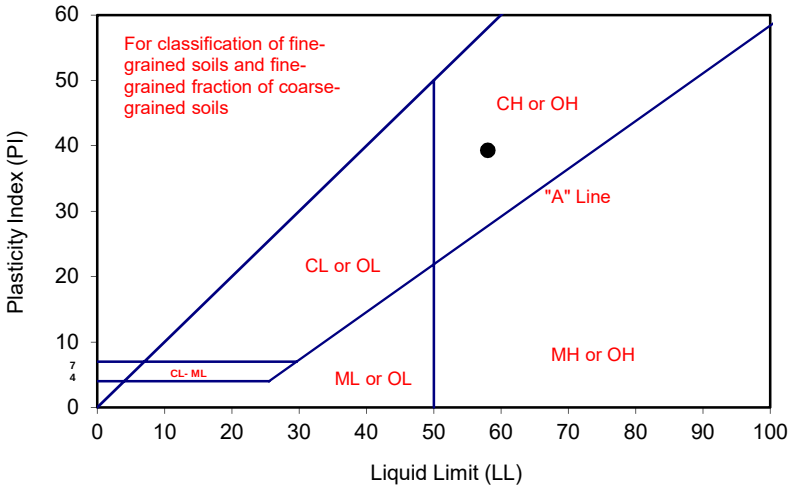
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			30	24	18	
Wet Wt. of Soil + Cont. (g)	9.11	9.17	21.51	21.35	22.60	
Dry Wt. of Soil + Cont. (g)	7.85	7.88	14.11	13.90	14.60	
Wt. of Container (g)	1.07	1.02	1.05	1.02	1.02	
Moisture Content (%) [Wn]	18.58	18.80	56.66	57.84	58.91	

Liquid Limit	**58**
Plastic Limit	**19**
Plasticity Index	**39**
Classification	**CH**

PI at "A" - Line = 0.73(LL-20) 27.74

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



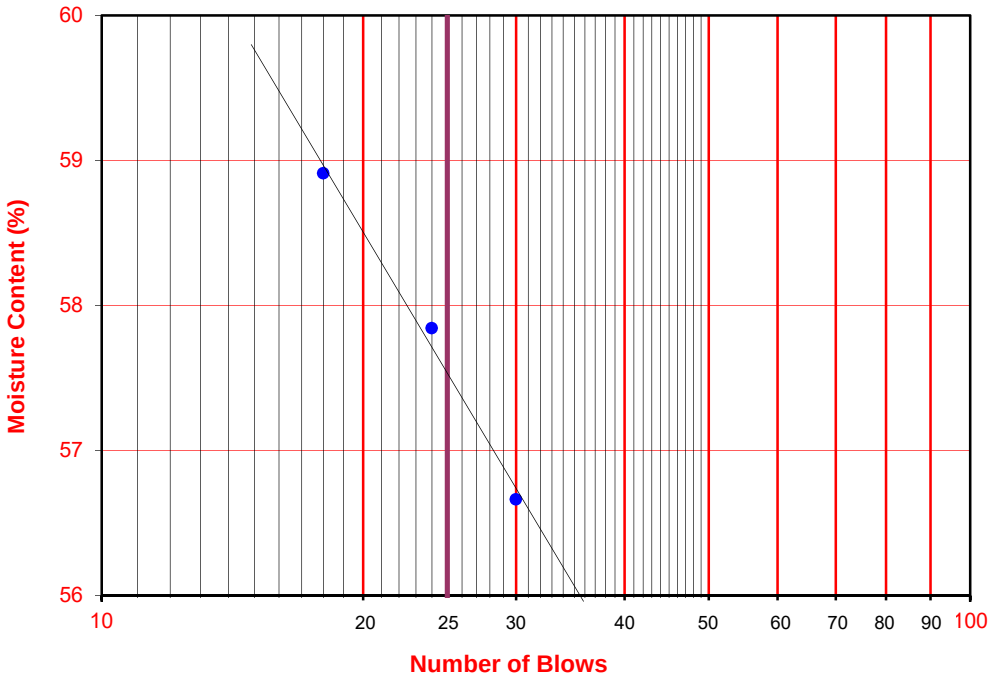
PROCEDURES USED

[ ] Wet Preparation
Multipoint - Wet

[X] Dry Preparation
Multipoint - Dry

[X] Procedure A
Multipoint Test

[ ] Procedure B
One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	Laguna Lake	Tested By:	A. Santos	Date:	04/26/16
Project No. :	11254.001	Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-14	Checked By:	J. Ward		
Sample No.:	B-3	Depth (ft.)	6-9		
Soil Identification:	Brown fat clay (CH)				

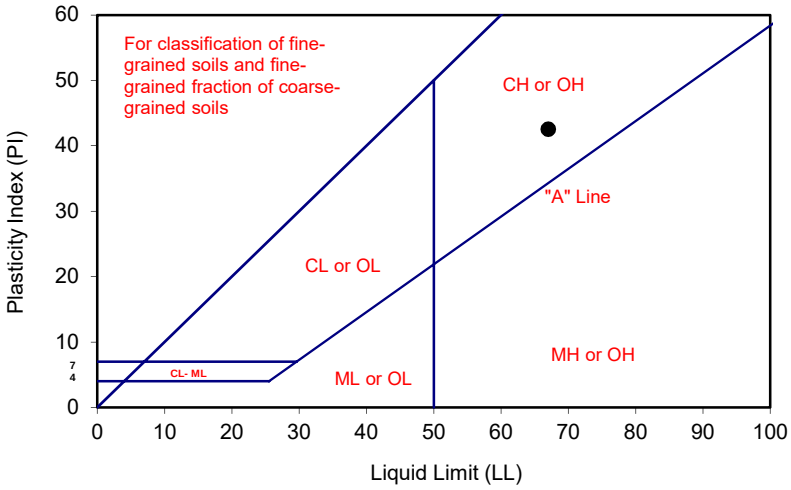
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			32	26	21	
Wet Wt. of Soil + Cont. (g)	9.79	9.19	24.22	21.08	22.65	
Dry Wt. of Soil + Cont. (g)	8.08	7.59	15.06	13.08	13.92	
Wt. of Container (g)	1.07	1.06	1.07	1.05	1.02	
Moisture Content (%) [Wn]	24.39	24.50	65.48	66.50	67.67	

Liquid Limit	**67**
Plastic Limit	**24**
Plasticity Index	**43**
Classification	**CH**

PI at "A" - Line = 0.73(LL-20) 34.31

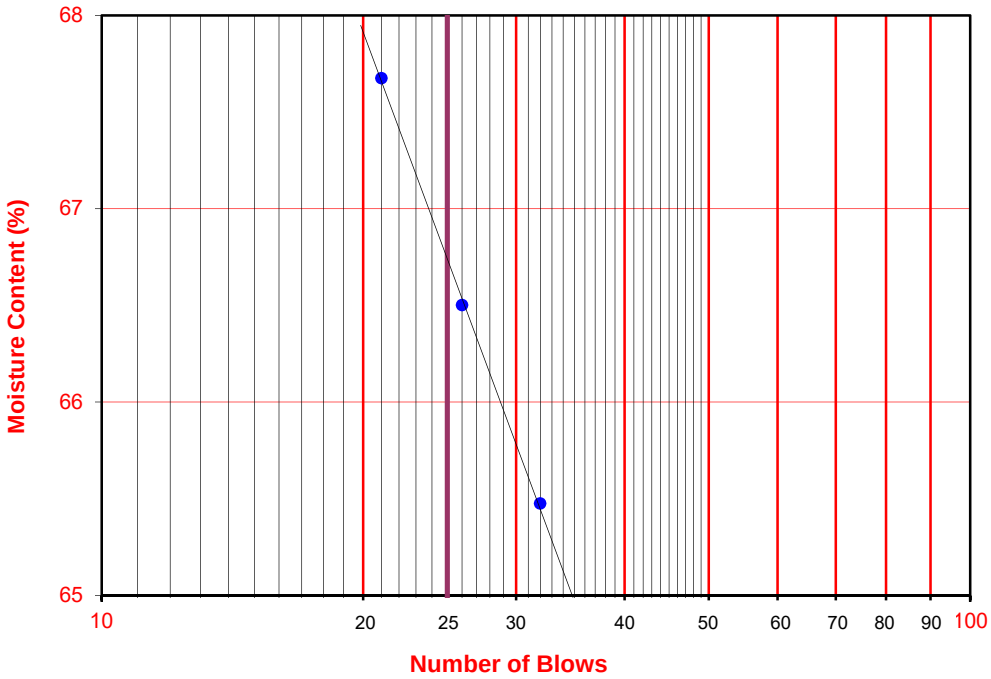
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



Leighton

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS

ASTM D 6913

Project Name:	Laguna Lake	Tested By:	A. Santos	Date:	04/21/16
Project No.:	11254.001	Checked By:	J. Ward	Date:	04/28/16
Boring No.:	V-7	Depth (feet):	1-1.5		
Sample No.:	B-2				
Soil Identification:	Olive silty sand (SM)				

Note: Some wood particles noted on sieve #4

		Moisture Content of Total Air - Dry Soil	
Container No.:	9554	Wt. of Air-Dry Soil + Cont. (g)	0.00
Wt. of Air-Dried Soil + Cont.(g)	680.4	Wt. of Dry Soil + Cont. (g)	0.00
Wt. of Container (g)	108.7	Wt. of Container No._____ (g)	1.00
Dry Wt. of Soil (g)	571.7	Moisture Content (%)	0.00

After Wet Sieve	Container No.	9554
	Wt. of Dry Soil + Container (g)	473.3
	Wt. of Container (g)	108.7
	Dry Wt. of Soil Retained on # 200 Sieve (g)	364.6

U. S. Sieve Size (in.)	U. S. Sieve Size (mm.)	Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
6"	152.400		
3"	75.000		
1 1/2	37.500		
3/4"	19.000		
3/8"	9.500	0.0	100.0
#4	4.750	4.3	99.2
#8	2.360	6.8	98.8
#16	1.180	11.7	98.0
#30	0.600	22.2	96.1
#50	0.300	56.6	90.1
#100	0.150	207.5	63.7
#200	0.075	363.1	36.5
PAN			

GRAVEL: **1 %**

SAND: **62 %**

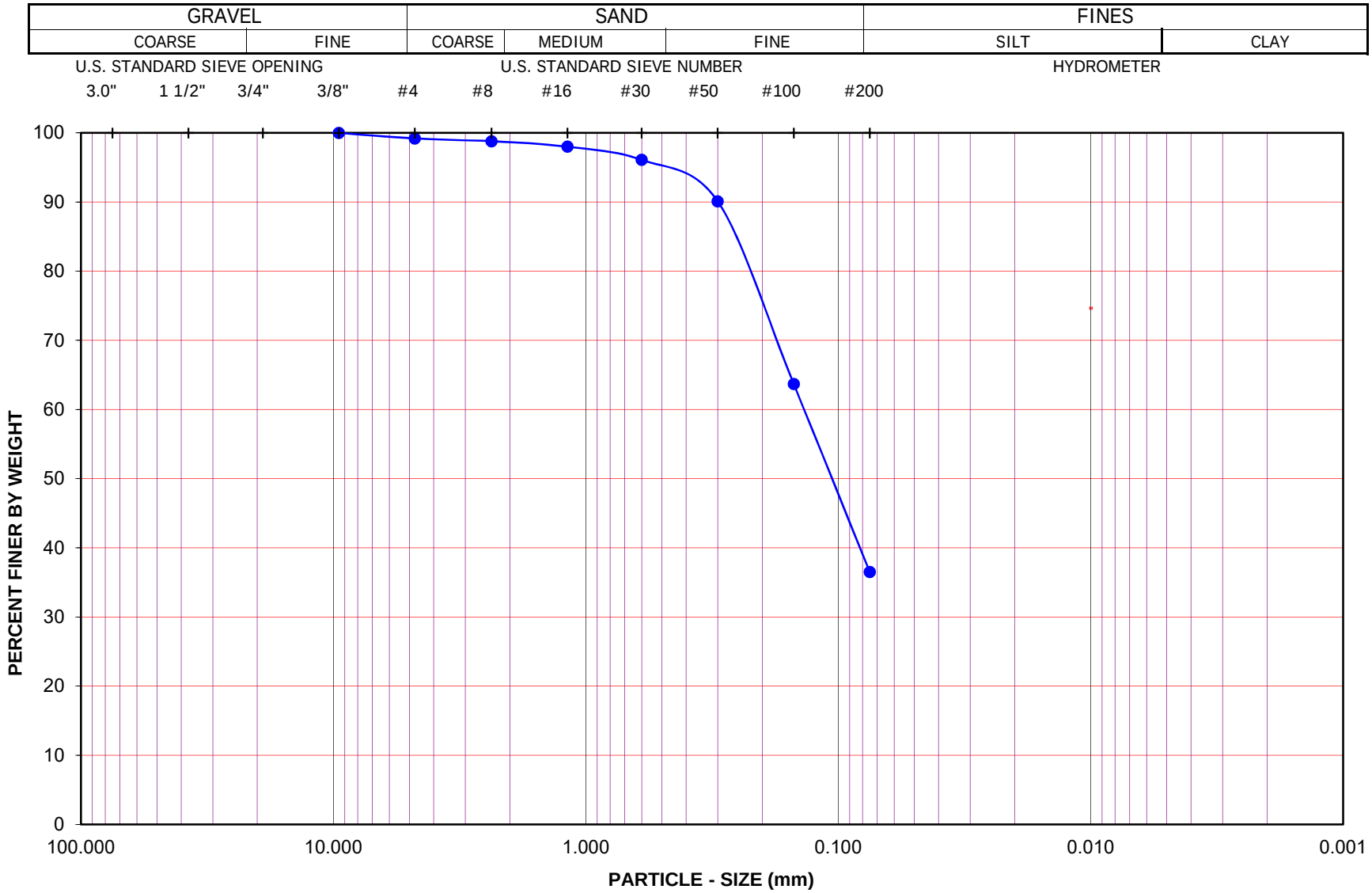
FINES: **37 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = _____

Cc = $(D30)^2/(D60*D10)$ = _____

Remarks: _____



Project Name: Laguna Lake

Project No.: 11254.001

Boring No.: V-7 Sample No.: B-2

Depth (feet): 1-1.5 Soil Type : SM

Soil Identification: Olive silty sand (SM)

GR:SA:FI : (%) 1 : 62 : 37

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

04/28/16

SA V-7, B-2 @ 1-1.5

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Leighton

Project Name:	Laguna Lake	Tested By:	GEB/ACS	Date:	04/25/16
Project No.:	11254.001	Data Input By:	J. Ward	Date:	04/28/16
Boring No.:	V-7				
Sample No.:	B-3	Depth (feet):	4-13		
Soil Identification:	Dark olive gray fat clay (CH)				

		Soil Type
% Gravel	0	CH
% Sand	11	
% Fines	89	

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	99.87	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	98.33	83.59
Wt.of Air-Dry Soil + Cont. (g)	640.90	Wt. of Container No.___ (g)	1.00	57.40	78.08
Wt. of Container	109.10	Moisture Content (%)	0.00	3.76	
Dry Wt. of Soil (g)	531.80	Wt. of Dry Soil (g)			5.51

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.00	100.0
No. 10	0.04	100.0
Pan		

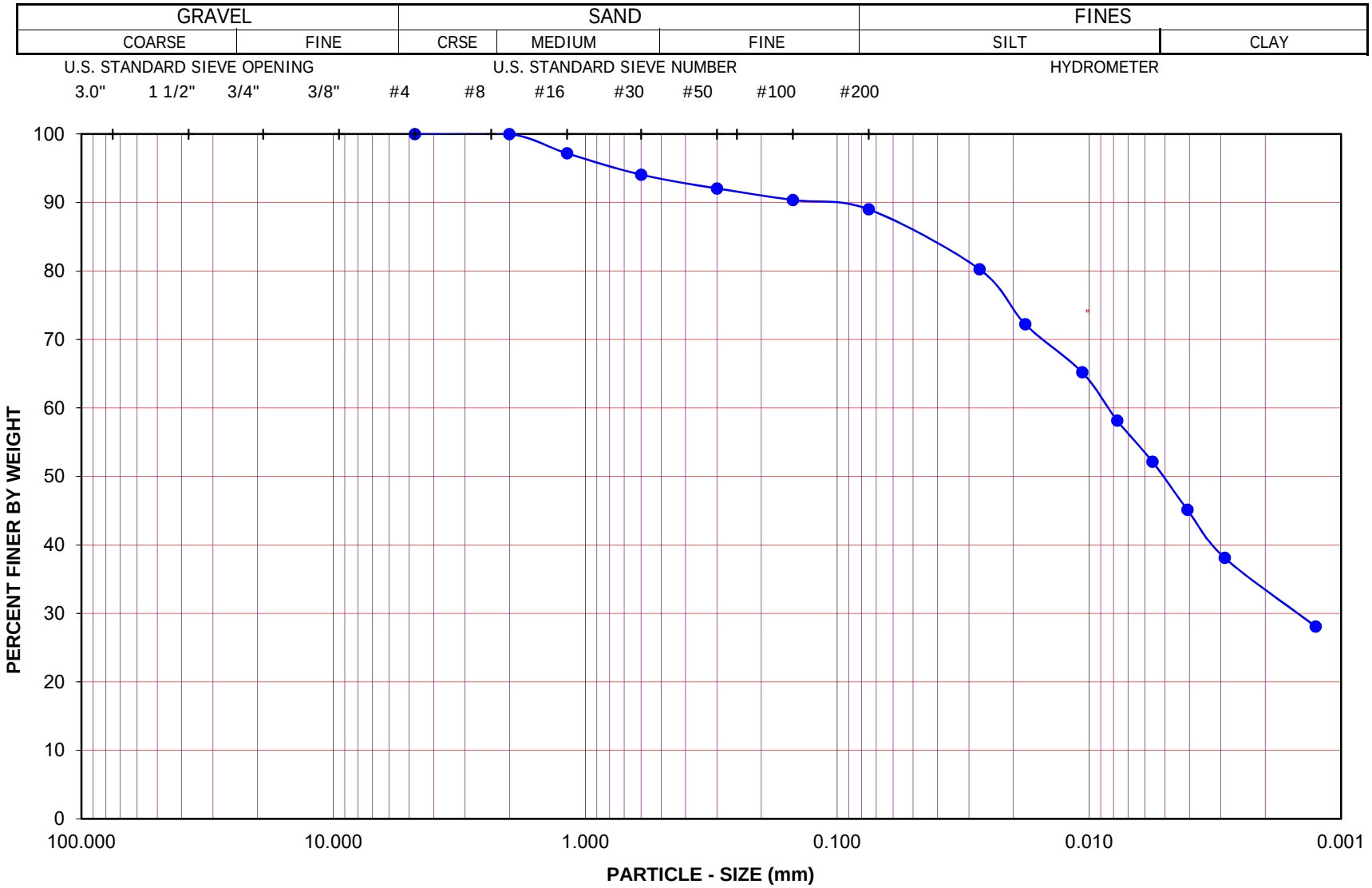
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	100.0
No. 16	1.39	97.2	97.2
No. 30	2.93	94.1	94.1
No. 50	3.92	92.1	92.1
No. 100	4.75	90.4	90.4
No. 200	5.43	89.0	89.0
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 51.30 Wt. of Dry Soil (g) 49.44

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
26-Apr-16	9:26	0		8.0			
	9:28	2	21.1	8.0	48.0	80.3	0.0272
	9:31	5	21.1	8.0	44.0	72.2	0.0179
	9:41	15	21.1	8.0	40.5	65.2	0.0107
	9:56	30	21.2	8.0	37.0	58.2	0.0077
	10:26	60	21.3	8.0	34.0	52.2	0.0056
	11:26	120	21.4	8.0	30.5	45.1	0.0041
	13:36	250	21.4	8.0	27.0	38.1	0.0029
27-Apr-16	9:26	1440	20.6	8.0	22.0	28.1	0.0013



Project Name: Laguna Lake

Project No.: 11254.001

Boring No.: V-7 Sample No.: B-3

Depth (feet): 4-13 Soil Type : CH

Soil Identification: Dark olive gray fat clay (CH)

GR:SA:FI : (%) 0 : 11 : 89

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

04/28/16

SA & Hyd V-7, B-3 @ 4-13

Leighton

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Project Name:	Laguna Lake	Tested By:	GEB/ACS	Date:	04/25/16
Project No.:	11254.001	Data Input By:	J. Ward	Date:	04/28/16
Boring No.:	V-7				
Sample No.:	R-1	Depth (feet):	11.0		
Soil Identification:	Dark olive gray elastic silt (MH)				

		Soil Type
% Gravel	0	MH
% Sand	9	
% Fines	91	

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	97.69	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	96.17	82.45
Wt.of Air-Dry Soil + Cont. (g)	430.00	Wt. of Container No.___ (g)	1.00	59.21	78.00
Wt. of Container	133.00	Moisture Content (%)	0.00	4.11	
Dry Wt. of Soil (g)	297.00	Wt. of Dry Soil (g)			4.45

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.00	100.0
No. 10	0.09	100.0
Pan		

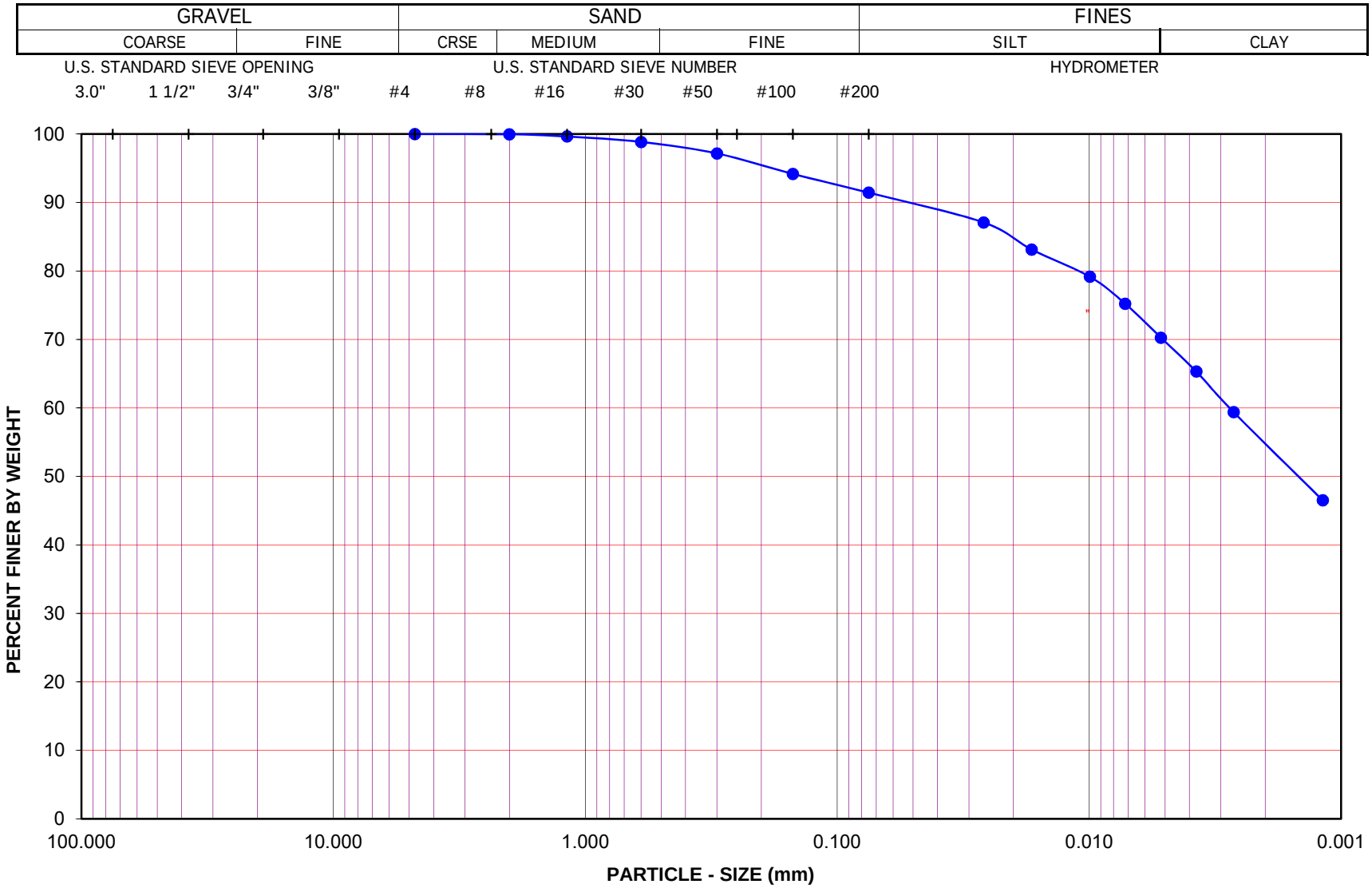
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	100.0
No. 16	0.16	99.7	99.7
No. 30	0.56	98.9	98.9
No. 50	1.40	97.2	97.2
No. 100	2.90	94.2	94.2
No. 200	4.27	91.5	91.4
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 52.16 Wt. of Dry Soil (g) 50.10

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
26-Apr-16	10:02	0		8.0			
	10:04	2	21.3	8.0	52.0	87.1	0.0262
	10:07	5	21.3	8.0	50.0	83.1	0.0169
	10:17	15	21.3	8.0	48.0	79.2	0.0099
	10:32	30	21.4	8.0	46.0	75.2	0.0072
	11:02	60	21.4	8.0	43.5	70.3	0.0052
	12:02	120	21.4	8.0	41.0	65.3	0.0038
	14:12	250	21.5	8.0	38.0	59.4	0.0027
27-Apr-16	10:02	1440	20.9	8.0	31.5	46.5	0.0012



Project Name: Laguna Lake

Project No.: 11254.001

Boring No.: V-7 Sample No.: R-1

Depth (feet): 11.0 Soil Type : MH

Soil Identification: Dark olive gray elastic silt (MH)

GR:SA:FI : (%) 0 : 9 : 91

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

04/28/16

SA & Hyd V-7, R-1 @ 11

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Leighton

Project Name:	Laguna Lake	Tested By:	GEB/ACS/OHF	Date:	04/21/16
Project No.:	11254.001	Data Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-8				
Sample No.:	B-1	Depth (feet):	5.5-6		
Soil Identification:	Dark olive sandy lean clay s(CL)				

		Soil Type
% Gravel	0	s(CL)
% Sand	42	
% Fines	58	

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	185.54	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	184.52	98.69
Wt.of Air-Dry Soil + Cont. (g)	1182.40	Wt. of Container No.___ (g)	1.00	59.26	76.44
Wt. of Container	273.20	Moisture Content (%)	0.00	0.81	
Dry Wt. of Soil (g)	909.20	Wt. of Dry Soil (g)			22.25

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.65	99.9
No. 10	0.78	99.9
Pan		

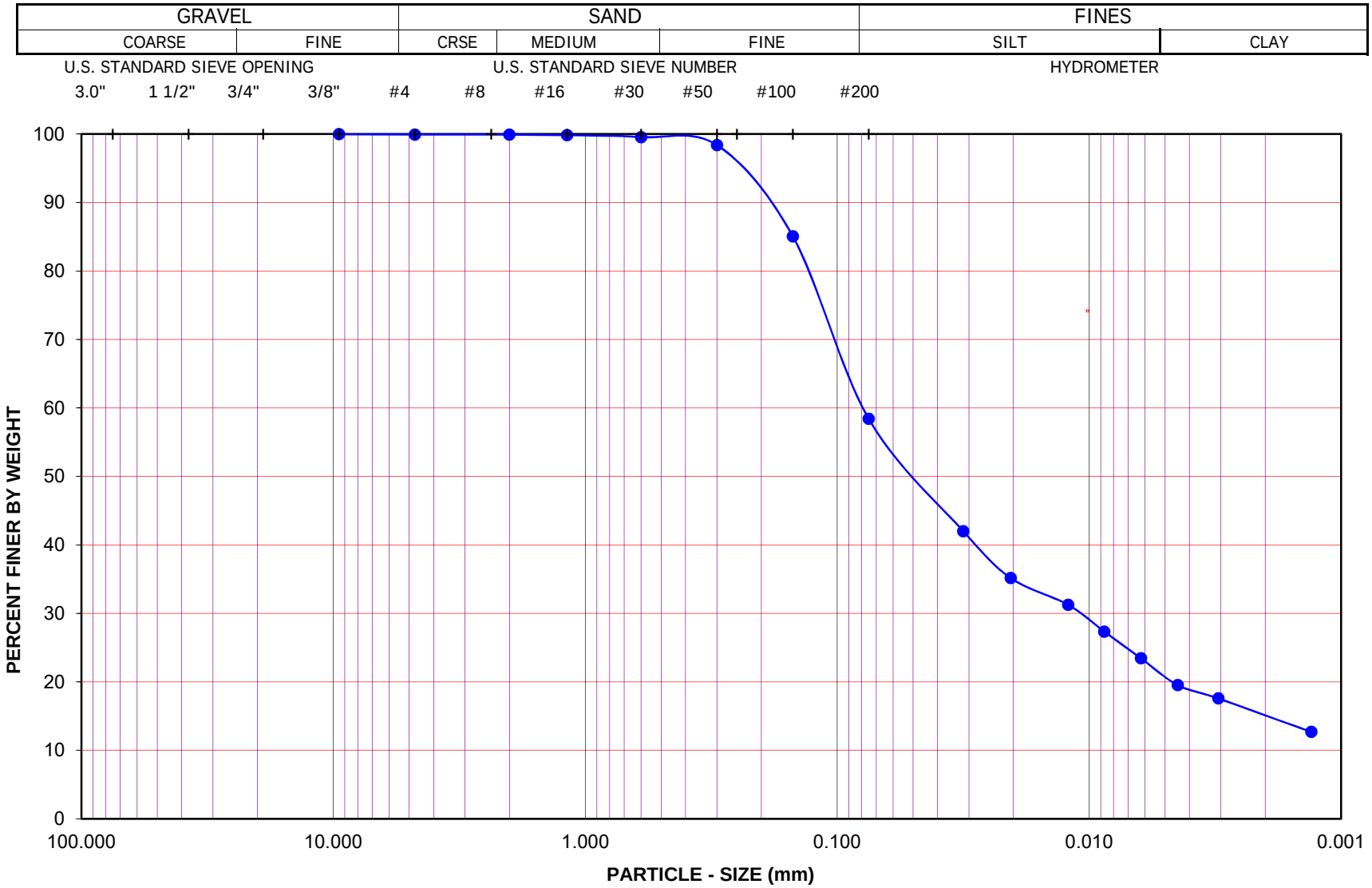
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	99.9
No. 16	0.04	99.9	99.8
No. 30	0.18	99.6	99.6
No. 50	0.78	98.5	98.4
No. 100	7.53	85.2	85.1
No. 200	21.05	58.5	58.4
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 51.12 Wt. of Dry Soil (g) 50.71

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
22-Apr-16	9:10	0		7.0			
	9:12	2	22.0	7.0	28.5	42.0	0.0316
	9:15	5	22.0	8.0	25.0	35.2	0.0205
	9:25	15	21.9	8.0	23.0	31.3	0.0121
	9:40	30	21.9	8.0	21.0	27.4	0.0087
	10:10	60	21.9	8.0	19.0	23.5	0.0062
	11:10	120	21.9	8.0	17.0	19.5	0.0045
	13:20	250	22.4	8.0	16.0	17.6	0.0031
23-Apr-16	9:10	1440	21.0	8.0	13.5	12.7	0.0013



Project Name: Laguna Lake

Project No.: 11254.001

Boring No.: V-8 Sample No.: B-1

Depth (feet): 5.5-6 Soil Type : s(CL)

Soil Identification: Dark olive sandy lean clay s(CL)

GR:SA:FI : (%) 0 : 42 : 58

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

04/29/16

SA & Hyd V-8, B-1 @ 5.5-6

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Leighton

Project Name:	Laguna Lake	Tested By:	GEB/ACS	Date:	04/25/16
Project No.:	11254.001	Data Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-9				
Sample No.:	B-1	Depth (feet):	4-10		
Soil Identification:	Dark olive fat clay with sand (CH)s				

		Soil Type
% Gravel	0	(CH)s
% Sand	22	
% Fines	78	

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	100.28	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	99.11	87.29
Wt.of Air-Dry Soil + Cont. (g)	617.00	Wt. of Container No.___ (g)	1.00	67.17	76.05
Wt. of Container	110.90	Moisture Content (%)	0.00	3.66	
Dry Wt. of Soil (g)	506.10	Wt. of Dry Soil (g)			11.24

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.66	99.9
No. 10	0.72	99.9
Pan		

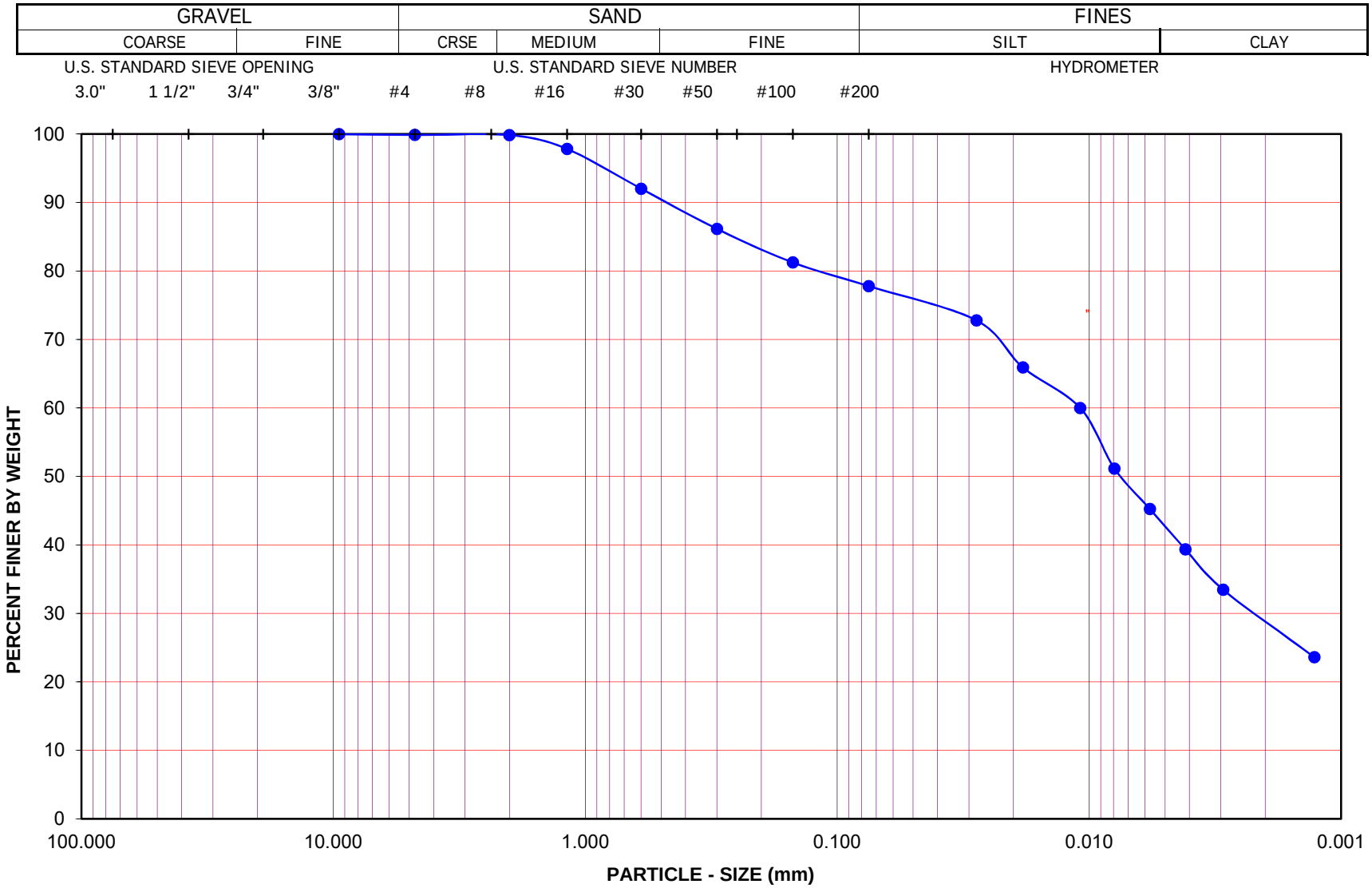
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	99.9
No. 16	1.03	98.0	97.8
No. 30	3.95	92.2	92.0
No. 50	6.91	86.3	86.2
No. 100	9.38	81.4	81.3
No. 200	11.12	77.9	77.8
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 52.19 Wt. of Dry Soil (g) 50.35

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
26-Apr-16	9:30	0		8.0			
	9:32	2	21.1	8.0	45.0	72.8	0.0280
	9:35	5	21.1	8.0	41.5	65.9	0.0183
	9:45	15	21.1	8.0	38.5	60.0	0.0108
	10:00	30	21.1	8.0	34.0	51.2	0.0079
	10:30	60	21.2	8.0	31.0	45.3	0.0057
	11:30	120	21.4	8.0	28.0	39.4	0.0041
	13:40	250	21.4	8.0	25.0	33.4	0.0029
27-Apr-16	9:30	1440	20.6	8.0	20.0	23.6	0.0013



Project Name: Laguna Lake

Project No.: 11254.001

Boring No.: V-9

Sample No.: B-1

Depth (feet): 4-10

Soil Type : (CH)s

Soil Identification: Dark olive fat clay with sand (CH)s

GR:SA:FI : (%) 0 : 22 : 78

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

04/29/16

SA & Hyd V-9, B-1 @ 4-10

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Leighton

Project Name:	Laguna Lake	Tested By:	GEB/ACS/OHF	Date:	04/21/16
Project No.:	11254.001	Data Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-10				
Sample No.:	B-1A	Depth (feet):	0-7.5		
Soil Identification:	Dark olive elastic silt with sand (MH)s				

% Gravel	0	Soil Type
% Sand	19	(MH)s
% Fines	81	

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	100.25	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	98.31	86.55
Wt.of Air-Dry Soil + Cont. (g)	589.40	Wt. of Container No.___ (g)	1.00	61.68	77.24
Wt. of Container	220.60	Moisture Content (%)	0.00	5.30	
Dry Wt. of Soil (g)	368.80	Wt. of Dry Soil (g)			9.31

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.00	100.0
No. 10	0.09	100.0
Pan		

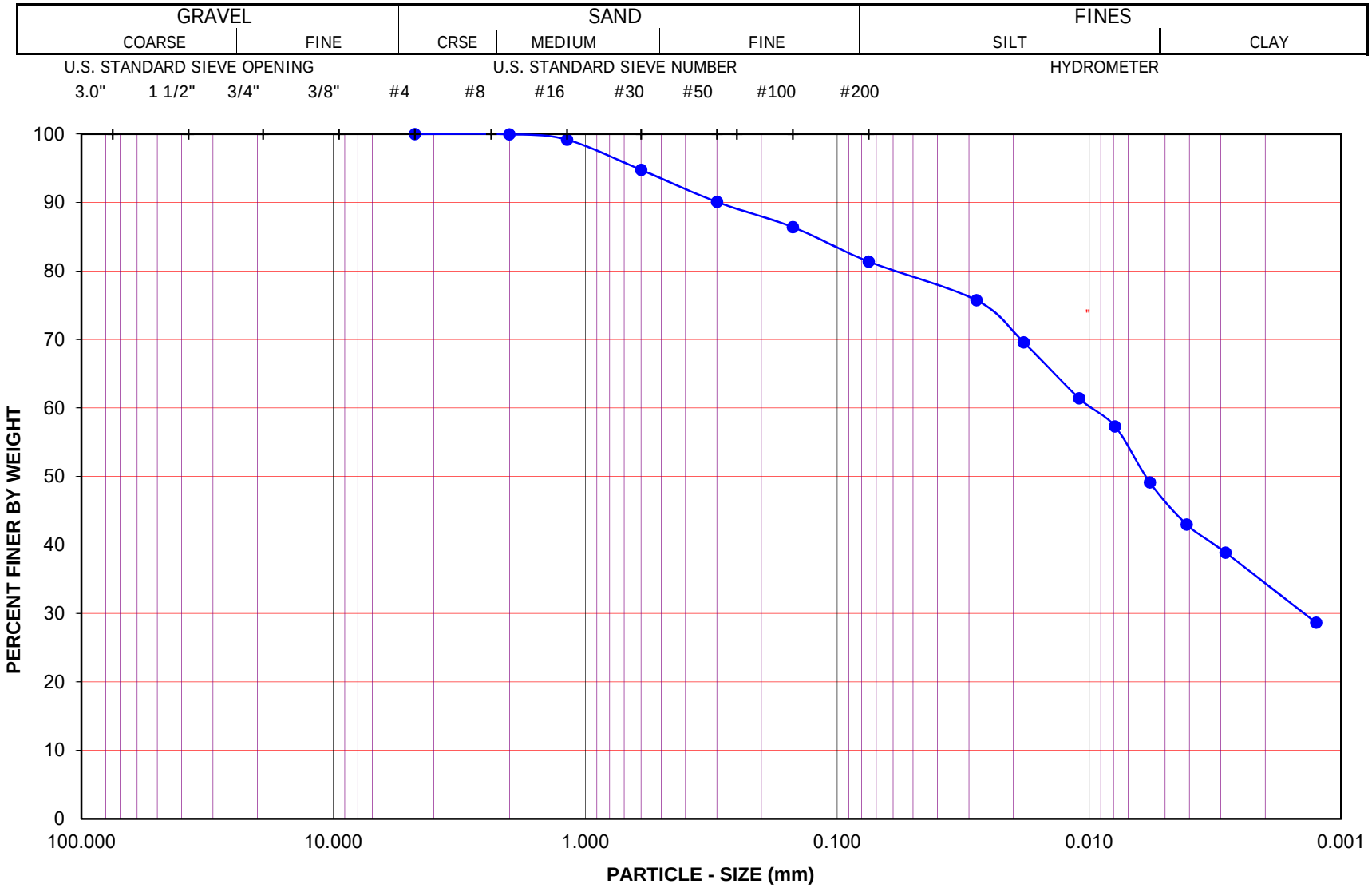
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	100.0
No. 16	0.39	99.2	99.2
No. 30	2.52	94.8	94.8
No. 50	4.79	90.1	90.1
No. 100	6.57	86.4	86.4
No. 200	9.01	81.4	81.4
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 51.02 Wt. of Dry Soil (g) 48.45

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
22-Apr-16	9:14	0		7.0			
	9:16	2	22.0	7.0	44.0	75.7	0.0280
	9:19	5	22.0	8.0	41.0	69.6	0.0182
	9:29	15	21.9	8.0	37.0	61.4	0.0110
	9:44	30	21.9	8.0	35.0	57.3	0.0079
	10:14	60	21.9	8.0	31.0	49.1	0.0057
	11:14	120	22.0	8.0	28.0	43.0	0.0041
	13:24	250	22.4	8.0	26.0	38.9	0.0029
23-Apr-16	9:14	1440	21.1	8.0	21.0	28.7	0.0013



Project Name: Laguna Lake

Project No.: 11254.001

Boring No.: V-10

Sample No.: B-1A

Depth (feet): 0-7.5

Soil Type : (MH)s

Soil Identification: Dark olive elastic silt with sand (MH)s

GR:SA:FI : (%) 0 : 19 : 81

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

04/29/16

SA & Hyd V-10, B-1A @ 0-7.5

Leighton

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Project Name:	Laguna Lake	Tested By:	GEB/ACS	Date:	04/21/16
Project No.:	11254.001	Data Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-11				
Sample No.:	B-1	Depth (feet):	0-7		
Soil Identification:	Dark grayish olive fat clay (CH)				

		Soil Type
% Gravel	0	CH
% Sand	5	
% Fines	95	

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.84	Wt.of Air-Dry Soil + Cont.(g)	0.00	105.71	
Correction for Specific Gravity	0.96	Dry Wt. of Soil + Cont. (g)	0.00	104.30	78.89
Wt.of Air-Dry Soil + Cont. (g)	543.60	Wt. of Container No.___ (g)	1.00	67.18	76.41
Wt. of Container	251.20	Moisture Content (%)	0.00	3.80	
Dry Wt. of Soil (g)	292.40	Wt. of Dry Soil (g)			2.48

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.00	100.0
No. 10	1.98	99.3
Pan		

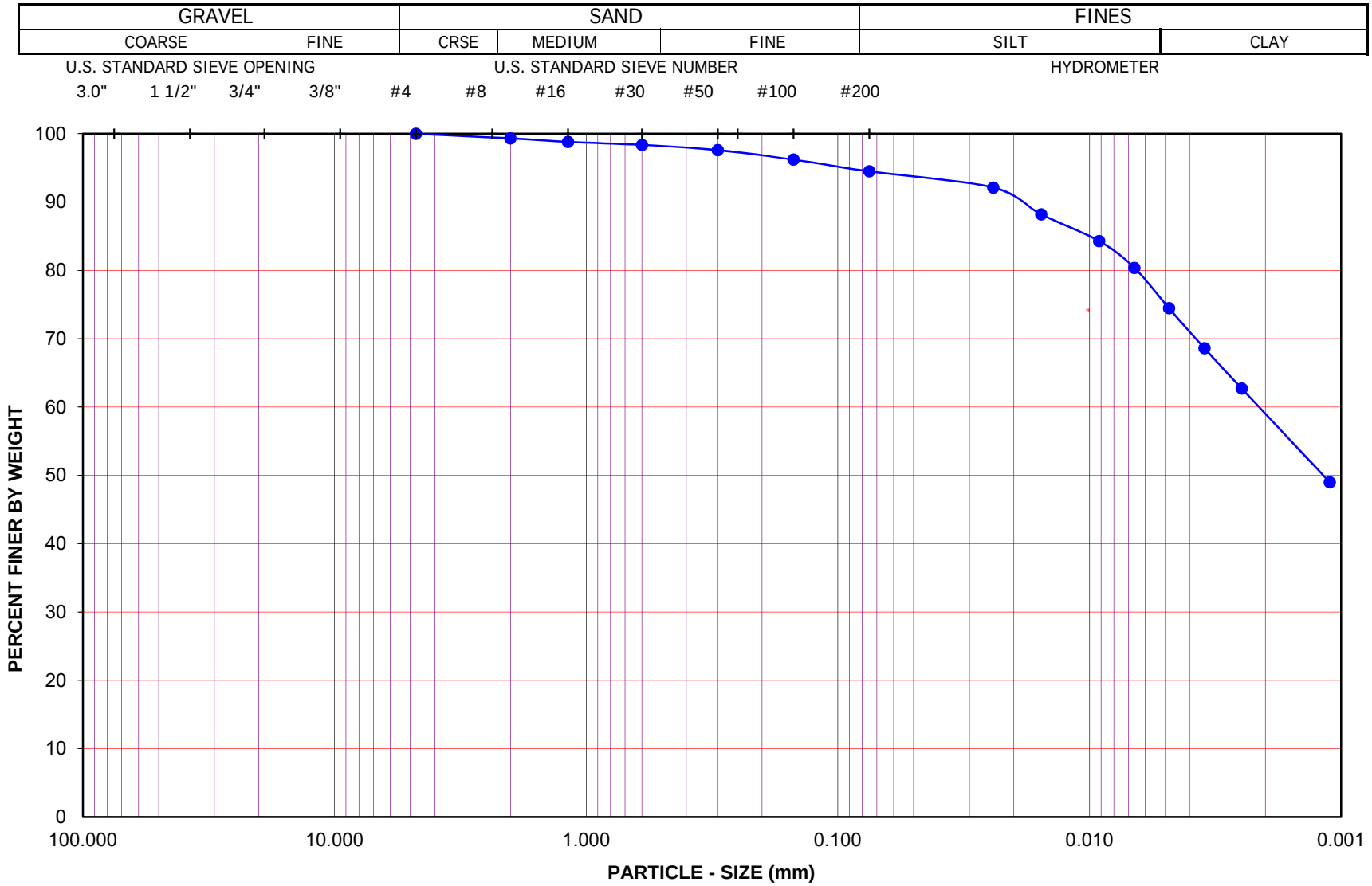
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	99.3
No. 16	0.25	99.5	98.8
No. 30	0.47	99.0	98.4
No. 50	0.84	98.3	97.6
No. 100	1.53	96.9	96.2
No. 200	2.37	95.1	94.5
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 50.70 Wt. of Dry Soil (g) 48.84

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
22-Apr-16	9:42	0		8.0			
	9:44	2	22.0	8.0	55.0	92.1	0.0241
	9:47	5	22.0	8.0	53.0	88.2	0.0156
	9:57	15	22.0	8.0	51.0	84.3	0.0092
	10:12	30	22.0	8.0	49.0	80.4	0.0066
	10:42	60	22.1	8.0	46.0	74.5	0.0048
	11:42	120	22.2	8.0	43.0	68.6	0.0035
	13:52	250	22.6	8.0	40.0	62.7	0.0025
23-Apr-16	9:42	1440	21.2	8.0	33.0	49.0	0.0011



Project Name: Laguna Lake

Project No.: 11254.001

Boring No.: V-11 Sample No.: B-1

Depth (feet): 0-7 Soil Type : CH

Soil Identification: Dark grayish olive fat clay (CH)

GR:SA:FI : (%) 0 : 5 : 95

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

04/29/16

SA & Hyd V-11, B-1 @ 0-7

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Leighton

Project Name:	Laguna Lake	Tested By:	GEB/ACS/OHF	Date:	04/21/16
Project No.:	11254.001	Data Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-11				
Sample No.:	B-2	Depth (feet):	10-12.5		
Soil Identification:	Dark olive fat clay (CH)				

% Gravel	**0**	**Soil Type**
% Sand	**3**	**CH**
% Fines	**97**	

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.84	Wt.of Air-Dry Soil + Cont.(g)	0.00	82.36	
Correction for Specific Gravity	0.96	Dry Wt. of Soil + Cont. (g)	0.00	81.70	78.77
Wt.of Air-Dry Soil + Cont. (g)	591.00	Wt. of Container No.___ (g)	1.00	58.15	77.02
Wt. of Container	250.00	Moisture Content (%)	0.00	2.80	
Dry Wt. of Soil (g)	341.00	Wt. of Dry Soil (g)			1.75

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.00	100.0
No. 10	0.07	100.0
Pan		

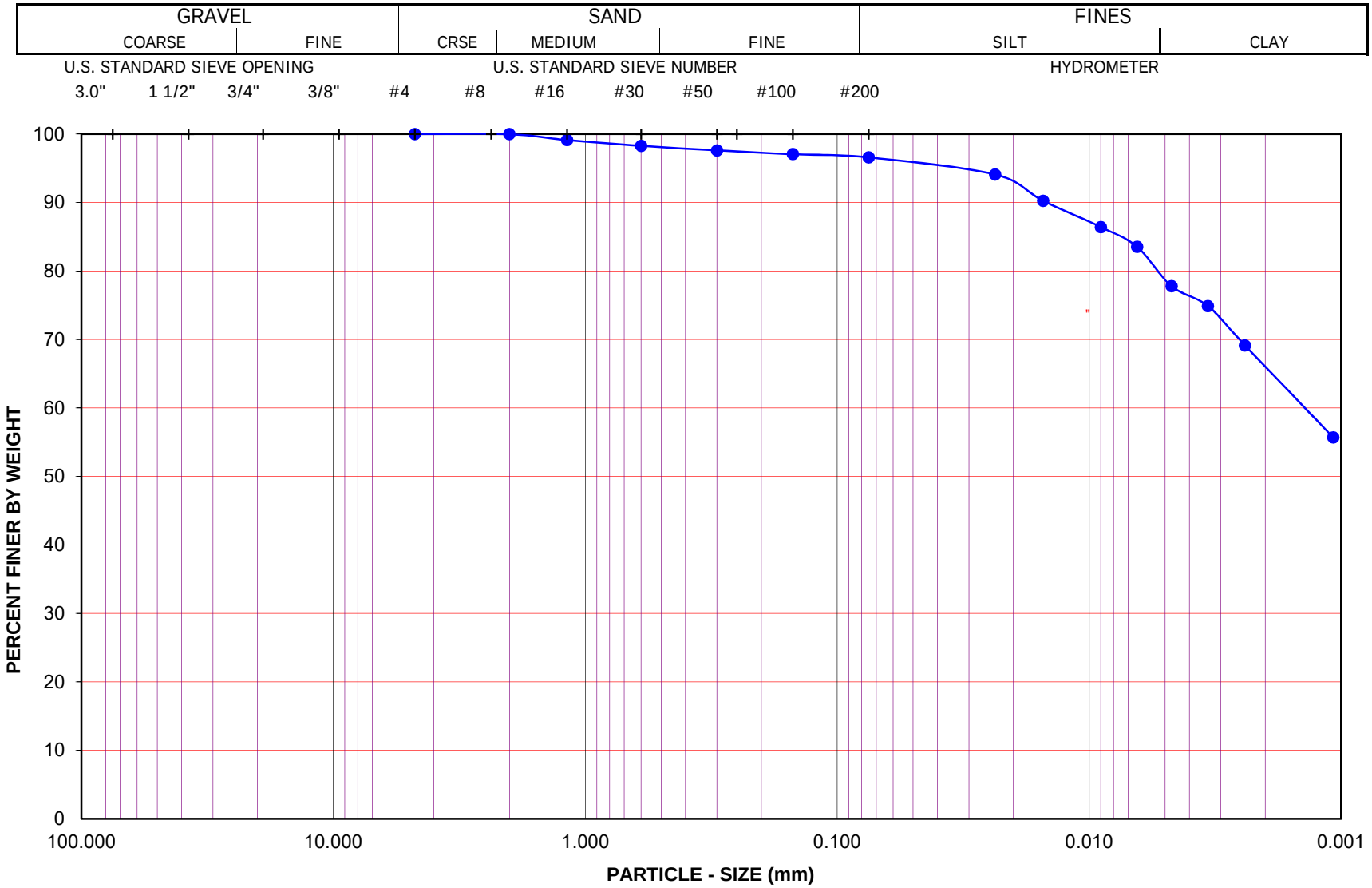
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	100.0
No. 16	0.43	99.1	99.1
No. 30	0.85	98.3	98.3
No. 50	1.19	97.6	97.6
No. 100	1.46	97.1	97.1
No. 200	1.70	96.6	96.6
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 51.59 Wt. of Dry Soil (g) 50.18

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
22-Apr-16	9:38	0		8.0			
	9:40	2	22.1	8.0	57.0	94.1	0.0236
	9:43	5	22.1	8.0	55.0	90.3	0.0152
	9:53	15	22.1	8.0	53.0	86.4	0.0090
	10:08	30	22.0	8.0	51.5	83.5	0.0065
	10:38	60	22.0	8.0	48.5	77.8	0.0047
	11:38	120	22.2	8.0	47.0	74.9	0.0034
	13:48	250	22.6	8.0	44.0	69.1	0.0024
23-Apr-16	9:38	1440	21.1	8.0	37.0	55.7	0.0011



Project Name: Laguna Lake

Project No.: 11254.001

Boring No.: V-11 Sample No.: B-2

Depth (feet): 10-12.5 Soil Type : CH

Soil Identification: Dark olive fat clay (CH)

GR:SA:FI : (%) 0 : 3 : 97

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

04/29/16

SA & Hyd V-11, B-2 @ 10-12.5

Leighton

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Project Name:	Laguna Lake	Tested By:	GEB/ACS	Date:	04/26/16
Project No.:	11254.001	Data Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-13				
Sample No.:	R-1	Depth (feet):	5.5		
Soil Identification:	Olive fat clay with sand (CH)s, shells noted				

% Gravel	2	Soil Type	
% Sand	27	(CH)s	
% Fines	71		

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	98.81	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	98.01	90.66
Wt.of Air-Dry Soil + Cont. (g)	613.40	Wt. of Container No.___ (g)	1.00	57.76	77.46
Wt. of Container	154.50	Moisture Content (%)	0.00	1.99	
Dry Wt. of Soil (g)	458.90	Wt. of Dry Soil (g)			13.20

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	3.22	99.3
No. 4	8.89	98.1
No. 10	25.27	94.5
Pan		

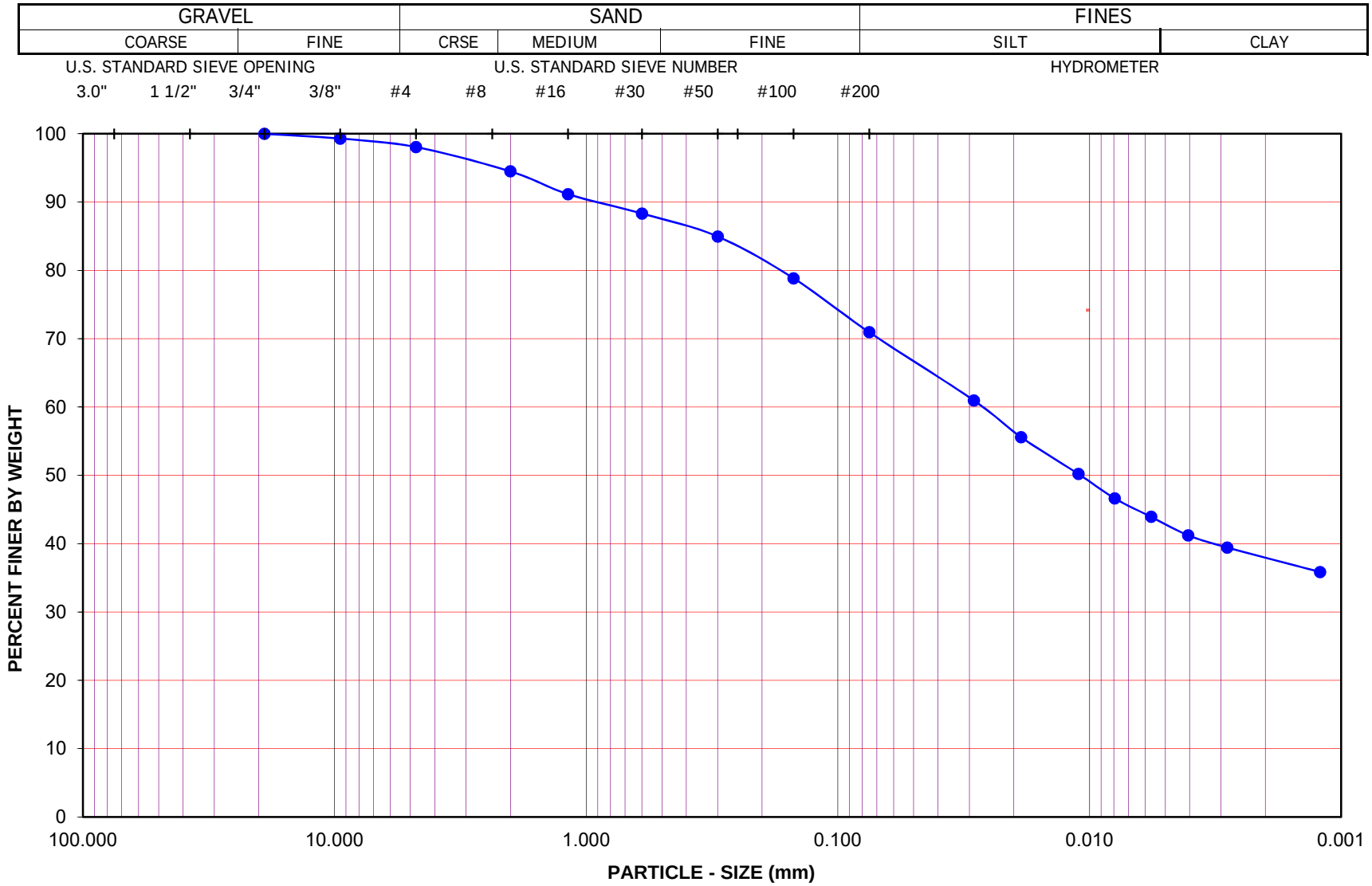
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	94.5
No. 16	1.84	96.5	91.2
No. 30	3.41	93.5	88.3
No. 50	5.27	89.9	85.0
No. 100	8.65	83.5	78.9
No. 200	13.02	75.1	71.0
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 53.31 Wt. of Dry Soil (g) 52.27

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
26-Apr-16	9:58	0		8.0			
	10:00	2	21.3	8.0	42.0	61.0	0.0288
	10:03	5	21.3	8.0	39.0	55.6	0.0187
	10:13	15	21.4	8.0	36.0	50.2	0.0111
	10:28	30	21.4	8.0	34.0	46.6	0.0079
	10:58	60	21.4	8.0	32.5	43.9	0.0057
	11:58	120	21.4	8.0	31.0	41.2	0.0041
	14:08	250	21.4	8.0	30.0	39.5	0.0028
27-Apr-16	9:58	1440	20.9	8.0	28.0	35.9	0.0012



Project Name: Laguna Lake

Project No.: 11254.001

Boring No.: V-13

Sample No.: R-1

Depth (feet): 5.5

Soil Type : (CH)s

Soil Identification: Olive fat clay with sand (CH)s, shells noted

GR:SA:FI : (%) 2 : 27 : 71

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

04/29/16

SA & Hyd V-13, R-1 @ 5.5

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Leighton

Project Name:	Laguna Lake	Tested By:	GEB/ACS/OHF	Date:	04/21/16
Project No.:	11254.001	Data Input By:	J. Ward	Date:	04/29/16
Boring No.:	V-14				
Sample No.:	B-2	Depth (feet):	2-4		
Soil Identification:	Olive fat clay (CH)				

% Gravel	**0**	**Soil Type**	
% Sand	**1**	**CH**	
% Fines	**99**		

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	88.59	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	87.71	83.27
Wt.of Air-Dry Soil + Cont. (g)	627.50	Wt. of Container No.___ (g)	1.00	57.76	82.69
Wt. of Container	252.30	Moisture Content (%)	0.00	2.94	
Dry Wt. of Soil (g)	375.20	Wt. of Dry Soil (g)			0.58

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.00	100.0
No. 10	0.00	100.0
Pan		

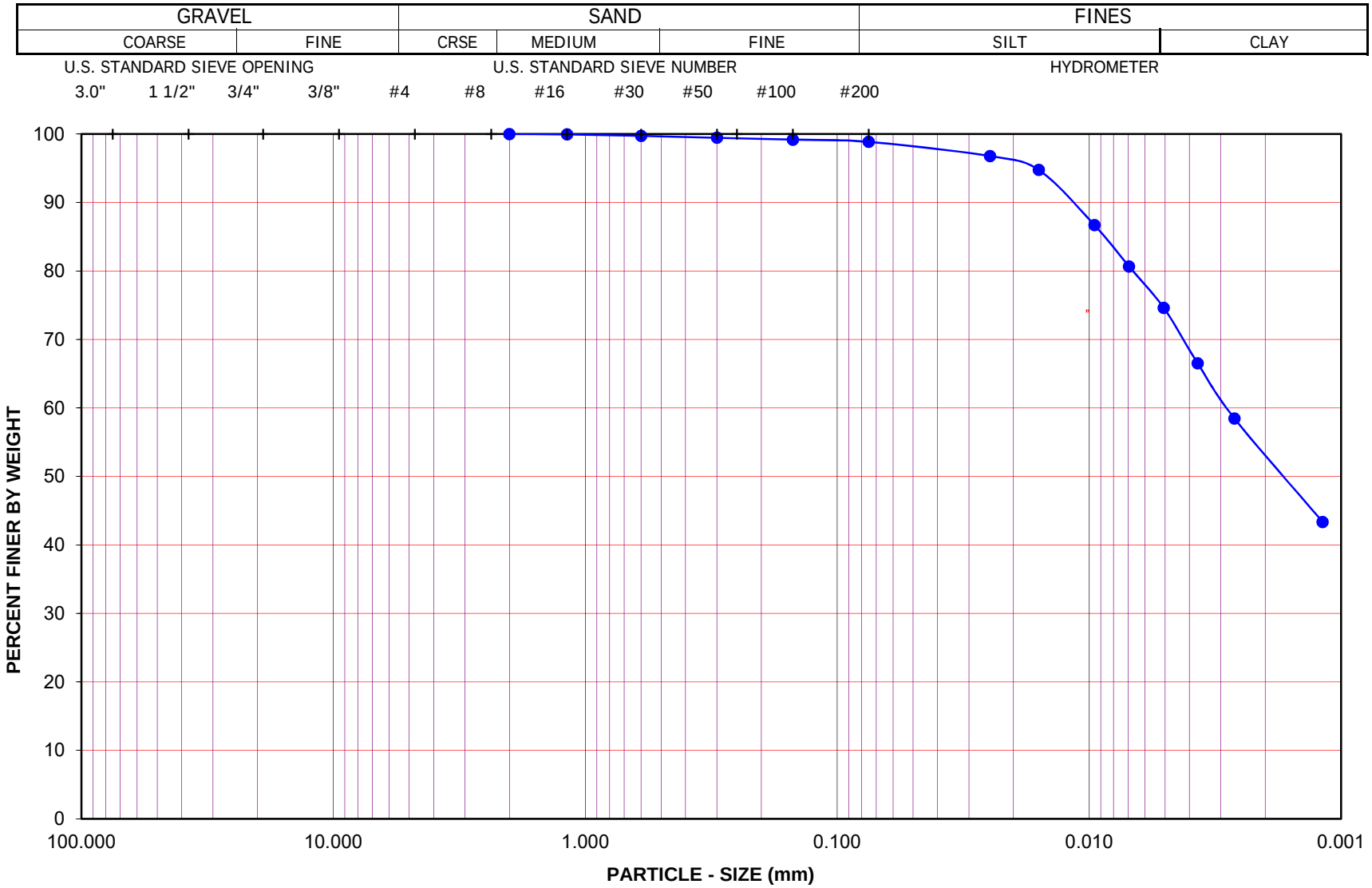
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	100.0
No. 16	0.02	100.0	100.0
No. 30	0.13	99.7	99.7
No. 50	0.26	99.5	99.5
No. 100	0.40	99.2	99.2
No. 200	0.56	98.9	98.9
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 50.64 Wt. of Dry Soil (g) 49.19

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
22-Apr-16	9:34	0		8.0			
	9:36	2	22.0	8.0	56.0	96.8	0.0247
	9:39	5	22.0	8.0	55.0	94.8	0.0159
	9:49	15	22.0	8.0	51.0	86.7	0.0095
	10:04	30	22.0	8.0	48.0	80.7	0.0069
	10:34	60	22.0	8.0	45.0	74.6	0.0051
	11:34	120	22.2	8.0	41.0	66.5	0.0037
	13:44	250	22.6	8.0	37.0	58.5	0.0027
23-Apr-16	9:34	1440	21.2	8.0	29.5	43.4	0.0012



Project Name: Laguna Lake

Project No.: 11254.001

Boring No.: V-14

Sample No.: B-2

Depth (feet): 2-4

Soil Type : CH

Soil Identification: Olive fat clay (CH)

GR:SA:FI : (%) 0 : 1 : 99

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

04/29/16

SA & Hyd V-14, B-2 @ 2-4

Leighton

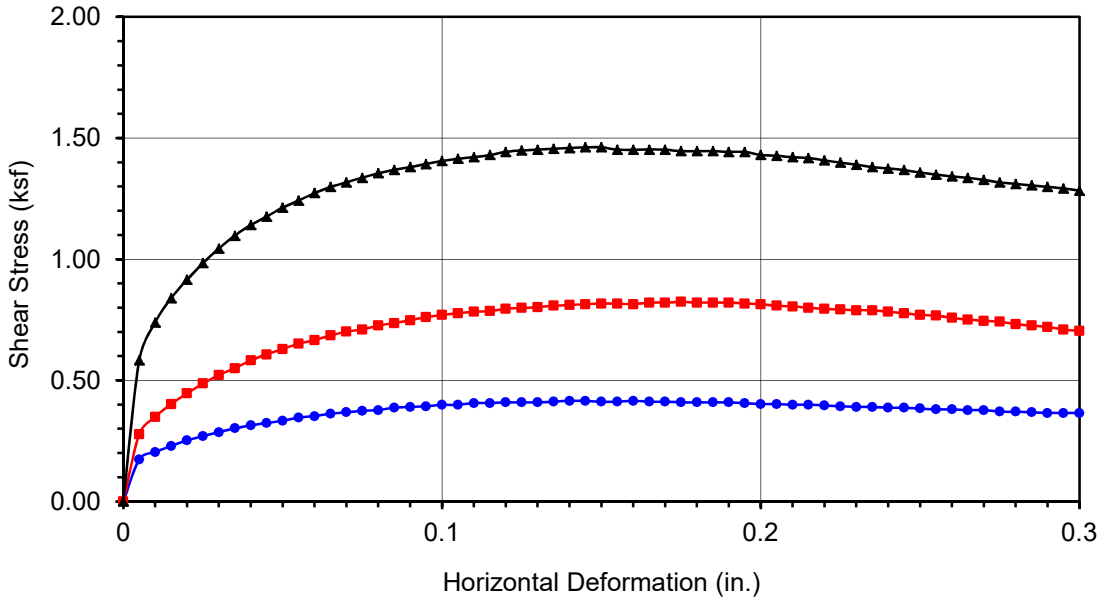
DIRECT SHEAR TEST

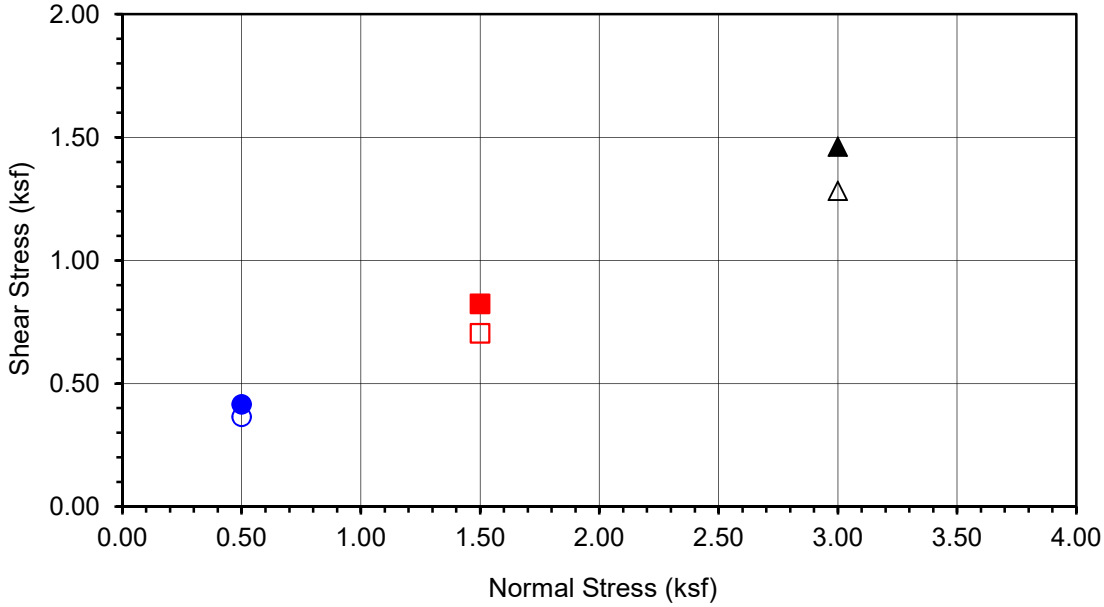
Consolidated Drained - ASTM D 3080

Project Name:	Laguna Lake	Tested By:	G. Bathala	Date:	04/22/16
Project No.:	11254.001	Checked By:	J. Ward	Date:	04/29/16
Boring No.:	V-7	Sample Type:	Ring		
Sample No.:	R-1	Depth (ft.):	11.0		

Soil Identification: Dark olive gray elastic silt (MH)

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	150.29	150.86	153.34
Weight of Ring(gm):	45.00	43.76	41.42
Before Shearing			
Weight of Wet Sample+Cont.(gm):	239.17	239.17	239.17
Weight of Dry Sample+Cont.(gm):	149.12	149.12	149.12
Weight of Container(gm):	59.21	59.21	59.21
Vertical Rdg.(in): Initial	0.2490	0.0000	0.2481
Vertical Rdg.(in): Final	0.2984	-0.1010	0.4075
After Shearing			
Weight of Wet Sample+Cont.(gm):	164.54	164.86	132.07
Weight of Dry Sample+Cont.(gm):	115.50	119.96	93.14
Weight of Container(gm):	66.55	69.14	36.70
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**V-7**
Sample No.	**R-1**
Depth (ft)	**11**

Sample Type:

Ring

Soil Identification:
Dark olive gray elastic silt (MH)

Normal Stress (kip/ft²)	0.500	1.500	3.000
Peak Shear Stress (kip/ft²)	● 0.415	■ 0.824	▲ 1.462
Shear Stress @ End of Test (ksf)	○ 0.365	□ 0.704	△ 1.283
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	100.16	100.16	100.16
Dry Density (pcf)	43.7	44.5	46.5
Saturation (%)	94.8	97.0	103.0
Soil Height Before Shearing (in.)	0.9506	0.8990	0.8406
Final Moisture Content (%)	100.2	88.4	69.0

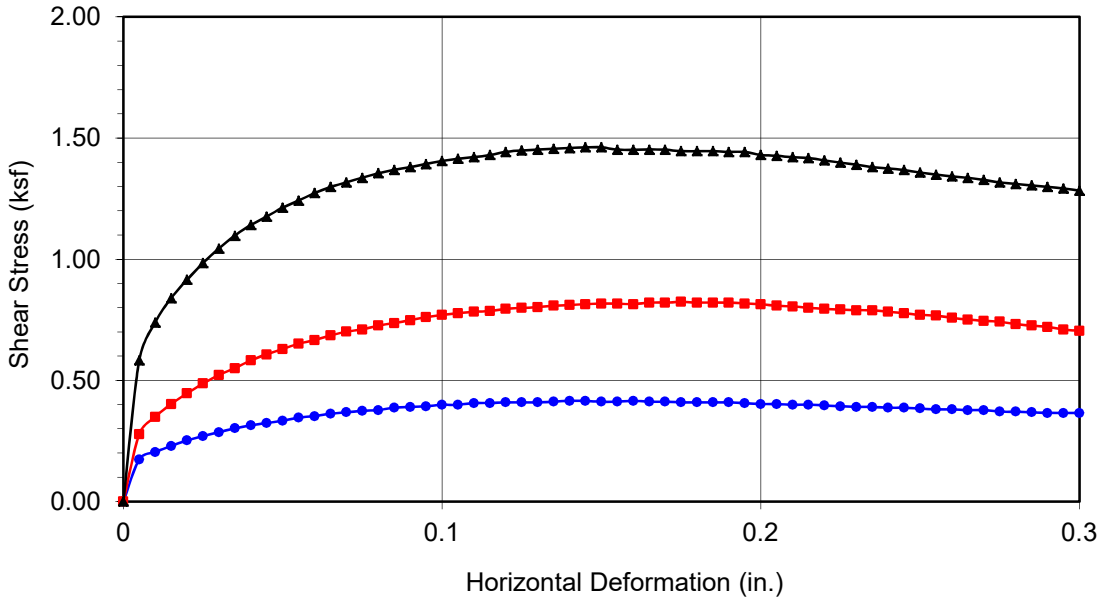
Leighton

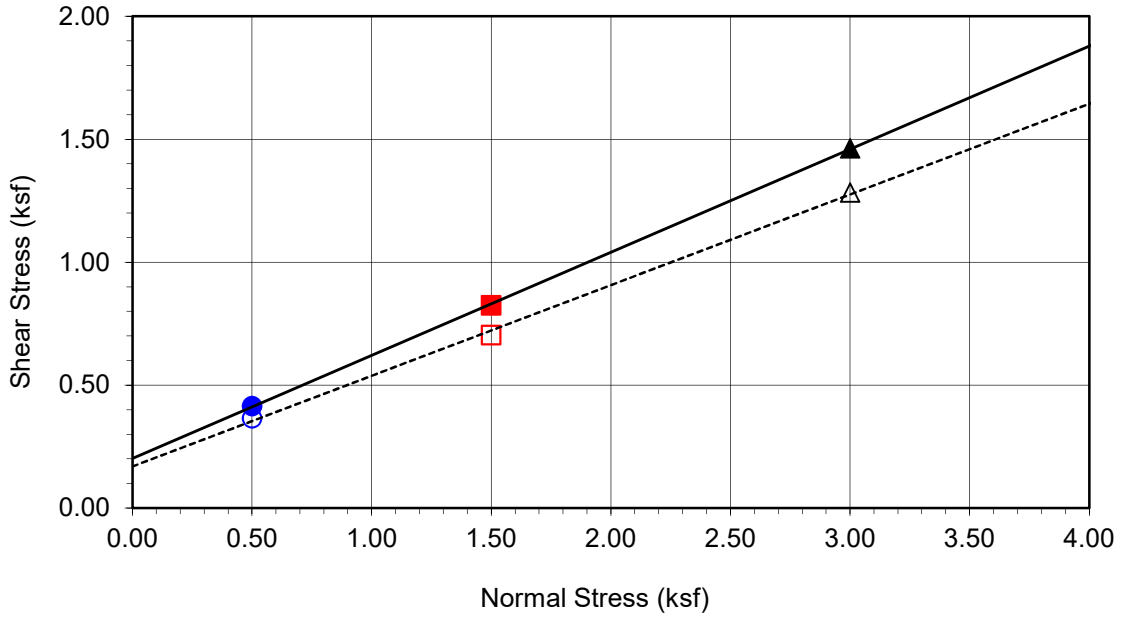
DIRECT SHEAR TEST RESULTS
Consolidated Drained - ASTM D 3080

Project No.: 11254.001

Laguna Lake

04-16





Boring No.	**V-7**
Sample No.	**R-1**
Depth (ft)	**11**
Sample Type:	Ring

Soil Identification:
Dark olive gray elastic silt (MH)

Strength Parameters

	C (psf)	ϕ (°)
Peak	201	23
Ultimate	170	20

Normal Stress (kip/ft²)	0.500	1.500	3.000
Peak Shear Stress (kip/ft²)	● 0.415	■ 0.824	▲ 1.462
Shear Stress @ End of Test (ksf)	○ 0.365	□ 0.704	△ 1.283
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	100.16	100.16	100.16
Dry Density (pcf)	43.7	44.5	46.5
Saturation (%)	94.8	97.0	103.0
Soil Height Before Shearing (in.)	0.9506	0.8990	0.8406
Final Moisture Content (%)	100.2	88.4	69.0

Leighton

DIRECT SHEAR TEST RESULTS
Consolidated Drained - ASTM D 3080

Project No.: 11254.001

Laguna Lake

04-16

Leighton

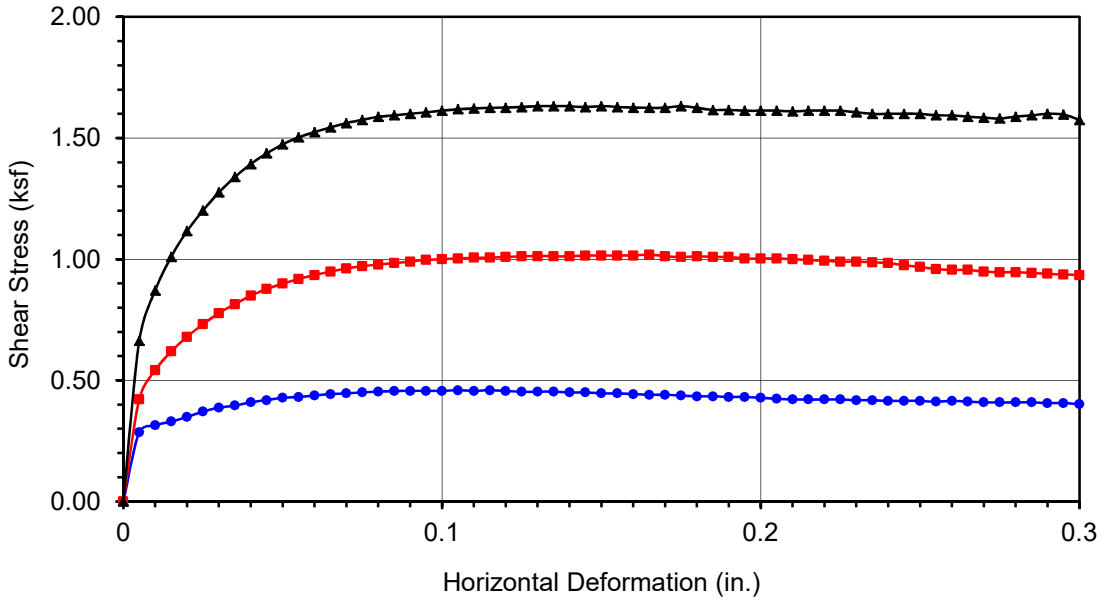
DIRECT SHEAR TEST

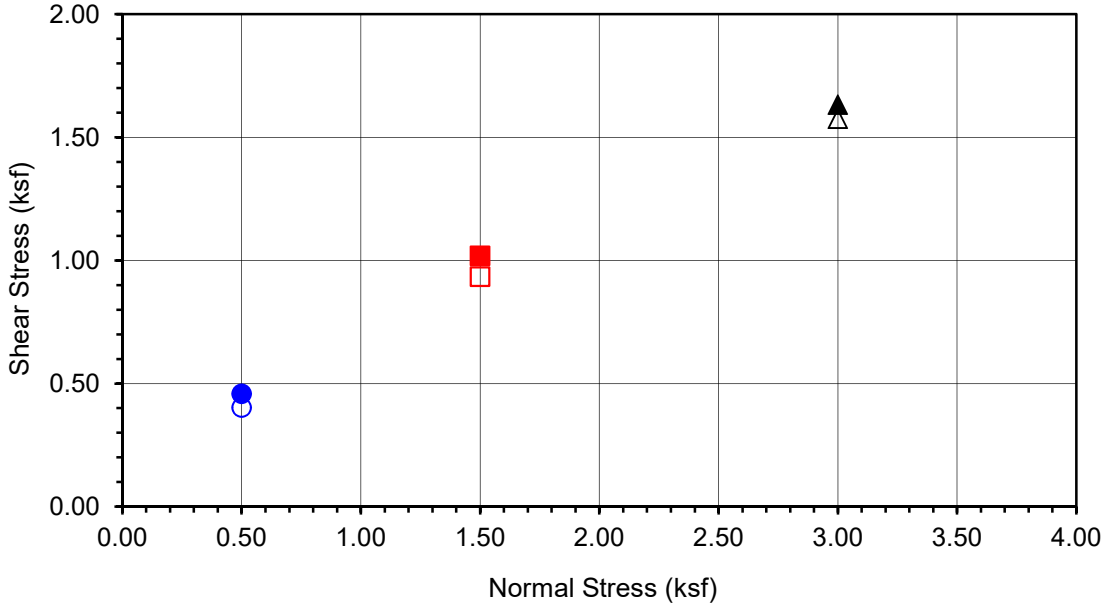
Consolidated Drained - ASTM D 3080

Project Name:	Laguna Lake	Tested By:	G. Bathala	Date:	04/23/16
Project No.:	11254.001	Checked By:	J. Ward	Date:	04/29/16
Boring No.:	V-13	Sample Type:	Ring		
Sample No.:	R-1	Depth (ft.):	5.5		

Soil Identification: Olive fat clay with sand (CH)s, shells noted

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	186.01	188.93	189.02
Weight of Ring(gm):	45.30	43.07	43.15
Before Shearing			
Weight of Wet Sample+Cont.(gm):	303.81	303.81	303.81
Weight of Dry Sample+Cont.(gm):	273.31	273.31	273.31
Weight of Container(gm):	154.46	154.46	154.46
Vertical Rdg.(in): Initial	0.0000	0.0000	0.0000
Vertical Rdg.(in): Final	0.0021	-0.0083	-0.0235
After Shearing			
Weight of Wet Sample+Cont.(gm):	200.89	184.91	214.50
Weight of Dry Sample+Cont.(gm):	168.21	153.22	184.46
Weight of Container(gm):	57.23	39.17	69.42
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**V-13**
Sample No.	**R-1**
Depth (ft)	**5.5**

Sample Type:

Ring

Soil Identification:
Olive fat clay with sand (CH)s, shells noted

Normal Stress (kip/ft²)	0.500	1.500	3.000
Peak Shear Stress (kip/ft²)	● 0.459	■ 1.019	▲ 1.632
Shear Stress @ End of Test (ksf)	○ 0.402	□ 0.934	△ 1.575
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	25.66	25.66	25.66
Dry Density (pcf)	93.1	96.5	96.5
Saturation (%)	85.5	92.9	92.9
Soil Height Before Shearing (in.)	1.0021	0.9917	0.9765
Final Moisture Content (%)	29.4	27.8	26.1

Leighton

DIRECT SHEAR TEST RESULTS

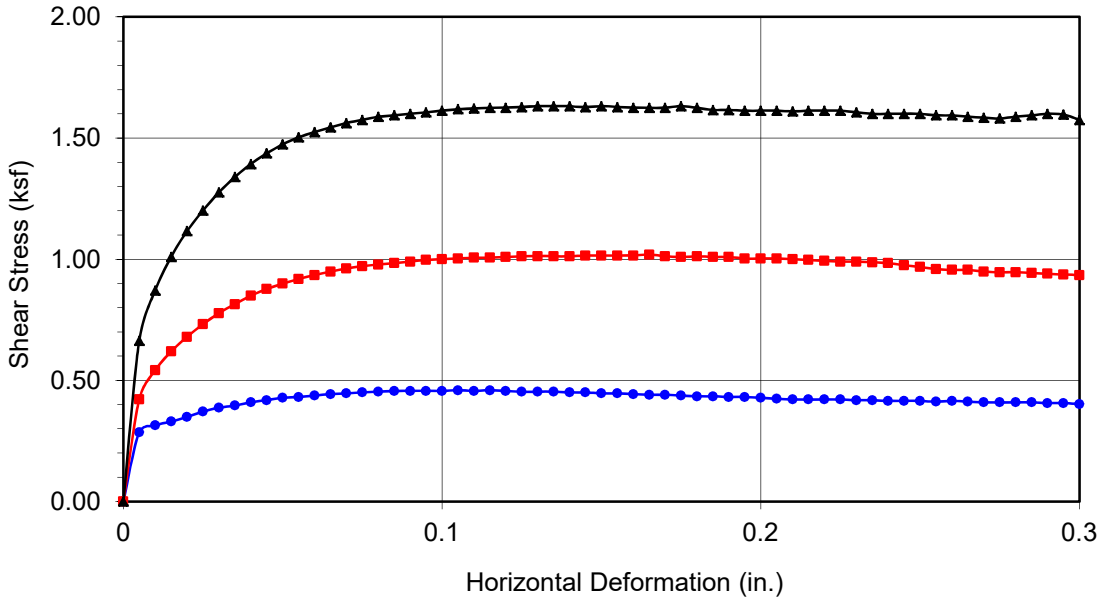
Consolidated Drained - ASTM D 3080

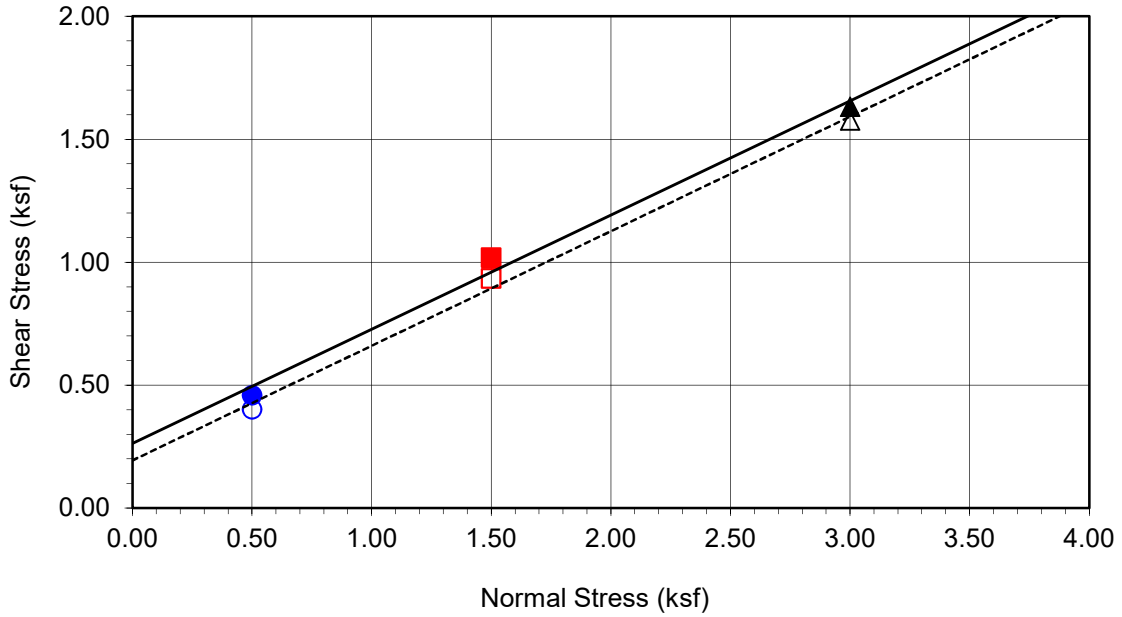
Project No.: 11254.001

Laguna Lake

04-16

DS V-13, R-1 @ 5.5





Boring No.	**V-13**
Sample No.	**R-1**
Depth (ft)	**5.5**
Sample Type:	Ring
Soil Identification: Olive fat clay with sand (CH)s, shells noted	

Strength Parameters

	C (psf)	ϕ (°)
Peak	263	25
Ultimate	194	25

Normal Stress (kip/ft²)	0.500	1.500	3.000
Peak Shear Stress (kip/ft²)	● 0.459	■ 1.019	▲ 1.632
Shear Stress @ End of Test (ksf)	○ 0.402	□ 0.934	△ 1.575
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	25.66	25.66	25.66
Dry Density (pcf)	93.1	96.5	96.5
Saturation (%)	85.5	92.9	92.9
Soil Height Before Shearing (in.)	1.0021	0.9917	0.9765
Final Moisture Content (%)	29.4	27.8	26.1

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 11254.001

Laguna Lake

04-16

DS V-13, R-1 @ 5.5

APPENDIX D
DREDGE CUT ANALYSES

SLOPE STABILITY ANALYSES

Leighton reviewed existing published reports for this project as well as nearby projects to obtain geotehcnil data for modeling the soil profile as well as materials strengths. Dredge cut slopes were analyzed using Roc Science's *SLIDE 7.0* software and Bishop's simplified method of analyses modeling circular slip surfaces within homogeneous soil conditions (for lake bottom sediments and cut). Althought the soil encopuntered below ten feet appeared to be stiffer, it is more conservative to model the bottom of the lake using a loeer strength. Addiointally, a lower bound strength was selected based on the lowest shear strength test result from CCL (1980). While this analysis resulted in a factor of safety below 1.5 for the dredge cut, the 1.5 factor of safety limits was well within the 30 foot stback form the top of the dredge cut. Modeled material strength parameters are tabulated below:

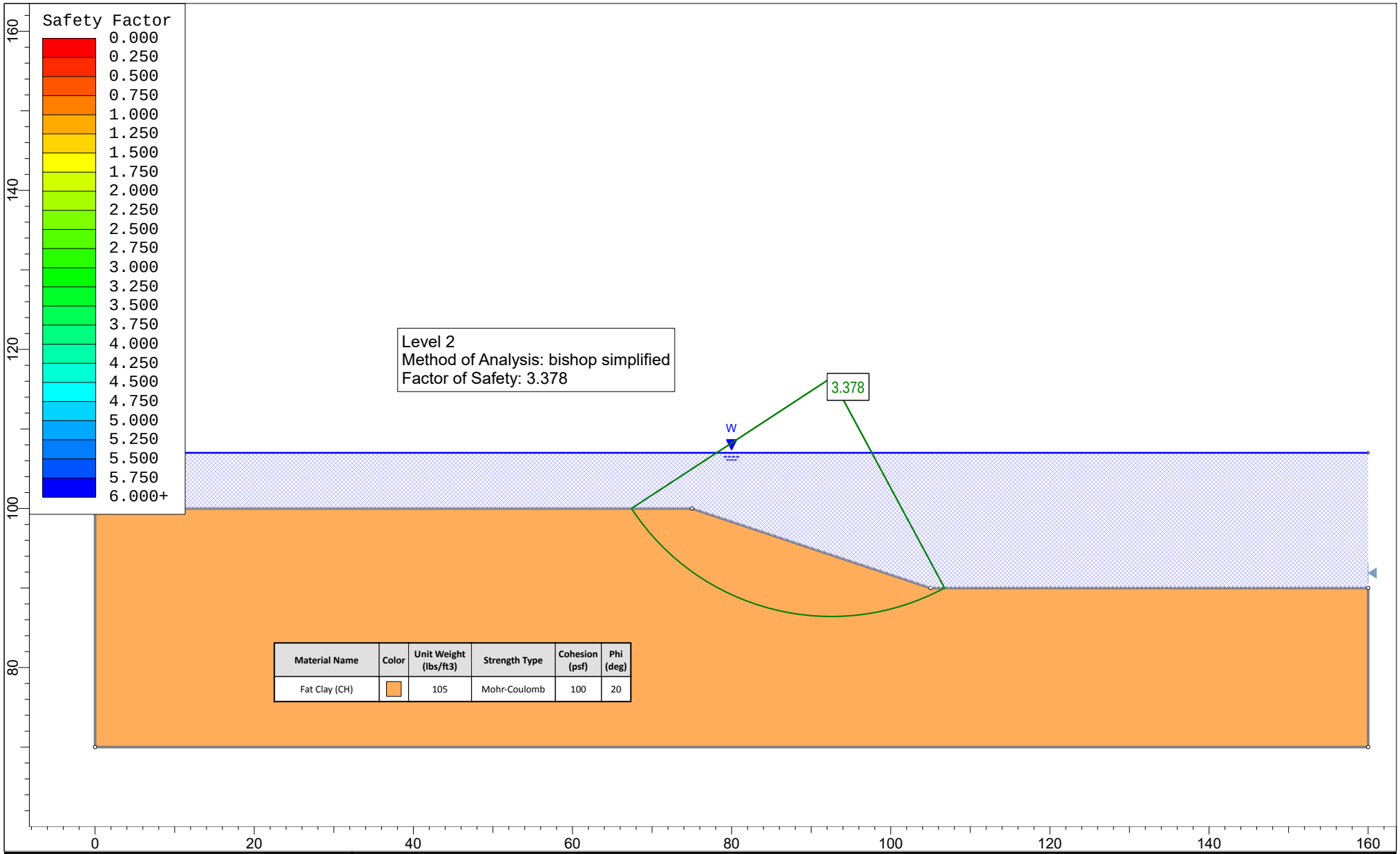
Table D-1. Earth Material Parameters

Description	Location	Moist Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degrees)
Soft lean to fat CLAY	lake bottom upper 6 to 10 ft	105	100	20
Soft lean to fat CLAY Lower Bound Condition	lake bottom upper 6 to 10 ft	105	30	12

Our analyses are summarized below:

Table D-2. SLIDE 7.0 Stability Analyses Summary

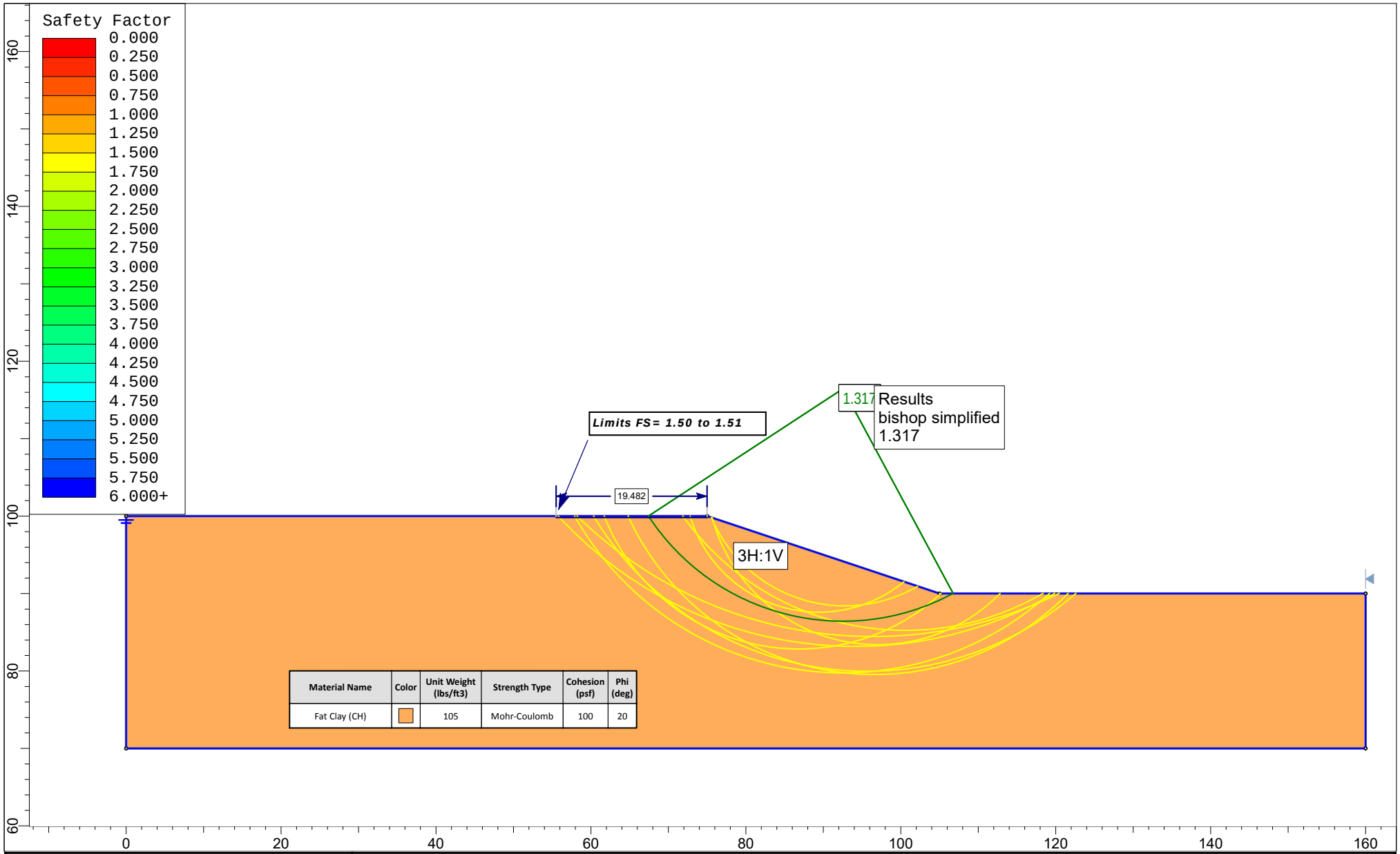
Slope 3H:1V Dredge Cut (horizontal:vertical)	Analyses Condition Description	Static Factor of Safety	1.5 Setback distance (feet)	Dredge Setback (feet)
Section D-D'- interpreted strength	water at maximum lake elevation	3.378	0	30
	rapid drawdown	1.317	20	30
Section D-D'- lower bound strength	water at maximum lake elevation	1.281	17.1	30



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Fat Clay (CH)		105	Mohr-Coulomb	100	20

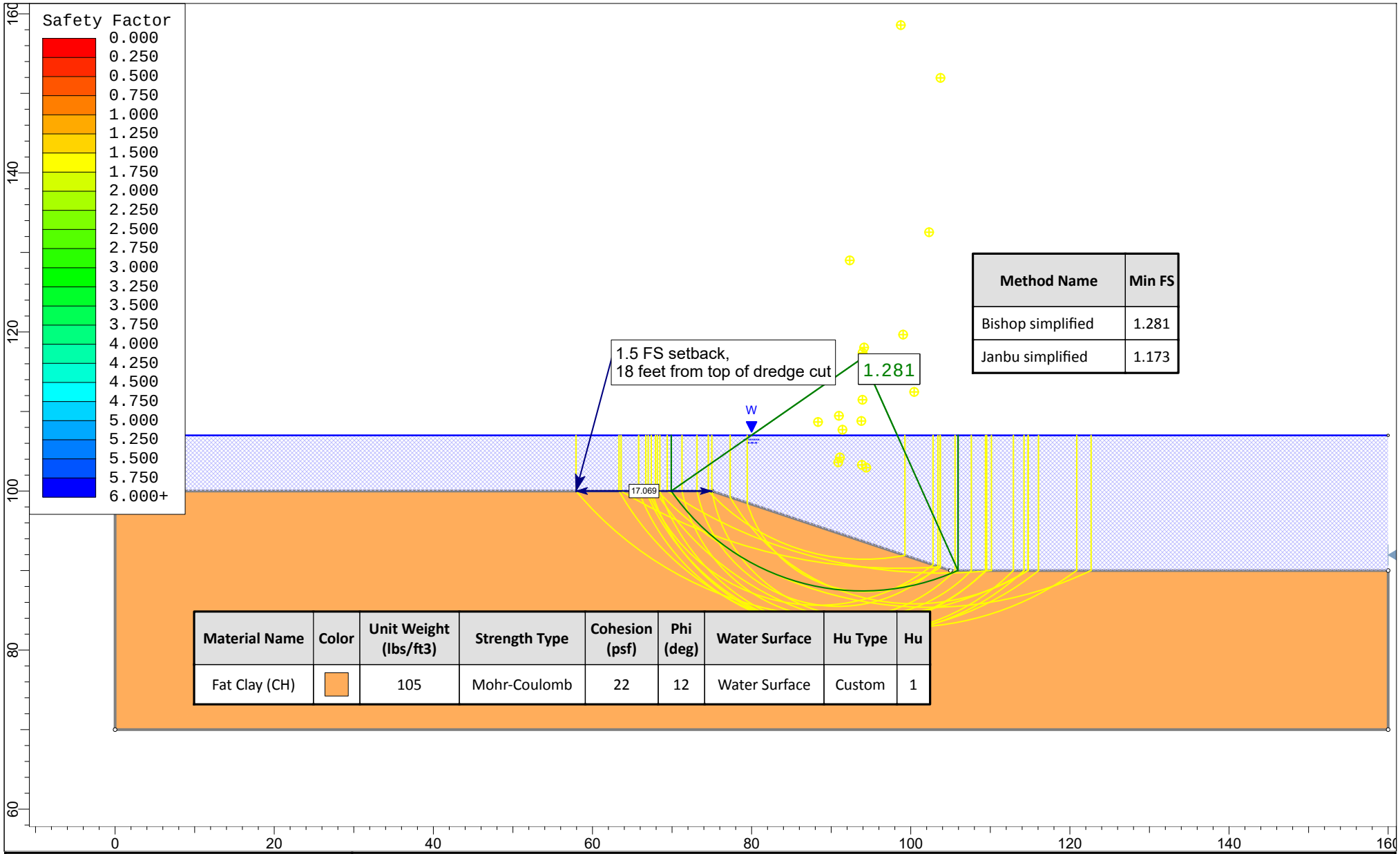
SLIDEINTERPRET 7.013

Project	Laguna Lake Dredging Study		
Analysis Description	Dredge Cut Stability		
Drawn By	Doyel, Lauren J	*Scale* 1:200	*Company* Leighton Consulting, Inc.
Date	4/20/2016, 11:44:22 AM		*File Name* 11254001_Section X 3to1 cut.slim



Project	Laguna Lake Dredging Study		
Analysis Description	Dredge Cut Stability		
Drawn By: Doyel, Lauren J	Scale: 1:205	Company: Leighton Consulting, Inc.	
Date: 4/20/2016, 11:44:22 AM		File Name: 11254001_Section X 3to1 cut_drawdown.slim	

SLIDEINTERPRET 7.013



Method Name	Min FS
Bishop simplified	1.281
Janbu simplified	1.173

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Fat Clay (CH)		105	Mohr-Coulomb	22	12	Water Surface	Custom	1

SLIDEINTERPRET 7.013

Project	Laguna Lake Dredging Study		
Analysis Description	Static Dredge Cut Stability		
Drawn By	Doyel, Lauren J	Scale 1:200	Company Leighton Consulting, Inc.
Date	4/20/2016, 11:44:22 AM		File Name 11254001_Section X 3to1 cut_Lower bound.slim

APPENDIX E
DISCRETE SEDIMENT CHEMISTRY TESTING

March 31, 2016

Lauren Doyel
Leighton Consulting, Inc.
1822 Goodyear Avenue
Ventura, CA 93003
Tel: (661) 705-3021
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1601126
Client Reference : Laguna Lake, 11254.001

Enclosed are the results for sample(s) received on March 24, 2016 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
LS-1	1601126-01	Sediment	3/21/16 10:00	3/24/16 14:55
LS-2	1601126-02	Sediment	3/21/16 11:00	3/24/16 14:55
LS-3	1601126-03	Sediment	3/21/16 11:10	3/24/16 14:55
LS-4	1601126-04	Sediment	3/21/16 11:20	3/24/16 14:55
LS-5	1601126-05	Sediment	3/21/16 15:10	3/24/16 14:55

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Client Sample ID LS-1
Lab ID: 1601126-01

Percent Solids
Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**85**	0.10	1	B6C0831	03/30/2016	03/30/16 10:30	

Nitrate by Ion Chromatography EPA 300
Analyst: PT

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Nitrate, as N	ND	1.2	1	B6C0807	03/29/2016	03/29/16 14:05	

Orthophosphate by Ion Chromatography EPA 300
Analyst: PT

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
ortho-Phosphate, as P	**8.3**	0.59	1	B6C0807	03/29/2016	03/29/16 14:05	

Title 22 Metals by ICP-AES EPA 6010B
Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.4	1	B6C0774	03/29/2016	03/30/16 09:39	
Arsenic	**1.3**	1.2	1	B6C0774	03/29/2016	03/30/16 09:39	
Barium	**30**	1.2	1	B6C0774	03/29/2016	03/30/16 09:38	
Beryllium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:38	
Cadmium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:39	
Chromium	**67**	1.2	1	B6C0774	03/29/2016	03/30/16 09:38	
Cobalt	**9.4**	1.2	1	B6C0774	03/29/2016	03/30/16 09:39	
Copper	**12**	2.4	1	B6C0774	03/29/2016	03/30/16 09:38	
Lead	**3.6**	1.2	1	B6C0774	03/29/2016	03/30/16 09:39	
Molybdenum	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:38	
Nickel	**63**	1.2	1	B6C0774	03/29/2016	03/30/16 09:38	
Selenium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:39	
Silver	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:38	
Thallium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:39	
Vanadium	**21**	1.2	1	B6C0774	03/29/2016	03/30/16 09:38	
Zinc	**22**	1.2	1	B6C0774	03/29/2016	03/30/16 10:36	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Client Sample ID LS-1

Lab ID: 1601126-01

Hexavalent Chromium by EPA 7196A/3060A **Analyst: LA**

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**1.4**	1.2	1	B6C0785	03/29/2016	03/31/16 10:07	

Mercury by AA (Cold Vapor) EPA 7471A **Analyst: SB**

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.12	1	B6C0780	03/29/2016	03/30/16 10:18	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Client Sample ID LS-2
Lab ID: 1601126-02

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**86**	0.10	1	B6C0831	03/30/2016	03/30/16 10:30	

Nitrate by Ion Chromatography EPA 300

Analyst: PT

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Nitrate, as N	**34**	1.2	1	B6C0807	03/29/2016	03/29/16 14:16	

Orthophosphate by Ion Chromatography EPA 300

Analyst: PT

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
ortho-Phosphate, as P	**22**	0.58	1	B6C0807	03/29/2016	03/29/16 14:16	

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.3	1	B6C0774	03/29/2016	03/30/16 09:48	
Arsenic	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:48	
Barium	**54**	1.2	1	B6C0774	03/29/2016	03/30/16 09:48	
Beryllium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:47	
Cadmium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:48	
Chromium	**2500**	5.8	5	B6C0774	03/29/2016	03/30/16 10:02	D6
Cobalt	**140**	1.2	1	B6C0774	03/29/2016	03/30/16 09:48	
Copper	**23**	2.3	1	B6C0774	03/29/2016	03/30/16 09:48	
Lead	**18**	1.2	1	B6C0774	03/29/2016	03/30/16 09:48	
Molybdenum	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:48	
Nickel	**2400**	5.8	5	B6C0774	03/29/2016	03/30/16 10:02	D6
Selenium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:48	
Silver	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:48	
Thallium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:48	
Vanadium	**46**	1.2	1	B6C0774	03/29/2016	03/30/16 09:48	
Zinc	**79**	5.8	5	B6C0774	03/29/2016	03/30/16 10:41	D6

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Client Sample ID LS-2
Lab ID: 1601126-02

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**7.8**	1.2	1	B6C0785	03/29/2016	03/31/16 10:07	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.12	1	B6C0780	03/29/2016	03/30/16 10:31	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Client Sample ID LS-3
Lab ID: 1601126-03

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**60**	0.10	1	B6C0831	03/30/2016	03/30/16 10:30	

Nitrate by Ion Chromatography EPA 300

Analyst: PT

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Nitrate, as N	ND	1.7	1	B6C0807	03/29/2016	03/29/16 14:27	

Orthophosphate by Ion Chromatography EPA 300

Analyst: PT

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
ortho-Phosphate, as P	**1.6**	0.83	1	B6C0807	03/29/2016	03/29/16 14:27	

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	3.3	1	B6C0774	03/29/2016	03/30/16 09:52	
Arsenic	**4.0**	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Barium	**140**	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Beryllium	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:51	
Cadmium	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Chromium	**1100**	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Cobalt	**130**	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Copper	**23**	3.3	1	B6C0774	03/29/2016	03/30/16 09:52	
Lead	**4.8**	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Molybdenum	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Nickel	**1700**	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Selenium	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Silver	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Thallium	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Vanadium	**57**	1.7	1	B6C0774	03/29/2016	03/30/16 09:52	
Zinc	**37**	1.7	1	B6C0774	03/29/2016	03/30/16 10:43	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Client Sample ID LS-3
Lab ID: 1601126-03

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**8.5**	1.7	1	B6C0785	03/29/2016	03/31/16 10:07	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.17	1	B6C0780	03/29/2016	03/30/16 10:32	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Client Sample ID LS-4
Lab ID: 1601126-04

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**58**	0.10	1	B6C0831	03/30/2016	03/30/16 10:30	

Nitrate by Ion Chromatography EPA 300

Analyst: PT

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Nitrate, as N	ND	1.7	1	B6C0807	03/29/2016	03/29/16 14:39	

Orthophosphate by Ion Chromatography EPA 300

Analyst: PT

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
ortho-Phosphate, as P	**7.6**	0.86	1	B6C0807	03/29/2016	03/29/16 14:39	

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	3.4	1	B6C0774	03/29/2016	03/30/16 09:56	
Arsenic	**2.0**	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Barium	**120**	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Beryllium	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:55	
Cadmium	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Chromium	**590**	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Cobalt	**52**	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Copper	**17**	3.4	1	B6C0774	03/29/2016	03/30/16 09:56	
Lead	**5.7**	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Molybdenum	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Nickel	**770**	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Selenium	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Silver	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Thallium	ND	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Vanadium	**36**	1.7	1	B6C0774	03/29/2016	03/30/16 09:56	
Zinc	**44**	1.7	1	B6C0774	03/29/2016	03/30/16 10:45	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Client Sample ID LS-4

Lab ID: 1601126-04

Hexavalent Chromium by EPA 7196A/3060A **Analyst: LA**

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.7	1	B6C0785	03/29/2016	03/31/16 10:07	

Mercury by AA (Cold Vapor) EPA 7471A **Analyst: SB**

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.17	1	B6C0780	03/29/2016	03/30/16 10:34	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Client Sample ID LS-5
Lab ID: 1601126-05

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**83**	0.10	1	B6C0831	03/30/2016	03/30/16 10:30	

Nitrate by Ion Chromatography EPA 300

Analyst: PT

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Nitrate, as N	ND	1.2	1	B6C0807	03/29/2016	03/29/16 14:50	

Orthophosphate by Ion Chromatography EPA 300

Analyst: PT

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
ortho-Phosphate, as P	ND	0.60	1	B6C0807	03/29/2016	03/29/16 14:50	

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.4	1	B6C0774	03/29/2016	03/30/16 09:59	
Arsenic	**3.4**	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Barium	**100**	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Beryllium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:58	
Cadmium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Chromium	**150**	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Cobalt	**23**	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Copper	**29**	2.4	1	B6C0774	03/29/2016	03/30/16 09:59	
Lead	**4.5**	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Molybdenum	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Nickel	**180**	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Selenium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Silver	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Thallium	ND	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Vanadium	**56**	1.2	1	B6C0774	03/29/2016	03/30/16 09:59	
Zinc	**38**	1.2	1	B6C0774	03/29/2016	03/30/16 10:47	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Client Sample ID LS-5

Lab ID: 1601126-05

Hexavalent Chromium by EPA 7196A/3060A **Analyst: LA**

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.2	1	B6C0785	03/29/2016	03/31/16 10:07	

Mercury by AA (Cold Vapor) EPA 7471A **Analyst: SB**

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.12	1	B6C0780	03/29/2016	03/30/16 10:36	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

QUALITY CONTROL SECTION

Percent Solids - Quality Control

Analyte	Result (% by Weight)	PQL (% by Weight)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6C0831 - No_Prep_WC1_SED									
Duplicate (B6C0831-DUP1)		**Source: 1601126-01**		Prepared: 3/30/2016 Analyzed: 3/30/2016					
Percent Solids	79.0318	0.10		84.5622	NR		6.76	30	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Nitrate by Ion Chromatography EPA 300 - Quality Control

Analyte	Result (mg/kg wet)	PQL (mg/kg wet)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6C0807 - Prep_IC1_SED									
Blank (B6C0807-BLK1)				Prepared: 3/29/2016 Analyzed: 3/29/2016					
Nitrate, as N	ND	1.0			NR				
LCS (B6C0807-BS1)				Prepared: 3/29/2016 Analyzed: 3/29/2016					
Nitrate, as N	26.6690	1.0	25.0000		107	90 - 110			
Duplicate (B6C0807-DUP1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/29/2016					
Nitrate, as N	1.25470	1.2		1.12225	NR		11.1	20	
Matrix Spike (B6C0807-MS1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/29/2016					
Nitrate, as N	34.2978	1.2	29.5641	1.12225	112	80 - 120			
Matrix Spike Dup (B6C0807-MSD1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/29/2016					
Nitrate, as N	34.2706	1.2	29.5641	1.12225	112	80 - 120	0.0793	20	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Orthophosphate by Ion Chromatography EPA 300 - Quality Control

Analyte	Result (mg/kg wet)	PQL (mg/kg wet)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6C0807 - Prep_IC1_SED									
Blank (B6C0807-BLK1)				Prepared: 3/29/2016 Analyzed: 3/29/2016					
ortho-Phosphate, as P	ND	0.50			NR				
LCS (B6C0807-BS1)				Prepared: 3/29/2016 Analyzed: 3/29/2016					
ortho-Phosphate, as P	25.5060	0.50	25.0000		102	90 - 110			
Duplicate (B6C0807-DUP1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/29/2016					
ortho-Phosphate, as P	8.29922	0.59		8.33706	NR		0.455	20	
Matrix Spike (B6C0807-MS1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/29/2016					
ortho-Phosphate, as P	35.6614	0.59	29.5641	8.33706	92.4	80 - 120			
Matrix Spike Dup (B6C0807-MSD1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/29/2016					
ortho-Phosphate, as P	35.5596	0.59	29.5641	8.33706	92.1	80 - 120	0.286	20	

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg wet)	PQL (mg/kg wet)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6C0774 - EPA 3050B_SED									
Blank (B6C0774-BLK1)				Prepared: 3/29/2016 Analyzed: 3/30/2016					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Blank (B6C0774-BLK2)				Prepared: 3/29/2016 Analyzed: 3/30/2016					
Zinc	ND	1.0			NR				
LCS (B6C0774-BS1)				Prepared: 3/29/2016 Analyzed: 3/30/2016					
Antimony	46.5806	2.0	50.0000		93.2	80 - 120			
Arsenic	46.7709	1.0	50.0000		93.5	80 - 120			
Barium	49.2180	1.0	50.0000		98.4	80 - 120			
Beryllium	49.1156	1.0	50.0000		98.2	80 - 120			
Cadmium	49.2247	1.0	50.0000		98.4	80 - 120			
Chromium	45.6576	1.0	50.0000		91.3	80 - 120			
Cobalt	48.4805	1.0	50.0000		97.0	80 - 120			
Copper	47.9651	2.0	50.0000		95.9	80 - 120			
Lead	49.2736	1.0	50.0000		98.5	80 - 120			
Molybdenum	47.8737	1.0	50.0000		95.7	80 - 120			
Nickel	48.3520	1.0	50.0000		96.7	80 - 120			
Selenium	46.0531	1.0	50.0000		92.1	80 - 120			
Silver	47.3247	1.0	50.0000		94.6	80 - 120			
Thallium	48.1201	1.0	50.0000		96.2	80 - 120			
Vanadium	47.8907	1.0	50.0000		95.8	80 - 120			
LCS (B6C0774-BS2)				Prepared: 3/29/2016 Analyzed: 3/30/2016					
Zinc	43.6280	1.0	50.0000		87.3	80 - 120			
Matrix Spike (B6C0774-MS1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/30/2016					
Antimony	118.072	2.4	147.820	ND	79.9	28 - 106			
Arsenic	137.503	1.2	147.820	1.34746	92.1	57 - 109			

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6C0774 - EPA 3050B_SED (continued)									
Matrix Spike (B6C0774-MS1) - Continued		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/30/2016					
Barium	183.313	1.2	147.820	29.8436	104	18 - 159			
Beryllium	141.229	1.2	147.820	ND	95.5	61 - 107			
Cadmium	137.766	1.2	147.820	0.212236	93.1	53 - 104			
Chromium	215.197	1.2	147.820	66.6211	101	53 - 121			
Cobalt	150.054	1.2	147.820	9.41397	95.1	55 - 109			
Copper	164.298	2.4	147.820	11.8114	103	58 - 124			
Lead	140.014	1.2	147.820	3.57789	92.3	35 - 129			
Molybdenum	126.003	1.2	147.820	ND	85.2	57 - 108			
Nickel	242.616	1.2	147.820	62.5196	122	44 - 122			
Selenium	133.916	1.2	147.820	ND	90.6	54 - 104			
Silver	134.253	1.2	147.820	ND	90.8	60 - 112			
Thallium	130.245	1.2	147.820	ND	88.1	50 - 103			
Vanadium	159.325	1.2	147.820	20.7708	93.7	54 - 123			
Matrix Spike (B6C0774-MS2)		**Source: 1601126-01RE1**		Prepared: 3/29/2016 Analyzed: 3/30/2016					
Zinc	142.097	1.2	147.820	21.6682	81.5	29 - 132			
Matrix Spike Dup (B6C0774-MSD1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/30/2016					
Antimony	114.747	2.4	147.820	ND	77.6	28 - 106	2.86	20	
Arsenic	134.893	1.2	147.820	1.34746	90.3	57 - 109	1.92	20	
Barium	178.514	1.2	147.820	29.8436	101	18 - 159	2.65	20	
Beryllium	137.376	1.2	147.820	ND	92.9	61 - 107	2.77	20	
Cadmium	133.032	1.2	147.820	0.212236	89.9	53 - 104	3.50	20	
Chromium	238.945	1.2	147.820	66.6211	117	53 - 121	10.5	20	
Cobalt	147.180	1.2	147.820	9.41397	93.2	55 - 109	1.93	20	
Copper	156.343	2.4	147.820	11.8114	97.8	58 - 124	4.96	20	
Lead	136.320	1.2	147.820	3.57789	89.8	35 - 129	2.67	20	
Molybdenum	123.407	1.2	147.820	ND	83.5	57 - 108	2.08	20	
Nickel	249.435	1.2	147.820	62.5196	126	44 - 122	2.77	20	M1
Selenium	129.498	1.2	147.820	ND	87.6	54 - 104	3.35	20	
Silver	130.501	1.2	147.820	ND	88.3	60 - 112	2.83	20	
Thallium	127.440	1.2	147.820	ND	86.2	50 - 103	2.18	20	
Vanadium	157.926	1.2	147.820	20.7708	92.8	54 - 123	0.882	20	
Matrix Spike Dup (B6C0774-MSD2)		**Source: 1601126-01RE1**		Prepared: 3/29/2016 Analyzed: 3/30/2016					
Zinc	141.093	1.2	147.820	21.6682	80.8	29 - 132	0.709	20	

Certificate of Analysis

Leighton Consulting, Inc.	Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue	Report To :	Lauren Doyel
Ventura , CA 93003	Reported :	03/31/2016

Hexavalent Chromium by EPA 7196A/3060A - Quality Control

Analyte	Result (mg/kg wet)	PQL (mg/kg wet)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6C0785 - EPA 3060A_SED (WC)									
Blank (B6C0785-BLK1)				Prepared: 3/29/2016 Analyzed: 3/31/2016					
Hexavalent Chromium	ND	1.0			NR				
LCS (B6C0785-BS1)				Prepared: 3/29/2016 Analyzed: 3/31/2016					
Hexavalent Chromium	46.9000	1.0	50.0000		93.8	80 - 120			
Duplicate (B6C0785-DUP1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/31/2016					
Hexavalent Chromium	ND	1.2		1.41908	NR			20	
Matrix Spike (B6C0785-MS1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/31/2016					
Hexavalent Chromium	3.66594	1.2	59.1281	1.41908	3.80	75 - 125			M2
Matrix Spike (B6C0785-MS2)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/31/2016					
Hexavalent Chromium	1963.05	59	1901.56	1.41908	103	75 - 125			
Matrix Spike Dup (B6C0785-MSD1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/31/2016					
Hexavalent Chromium	5.32153	1.2	59.1281	1.41908	6.60	75 - 125	36.8	20	M2

Certificate of Analysis

Leighton Consulting, Inc.	Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue	Report To :	Lauren Doyel
Ventura , CA 93003	Reported :	03/31/2016

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg wet)	PQL (mg/kg wet)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6C0780 - EPA 7471_SED									
Blank (B6C0780-BLK1)				Prepared: 3/29/2016 Analyzed: 3/30/2016					
Mercury	ND	0.10			NR				
LCS (B6C0780-BS1)				Prepared: 3/29/2016 Analyzed: 3/30/2016					
Mercury	0.807760	0.10	0.833333		96.9	80 - 120			
Matrix Spike (B6C0780-MS1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/30/2016					
Mercury	0.943648	0.12	0.985468	0.034907	92.2	70 - 130			
Matrix Spike Dup (B6C0780-MSD1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/30/2016					
Mercury	0.931287	0.12	0.985468	0.034907	91.0	70 - 130	1.32	20	
Post Spike (B6C0780-PS1)		**Source: 1601126-01**		Prepared: 3/29/2016 Analyzed: 3/30/2016					
Mercury	0.005736		5.00000E-3	ND	108	85 - 115			

Certificate of Analysis

Leighton Consulting, Inc.		Project Number :	Laguna Lake, 11254.001
1822 Goodyear Avenue		Report To :	Lauren Doyel
Ventura , CA 93003		Reported :	03/31/2016

Notes and Definitions

M2	Matrix spike recovery outside of acceptance limit due to possible matrix interference. The analytical batch was validated by the laboratory control sample.
M1	Matrix spike recovery outside of acceptance limit. The analytical batch was validated by the laboratory control sample.
D6	Sample required dilution due to high concentration of target analyte.
ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 1

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport	Sample Conditions Upon Receipt					
	Condition	Y	N	Condition	Y	N
☐ Client ☒ ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
☐ FedEx ☐ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
☐ GSO	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 5.2		
☐ Other:	4. SEALED	☐	☑			

CUSTOMER

Company: Leighton Consulting, Inc.
Address: 1822 Goodyear
City: Ventura
State: CA
Zip: 93003
Tel: 661-705-3021
Fax:

SEND REPORT TO:
Attn: Lauren Degel
Email: ldegel@leightongroup.com
Company: Leighton Consulting, Inc.
Address: 1822 Goodyear
City: Ventura
State: CA
Zip: 93003

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Accounts Payable
Email: acctpayable@leightongroup.com
Company: Leighton Consulting, Inc.
Address: 17751 Cowan
City: Irvine
State: CA
Zip: 92614

PROJECT SAMPLES

Project Name: Laguna Lake
Project No.: 11254.001
Sampler: Robin Tarber
Quote No: —
PO #: —
Special Instructions/Comments: —

Encircle or Write Requested Analysis; Encircle Sample Matrix; Container; QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 / 7000(Title 22 Metals)	TO-15	7196 Hex chromium	EPA 300 Phosphate	EPA 300 Nitrate	SOIL / SEDIMENT / SLUDGE	SOLIDS / WIPE / FILTER	WATER - DRINKING / GROUND	WATER - STORM / WASTE	AQUEOUS / LAYERED - OIL	TAT	#	Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (Ac)2; 6=NaOH; 7=NA2S2O3	REMARKS
1	1601125 - 1	LS-1	3-21-16	1000							X		X	X	X	X					5	1	5	1		
2	- 2	LS-2	↓	1100							X		X	X	X	X					↓	↓	↓	↓		
3	- 3	LS-3	↓	1110							X		X	X	X	X					↓	↓	↓	↓		
4	- 4	LS-4	↓	1120							X		X	X	X	X					↓	↓	↓	↓		
5	- 5	LS-5	↓	1510							X		X	X	X	X					↓	↓	↓	↓		
6																										
7																										
8																										
9																										
10																										

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab -- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for fi ve (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-fi ve (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Wallace Seniors — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Wallace Seniors	3-24-16	1455	Edward Rodriguez	3-24-16	1455
Edward Rodriguez	3-24-16	1835	Edward Rodriguez	3/24/16	1835

April 11, 2016

Robin Ferber
Leighton Consulting
25570 Rye Cyn Rd
Santa Clarita, CA 91355
Tel: (661) 755-4772
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1601203
Client Reference : Laguna Lake Dredging, 11254.001

Enclosed are the results for sample(s) received on April 01, 2016 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
V1-S1 (0.'1)	1601203-01	Sediment	3/31/16 11:40	4/01/16 15:40
V1-S2 (5')	1601203-02	Sediment	3/31/16 12:03	4/01/16 15:40
V1-S3 (10')	1601203-03	Sediment	3/31/16 11:59	4/01/16 15:40
V3-S1 (0.'1)	1601203-04	Sediment	3/31/16 11:07	4/01/16 15:40
V3-S2 (5')	1601203-05	Sediment	3/31/16 11:11	4/01/16 15:40
V3-S3 (10')	1601203-06	Sediment	3/31/16 11:15	4/01/16 15:40
V7-S1 (0.1)	1601203-07	Sediment	3/31/16 9:30	4/01/16 15:40
V7-S2 (5')	1601203-08	Sediment	3/31/16 9:33	4/01/16 15:40
V7-S3 (10')	1601203-09	Sediment	3/31/16 9:43	4/01/16 15:40
V7-S4 (14')	1601203-10	Sediment	3/31/16 9:48	4/01/16 15:40
V11-S1 (0.'1)	1601203-11	Sediment	3/30/16 15:28	4/01/16 15:40
V11-S2 (6')	1601203-12	Sediment	3/30/16 15:32	4/01/16 15:40
V11-S3 (12.5')	1601203-13	Sediment	3/30/16 15:36	4/01/16 15:40
V14-S1 (0.'1)	1601203-14	Sediment	3/30/16 11:22	4/01/16 15:40
V14-S2 (4' 7")	1601203-15	Sediment	3/30/16 11:27	4/01/16 15:40
V14-S3 (9' 4")	1601203-16	Sediment	3/30/16 11:31	4/01/16 15:40

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V1-S1 (0.'1)
Lab ID: 1601203-01

Percent Solids
Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**64**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B
Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	1.6	1	B6D0142	04/07/2016	04/08/16 15:15	
Nickel	**210**	1.6	1	B6D0142	04/07/2016	04/08/16 15:15	

Hexavalent Chromium by EPA 7196A/3060A
Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.6	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V1-S2 (5')
Lab ID: 1601203-02

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**49**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**150**	2.0	1	B6D0142	04/07/2016	04/08/16 15:19	
Nickel	**220**	2.0	1	B6D0142	04/07/2016	04/08/16 15:19	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**2.9**	2.0	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V1-S3 (10')
Lab ID: 1601203-03

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**70**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	1.4	1	B6D0142	04/07/2016	04/08/16 15:21	
Nickel	**190**	1.4	1	B6D0142	04/07/2016	04/08/16 15:21	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**3.1**	1.4	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V3-S1 (0.'1)
Lab ID: 1601203-04

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**63**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	1.6	1	B6D0142	04/07/2016	04/08/16 15:23	
Nickel	**210**	1.6	1	B6D0142	04/07/2016	04/08/16 15:23	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.6	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V3-S2 (5')
Lab ID: 1601203-05

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**44**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**170**	2.3	1	B6D0142	04/07/2016	04/08/16 15:24	
Nickel	**260**	2.3	1	B6D0142	04/07/2016	04/08/16 15:24	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**2.3**	2.3	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V3-S3 (10')
Lab ID: 1601203-06

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**57**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**160**	1.7	1	B6D0142	04/07/2016	04/08/16 15:26	
Nickel	**220**	1.7	1	B6D0142	04/07/2016	04/08/16 15:26	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.7	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V7-S1 (0.1)
Lab ID: 1601203-07

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**46**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**160**	2.2	1	B6D0142	04/07/2016	04/08/16 15:32	
Nickel	**250**	2.2	1	B6D0142	04/07/2016	04/08/16 15:32	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	2.2	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V7-S2 (5')
Lab ID: 1601203-08

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**51**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	2.0	1	B6D0142	04/07/2016	04/08/16 15:33	
Nickel	**200**	2.0	1	B6D0142	04/07/2016	04/08/16 15:33	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	2.0	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V7-S3 (10')
Lab ID: 1601203-09

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**59**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	1.7	1	B6D0142	04/07/2016	04/08/16 15:35	
Nickel	**230**	1.7	1	B6D0142	04/07/2016	04/08/16 15:35	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.7	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V7-S4 (14')
Lab ID: 1601203-10

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**50**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**170**	2.0	1	B6D0142	04/07/2016	04/08/16 15:37	
Nickel	**260**	2.0	1	B6D0142	04/07/2016	04/08/16 15:37	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	2.0	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V11-S1 (0.'1)
Lab ID: 1601203-11

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**65**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	1.5	1	B6D0142	04/07/2016	04/08/16 15:38	
Nickel	**220**	1.5	1	B6D0142	04/07/2016	04/08/16 15:38	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.5	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V11-S2 (6')
Lab ID: 1601203-12

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**59**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**180**	1.7	1	B6D0142	04/07/2016	04/08/16 15:40	
Nickel	**250**	1.7	1	B6D0142	04/07/2016	04/08/16 15:40	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**3.0**	1.7	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V11-S3 (12.5')
Lab ID: 1601203-13

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**51**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**210**	2.0	1	B6D0142	04/07/2016	04/08/16 15:42	
Nickel	**280**	2.0	1	B6D0142	04/07/2016	04/08/16 15:42	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	2.0	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V14-S1 (0.'1)
Lab ID: 1601203-14

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**56**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**160**	1.8	1	B6D0142	04/07/2016	04/08/16 15:43	
Nickel	**230**	1.8	1	B6D0142	04/07/2016	04/08/16 15:43	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.8	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V14-S2 (4' 7")
Lab ID: 1601203-15

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**46**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**190**	2.2	1	B6D0142	04/07/2016	04/08/16 15:45	
Nickel	**290**	2.2	1	B6D0142	04/07/2016	04/08/16 15:45	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	2.2	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Client Sample ID V14-S3 (9' 4'')
Lab ID: 1601203-16

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**77**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**210**	1.3	1	B6D0142	04/07/2016	04/08/16 15:46	
Nickel	**350**	1.3	1	B6D0142	04/07/2016	04/08/16 15:46	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.3	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

QUALITY CONTROL SECTION

Percent Solids - Quality Control

Analyte	Result (% by Weight)	PQL (% by Weight)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6D0193 - No_Prep_WC1_SED									
Duplicate (B6D0193-DUP1)		**Source: 1601203-16**		Prepared: 4/8/2016 Analyzed: 4/8/2016					
Percent Solids	77.7539	0.10		77.4859	NR		0.345	30	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Total Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg wet)	PQL (mg/kg wet)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6D0142 - EPA 3050B_SED									
Blank (B6D0142-BLK1)				Prepared: 4/7/2016 Analyzed: 4/8/2016					
Chromium	ND	1.0			NR				
Nickel	ND	1.0			NR				
LCS (B6D0142-BS1)				Prepared: 4/7/2016 Analyzed: 4/8/2016					
Chromium	48.0606	1.0	50.0000		96.1	80 - 120			
Nickel	45.3273	1.0	50.0000		90.7	80 - 120			
Matrix Spike (B6D0142-MS1)		**Source: 1601203-01**		Prepared: 4/7/2016 Analyzed: 4/8/2016					
Chromium	285.966	1.6	195.895	143.784	72.6	53 - 121			
Nickel	326.476	1.6	195.895	205.954	61.5	44 - 122			
Matrix Spike Dup (B6D0142-MSD1)		**Source: 1601203-01**		Prepared: 4/7/2016 Analyzed: 4/8/2016					
Chromium	290.574	1.6	195.895	143.784	74.9	53 - 121	1.60	20	
Nickel	332.348	1.6	195.895	205.954	64.5	44 - 122	1.78	20	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Hexavalent Chromium by EPA 7196A/3060A - Quality Control

Analyte	Result (mg/kg wet)	PQL (mg/kg wet)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6D0098 - EPA 3060A_SED (WC)									
Blank (B6D0098-BLK1)				Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	ND	1.0			NR				
LCS (B6D0098-BS1)				Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	42.6000	1.0	50.0000		85.2	80 - 120			
Duplicate (B6D0098-DUP1)		**Source: 1601203-01**		Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	3.91791	1.6		ND	NR			20	R
Matrix Spike (B6D0098-MS1)		**Source: 1601203-01**		Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	31.5000	1.6	78.3581	ND	40.2	75 - 125			M2
Matrix Spike (B6D0098-MS2)		**Source: 1601203-01**		Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	2758.20	78	2520.00	ND	109	75 - 125			
Matrix Spike Dup (B6D0098-MSD1)		**Source: 1601203-01**		Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	31.6567	1.6	78.3581	ND	40.4	75 - 125	0.496	20	M2

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/11/2016

Notes and Definitions

R	RPD value outside acceptance criteria. Calculation is based on raw values.
M2	Matrix spike recovery outside of acceptance limit due to possible matrix interference. The analytical batch was validated by the laboratory control sample.
ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED TECHNOLOGY LABORATORIES

3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport	Sample Conditions Upon Receipt: Condition	Y	N	Condition	Y	N
☐ Client ☒ ATL ☐ FedEx ☐ OnTrac ☐ GSO ☐ Other:	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 5.4		
	4. SEALED	☐	☑			

CUSTOMER

Company: Leighton Consulting, Inc.
Address: 25570 Rye Canyon Road
City: Santa Clarita State: CA Zip: 91355
Tel: 661.705.3025 Fax:

SEND REPORT TO:
Attn: Robin Ferber Email: rferber@leightongroup.com
Company: Leighton Consulting, Inc.
Address: 25570 Rye Canyon Road
City: Santa Clarita State: CA Zip: 91355

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: Laguna Lake Dredging
Project No.: 11254.001
Sampler: Vibracore
Quote No:
PO #:
Special Instructions/Comments: Copy Lauren Doyel at Ldoyel@leightongroup.com on report

Encircle or Write Requested Analysis: 8260 / 624 (Volatiles); 8015(GRO); 8015(DRO); 8270(Semi-volatiles); 8081(Organochlorine Pesticides); 8082(PCBs); 6010 / 7000(Title 22 Metals); TO-15; Chromium total - 6010B; Nickel total - 6010B; Chromium VI 7196-3060

Encircle Sample Matrix: SOIL / SEDIMENT / SLUDGE; SOLIDS / WIPE / FILTER; WATER - DRINKING / GROUND; WATER - STORM / WASTE; AQUEOUS / LAYERED - OIL

Container: # ; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7 = Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn (Ac)2; 6=NaOH; 7=NA2S2O3

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	Chromium total - 6010B	Nickel total - 6010B	Chromium VI 7196-3060	TAT	REMARKS
1	1601203-1	V1-S1 (0.1)	3/31/16	11:40	X	X	X	5	
2	-2	V1-S2 (5')	3/31/16	12:03	X	X	X		
3	-3	V1-S3 (10')	3/31/16	11:59	X	X	X		
4	-4	V3-S1 (0.1)	3/31/16	11:07	X	X	X		
5	-5	V3-S2 (5')	3/31/16	11:11	X	X	X		
6	-6	V3-S3 (10')	3/31/16	11:15	X	X	X		
7	-7	V7-S1 (0.1)	3/31/16	09:30	X	X	X		
8	-8	V7-S2 (5')	3/31/16	09:33	X	X	X		
9	-9	V7-S3 (10')	3/31/16	09:43	X	X	X		
10	-10	V7-S4 (14')	3/31/16	09:48	X	X	X		

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for fi ve (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-fi ve (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Submitter Print Name _____ Signature _____

SIGNATURES

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Luis S. Rodriguez	3/31/16				
Lauren J. Doyel	4/1/16		Edward Rodriguez	4-1-16	1540
Edward Rodriguez	4-1-16	1830	FEDEX	4/1/16	1830

ADVANCED ATECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport: ☐ Client ☒ ATL ☐ FedEx ☐ OnTrac ☐ GSO ☐ Other:

Sample Conditions Upon Receipt					
Condition	Y	N	Condition	Y	N
1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C:	5.4	
4. SEALED	☐	☑			

CUSTOMER

Company: Leighton Consulting, Inc.
Address: 25570 Rye Canyon Road
City: Santa Clarita State: CA Zip: 91350
Tel: 661.289.1273 Fax:

SEND REPORT TO:
Attn: Robin Ferber Email: rferber@leightongroup.com
Company: Leighton Consulting
Address: 25570 Rye Canyon Road
City: Santa Clarita State: CA Zip: 91350

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: Laguna Lake
Project No.: 11254.001
Sampler: Vibra-core
Quote No:
PO #:
Special Instructions/Comments: copy Lauren Doyel @ ldoyel@leightongroup.com on report

Encircle or Write Requested Analysis: 8260 / 624 (Volatiles); 8015(GRO); 8015(DRO); 8270(Semi-volatiles); 8081(Organochlorine Pesticides); 8082(PCBs); 6010 / 7000(Title 22 Metals); TO-15; Chromium total 6010B; Nickel total 6010B; Chromium VI EPA 7196-3060A

Encircle Sample Matrix: SOIL / SEDIMENT / SLUDGE; SOLIDS / WIPE/ FILTER; WATER - DRINKING / GROUND; WATER - STORM / WASTE; AQUEOUS / LAYERED - OIL

Container: # ; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (AcI)2; 6=NaOH; 7=NA2S2O3

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 / 7000(Title 22 Metals)	TO-15	Chromium total 6010B	Nickel total 6010B	Chromium VI EPA 7196-3060A	TAT	#	Type	Material	Preservative	REMARKS
1	1601203-11	V11-S1 (0.1')	3/30/16	15:28									X	X	X	5					
2	-12	V11-S2 (6')	3/30/16	15:32									X	X	X						
3	-13	V11-S3 (12.5')	3/30/16	15:36									X	X	X						
4	-14	V14-S1 (0.1')	3/30/16	11:22									X	X	X						
5	-15	V14-S2 (4'7")	3/30/16	11:27									X	X	X						
6	-16	V14-S3 (9'4")	3/30/16	11:31									X	X	X						
7		~~V13-S3~~																			
8	-17	LL16-D01 Discrete-01	3/30/16	11:59																	HOLD
9	-18	LL16-D03 Discrete-03	3/30/16	11:15																	HOLD
10																					

SUBMITTED TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Submitter Print Name _____ Signature _____

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
~~Luis J. Rincon~~ CR	~~3/31/16~~				
LAUREN J. DOYEL	4/1/16		Edward Rodriguez	4-1-16	1540
Edward Rodriguez	4-1-16	1830	Fedex	4/1/16	1830

April 22, 2016

Robin Ferber
Leighton Consulting
25570 Rye Cyn Rd
Santa Clarita, CA 91355
Tel: (661) 755-4772
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1601203
Client Reference : Laguna Lake Dredging, 11254.001

Enclosed are the results for sample(s) received on April 01, 2016 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
V1-S1 (0.'1)	1601203-01	Sediment	3/31/16 11:40	4/01/16 15:40
V1-S2 (5')	1601203-02	Sediment	3/31/16 12:03	4/01/16 15:40
V1-S3 (10')	1601203-03	Sediment	3/31/16 11:59	4/01/16 15:40
V3-S1 (0.'1)	1601203-04	Sediment	3/31/16 11:07	4/01/16 15:40
V3-S2 (5')	1601203-05	Sediment	3/31/16 11:11	4/01/16 15:40
V3-S3 (10')	1601203-06	Sediment	3/31/16 11:15	4/01/16 15:40
V7-S1 (0.1)	1601203-07	Sediment	3/31/16 9:30	4/01/16 15:40
V7-S2 (5')	1601203-08	Sediment	3/31/16 9:33	4/01/16 15:40
V7-S3 (10')	1601203-09	Sediment	3/31/16 9:43	4/01/16 15:40
V7-S4 (14')	1601203-10	Sediment	3/31/16 9:48	4/01/16 15:40
V11-S1 (0.'1)	1601203-11	Sediment	3/30/16 15:28	4/01/16 15:40
V11-S2 (6')	1601203-12	Sediment	3/30/16 15:32	4/01/16 15:40
V11-S3 (12.5')	1601203-13	Sediment	3/30/16 15:36	4/01/16 15:40
V14-S1 (0.'1)	1601203-14	Sediment	3/30/16 11:22	4/01/16 15:40
V14-S2 (4' 7")	1601203-15	Sediment	3/30/16 11:27	4/01/16 15:40
V14-S3 (9' 4")	1601203-16	Sediment	3/30/16 11:31	4/01/16 15:40

CASE NARRATIVE

Analytical Comments for EPA 7196

Results were J-flagged. "J" is used to flag those results that are between the PQL (Practical Quantitation Limit) and the calculated MDL (Method Detection Limit). Results that are "J" flagged are estimated values since it becomes difficult to accurately quantitate the analyte near the MDL.

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V1-S1 (0.'1)
Lab ID: 1601203-01

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**64**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	1.6	1	B6D0142	04/07/2016	04/08/16 15:15	
Nickel	**210**	1.6	1	B6D0142	04/07/2016	04/08/16 15:15	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.6	1.2	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V1-S2 (5')
Lab ID: 1601203-02

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**49**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**150**	2.0	1	B6D0142	04/07/2016	04/08/16 15:19	
Nickel	**220**	2.0	1	B6D0142	04/07/2016	04/08/16 15:19	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**2.9**	2.0	1.6	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V1-S3 (10')
Lab ID: 1601203-03

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**70**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	1.4	1	B6D0142	04/07/2016	04/08/16 15:21	
Nickel	**190**	1.4	1	B6D0142	04/07/2016	04/08/16 15:21	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**3.1**	1.4	1.1	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V3-S1 (0.'1)
Lab ID: 1601203-04

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**63**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	1.6	1	B6D0142	04/07/2016	04/08/16 15:23	
Nickel	**210**	1.6	1	B6D0142	04/07/2016	04/08/16 15:23	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**1.4**	1.6	1.2	1	B6D0098	04/06/2016	04/08/16 12:43	J

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V3-S2 (5')
Lab ID: 1601203-05

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**44**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**170**	2.3	1	B6D0142	04/07/2016	04/08/16 15:24	
Nickel	**260**	2.3	1	B6D0142	04/07/2016	04/08/16 15:24	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**2.3**	2.3	1.8	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V3-S3 (10')
Lab ID: 1601203-06

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**57**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**160**	1.7	1	B6D0142	04/07/2016	04/08/16 15:26	
Nickel	**220**	1.7	1	B6D0142	04/07/2016	04/08/16 15:26	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.7	1.3	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V7-S1 (0.1)
Lab ID: 1601203-07

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**46**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**160**	2.2	1	B6D0142	04/07/2016	04/08/16 15:32	
Nickel	**250**	2.2	1	B6D0142	04/07/2016	04/08/16 15:32	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	2.2	1.7	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V7-S2 (5')
Lab ID: 1601203-08

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**51**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	2.0	1	B6D0142	04/07/2016	04/08/16 15:33	
Nickel	**200**	2.0	1	B6D0142	04/07/2016	04/08/16 15:33	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	2.0	1.5	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V7-S3 (10')
Lab ID: 1601203-09

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**59**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	1.7	1	B6D0142	04/07/2016	04/08/16 15:35	
Nickel	**230**	1.7	1	B6D0142	04/07/2016	04/08/16 15:35	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.7	1.3	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V7-S4 (14')
Lab ID: 1601203-10

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**50**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**170**	2.0	1	B6D0142	04/07/2016	04/08/16 15:37	
Nickel	**260**	2.0	1	B6D0142	04/07/2016	04/08/16 15:37	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	2.0	1.5	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V11-S1 (0.'1)
Lab ID: 1601203-11

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**65**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**140**	1.5	1	B6D0142	04/07/2016	04/08/16 15:38	
Nickel	**220**	1.5	1	B6D0142	04/07/2016	04/08/16 15:38	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.5	1.2	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V11-S2 (6')
Lab ID: 1601203-12

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**59**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**180**	1.7	1	B6D0142	04/07/2016	04/08/16 15:40	
Nickel	**250**	1.7	1	B6D0142	04/07/2016	04/08/16 15:40	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	**3.0**	1.7	1.3	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V11-S3 (12.5')
Lab ID: 1601203-13

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**51**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**210**	2.0	1	B6D0142	04/07/2016	04/08/16 15:42	
Nickel	**280**	2.0	1	B6D0142	04/07/2016	04/08/16 15:42	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	2.0	1.5	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V14-S1 (0.'1)
Lab ID: 1601203-14

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**56**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**160**	1.8	1	B6D0142	04/07/2016	04/08/16 15:43	
Nickel	**230**	1.8	1	B6D0142	04/07/2016	04/08/16 15:43	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.8	1.4	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V14-S2 (4' 7")
Lab ID: 1601203-15

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**46**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**190**	2.2	1	B6D0142	04/07/2016	04/08/16 15:45	
Nickel	**290**	2.2	1	B6D0142	04/07/2016	04/08/16 15:45	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	2.2	1.7	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Client Sample ID V14-S3 (9' 4'')
Lab ID: 1601203-16

Percent Solids

Analyst: PT

Analyte	Result (% by Weight)	PQL (% by Weight)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Percent Solids	**77**	0.10	1	B6D0193	04/08/2016	04/08/16 10:00	

Total Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Chromium	**210**	1.3	1	B6D0142	04/07/2016	04/08/16 15:46	
Nickel	**350**	1.3	1	B6D0142	04/07/2016	04/08/16 15:46	

Hexavalent Chromium by EPA 7196A/3060A

Analyst: LA

Analyte	Result (mg/kg dry)	PQL (mg/kg dry)	MDL (mg/kg dry)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Hexavalent Chromium	ND	1.3	0.99	1	B6D0098	04/06/2016	04/08/16 12:43	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

QUALITY CONTROL SECTION

Percent Solids - Quality Control

Analyte	Result (% by Weight)	PQL (% by Weight)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6D0193 - No_Prep_WC1_SED									
Duplicate (B6D0193-DUP1)		**Source: 1601203-16**		Prepared: 4/8/2016 Analyzed: 4/8/2016					
Percent Solids	77.7539	0.10		77.4859	NR		0.345	30	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Total Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg wet)	PQL (mg/kg wet)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6D0142 - EPA 3050B_SED									
Blank (B6D0142-BLK1)				Prepared: 4/7/2016 Analyzed: 4/8/2016					
Chromium	ND	1.0			NR				
Nickel	ND	1.0			NR				
LCS (B6D0142-BS1)				Prepared: 4/7/2016 Analyzed: 4/8/2016					
Chromium	48.0606	1.0	50.0000		96.1	80 - 120			
Nickel	45.3273	1.0	50.0000		90.7	80 - 120			
Matrix Spike (B6D0142-MS1)		**Source: 1601203-01**		Prepared: 4/7/2016 Analyzed: 4/8/2016					
Chromium	285.966	1.6	195.895	143.784	72.6	53 - 121			
Nickel	326.476	1.6	195.895	205.954	61.5	44 - 122			
Matrix Spike Dup (B6D0142-MSD1)		**Source: 1601203-01**		Prepared: 4/7/2016 Analyzed: 4/8/2016					
Chromium	290.574	1.6	195.895	143.784	74.9	53 - 121	1.60	20	
Nickel	332.348	1.6	195.895	205.954	64.5	44 - 122	1.78	20	

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Hexavalent Chromium by EPA 7196A/3060A - Quality Control

Analyte	Result (mg/kg wet)	PQL (mg/kg wet)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B6D0098 - EPA 3060A_SED (WC)									
Blank (B6D0098-BLK1)				Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	ND	1.0			NR				
LCS (B6D0098-BS1)				Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	42.6000	1.0	50.0000		85.2	80 - 120			
Duplicate (B6D0098-DUP1)		**Source: 1601203-01**		Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	3.91791	1.6		ND	NR			20	R
Matrix Spike (B6D0098-MS1)		**Source: 1601203-01**		Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	31.5000	1.6	78.3581	ND	40.2	75 - 125			M2
Matrix Spike (B6D0098-MS2)		**Source: 1601203-01**		Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	2758.20	78	2520.00	ND	109	75 - 125			
Matrix Spike Dup (B6D0098-MSD1)		**Source: 1601203-01**		Prepared: 4/6/2016 Analyzed: 4/8/2016					
Hexavalent Chromium	31.6567	1.6	78.3581	ND	40.4	75 - 125	0.496	20	M2

Certificate of Analysis

Leighton Consulting		Project Number :	Laguna Lake Dredging, 11254.001
25570 Rye Cyn Rd		Report To :	Robin Ferber
Santa Clarita , CA 91355		Reported :	04/22/2016

Notes and Definitions

R	RPD value outside acceptance criteria. Calculation is based on raw values.
M2	Matrix spike recovery outside of acceptance limit due to possible matrix interference. The analytical batch was validated by the laboratory control sample.
J	Analyte detected below the Practical Quantitation Limit but above or equal to the Method Detection Limit. Result is an estimated concentration.
ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED TECHNOLOGY LABORATORIES

3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport	Sample Conditions Upon Receipt: Condition	Y	N	Condition	Y	N
☐ Client ☒ ATL ☐ FedEx ☐ OnTrac ☐ GSO ☐ Other:	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 5.4		
	4. SEALED	☐	☑			

CUSTOMER

Company: Leighton Consulting, Inc.
Address: 25570 Rye Canyon Road
City: Santa Clarita State: CA Zip: 91355
Tel: 661.705.3025 Fax:

SEND REPORT TO:
Attn: Robin Ferber Email: rferber@leightongroup.com
Company: Leighton Consulting, Inc.
Address: 25570 Rye Canyon Road
City: Santa Clarita State: CA Zip: 91355

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: Laguna Lake Dredging
Project No.: 11254.001
Sampler: Vibracore
Quote No:
PO #:
Special Instructions/Comments: Copy Lauren Doyel at Ldoyel@leightongroup.com on report

Encircle or Write Requested Analysis: 8260 / 624 (Volatiles); 8015(GRO); 8015(DRO); 8270(Semi-volatiles); 8081(Organochlorine Pesticides); 8082(PCBs); 6010 / 7000(Title 22 Metals); TO-15; Chromium total - 6010B; Nickel total - 6010B; Chromium VI 7196-3060

Encircle Sample Matrix: SOIL / SEDIMENT / SLUDGE; SOLIDS / WIPE / FILTER; WATER - DRINKING / GROUND; WATER - STORM / WASTE; AQUEOUS / LAYERED - OIL

Container: # ; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7 = Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn (Ac)2; 6=NaOH; 7=NA2S2O3

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	Chromium total - 6010B	Nickel total - 6010B	Chromium VI 7196-3060	TAT	REMARKS
1	1601203-1	V1-S1 (0.1)	3/31/16	11:40	X	X	X	5	
2	-2	V1-S2 (5')	3/31/16	12:03	X	X	X		
3	-3	V1-S3 (10')	3/31/16	11:59	X	X	X		
4	-4	V3-S1 (0.1)	3/31/16	11:07	X	X	X		
5	-5	V3-S2 (5')	3/31/16	11:11	X	X	X		
6	-6	V3-S3 (10')	3/31/16	11:15	X	X	X		
7	-7	V7-S1 (0.1)	3/31/16	09:30	X	X	X		
8	-8	V7-S2 (5')	3/31/16	09:33	X	X	X		
9	-9	V7-S3 (10')	3/31/16	09:43	X	X	X		
10	-10	V7-S4 (14')	3/31/16	09:48	X	X	X		

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for fi ve (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-fi ve (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Submitter Print Name _____ Signature _____

SIGNATURES

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Luis S. Rodriguez	3/31/16				
Lauren J. Doyel	4/1/16		Edward Rodriguez	4-1-16	1540
Edward Rodriguez	4-1-16	1830	FEDEX	4/1/16	1830

ADVANCED ATECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport: ☐ Client ☒ ATL ☐ FedEx ☐ OnTrac ☐ GSO ☐ Other:

Sample Conditions Upon Receipt					
Condition	Y	N	Condition	Y	N
1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C:	5.4	
4. SEALED	☐	☑			

CUSTOMER

Company: Leighton Consulting, Inc.
Address: 25570 Rye Canyon Road
City: Santa Clarita State: CA Zip: 91350
Tel: 661.289.1273 Fax:

SEND REPORT TO:
Attn: Robin Ferber Email: rferber@leightongroup.com
Company: Leighton Consulting
Address: 25570 Rye Canyon Road
City: Santa Clarita State: CA Zip: 91350

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: Laguna Lake
Project No.: 11254.001
Sampler: Vibra-core
Quote No:
PO #:
Special Instructions/Comments: copy Lauren Doyel @ ldoyel@leightongroup.com on report

Encircle or Write Requested Analysis: 8260 / 624 (Volatiles); 8015(GRO); 8015(DRO); 8270(Semi-volatiles); 8081(Organochlorine Pesticides); 8082(PCBs); 6010 / 7000(Title 22 Metals); TO-15; Chromium total 6010B; Nickel total 6010B; Chromium VI EPA 7196-3060A

Encircle Sample Matrix: SOIL / SEDIMENT / SLUDGE; SOLIDS / WIPE/ FILTER; WATER - DRINKING / GROUND; WATER - STORM / WASTE; AQUEOUS / LAYERED - OIL

Container: # ; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (AcI)2; 6=NaOH; 7=NA2S2O3

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 / 7000(Title 22 Metals)	TO-15	Chromium total 6010B	Nickel total 6010B	Chromium VI EPA 7196-3060A	TAT	#	Type	Material	Preservative	REMARKS
1	1601203-11	V11-S1 (0.1')	3/30/16	15:28									X	X	X	5					
2	-12	V11-S2 (6')	3/30/16	15:32									X	X	X						
3	-13	V11-S3 (12.5')	3/30/16	15:36									X	X	X						
4	-14	V14-S1 (0.1')	3/30/16	11:22									X	X	X						
5	-15	V14-S2 (4'7")	3/30/16	11:27									X	X	X						
6	-16	V14-S3 (9'4")	3/30/16	11:31									X	X	X						
7		~~V13-S3~~																			
8	-17	LL16-D01 Discrete-01	3/30/16	11:59																	HOLD
9	-18	LL16-D03 Discrete-03	3/30/16	11:15																	HOLD
10																					

SUBMITTED TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Submitter Print Name _____ Signature _____

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
~~Luis J. Rincon~~ CR	~~3/31/16~~				
LAUREN J. DOYEL	4/1/16		Edward Rodriguez	4-1-16	1540
Edward Rodriguez	4-1-16	1830	Fedex	4/1/16	1830

APPENDIX F
COMPOSITE SEDIMENT CHEMISTRY TESTING

eurofins | Calscience

WORK ORDER NUMBER: 16-04-0013

The difference is service

AIR | SOIL | WATER | MARINE CHEMISTRY

Analytical Report For

Client: Kinnetic Laboratories, Inc.

Client Project Name: Laguna Lake

Attention: Tim Fleming
5225 Avenida Encinas
Suite H
Carlsbad, CA 92008-4367

Kathleen M. Burney FOR

Approved for release on 04/18/2016 by:
Carla Hollowell
Project Manager

ResultLink

Email your PM

Eurofins Calscience, Inc. (Calscience) certifies that the test results provided in this report meet all NELAC requirements for parameters for which accreditation is required or available. Any exceptions to NELAC requirements are noted in the case narrative. The original report of subcontracted analyses, if any, is attached to this report. The results in this report are limited to the sample(s) tested and any reproduction thereof must be made in its entirety. The client or recipient of this report is specifically prohibited from making material changes to said report and, to the extent that such changes are made, Calscience is not responsible, legally or otherwise. The client or recipient agrees to indemnify Calscience for any defense to any litigation which may arise.

eurofins | Calscience

Contents

Client Project Name: Laguna Lake
Work Order Number: 16-04-0013

1 Work Order Narrative. 3

2 Sample Summary. 4

3 Client Sample Data. 5
3.1 EPA 7199/3060A Chromium VI (Solid). 5
3.2 EPA 1664A (M) HEM: Oil and Grease (Solid). 6
3.3 EPA 1664A (M) HEM-SGT: Oil and Grease (Solid). 7
3.4 EPA 376.2 (M) Total Sulfide (Solid). 8
3.5 EPA 376.2 (M) Dissolved Sulfide (Solid). 9
3.6 EPA 9045D pH (Solid). 10
3.7 EPA 9060A Total Organic Carbon (Solid). 11
3.8 SM 2540 B (M) Total Solids (Solid). 12
3.9 SM 4500-NH3 B/C (M) Ammonia (Solid). 13
3.10 EPA 6020 ICP/MS Metals (Solid). 14
3.11 EPA 7471A Mercury (Solid). 17
3.12 EPA 8081A Organochlorine Pesticides (Solid). 18
3.13 EPA 8082 PCB Aroclors (Solid). 21
3.14 EPA 8270C SIM (Solid). 23
3.15 EPA 8270C SIM PCB Congeners (Solid). 29
3.16 Krone et al. Organotins (Solid). 35

4 Quality Control Sample Data. 36
4.1 MS/MSD. 36
4.2 PDS/PDSD. 47
4.3 Sample Duplicate. 48
4.4 LCS/LCSD. 52

5 Glossary of Terms and Qualifiers. 66

6 Chain-of-Custody/Sample Receipt Form. 67

eurofins | Calscience

Work Order Narrative

Work Order: 16-04-0013 Page 1 of 1

Condition Upon Receipt:

Samples were received under Chain-of-Custody (COC) on 04/01/16. They were assigned to Work Order 16-04-0013.

Unless otherwise noted on the Sample Receiving forms all samples were received in good condition and within the recommended EPA temperature criteria for the methods noted on the COC. The COC and Sample Receiving Documents are integral elements of the analytical report and are presented at the back of the report.

Holding Times:

All samples were analyzed within prescribed holding times (HT) and/or in accordance with the Calscience Sample Acceptance Policy unless otherwise noted in the analytical report and/or comprehensive case narrative, if required.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

Quality Control:

All quality control parameters (QC) were within established control limits except where noted in the QC summary forms or described further within this report.

Subcontractor Information:

Unless otherwise noted below (or on the subcontract form), no samples were subcontracted.

Additional Comments:

Air - Sorbent-extracted air methods (EPA TO-4A, EPA TO-10, EPA TO-13A, EPA TO-17): Analytical results are converted from mass/sample basis to mass/volume basis using client-supplied air volumes.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are always reported on a wet weight basis.

The samples were analyzed or extracted outside the EPA Method recommended solid sample holding time for pH. However, the samples were frozen after collection (prior to holding time expiration) at -18°C, and remained frozen until the laboratory was ready to prepare the samples for analysis. Eurofins Calscience, Inc. follows SWAMP criteria and the Puget Sound Protocol (USEPA/PSWQAT, 1997, Table 2) for holding times in sediment samples, which states holding times may be extended up to six months to one year (two years for metals) if stored frozen at -18°C after collection. Therefore, the sample results have not been flagged as exceeding the EPA Method recommended holding time.

Return to Contents

eurofins | Calscience

Sample Summary

Client:	Kinnetic Laboratories, Inc. 5225 Avenida Encinas, Suite H Carlsbad, CA 92008-4367	Work Order:	16-04-0013
		Project Name:	Laguna Lake
		PO Number:	
		Date/Time Received:	04/01/16 10:10
		Number of Containers:	2
Attn:	Tim Fleming		

Sample Identification	Lab Number	Collection Date and Time	Number of Containers	Matrix
LL16-PAI	16-04-0013-1	03/31/16 08:35	1	Sediment
LL16-SAI	16-04-0013-2	03/30/16 12:50	1	Sediment

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3060A
		Method:	EPA 7199
		Units:	ug/kg
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**IC 11**	**04/02/16**	**04/02/16 18:21**	**160402L01P**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Chromium, Hexavalent	ND	690	350	1.00	

LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**IC 11**	**04/02/16**	**04/02/16 18:30**	**160402L01P**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Chromium, Hexavalent	ND	640	320	1.00	

Method Blank	**099-05-125-2903**	**N/A**	**Solid**	**IC 11**	**04/02/16**	**04/02/16 17:54**	**160402L01P**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Chromium, Hexavalent	ND	400	200	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 1664A (M)
		Units:	mg/kg
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**N/A**	**04/11/16**	**04/11/16 13:30**	**G0411HEML3**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
HEM: Oil and Grease	23	17	14	1.00	

LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**N/A**	**04/11/16**	**04/11/16 13:30**	**G0411HEML3**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
HEM: Oil and Grease	48	16	13	1.00	

Method Blank	**099-12-040-607**	**N/A**	**Solid**	**N/A**	**04/11/16**	**04/11/16 13:30**	**G0411HEML3**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
HEM: Oil and Grease	ND	10	7.9	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 1664A (M)
		Units:	mg/kg
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**N/A**	**04/11/16**	**04/11/16 17:30**	**G0411HEML4**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
HEM - SGT: Oil and Grease	ND	17	14	1.00	

LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**N/A**	**04/11/16**	**04/11/16 17:30**	**G0411HEML4**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
HEM - SGT: Oil and Grease	21	16	13	1.00	

Method Blank	**099-12-207-137**	**N/A**	**Solid**	**N/A**	**04/11/16**	**04/11/16 17:30**	**G0411HEML4**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
HEM - SGT: Oil and Grease	ND	10	8.1	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 376.2M
		Units:	mg/kg
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**N/A**	**04/06/16**	**04/06/16 16:25**	**G0406SL2**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Sulfide, Total	4.7	0.17	0.15	1.00	

LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**N/A**	**04/06/16**	**04/06/16 16:25**	**G0406SL2**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Sulfide, Total	4.2	0.16	0.13	1.00	

Method Blank	**099-16-352-101**	**N/A**	**Solid**	**N/A**	**04/06/16**	**04/06/16 16:25**	**G0406SL2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Sulfide, Total	ND	0.10	0.084	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 376.2M
		Units:	mg/kg
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**N/A**	**04/06/16**	**04/06/16 15:50**	**G0406DSL2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Sulfide, Dissolved	ND	0.10	0.017	1.00	

LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**N/A**	**04/06/16**	**04/06/16 15:50**	**G0406DSL2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Sulfide, Dissolved	ND	0.10	0.017	1.00	

Method Blank	**099-16-354-50**	**N/A**	**Solid**	**N/A**	**04/06/16**	**04/06/16 15:50**	**G0406DSL2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Sulfide, Dissolved	ND	0.10	0.017	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 9045D
		Units:	pH units
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**PH 4**	**N/A**	**04/02/16 12:04**	**G0402PHD1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
pH	7.16	0.01	0.01	1.00	

LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**PH 4**	**N/A**	**04/02/16 12:04**	**G0402PHD1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
pH	7.31	0.01	0.01	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 9060A
		Units:	%
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-A**	**03/31/16 08:35**	**Sediment**	**TOC 9**	**04/11/16**	**04/12/16 09:21**	**G0411TOCL1**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Carbon, Total Organic	3.2	0.087	0.030	1.00	

LL16-SAI	**16-04-0013-2-A**	**03/30/16 12:50**	**Sediment**	**TOC 9**	**04/11/16**	**04/12/16 09:21**	**G0411TOCL1**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Carbon, Total Organic	2.7	0.080	0.028	1.00	

Method Blank	**099-06-013-1525**	**N/A**	**Solid**	**TOC 9**	**04/11/16**	**04/12/16 09:21**	**G0411TOCL1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Carbon, Total Organic	ND	0.050	0.017	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	SM 2540 B (M)
		Units:	%
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**N/A**	**04/05/16**	**04/05/16 18:30**	**G0405TSB7**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	57.7	0.100	0.100	1.00	

LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**N/A**	**04/05/16**	**04/05/16 18:30**	**G0405TSB7**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	62.6	0.100	0.100	1.00	

Method Blank	**099-05-019-3246**	**N/A**	**Solid**	**N/A**	**04/05/16**	**04/05/16 18:30**	**G0405TSB7**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total	ND	0.100	0.100	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	SM 4500-NH3 B/C (M)
		Units:	mg/kg
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-A**	**03/31/16 08:35**	**Sediment**	**BUR05**	**04/14/16**	**04/14/16 16:19**	**G0414NH3L1**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Ammonia (as N)	19	0.35	0.19	1.00	

LL16-SAI	**16-04-0013-2-A**	**03/30/16 12:50**	**Sediment**	**BUR05**	**04/14/16**	**04/14/16 16:19**	**G0414NH3L1**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Ammonia (as N)	9.8	0.32	0.18	1.00	

Method Blank	**099-12-816-134**	**N/A**	**Solid**	**BUR05**	**04/14/16**	**04/14/16 16:19**	**G0414NH3L1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Ammonia (as N)	ND	0.20	0.11	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3050B
		Method:	EPA 6020
		Units:	mg/kg
Project: Laguna Lake			Page 1 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**ICP/MS 03**	**04/02/16**	**04/04/16 18:53**	**160402L01E**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Antimony	ND	0.867	0.0672	1.00	
Arsenic	3.59	0.173	0.151	1.00	
Barium	293	0.173	0.0731	1.00	
Beryllium	0.804	0.867	0.134	1.00	J
Cadmium	0.533	0.173	0.0992	1.00	
Chromium	175	0.173	0.108	1.00	
Cobalt	31.7	0.173	0.0632	1.00	
Copper	56.0	0.173	0.0726	1.00	
Lead	11.3	0.173	0.114	1.00	
Molybdenum	0.493	0.347	0.253	1.00	
Nickel	305	0.173	0.0877	1.00	
Selenium	0.494	0.173	0.127	1.00	
Silver	0.145	0.173	0.0542	1.00	J
Thallium	0.134	0.173	0.0488	1.00	J
Vanadium	74.7	1.73	0.113	1.00	
Zinc	84.4	1.73	1.38	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3050B
		Method:	EPA 6020
		Units:	mg/kg
Project: Laguna Lake			Page 2 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**ICP/MS 03**	**04/02/16**	**04/04/16 18:55**	**160402L01E**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Antimony	0.118	0.799	0.0620	1.00	J
Arsenic	3.58	0.160	0.139	1.00	
Barium	235	0.160	0.0674	1.00	
Beryllium	0.750	0.799	0.123	1.00	J
Cadmium	0.652	0.160	0.0914	1.00	
Chromium	170	0.160	0.0992	1.00	
Cobalt	28.9	0.160	0.0583	1.00	
Copper	48.6	0.160	0.0670	1.00	
Lead	12.7	0.160	0.105	1.00	
Molybdenum	0.389	0.319	0.234	1.00	
Nickel	294	0.160	0.0809	1.00	
Selenium	0.301	0.160	0.117	1.00	
Silver	0.124	0.160	0.0500	1.00	J
Thallium	0.124	0.160	0.0449	1.00	J
Vanadium	65.7	1.60	0.104	1.00	
Zinc	76.4	1.60	1.27	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3050B
		Method:	EPA 6020
		Units:	mg/kg
Project: Laguna Lake			Page 3 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-15-254-403**	**N/A**	**Solid**	**ICP/MS 03**	**04/02/16**	**04/04/16 18:15**	**160402L01E**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Antimony	ND	0.500	0.0388	1.00	
Arsenic	ND	0.100	0.0873	1.00	
Barium	ND	0.100	0.0422	1.00	
Beryllium	ND	0.500	0.0771	1.00	
Cadmium	ND	0.100	0.0572	1.00	
Chromium	ND	0.100	0.0621	1.00	
Cobalt	ND	0.100	0.0365	1.00	
Copper	ND	0.100	0.0419	1.00	
Lead	ND	0.100	0.0659	1.00	
Molybdenum	ND	0.200	0.146	1.00	
Nickel	ND	0.100	0.0506	1.00	
Selenium	ND	0.100	0.0731	1.00	
Silver	ND	0.100	0.0313	1.00	
Thallium	ND	0.100	0.0281	1.00	
Vanadium	ND	1.00	0.0652	1.00	
Zinc	ND	1.00	0.795	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 7471A Total
		Method:	EPA 7471A
		Units:	mg/kg
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**Mercury 05**	**04/05/16**	**04/05/16 16:16**	**160405L02E**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	0.0647	0.0365	0.0107	1.00	

LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**Mercury 05**	**04/05/16**	**04/05/16 16:23**	**160405L02E**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	0.0500	0.0331	0.00970	1.00	

Method Blank	**099-16-278-222**	**N/A**	**Solid**	**Mercury 05**	**04/05/16**	**04/05/16 16:12**	**160405L02E**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	ND	0.0200	0.00587	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8081A
		Units:	ug/kg
Project: Laguna Lake			Page 1 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**GC 44**	**04/09/16**	**04/14/16 15:13**	**160409L12**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Aldrin	ND	1.7	0.76	1.00	
Alpha-BHC	ND	3.4	1.3	1.00	
Beta-BHC	ND	1.7	0.86	1.00	
Delta-BHC	ND	3.4	1.5	1.00	
Gamma-BHC	ND	1.7	0.77	1.00	
Chlordane	ND	17	9.1	1.00	
Dieldrin	ND	1.7	0.76	1.00	
Trans-nonachlor	ND	1.7	0.47	1.00	
2,4'-DDD	ND	1.7	0.49	1.00	
2,4'-DDE	ND	3.4	1.7	1.00	
2,4'-DDT	ND	1.7	0.54	1.00	
4,4'-DDD	ND	1.7	0.86	1.00	
4,4'-DDE	ND	1.7	0.77	1.00	
4,4'-DDT	ND	1.7	0.75	1.00	
Endosulfan I	ND	1.7	0.68	1.00	
Endosulfan II	ND	1.7	0.81	1.00	
Endosulfan Sulfate	ND	1.7	0.90	1.00	
Endrin	ND	1.7	0.83	1.00	
Endrin Aldehyde	ND	1.7	1.0	1.00	
Endrin Ketone	ND	1.7	0.87	1.00	
Heptachlor	ND	1.7	0.75	1.00	
Heptachlor Epoxide	ND	3.4	1.3	1.00	
Methoxychlor	ND	1.7	0.96	1.00	
Toxaphene	ND	34	15	1.00	
Alpha Chlordane	ND	1.7	0.70	1.00	
Gamma Chlordane	ND	3.4	1.5	1.00	
Cis-nonachlor	ND	1.7	0.45	1.00	
Oxychlordane	ND	1.7	0.47	1.00	
Mirex	ND	1.7	0.57	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	107	25-145	
Decachlorobiphenyl	108	24-168	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8081A
		Units:	ug/kg
Project: Laguna Lake			Page 2 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**GC 44**	**04/09/16**	**04/14/16 15:27**	**160409L12**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Aldrin	ND	1.6	0.70	1.00	
Alpha-BHC	ND	3.2	1.2	1.00	
Beta-BHC	ND	1.6	0.79	1.00	
Delta-BHC	ND	3.2	1.4	1.00	
Gamma-BHC	ND	1.6	0.71	1.00	
Chlordane	ND	16	8.4	1.00	
Dieldrin	ND	1.6	0.70	1.00	
Trans-nonachlor	ND	1.6	0.43	1.00	
2,4'-DDD	ND	1.6	0.46	1.00	
2,4'-DDE	ND	3.2	1.6	1.00	
2,4'-DDT	ND	1.6	0.50	1.00	
4,4'-DDD	ND	1.6	0.80	1.00	
4,4'-DDE	0.77	1.6	0.71	1.00	J
4,4'-DDT	ND	1.6	0.70	1.00	
Endosulfan I	ND	1.6	0.63	1.00	
Endosulfan II	ND	1.6	0.75	1.00	
Endosulfan Sulfate	ND	1.6	0.83	1.00	
Endrin	ND	1.6	0.77	1.00	
Endrin Aldehyde	ND	1.6	0.97	1.00	
Endrin Ketone	ND	1.6	0.80	1.00	
Heptachlor	ND	1.6	0.69	1.00	
Heptachlor Epoxide	ND	3.2	1.2	1.00	
Methoxychlor	ND	1.6	0.89	1.00	
Toxaphene	ND	32	14	1.00	
Alpha Chlordane	ND	1.6	0.65	1.00	
Gamma Chlordane	ND	3.2	1.4	1.00	
Cis-nonachlor	ND	1.6	0.41	1.00	
Oxychlordane	ND	1.6	0.43	1.00	
Mirex	ND	1.6	0.52	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	107	25-145	
Decachlorobiphenyl	97	24-168	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8081A
		Units:	ug/kg
Project: Laguna Lake			Page 3 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-12-858-403**	**N/A**	**Solid**	**GC 44**	**04/09/16**	**04/14/16 14:30**	**160409L12**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Aldrin	ND	1.0	0.44	1.00	
Alpha-BHC	ND	2.0	0.74	1.00	
Beta-BHC	ND	1.0	0.50	1.00	
Delta-BHC	ND	2.0	0.88	1.00	
Gamma-BHC	ND	1.0	0.45	1.00	
Chlordane	ND	10	5.3	1.00	
Dieldrin	ND	1.0	0.44	1.00	
Trans-nonachlor	ND	1.0	0.27	1.00	
2,4'-DDD	ND	1.0	0.29	1.00	
2,4'-DDE	ND	2.0	0.99	1.00	
2,4'-DDT	ND	1.0	0.31	1.00	
4,4'-DDD	ND	1.0	0.50	1.00	
4,4'-DDE	ND	1.0	0.44	1.00	
4,4'-DDT	ND	1.0	0.44	1.00	
Endosulfan I	ND	1.0	0.40	1.00	
Endosulfan II	ND	1.0	0.47	1.00	
Endosulfan Sulfate	ND	1.0	0.52	1.00	
Endrin	ND	1.0	0.48	1.00	
Endrin Aldehyde	ND	1.0	0.60	1.00	
Endrin Ketone	ND	1.0	0.50	1.00	
Heptachlor	ND	1.0	0.43	1.00	
Heptachlor Epoxide	ND	2.0	0.74	1.00	
Methoxychlor	ND	1.0	0.56	1.00	
Toxaphene	ND	20	9.0	1.00	
Alpha Chlordane	ND	1.0	0.41	1.00	
Gamma Chlordane	ND	2.0	0.89	1.00	
Cis-nonachlor	ND	1.0	0.26	1.00	
Oxychlordane	ND	1.0	0.27	1.00	
Mirex	ND	1.0	0.33	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	97	25-145	
Decachlorobiphenyl	107	24-168	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8082
		Units:	ug/kg
Project: Laguna Lake			Page 1 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**GC 31**	**04/09/16**	**04/11/16 16:50**	**160409L05**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Aroclor-1016	ND	17	7.2	1.00	
Aroclor-1221	ND	17	15	1.00	
Aroclor-1232	ND	17	8.7	1.00	
Aroclor-1242	ND	17	8.8	1.00	
Aroclor-1248	ND	17	11	1.00	
Aroclor-1254	ND	17	11	1.00	
Aroclor-1260	ND	17	11	1.00	
Aroclor-1262	ND	17	11	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	92	25-145	
Decachlorobiphenyl	94	24-168	

LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**GC 31**	**04/09/16**	**04/11/16 17:47**	**160409L05**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Aroclor-1016	ND	16	6.7	1.00	
Aroclor-1221	ND	16	14	1.00	
Aroclor-1232	ND	16	8.0	1.00	
Aroclor-1242	ND	16	8.1	1.00	
Aroclor-1248	ND	16	10	1.00	
Aroclor-1254	ND	16	10	1.00	
Aroclor-1260	ND	16	10	1.00	
Aroclor-1262	ND	16	10	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	87	25-145	
Decachlorobiphenyl	90	24-168	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8082
		Units:	ug/kg
Project: Laguna Lake			Page 2 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-12-565-452**	**N/A**	**Solid**	**GC 31**	**04/09/16**	**04/11/16 15:53**	**160409L05**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Aroclor-1016	ND	2.0	0.83	0.200	
Aroclor-1221	ND	2.0	1.7	0.200	
Aroclor-1232	ND	2.0	1.0	0.200	
Aroclor-1242	ND	2.0	1.0	0.200	
Aroclor-1248	ND	2.0	1.3	0.200	
Aroclor-1254	ND	2.0	1.3	0.200	
Aroclor-1260	ND	2.0	1.3	0.200	
Aroclor-1262	ND	2.0	1.3	0.200	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,5,6-Tetrachloro-m-Xylene	60	25-145	
Decachlorobiphenyl	67	24-168	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM
		Units:	ug/kg
Project: Laguna Lake			Page 1 of 6

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**GC/MS MM**	**04/09/16**	**04/12/16 19:35**	**160409L04**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
1-Methylnaphthalene	ND	17	7.0	1.00	
2,4,5-Trichlorophenol	ND	17	10	1.00	
2,4,6-Trichlorophenol	ND	17	10	1.00	
2,4-Dichlorophenol	ND	17	10	1.00	
2,4-Dimethylphenol	ND	870	260	1.00	
2,4-Dinitrophenol	ND	870	130	1.00	
2-Chlorophenol	ND	17	6.8	1.00	
2-Methylnaphthalene	ND	17	7.9	1.00	
2-Methylphenol	ND	17	8.5	1.00	
2-Nitrophenol	ND	870	250	1.00	
3/4-Methylphenol	ND	17	17	1.00	
4,6-Dinitro-2-Methylphenol	ND	870	180	1.00	
4-Chloro-3-Methylphenol	ND	17	8.5	1.00	
4-Nitrophenol	ND	870	590	1.00	
Acenaphthene	ND	17	8.1	1.00	
Acenaphthylene	ND	17	7.9	1.00	
Anthracene	ND	17	8.7	1.00	
Benzo (a) Anthracene	ND	17	7.7	1.00	
Benzo (a) Pyrene	ND	17	8.3	1.00	
Benzo (b) Fluoranthene	ND	17	8.5	1.00	
Benzo (g,h,i) Perylene	ND	17	8.4	1.00	
Benzo (k) Fluoranthene	ND	17	8.4	1.00	
Bis(2-Ethylhexyl) Phthalate	75	87	47	1.00	J
Butyl Benzyl Phthalate	43	87	42	1.00	J
Chrysene	7.9	17	7.2	1.00	J
Di-n-Butyl Phthalate	ND	87	41	1.00	
Di-n-Octyl Phthalate	ND	87	41	1.00	
Dibenz (a,h) Anthracene	ND	17	8.1	1.00	
Diethyl Phthalate	ND	87	48	1.00	
Dimethyl Phthalate	ND	87	33	1.00	
Fluoranthene	11	17	8.6	1.00	J
Fluorene	ND	17	8.6	1.00	
Indeno (1,2,3-c,d) Pyrene	ND	17	11	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM
		Units:	ug/kg
Project: Laguna Lake			Page 2 of 6

Parameter	Result	RL	MDL	DF	Qualifiers
Naphthalene	12	17	7.2	1.00	J
Pentachlorophenol	ND	870	120	1.00	
Phenanthrene	17	17	8.6	1.00	J
Phenol	ND	17	10	1.00	
Pyrene	14	17	7.4	1.00	J
1,6,7-Trimethylnaphthalene	ND	17	2.9	1.00	
2,3,4,6-Tetrachlorophenol	ND	17	16	1.00	
2,6-Dichlorophenol	ND	17	7.8	1.00	
DCPA	ND	17	2.4	1.00	
Dibenzothiophene	ND	17	2.7	1.00	
Perthane	ND	17	2.9	1.00	
1-Methylphenanthrene	ND	17	2.1	1.00	
Benzo (e) Pyrene	ND	17	3.4	1.00	
Perylene	ND	17	2.6	1.00	
Biphenyl	ND	17	3.2	1.00	
2,6-Dimethylnaphthalene	7.8	17	3.0	1.00	J
Isophorone	ND	870	270	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,6-Tribromophenol	122	32-143	
2-Fluorobiphenyl	89	14-146	
2-Fluorophenol	85	15-138	
Nitrobenzene-d5	71	18-162	
p-Terphenyl-d14	85	34-148	
Phenol-d6	84	17-141	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM
		Units:	ug/kg
Project: Laguna Lake			Page 3 of 6

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**GC/MS MM**	**04/09/16**	**04/12/16 19:57**	**160409L04**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
1-Methylnaphthalene	ND	16	6.5	1.00	
2,4,5-Trichlorophenol	ND	16	9.3	1.00	
2,4,6-Trichlorophenol	ND	16	9.3	1.00	
2,4-Dichlorophenol	ND	16	9.4	1.00	
2,4-Dimethylphenol	ND	800	240	1.00	
2,4-Dinitrophenol	ND	800	120	1.00	
2-Chlorophenol	ND	16	6.3	1.00	
2-Methylnaphthalene	ND	16	7.3	1.00	
2-Methylphenol	ND	16	7.8	1.00	
2-Nitrophenol	ND	800	230	1.00	
3/4-Methylphenol	ND	16	16	1.00	
4,6-Dinitro-2-Methylphenol	ND	800	170	1.00	
4-Chloro-3-Methylphenol	ND	16	7.8	1.00	
4-Nitrophenol	ND	800	540	1.00	
Acenaphthene	ND	16	7.5	1.00	
Acenaphthylene	ND	16	7.3	1.00	
Anthracene	ND	16	8.0	1.00	
Benzo (a) Anthracene	14	16	7.1	1.00	J
Benzo (a) Pyrene	13	16	7.6	1.00	J
Benzo (b) Fluoranthene	16	16	7.9	1.00	J
Benzo (g,h,i) Perylene	13	16	7.8	1.00	J
Benzo (k) Fluoranthene	11	16	7.7	1.00	J
Bis(2-Ethylhexyl) Phthalate	82	80	44	1.00	
Butyl Benzyl Phthalate	ND	80	39	1.00	
Chrysene	21	16	6.7	1.00	
Di-n-Butyl Phthalate	ND	80	38	1.00	
Di-n-Octyl Phthalate	ND	80	38	1.00	
Dibenz (a,h) Anthracene	ND	16	7.4	1.00	
Diethyl Phthalate	ND	80	44	1.00	
Dimethyl Phthalate	ND	80	30	1.00	
Fluoranthene	29	16	7.9	1.00	
Fluorene	ND	16	8.0	1.00	
Indeno (1,2,3-c,d) Pyrene	ND	16	10	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM
		Units:	ug/kg
Project: Laguna Lake			Page 4 of 6

Parameter	Result	RL	MDL	DF	Qualifiers
Naphthalene	10	16	6.6	1.00	J
Pentachlorophenol	ND	800	110	1.00	
Phenanthrene	26	16	7.9	1.00	
Phenol	ND	16	9.4	1.00	
Pyrene	35	16	6.8	1.00	
1,6,7-Trimethylnaphthalene	ND	16	2.6	1.00	
2,3,4,6-Tetrachlorophenol	ND	16	15	1.00	
2,6-Dichlorophenol	ND	16	7.2	1.00	
DCPA	ND	16	2.2	1.00	
Dibenzothiophene	ND	16	2.5	1.00	
Perthane	ND	16	2.7	1.00	
1-Methylphenanthrene	ND	16	2.0	1.00	
Benzo (e) Pyrene	ND	16	3.2	1.00	
Perylene	ND	16	2.4	1.00	
Biphenyl	ND	16	2.9	1.00	
2,6-Dimethylnaphthalene	ND	16	2.7	1.00	
Isophorone	ND	800	250	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,6-Tribromophenol	106	32-143	
2-Fluorobiphenyl	87	14-146	
2-Fluorophenol	91	15-138	
Nitrobenzene-d5	74	18-162	
p-Terphenyl-d14	89	34-148	
Phenol-d6	90	17-141	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM
		Units:	ug/kg
Project: Laguna Lake			Page 5 of 6

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-14-256-150**	**N/A**	**Solid**	**GC/MS MM**	**04/09/16**	**04/12/16 18:49**	**160409L04**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
1-Methylnaphthalene	ND	10	4.0	1.00	
2,4,5-Trichlorophenol	ND	10	5.8	1.00	
2,4,6-Trichlorophenol	ND	10	5.8	1.00	
2,4-Dichlorophenol	ND	10	5.9	1.00	
2,4-Dimethylphenol	ND	500	150	1.00	
2,4-Dinitrophenol	ND	500	76	1.00	
2-Chlorophenol	ND	10	3.9	1.00	
2-Methylnaphthalene	ND	10	4.6	1.00	
2-Methylphenol	ND	10	4.9	1.00	
2-Nitrophenol	ND	500	140	1.00	
3/4-Methylphenol	ND	10	9.7	1.00	
4,6-Dinitro-2-Methylphenol	ND	500	100	1.00	
4-Chloro-3-Methylphenol	ND	10	4.9	1.00	
4-Nitrophenol	ND	500	340	1.00	
Acenaphthene	ND	10	4.7	1.00	
Acenaphthylene	ND	10	4.6	1.00	
Anthracene	ND	10	5.0	1.00	
Benzo (a) Anthracene	ND	10	4.5	1.00	
Benzo (a) Pyrene	ND	10	4.8	1.00	
Benzo (b) Fluoranthene	ND	10	4.9	1.00	
Benzo (g,h,i) Perylene	ND	10	4.9	1.00	
Benzo (k) Fluoranthene	ND	10	4.8	1.00	
Bis(2-Ethylhexyl) Phthalate	ND	50	27	1.00	
Butyl Benzyl Phthalate	ND	50	24	1.00	
Chrysene	ND	10	4.2	1.00	
Di-n-Butyl Phthalate	ND	50	24	1.00	
Di-n-Octyl Phthalate	ND	50	24	1.00	
Dibenz (a,h) Anthracene	ND	10	4.7	1.00	
Diethyl Phthalate	ND	50	28	1.00	
Dimethyl Phthalate	ND	50	19	1.00	
Fluoranthene	ND	10	5.0	1.00	
Fluorene	ND	10	5.0	1.00	
Indeno (1,2,3-c,d) Pyrene	ND	10	6.3	1.00	
Naphthalene	ND	10	4.2	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM
		Units:	ug/kg
Project: Laguna Lake			Page 6 of 6

Parameter	Result	RL	MDL	DF	Qualifiers
Pentachlorophenol	ND	500	71	1.00	
Phenanthrene	ND	10	5.0	1.00	
Phenol	ND	10	5.9	1.00	
Pyrene	ND	10	4.3	1.00	
1,6,7-Trimethylnaphthalene	ND	10	1.6	1.00	
2,3,4,6-Tetrachlorophenol	ND	10	9.3	1.00	
2,6-Dichlorophenol	ND	10	4.5	1.00	
DCPA	ND	10	1.4	1.00	
Dibenzothiophene	ND	10	1.5	1.00	
Perthane	ND	10	1.7	1.00	
1-Methylphenanthrene	ND	10	1.2	1.00	
Benzo (e) Pyrene	ND	10	2.0	1.00	
Perylene	ND	10	1.5	1.00	
Biphenyl	ND	10	1.8	1.00	
2,6-Dimethylnaphthalene	ND	10	1.7	1.00	
Isophorone	ND	500	160	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2,4,6-Tribromophenol	88	32-143	
2-Fluorobiphenyl	82	14-146	
2-Fluorophenol	82	15-138	
Nitrobenzene-d5	70	18-162	
p-Terphenyl-d14	85	34-148	
Phenol-d6	81	17-141	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM PCB Congeners
		Units:	ug/kg
Project: Laguna Lake			Page 1 of 6

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**GC/MS HHH**	**04/09/16**	**04/13/16 13:34**	**160409L11**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
PCB003	ND	0.34	0.15	1.00	
PCB005/008	ND	0.69	0.25	1.00	
PCB015	ND	0.34	0.12	1.00	
PCB018	ND	0.34	0.12	1.00	
PCB027	ND	0.34	0.13	1.00	
PCB028	ND	0.34	0.058	1.00	
PCB029	ND	0.34	0.14	1.00	
PCB031	ND	0.34	0.086	1.00	
PCB033	ND	0.34	0.21	1.00	
PCB037	ND	0.34	0.10	1.00	
PCB044	ND	0.34	0.15	1.00	
PCB049	ND	0.34	0.19	1.00	
PCB052	ND	0.34	0.11	1.00	
PCB056	ND	0.34	0.22	1.00	
PCB060	ND	0.34	0.25	1.00	
PCB066	ND	0.34	0.18	1.00	
PCB070	ND	0.34	0.10	1.00	
PCB074	ND	0.34	0.15	1.00	
PCB077	ND	0.34	0.13	1.00	
PCB081	ND	0.34	0.21	1.00	
PCB087	ND	0.34	0.18	1.00	
PCB095	ND	0.34	0.25	1.00	
PCB097	ND	0.34	0.24	1.00	
PCB099	ND	0.34	0.10	1.00	
PCB101	ND	0.34	0.17	1.00	
PCB105	ND	0.34	0.094	1.00	
PCB110	ND	0.34	0.079	1.00	
PCB114	ND	0.34	0.14	1.00	
PCB118	ND	0.34	0.14	1.00	
PCB119	ND	0.34	0.16	1.00	
PCB123	ND	0.34	0.18	1.00	
PCB126	ND	0.34	0.14	1.00	
PCB128	ND	0.34	0.18	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM PCB Congeners
		Units:	ug/kg
Project: Laguna Lake			Page 2 of 6

Parameter	Result	RL	MDL	DF	Qualifiers
PCB132/153	ND	0.69	0.30	1.00	
PCB137	ND	0.34	0.23	1.00	
PCB138/158	ND	0.69	0.16	1.00	
PCB141	ND	0.34	0.20	1.00	
PCB149	ND	0.34	0.17	1.00	
PCB151	ND	0.34	0.12	1.00	
PCB156	ND	0.34	0.099	1.00	
PCB157	ND	0.34	0.090	1.00	
PCB167	ND	0.34	0.11	1.00	
PCB168	ND	0.34	0.084	1.00	
PCB169	ND	0.34	0.11	1.00	
PCB170	ND	0.34	0.11	1.00	
PCB174	ND	0.34	0.25	1.00	
PCB177	ND	0.34	0.15	1.00	
PCB180	ND	0.34	0.072	1.00	
PCB183	ND	0.34	0.19	1.00	
PCB184	ND	0.34	0.18	1.00	
PCB187	ND	0.34	0.15	1.00	
PCB189	ND	0.34	0.11	1.00	
PCB194	ND	0.34	0.19	1.00	
PCB195	ND	0.34	0.20	1.00	
PCB200	ND	0.34	0.24	1.00	
PCB201	ND	0.34	0.17	1.00	
PCB203	ND	0.34	0.21	1.00	
PCB206	ND	0.34	0.33	1.00	
PCB209	ND	0.34	0.25	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	78	50-150	
p-Terphenyl-d14	76	50-150	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM PCB Congeners
		Units:	ug/kg
Project: Laguna Lake			Page 3 of 6

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**GC/MS HHH**	**04/09/16**	**04/13/16 13:58**	**160409L11**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
PCB003	ND	0.32	0.14	1.00	
PCB005/008	ND	0.64	0.23	1.00	
PCB015	ND	0.32	0.11	1.00	
PCB018	ND	0.32	0.11	1.00	
PCB027	ND	0.32	0.12	1.00	
PCB028	ND	0.32	0.054	1.00	
PCB029	ND	0.32	0.13	1.00	
PCB031	ND	0.32	0.079	1.00	
PCB033	ND	0.32	0.20	1.00	
PCB037	ND	0.32	0.096	1.00	
PCB044	ND	0.32	0.14	1.00	
PCB049	ND	0.32	0.18	1.00	
PCB052	ND	0.32	0.10	1.00	
PCB056	ND	0.32	0.20	1.00	
PCB060	ND	0.32	0.23	1.00	
PCB066	ND	0.32	0.16	1.00	
PCB070	ND	0.32	0.095	1.00	
PCB074	ND	0.32	0.14	1.00	
PCB077	ND	0.32	0.12	1.00	
PCB081	ND	0.32	0.19	1.00	
PCB087	ND	0.32	0.17	1.00	
PCB095	ND	0.32	0.23	1.00	
PCB097	ND	0.32	0.22	1.00	
PCB099	ND	0.32	0.097	1.00	
PCB101	ND	0.32	0.16	1.00	
PCB105	ND	0.32	0.087	1.00	
PCB110	ND	0.32	0.073	1.00	
PCB114	ND	0.32	0.13	1.00	
PCB118	ND	0.32	0.13	1.00	
PCB119	ND	0.32	0.15	1.00	
PCB123	ND	0.32	0.17	1.00	
PCB126	ND	0.32	0.13	1.00	
PCB128	ND	0.32	0.16	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM PCB Congeners
		Units:	ug/kg
Project: Laguna Lake			Page 4 of 6

Parameter	Result	RL	MDL	DF	Qualifiers
PCB132/153	ND	0.64	0.28	1.00	
PCB137	ND	0.32	0.21	1.00	
PCB138/158	ND	0.64	0.15	1.00	
PCB141	ND	0.32	0.18	1.00	
PCB149	ND	0.32	0.16	1.00	
PCB151	ND	0.32	0.11	1.00	
PCB156	ND	0.32	0.092	1.00	
PCB157	ND	0.32	0.083	1.00	
PCB167	ND	0.32	0.098	1.00	
PCB168	ND	0.32	0.078	1.00	
PCB169	ND	0.32	0.097	1.00	
PCB170	ND	0.32	0.10	1.00	
PCB174	ND	0.32	0.23	1.00	
PCB177	ND	0.32	0.14	1.00	
PCB180	ND	0.32	0.067	1.00	
PCB183	ND	0.32	0.18	1.00	
PCB184	ND	0.32	0.17	1.00	
PCB187	ND	0.32	0.13	1.00	
PCB189	ND	0.32	0.097	1.00	
PCB194	ND	0.32	0.18	1.00	
PCB195	ND	0.32	0.19	1.00	
PCB200	ND	0.32	0.22	1.00	
PCB201	ND	0.32	0.15	1.00	
PCB203	ND	0.32	0.19	1.00	
PCB206	ND	0.32	0.31	1.00	
PCB209	ND	0.32	0.23	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	76	50-150	
p-Terphenyl-d14	77	50-150	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM PCB Congeners
		Units:	ug/kg
Project: Laguna Lake			Page 5 of 6

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-16-418-201**	**N/A**	**Solid**	**GC/MS HHH**	**04/09/16**	**04/13/16 12:00**	**160409L11**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
PCB003	ND	0.20	0.086	1.00	
PCB005/008	ND	0.40	0.14	1.00	
PCB015	ND	0.20	0.067	1.00	
PCB018	ND	0.20	0.071	1.00	
PCB027	ND	0.20	0.076	1.00	
PCB028	ND	0.20	0.034	1.00	
PCB029	ND	0.20	0.080	1.00	
PCB031	ND	0.20	0.050	1.00	
PCB033	ND	0.20	0.12	1.00	
PCB037	ND	0.20	0.060	1.00	
PCB044	ND	0.20	0.087	1.00	
PCB049	ND	0.20	0.11	1.00	
PCB052	ND	0.20	0.063	1.00	
PCB056	ND	0.20	0.13	1.00	
PCB060	ND	0.20	0.14	1.00	
PCB066	ND	0.20	0.10	1.00	
PCB070	ND	0.20	0.060	1.00	
PCB074	ND	0.20	0.087	1.00	
PCB077	ND	0.20	0.078	1.00	
PCB081	ND	0.20	0.12	1.00	
PCB087	ND	0.20	0.11	1.00	
PCB095	ND	0.20	0.15	1.00	
PCB097	ND	0.20	0.14	1.00	
PCB099	ND	0.20	0.061	1.00	
PCB101	ND	0.20	0.098	1.00	
PCB105	ND	0.20	0.055	1.00	
PCB110	ND	0.20	0.046	1.00	
PCB114	ND	0.20	0.082	1.00	
PCB118	ND	0.20	0.084	1.00	
PCB119	ND	0.20	0.094	1.00	
PCB123	ND	0.20	0.10	1.00	
PCB126	ND	0.20	0.080	1.00	
PCB128	ND	0.20	0.10	1.00	
PCB132/153	ND	0.40	0.17	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM PCB Congeners
		Units:	ug/kg
Project: Laguna Lake			Page 6 of 6

Parameter	Result	RL	MDL	DF	Qualifiers
PCB137	ND	0.20	0.13	1.00	
PCB138/158	ND	0.40	0.094	1.00	
PCB141	ND	0.20	0.11	1.00	
PCB149	ND	0.20	0.098	1.00	
PCB151	ND	0.20	0.067	1.00	
PCB156	ND	0.20	0.058	1.00	
PCB157	ND	0.20	0.052	1.00	
PCB167	ND	0.20	0.062	1.00	
PCB168	ND	0.20	0.049	1.00	
PCB169	ND	0.20	0.061	1.00	
PCB170	ND	0.20	0.063	1.00	
PCB174	ND	0.20	0.15	1.00	
PCB177	ND	0.20	0.087	1.00	
PCB180	ND	0.20	0.042	1.00	
PCB183	ND	0.20	0.11	1.00	
PCB184	ND	0.20	0.10	1.00	
PCB187	ND	0.20	0.084	1.00	
PCB189	ND	0.20	0.061	1.00	
PCB194	ND	0.20	0.11	1.00	
PCB195	ND	0.20	0.12	1.00	
PCB200	ND	0.20	0.14	1.00	
PCB201	ND	0.20	0.097	1.00	
PCB203	ND	0.20	0.12	1.00	
PCB206	ND	0.20	0.19	1.00	
PCB209	ND	0.20	0.15	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
2-Fluorobiphenyl	69	50-150	
p-Terphenyl-d14	82	50-150	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3550B (M)
		Method:	Organotins by Krone et al.
		Units:	ug/kg
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI	**16-04-0013-1-AA**	**03/31/16 08:35**	**Sediment**	**GC/MS Y**	**04/07/16**	**04/11/16 13:50**	**160407L09**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Dibutyltin	ND	5.1	1.3	1.00	
Monobutyltin	ND	5.1	2.4	1.00	
Tetrabutyltin	ND	5.1	1.3	1.00	
Tributyltin	ND	5.1	2.6	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
Tripentyltin	102	27-135	

LL16-SAI	**16-04-0013-2-AA**	**03/30/16 12:50**	**Sediment**	**GC/MS Y**	**04/07/16**	**04/11/16 14:06**	**160407L09**

Comment(s): - Results are reported on a dry weight basis.
- Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Dibutyltin	ND	4.8	1.2	1.00	
Monobutyltin	ND	4.8	2.2	1.00	
Tetrabutyltin	ND	4.8	1.2	1.00	
Tributyltin	ND	4.8	2.4	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
Tripentyltin	97	27-135	

Method Blank	**099-07-016-1395**	**N/A**	**Solid**	**GC/MS Y**	**04/07/16**	**04/11/16 13:03**	**160407L09**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Dibutyltin	ND	3.0	0.73	1.00	
Monobutyltin	ND	3.0	1.4	1.00	
Tetrabutyltin	ND	3.0	0.74	1.00	
Tributyltin	ND	3.0	1.5	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
Tripentyltin	74	27-135	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

Return to Contents

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3060A
		Method:	EPA 7199
Project: Laguna Lake			Page 1 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-PAI	**Sample**	**Sediment**	**IC 11**	**04/02/16**	**04/02/16 18:21**	**160402S01P**
LL16-PAI	**Matrix Spike**	**Sediment**	**IC 11**	**04/02/16**	**04/02/16 18:39**	**160402S01P**
LL16-PAI	**Matrix Spike Duplicate**	**Sediment**	**IC 11**	**04/02/16**	**04/02/16 18:48**	**160402S01P**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Chromium, Hexavalent	ND	20000	55.20	0	44.40	0	75-125	22	0-25	3

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 1664A (M)
Project: Laguna Lake			Page 2 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-SAI	**Sample**	**Sediment**	**N/A**	**04/11/16**	**04/11/16 13:30**	**G0411HEMS3**
LL16-SAI	**Matrix Spike**	**Sediment**	**N/A**	**04/11/16**	**04/11/16 13:30**	**G0411HEMS3**
LL16-SAI	**Matrix Spike Duplicate**	**Sediment**	**N/A**	**04/11/16**	**04/11/16 13:30**	**G0411HEMS3**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
HEM: Oil and Grease	30.00	40.00	62.96	82	63.35	83	78-114	1	0-18	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 1664A (M)
Project: Laguna Lake			Page 3 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-SAI	**Sample**	**Sediment**	**N/A**	**04/11/16**	**04/11/16 17:30**	**G0411HEMS4**
LL16-SAI	**Matrix Spike**	**Sediment**	**N/A**	**04/11/16**	**04/11/16 17:30**	**G0411HEMS4**
LL16-SAI	**Matrix Spike Duplicate**	**Sediment**	**N/A**	**04/11/16**	**04/11/16 17:30**	**G0411HEMS4**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
HEM - SGT: Oil and Grease	13.33	20.00	33.13	99	33.34	100	78-114	1	0-18	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 9060A
Project: Laguna Lake			Page 4 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-PAI	**Sample**	**Sediment**	**TOC 9**	**04/11/16**	**04/12/16 09:21**	**G0411TOCS1**
LL16-PAI	**Matrix Spike**	**Sediment**	**TOC 9**	**04/11/16**	**04/12/16 09:21**	**G0411TOCS1**
LL16-PAI	**Matrix Spike Duplicate**	**Sediment**	**TOC 9**	**04/11/16**	**04/12/16 09:21**	**G0411TOCS1**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Carbon, Total Organic	1.819	3.000	5.408	120	5.065	108	75-125	7	0-25	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3050B
		Method:	EPA 6020
Project: Laguna Lake			Page 5 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-PAI	**Sample**	**Sediment**	**ICP/MS 03**	**04/02/16**	**04/04/16 18:53**	**160402S01A**
LL16-PAI	**Matrix Spike**	**Sediment**	**ICP/MS 03**	**04/02/16**	**04/04/16 18:43**	**160402S01A**
LL16-PAI	**Matrix Spike Duplicate**	**Sediment**	**ICP/MS 03**	**04/02/16**	**04/04/16 18:45**	**160402S01A**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Antimony	ND	25.00	7.839	31	8.191	33	80-120	4	0-20	3
Arsenic	2.072	25.00	26.14	96	26.76	99	80-120	2	0-20	
Barium	169.3	25.00	197.6	4X	196.7	4X	80-120	4X	0-20	Q
Beryllium	ND	25.00	28.35	113	29.10	116	80-120	3	0-20	
Cadmium	0.3076	25.00	28.18	111	28.63	113	80-120	2	0-20	
Chromium	100.9	25.00	132.1	4X	133.5	4X	80-120	4X	0-20	Q
Cobalt	18.27	25.00	43.25	100	43.99	103	80-120	2	0-20	
Copper	32.33	25.00	57.17	99	58.46	104	80-120	2	0-20	
Lead	6.509	25.00	31.75	101	33.12	106	80-120	4	0-20	
Molybdenum	0.2842	25.00	23.30	92	24.16	96	80-120	4	0-20	
Nickel	176.1	25.00	208.9	4X	213.0	4X	80-120	4X	0-20	Q
Selenium	0.2852	25.00	23.04	91	22.58	89	80-120	2	0-20	
Silver	ND	12.50	13.10	105	13.55	108	80-120	3	0-20	
Thallium	ND	25.00	24.41	98	25.63	103	80-120	5	0-20	
Vanadium	43.10	25.00	71.95	115	72.53	118	80-120	1	0-20	
Zinc	48.70	25.00	74.60	104	77.02	113	80-120	3	0-20	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 7471A Total
		Method:	EPA 7471A
Project: Laguna Lake			Page 6 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-PAI	**Sample**	**Sediment**	**Mercury 05**	**04/05/16**	**04/05/16 16:16**	**160405S02**
LL16-PAI	**Matrix Spike**	**Sediment**	**Mercury 05**	**04/05/16**	**04/05/16 16:18**	**160405S02**
LL16-PAI	**Matrix Spike Duplicate**	**Sediment**	**Mercury 05**	**04/05/16**	**04/05/16 16:20**	**160405S02**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Mercury	0.03733	0.8350	0.8764	100	0.8292	95	76-136	6	0-16	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8081A
Project: Laguna Lake			Page 7 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-PAI	**Sample**	**Sediment**	**GC 44**	**04/09/16**	**04/14/16 15:13**	**160409S12**
LL16-PAI	**Matrix Spike**	**Sediment**	**GC 44**	**04/09/16**	**04/14/16 14:44**	**160409S12**
LL16-PAI	**Matrix Spike Duplicate**	**Sediment**	**GC 44**	**04/09/16**	**04/14/16 14:58**	**160409S12**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Aldrin	ND	5.000	4.075	82	3.494	70	50-135	15	0-25	
Alpha-BHC	ND	5.000	4.656	93	4.160	83	50-135	11	0-25	
Beta-BHC	ND	5.000	6.582	132	6.044	121	50-135	9	0-25	
Delta-BHC	ND	5.000	11.95	239	12.15	243	50-135	2	0-25	3
Gamma-BHC	ND	5.000	4.750	95	4.356	87	50-135	9	0-25	
Dieldrin	ND	5.000	4.924	98	4.260	85	50-135	14	0-25	
4,4'-DDD	ND	5.000	5.219	104	4.902	98	50-135	6	0-25	
4,4'-DDE	ND	5.000	5.387	108	4.839	97	50-135	11	0-25	
4,4'-DDT	ND	5.000	4.199	84	2.755	55	50-135	42	0-25	4
Endosulfan I	ND	5.000	4.769	95	4.284	86	50-135	11	0-25	
Endosulfan II	ND	5.000	4.940	99	4.842	97	50-135	2	0-25	
Endosulfan Sulfate	ND	5.000	5.108	102	4.612	92	50-135	10	0-25	
Endrin	ND	5.000	5.460	109	4.615	92	50-135	17	0-25	
Endrin Aldehyde	ND	5.000	3.506	70	3.150	63	50-135	11	0-25	
Endrin Ketone	ND	5.000	5.058	101	4.210	84	50-135	18	0-25	
Heptachlor	ND	5.000	4.787	96	3.809	76	50-135	23	0-25	
Heptachlor Epoxide	ND	5.000	5.046	101	4.327	87	50-135	15	0-25	
Methoxychlor	ND	5.000	4.956	99	5.375	108	50-135	8	0-25	
Alpha Chlordane	ND	5.000	5.019	100	4.505	90	50-135	11	0-25	
Gamma Chlordane	ND	5.000	4.843	97	4.171	83	50-135	15	0-25	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8082
Project: Laguna Lake			Page 8 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-PAI	**Sample**	**Sediment**	**GC 31**	**04/09/16**	**04/11/16 16:50**	**160409S05**
LL16-PAI	**Matrix Spike**	**Sediment**	**GC 31**	**04/09/16**	**04/11/16 17:09**	**160409S05**
LL16-PAI	**Matrix Spike Duplicate**	**Sediment**	**GC 31**	**04/09/16**	**04/11/16 17:28**	**160409S05**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Aroclor-1016	ND	20.00	18.76	94	19.50	97	50-135	4	0-25	
Aroclor-1260	ND	20.00	21.32	107	20.83	104	50-135	2	0-25	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM
Project: Laguna Lake			Page 9 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-PAI	**Sample**	**Sediment**	**GC/MS MM**	**04/09/16**	**04/12/16 19:35**	**160409S04**
LL16-PAI	**Matrix Spike**	**Sediment**	**GC/MS MM**	**04/09/16**	**04/12/16 20:20**	**160409S04**
LL16-PAI	**Matrix Spike Duplicate**	**Sediment**	**GC/MS MM**	**04/09/16**	**04/12/16 20:42**	**160409S04**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
2,4,6-Trichlorophenol	ND	1000	896.8	90	1287	129	40-160	36	0-20	4
2,4-Dichlorophenol	ND	1000	850.0	85	1147	115	40-160	30	0-20	4
2-Methylphenol	ND	1000	959.1	96	1308	131	40-160	31	0-20	4
2-Nitrophenol	ND	1000	788.5	79	1096	110	40-160	33	0-20	4
4-Chloro-3-Methylphenol	ND	1000	981.2	98	1328	133	40-160	30	0-20	4
Acenaphthene	ND	1000	951.0	95	1315	132	40-160	32	0-20	4
Benzo (a) Pyrene	ND	1000	860.6	86	1183	118	17-163	32	0-20	4
Chrysene	ND	1000	1005	100	1325	132	17-168	27	0-20	4
Di-n-Butyl Phthalate	ND	1000	732.3	73	966.3	97	40-160	28	0-20	4
Dimethyl Phthalate	ND	1000	967.8	97	1009	101	40-160	4	0-20	
Fluoranthene	ND	1000	886.7	89	1137	114	26-137	25	0-20	4
Fluorene	ND	1000	976.0	98	1349	135	59-121	32	0-20	3,4
Naphthalene	ND	1000	872.9	87	1167	117	21-133	29	0-20	4
Phenanthrene	ND	1000	1105	111	1506	151	54-120	31	0-20	3,4
Phenol	ND	1000	862.5	86	1197	120	40-160	32	0-20	4
Pyrene	ND	1000	1162	116	1574	157	6-156	30	0-46	3

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM PCB Congeners
Project: Laguna Lake			Page 10 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-PAI	**Sample**	**Sediment**	**GC/MS HHH**	**04/09/16**	**04/13/16 13:34**	**160409S11A**
LL16-PAI	**Matrix Spike**	**Sediment**	**GC/MS HHH**	**04/09/16**	**04/13/16 18:17**	**160409S11A**
LL16-PAI	**Matrix Spike Duplicate**	**Sediment**	**GC/MS HHH**	**04/09/16**	**04/13/16 18:40**	**160409S11A**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
PCB018	ND	50.00	36.19	72	31.92	64	50-150	13	0-25	
PCB028	ND	50.00	40.17	80	40.75	81	50-150	1	0-25	
PCB044	ND	50.00	38.71	77	38.96	78	50-150	1	0-25	
PCB052	ND	50.00	37.18	74	36.07	72	50-150	3	0-25	
PCB066	ND	50.00	45.17	90	45.21	90	50-150	0	0-25	
PCB077	ND	50.00	43.60	87	42.77	86	50-150	2	0-25	
PCB101	ND	50.00	38.35	77	38.88	78	50-150	1	0-25	
PCB105	ND	50.00	46.35	93	47.41	95	50-150	2	0-25	
PCB118	ND	50.00	47.72	95	48.29	97	50-150	1	0-25	
PCB126	ND	50.00	48.05	96	48.02	96	50-150	0	0-25	
PCB128	ND	50.00	44.37	89	37.85	76	50-150	16	0-25	
PCB170	ND	50.00	42.31	85	40.99	82	50-150	3	0-25	
PCB180	ND	50.00	51.18	102	43.82	88	50-150	15	0-25	
PCB187	ND	50.00	45.71	91	45.56	91	50-150	0	0-25	
PCB195	ND	50.00	43.78	88	47.79	96	50-150	9	0-25	
PCB206	ND	50.00	45.99	92	48.77	98	50-150	6	0-25	
PCB209	ND	50.00	44.29	89	45.71	91	50-150	3	0-25	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3550B (M)
		Method:	Organotins by Krone et al.
Project: Laguna Lake			Page 11 of 11

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-PAI	**Sample**	**Sediment**	**GC/MS Y**	**04/07/16**	**04/11/16 13:50**	**160407S09**
LL16-PAI	**Matrix Spike**	**Sediment**	**GC/MS Y**	**04/07/16**	**04/11/16 15:40**	**160407S09**
LL16-PAI	**Matrix Spike Duplicate**	**Sediment**	**GC/MS Y**	**04/07/16**	**04/11/16 15:56**	**160407S09**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Tetrabutyltin	ND	100.0	90.37	90	96.42	96	33-129	6	0-36	
Tributyltin	ND	100.0	79.64	80	83.91	84	34-142	5	0-50	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - PDS

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3050B
		Method:	EPA 6020
Project: Laguna Lake			Page 1 of 1

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	PDS/PDSD Batch Number
LL16-PAI	**Sample**	**Sediment**	**ICP/MS 03**	**04/02/16 00:00**	**04/04/16 18:53**	**160402S01A**
LL16-PAI	**PDS**	**Sediment**	**ICP/MS 03**	**04/02/16 00:00**	**04/04/16 18:48**	**160402S01A**

Parameter	Sample Conc.	Spike Added	PDS Conc.	PDS %Rec.	%Rec. CL	Qualifiers
Antimony	ND	25.00	25.21	101	75-125	
Arsenic	2.072	25.00	25.78	95	75-125	
Barium	169.3	25.00	192.0	4X	75-125	Q
Beryllium	ND	25.00	26.23	105	75-125	
Cadmium	0.3076	25.00	26.12	103	75-125	
Chromium	100.9	25.00	124.5	4X	75-125	Q
Cobalt	18.27	25.00	41.68	94	75-125	
Copper	32.33	25.00	55.34	92	75-125	
Lead	6.509	25.00	30.01	94	75-125	
Molybdenum	0.2842	25.00	25.74	102	75-125	
Nickel	176.1	25.00	198.6	4X	75-125	Q
Selenium	0.2852	25.00	23.64	93	75-125	
Silver	ND	12.50	11.85	95	75-125	
Thallium	ND	25.00	23.31	93	75-125	
Vanadium	43.10	25.00	67.58	98	75-125	
Zinc	48.70	25.00	72.52	95	75-125	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - Sample Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 376.2M
Project: Laguna Lake			Page 1 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
LL16-PAI	**Sample**	**Sediment**	**N/A**	**04/06/16 00:00**	**04/06/16 16:25**	**G0406SD2**
LL16-PAI	**Sample Duplicate**	**Sediment**	**N/A**	**04/06/16 00:00**	**04/06/16 16:25**	**G0406SD2**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Sulfide, Total	2.700	2.700	0	0-25	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Sample Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 376.2M
Project: Laguna Lake			Page 2 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
LL16-PAI	**Sample**	**Sediment**	**N/A**	**04/06/16 00:00**	**04/06/16 15:50**	**G0406DSD2**
LL16-PAI	**Sample Duplicate**	**Sediment**	**N/A**	**04/06/16 00:00**	**04/06/16 15:50**	**G0406DSD2**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Sulfide, Dissolved	ND	ND	N/A	0-25	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Sample Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 9045D
Project: Laguna Lake			Page 3 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
LL16-PAI	**Sample**	**Sediment**	**PH 4**	**N/A**	**04/02/16 12:04**	**G0402PHD1**
LL16-PAI	**Sample Duplicate**	**Sediment**	**PH 4**	**N/A**	**04/02/16 12:04**	**G0402PHD1**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
pH	7.160	7.210	1	0-25	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Sample Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	SM 2540 B (M)
Project: Laguna Lake			Page 4 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
LL16-PAI	**Sample**	**Sediment**	**N/A**	**04/05/16 00:00**	**04/05/16 18:30**	**G0405TSD7**
LL16-PAI	**Sample Duplicate**	**Sediment**	**N/A**	**04/05/16 00:00**	**04/05/16 18:30**	**G0405TSD7**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Solids, Total	57.70	57.50	0	0-10	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3060A
		Method:	EPA 7199
Project: Laguna Lake			Page 1 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-05-125-2903	**LCS**	**Solid**	**IC 11**	**04/02/16**	**04/02/16 18:03**	**160402L01P**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	Qualifiers
Chromium, Hexavalent	20000	21250	106	80-120	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS/LCSD

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 1664A (M)
Project: Laguna Lake			Page 2 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-12-040-607	**LCS**	**Solid**	**N/A**	**04/11/16**	**04/11/16 13:30**	**G0411HEML3**
099-12-040-607	**LCSD**	**Solid**	**N/A**	**04/11/16**	**04/11/16 13:30**	**G0411HEML3**

Parameter	LCS Spike	LCS Conc.	LCS %Rec.	LCSD Spike	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
HEM: Oil and Grease	40.00	33.42	84	40.00	36.76	92	78-114	10	0-18	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS/LCSD

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 1664A (M)
Project: Laguna Lake			Page 3 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-12-207-137	**LCS**	**Solid**	**N/A**	**04/11/16**	**04/11/16 17:30**	**G0411HEML4**
099-12-207-137	**LCSD**	**Solid**	**N/A**	**04/11/16**	**04/11/16 17:30**	**G0411HEML4**

Parameter	LCS Spike	LCS Conc.	LCS %Rec.	LCSD Spike	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
HEM - SGT: Oil and Grease	20.00	20.05	100	20.00	23.40	117	64-132	15	0-34	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS/LCSD

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 376.2M
Project: Laguna Lake			Page 4 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-16-352-101	**LCS**	**Solid**	**N/A**	**04/06/16**	**04/06/16 16:25**	**G0406SL2**
099-16-352-101	**LCSD**	**Solid**	**N/A**	**04/06/16**	**04/06/16 16:25**	**G0406SL2**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Sulfide, Total	1.000	0.8000	80	0.8500	85	80-120	6	0-20	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS/LCSD

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 376.2M
Project: Laguna Lake			Page 5 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-16-354-50	**LCS**	**Solid**	**N/A**	**04/06/16**	**04/06/16 15:50**	**G0406DSL2**
099-16-354-50	**LCSD**	**Solid**	**N/A**	**04/06/16**	**04/06/16 15:50**	**G0406DSL2**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Sulfide, Dissolved	1.000	0.8500	85	0.8500	85	80-120	0	0-20	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS/LCSD

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	EPA 9060A
Project: Laguna Lake			Page 6 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-06-013-1525	**LCS**	**Solid**	**TOC 9**	**04/11/16**	**04/12/16 09:21**	**G0411TOCL1**
099-06-013-1525	**LCSD**	**Solid**	**TOC 9**	**04/11/16**	**04/12/16 09:21**	**G0411TOCL1**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Carbon, Total Organic	0.6000	0.7196	120	0.6994	117	80-120	3	0-20	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS/LCSD

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	SM 4500-NH3 B/C (M)
Project: Laguna Lake			Page 7 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-12-816-134	**LCS**	**Solid**	**BUR05**	**04/14/16**	**04/14/16 16:19**	**G0414NH3L1**
099-12-816-134	**LCSD**	**Solid**	**BUR05**	**04/14/16**	**04/14/16 16:19**	**G0414NH3L1**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Ammonia (as N)	10.00	8.680	87	9.100	91	80-120	5	0-20	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS/LCSD

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3050B
		Method:	EPA 6020
Project: Laguna Lake			Page 8 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-15-254-403	**LCS**	**Solid**	**ICP/MS 03**	**04/02/16**	**04/04/16 18:18**	**160402L01E**
099-15-254-403	**LCSD**	**Solid**	**ICP/MS 03**	**04/02/16**	**04/04/16 18:20**	**160402L01E**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	ME CL	RPD	RPD CL	Qualifiers
Antimony	25.00	28.47	114	27.23	109	80-120	73-127	4	0-20	
Arsenic	25.00	28.45	114	27.30	109	80-120	73-127	4	0-20	
Barium	25.00	27.56	110	26.19	105	80-120	73-127	5	0-20	
Beryllium	25.00	29.21	117	27.86	111	80-120	73-127	5	0-20	
Cadmium	25.00	29.06	116	27.69	111	80-120	73-127	5	0-20	
Chromium	25.00	27.74	111	27.58	110	80-120	73-127	1	0-20	
Cobalt	25.00	27.08	108	25.82	103	80-120	73-127	5	0-20	
Copper	25.00	27.84	111	26.67	107	80-120	73-127	4	0-20	
Lead	25.00	26.62	106	24.77	99	80-120	73-127	7	0-20	
Molybdenum	25.00	27.11	108	26.19	105	80-120	73-127	3	0-20	
Nickel	25.00	27.35	109	26.05	104	80-120	73-127	5	0-20	
Selenium	25.00	29.94	120	28.47	114	80-120	73-127	5	0-20	
Silver	12.50	13.99	112	13.44	108	80-120	73-127	4	0-20	
Thallium	25.00	25.68	103	24.16	97	80-120	73-127	6	0-20	
Vanadium	25.00	26.23	105	25.76	103	80-120	73-127	2	0-20	
Zinc	25.00	29.83	119	28.71	115	80-120	73-127	4	0-20	

Total number of LCS compounds: 16
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - LCS

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 7471A Total
		Method:	EPA 7471A
Project: Laguna Lake			Page 9 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-16-278-222	**LCS**	**Solid**	**Mercury 05**	**04/05/16**	**04/05/16 16:14**	**160405L02E**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	Qualifiers
Mercury	0.8350	0.8186	98	82-124	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8081A
Project: Laguna Lake			Page 10 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-12-858-403	**LCS**	**Solid**	**GC 44**	**04/09/16**	**04/14/16 15:41**	**160409L12**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	ME CL	Qualifiers
Aldrin	5.000	3.888	78	50-135	36-149	
Alpha-BHC	5.000	3.796	76	50-135	36-149	
Beta-BHC	5.000	3.788	76	50-135	36-149	
Delta-BHC	5.000	4.114	82	50-135	36-149	
Gamma-BHC	5.000	3.834	77	50-135	36-149	
Dieldrin	5.000	4.063	81	50-135	36-149	
4,4'-DDD	5.000	4.032	81	50-135	36-149	
4,4'-DDE	5.000	3.985	80	50-135	36-149	
4,4'-DDT	5.000	4.440	89	50-135	36-149	
Endosulfan I	5.000	3.814	76	50-135	36-149	
Endosulfan II	5.000	4.174	83	50-135	36-149	
Endosulfan Sulfate	5.000	4.128	83	50-135	36-149	
Endrin	5.000	4.027	81	50-135	36-149	
Endrin Aldehyde	5.000	3.977	80	50-135	36-149	
Endrin Ketone	5.000	4.418	88	50-135	36-149	
Heptachlor	5.000	4.146	83	50-135	36-149	
Heptachlor Epoxide	5.000	3.871	77	50-135	36-149	
Methoxychlor	5.000	4.253	85	50-135	36-149	
Alpha Chlordane	5.000	3.757	75	50-135	36-149	
Gamma Chlordane	5.000	3.815	76	50-135	36-149	

Total number of LCS compounds: 20
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - LCS

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8082
Project: Laguna Lake			Page 11 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-12-565-452	**LCS**	**Solid**	**GC 31**	**04/09/16**	**04/11/16 16:12**	**160409L05**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	Qualifiers
Aroclor-1016	20.00	14.51	73	50-135	
Aroclor-1260	20.00	16.26	81	50-135	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM
Project: Laguna Lake			Page 12 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-14-256-150	**LCS**	**Solid**	**GC/MS MM**	**04/09/16**	**04/12/16 19:12**	**160409L04**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	ME CL	Qualifiers
2,4,6-Trichlorophenol	1000	898.0	90	40-160	20-180	
2,4-Dichlorophenol	1000	813.4	81	40-160	20-180	
2-Methylphenol	1000	949.4	95	40-160	20-180	
2-Nitrophenol	1000	792.8	79	40-160	20-180	
4-Chloro-3-Methylphenol	1000	926.7	93	40-160	20-180	
Acenaphthene	1000	943.0	94	48-108	38-118	
Benzo (a) Pyrene	1000	882.7	88	17-163	0-187	
Chrysene	1000	988.2	99	17-168	0-193	
Di-n-Butyl Phthalate	1000	795.6	80	40-160	20-180	
Dimethyl Phthalate	1000	980.0	98	40-160	20-180	
Fluoranthene	1000	976.8	98	26-137	8-156	
Fluorene	1000	957.5	96	59-121	49-131	
Naphthalene	1000	876.0	88	21-133	2-152	
Phenanthrene	1000	968.0	97	54-120	43-131	
Phenol	1000	871.7	87	40-160	20-180	
Pyrene	1000	1060	106	28-106	15-119	

Total number of LCS compounds: 16
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - LCS/LCSD

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3541
		Method:	EPA 8270C SIM PCB Congeners
Project: Laguna Lake			Page 13 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-16-418-201	**LCS**	**Solid**	**GC/MS HHH**	**04/09/16**	**04/13/16 12:23**	**160409L11**
099-16-418-201	**LCSD**	**Solid**	**GC/MS HHH**	**04/09/16**	**04/13/16 12:47**	**160409L11**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	ME CL	RPD	RPD CL	Qualifiers
PCB018	50.00	36.71	73	35.56	71	50-150	33-167	3	0-25	
PCB028	50.00	38.54	77	37.49	75	50-150	33-167	3	0-25	
PCB044	50.00	38.48	77	36.95	74	50-150	33-167	4	0-25	
PCB052	50.00	36.57	73	35.35	71	50-150	33-167	3	0-25	
PCB066	50.00	44.86	90	43.60	87	50-150	33-167	3	0-25	
PCB077	50.00	42.63	85	41.10	82	50-150	33-167	4	0-25	
PCB101	50.00	37.87	76	38.01	76	50-150	33-167	0	0-25	
PCB105	50.00	45.44	91	43.42	87	50-150	33-167	5	0-25	
PCB118	50.00	45.40	91	43.70	87	50-150	33-167	4	0-25	
PCB126	50.00	44.86	90	42.19	84	50-150	33-167	6	0-25	
PCB128	50.00	41.82	84	39.48	79	50-150	33-167	6	0-25	
PCB170	50.00	40.21	80	39.37	79	50-150	33-167	2	0-25	
PCB180	50.00	45.58	91	42.90	86	50-150	33-167	6	0-25	
PCB187	50.00	45.02	90	42.30	85	50-150	33-167	6	0-25	
PCB195	50.00	41.08	82	41.99	84	50-150	33-167	2	0-25	
PCB206	50.00	44.39	89	42.08	84	50-150	33-167	5	0-25	
PCB209	50.00	38.71	77	38.93	78	50-150	33-167	1	0-25	

Total number of LCS compounds: 17
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - LCS/LCSD

Kinnetic Laboratories, Inc.		Date Received:	04/01/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0013
Carlsbad, CA 92008-4367		Preparation:	EPA 3550B (M)
		Method:	Organotins by Krone et al.
Project: Laguna Lake			Page 14 of 14

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-07-016-1395	**LCS**	**Solid**	**GC/MS Y**	**04/07/16**	**04/11/16 13:18**	**160407L09**
099-07-016-1395	**LCSD**	**Solid**	**GC/MS Y**	**04/07/16**	**04/11/16 13:34**	**160407L09**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Tetrabutyltin	100.0	101.4	101	104.7	105	40-142	3	0-20	
Tributyltin	100.0	88.80	89	88.75	89	33-147	0	0-20	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Glossary of Terms and Qualifiers

Work Order: 16-04-0013 Page 1 of 1

Qualifiers	Definition
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution. Therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to suspected matrix interference. The associated LCS recovery was in control.
4	The MS/MSD RPD was out of control due to suspected matrix interference.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to suspected matrix interference.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
BV	Sample received after holding time expired.
CI	See case narrative.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
HD	The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
HDH	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but heavier hydrocarbons were also present (or detected).
HDL	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but lighter hydrocarbons were also present (or detected).
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
JA	Analyte positively identified but quantitation is an estimate.
ME	LCS Recovery Percentage is within Marginal Exceedance (ME) Control Limit range (+/- 4 SD from the mean).
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
SG	The sample extract was subjected to Silica Gel treatment prior to analysis.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.
	Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.
	Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.
	A calculated total result (Example: Total Pesticides) is the summation of each component concentration and/or, if "J" flags are reported, estimated concentration. Component concentrations showing not detected (ND) are summed into the calculated total result as zero concentrations.

Return to Contents

Chain of Custody Record

To:
Eurofins Calscience
7440 Lincoln Way
Garden Grove, CA 92841
Phone: (714) 895-5494

Contact: Carla Hollowell

Date Received:

Lab #: **16-04-0013**

From:
Kinnetic Laboratories, Inc
5225 Avenida Encinas, Suite H
Carlsbad, CA 92008
(760) 438-8968
(760) 438-2959
Contact: Tim Fleming

Project: Laguna Lake

Matrix: Sediment

Project #: 5720.154

Complete by: 2 weeks

SampleID	StationID	Sample Date	Sample Time	Sample Type	Analysis	Container	Pres	No. of Bottles	LabID	Condition Upon Receipt
LL16-PAI	Primary Area	3/30	0835	Composite	Bulk Sediment Chemisty*	1L WMGJ	4° C	1	1	
LL16-SAI	Secondary Area	3/30	12:50	Composite	Bulk Sediment Chemisty*	1L WMGJ	4° C	1	2	

Data Report MUST include the following: Sample ID, Analytical Method, Detection Limit, Date of Extraction if applicable, Date of Analysis, Analytical Results and Signature of QA Reviewer.
All times on this sheet are military time. Email sample receipt confirmations, PDF reports, and EDDs to edd@kinneticlabs.net and tfleming@kinneticlabs.net.

Special Instructions/Comments: *See attached list of analytes, methods, RLs. Run MS/MSD/QC on project sample. Report on a dry wt. basis.
Bulk Chem analyses: Total Metals, Total & Diss. Sulfide, OC Pest, PCB Aroclors & Congeners, PAHs, Phenols, Phthalates, Organotins, % Solids, O&G, O&G w/SGT, pH, Ammonia, Hex. Chrom.

Sampled and Relinquished By:	Date/Time:	Transporter	Received By:	Date/Time:
[illegible]	3/31 11/25		[illegible]	3/31 11/25
Relinquished By:	**Date/Time:**	**Transporter**	**Received By:**	**Date/Time:**
[illegible]	3/31 14:00		[illegible]	4/01/16 1010

v20020904

Return to Contents

0013

DATE 3/31/16

COMPANY CAL SCIENCE

ADDRESS 320 MASON WAY

ADDRESS

STE/ROOM

CITY SAN LUIS OBISPO

ZIP CODE 93401

STATE CA

PHONE NUMBER 805-550-7399

COMPANY SYSTEMS CONTROL

PHONE NUMBER 714-895-5494

ADDRESS

ADDRESS 1 [illegible] WAY

STE/ROOM

CITY [illegible]

ZIP CODE 92841

YOUR INTERNAL BILLING REFERENCE WILL APPEAR ON YOUR INVOICE

AL UCTIONS

GSO GOLDEN STATE OVERNIGHT

1-800-322-5555

WWW.GSO.COM

SHIPPING AIR BILL

PACKAGE LABEL

4 PACKAGE INFORMATION

- [ ] LETTER (MAX 8 OZ)
- [x] PACKAGE (WT) _____
- [ ] DECLARED VALUE $ _____
- [ ] COD AMOUNT $ _____ (CASH NOT ACCEPTED)

5 DELIVERY SERVICE

- [x] PRIORITY OVERNIGHT BY 10:30 AM
- [ ] EARLY PRIORITY BY 8:00 AM
- [ ] SATURDAY DELIVERY

*DELIVERY TIMES MAY BE LATER IN SOME AREAS - CONSULT YOUR SERVICE GUIDE OR CALL GOLDEN STATE OVERNIGHT

6 RELEASE SIGNATURE _____ SIGN TO AUTHORIZE DELIVERY WITHOUT OBTAINING SIGNATURE

7 PICK UP INFORMATION _____ TIME _____ DRIVER # _____ ROUTE # _____

GSOAB108037716

GSOAB108037716 PEEL OFF HERE

8 GSO TRACKING NUMBER

Return to Contents

eurofins | Calscience

WORK ORDER NUMBER: 16-04-0013

SAMPLE RECEIPT CHECKLIST

COOLER 1 OF 1

CLIENT: Kinnetic Labs., Inc.

DATE: 04 / 01 / 2016

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC2A (CF: 0.0°C); Temperature (w/o CF): 3-4 °C (w/ CF): 3-4 °C; ☐ Blank ☑ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter

Checked by: 836

CUSTODY SEAL:

Cooler	☐ Present and Intact	☐ Present but Not Intact	☑ Not Present	☐ N/A	Checked by: 836
Sample(s)	☐ Present and Intact	☐ Present but Not Intact	☑ Not Present	☐ N/A	Checked by: 1058

SAMPLE CONDITION:

	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Sampling date ☐ Sampling time ☐ Matrix ☐ Number of containers			
☐ No analysis requested ☐ Not relinquished ☐ No relinquished date ☐ No relinquished time			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and in good condition	☑	☐	☐
Proper containers for analyses requested	☑	☐	☐
Sufficient volume/mass for analyses requested	☑	☐	☐
Samples received within holding time	☑	☐	☐
Aqueous samples for certain analyses received within 15-minute holding time			
☐ pH ☐ Residual Chlorine ☐ Dissolved Sulfide ☐ Dissolved Oxygen	☐	☐	☑
Proper preservation chemical(s) noted on COC and/or sample container	☐	☐	☑
Unpreserved aqueous sample(s) received for certain analyses			
☐ Volatile Organics ☐ Total Metals ☐ Dissolved Metals			
Container(s) for certain analysis free of headspace	☐	☐	☑
☐ Volatile Organics ☐ Dissolved Gases (RSK-175) ☐ Dissolved Oxygen (SM 4500)			
☐ Carbon Dioxide (SM 4500) ☐ Ferrous Iron (SM 3500) ☐ Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE: (Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOAh ☐ VOAna$_2$ ☐ 100PJ ☐ 100PJna$_2$ ☐ 125AGB ☐ 125AGBh ☐ 125AGBp ☐ 125PB

☐ 125PBznna ☐ 250AGB ☐ 250CGB ☐ 250CGBs ☐ 250PB ☐ 250PBn ☐ 500AGB ☐ 500AGJ ☐ 500AGJs

☐ 500PB ☐ 1AGB ☐ 1AGBna$_2$ ☐ 1AGBs ☐ 1PB ☐ 1PBna ☐ _____ ☐ _____ ☐ _____ ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve (_____) ☐ EnCores® (_____) ☐ TerraCores® (_____) ☑ 1GJ

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ **Other Matrix** (_____): ☐ _____ ☐ _____

Container: **A** = Amber, **B** = Bottle, **C** = Clear, **E** = Envelope, **G** = Glass, **J** = Jar, **P** = Plastic, and **Z** = Ziploc/Resealable Bag

Preservative: **b** = buffered, **f** = filtered, **h** = HCl, **n** = HNO_3, **na** = NaOH, **na$_2$** = $Na_2S_2O_3$, **p** = H_3PO_4, **s** = H_2SO_4, **u** = ultra-pure, **znna** = $Zn(CH_3CO_2)_2$ + NaOH

Labeled/Checked by: 1058

Reviewed by: 778

Return to Contents

APPENDIX G
ELUTRIATE CHEMISTRY TESTING

eurofins | Calscience

WORK ORDER NUMBER: 16-04-0376

The difference is service

AIR | SOIL | WATER | MARINE CHEMISTRY

Analytical Report For

Client: Kinnetic Laboratories, Inc.

Client Project Name: Laguna Lake

Attention: Tim Fleming
5225 Avenida Encinas
Suite H
Carlsbad, CA 92008-4367

Kathleen M. Burney FOR

Approved for release on 04/15/2016 by:
Carla Hollowell
Project Manager

ResultLink ▸

Email your PM ▸

Eurofins Calscience, Inc. (Calscience) certifies that the test results provided in this report meet all NELAC requirements for parameters for which accreditation is required or available. Any exceptions to NELAC requirements are noted in the case narrative. The original report of subcontracted analyses, if any, is attached to this report. The results in this report are limited to the sample(s) tested and any reproduction thereof must be made in its entirety. The client or recipient of this report is specifically prohibited from making material changes to said report and, to the extent that such changes are made, Calscience is not responsible, legally or otherwise. The client or recipient agrees to indemnify Calscience for any defense to any litigation which may arise.

eurofins | Calscience

Contents

Client Project Name: Laguna Lake
Work Order Number: 16-04-0376

1 Work Order Narrative. 3

2 Sample Summary. 4

3 Client Sample Data. 5
3.1 SM 2340 C Total Hardness (Aqueous). 5
3.2 SM 2540 D Total Suspended Solids (Aqueous). 6
3.3 EPA 6020 ICP/MS Metals (Aqueous). 7
3.4 EPA 6020/7470A CAC Title 22 Metals, Filtered (Aqueous). 10
3.5 EPA 7470A Mercury (Aqueous). 13
3.6 EPA 7470A Mercury (Aqueous). 14

4 Quality Control Sample Data. 15
4.1 MS/MSD. 15
4.2 PDS/PDSD. 19
4.3 Sample Duplicate. 22
4.4 LCS/LCSD. 24

5 Glossary of Terms and Qualifiers. 29

6 Chain-of-Custody/Sample Receipt Form. 30

eurofins | Calscience

Work Order Narrative

Work Order: 16-04-0376 Page 1 of 1

Condition Upon Receipt:

Samples were received under Chain-of-Custody (COC) on 04/07/16. They were assigned to Work Order 16-04-0376.

Unless otherwise noted on the Sample Receiving forms all samples were received in good condition and within the recommended EPA temperature criteria for the methods noted on the COC. The COC and Sample Receiving Documents are integral elements of the analytical report and are presented at the back of the report.

Holding Times:

All samples were analyzed within prescribed holding times (HT) and/or in accordance with the Calscience Sample Acceptance Policy unless otherwise noted in the analytical report and/or comprehensive case narrative, if required.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

Quality Control:

All quality control parameters (QC) were within established control limits except where noted in the QC summary forms or described further within this report.

Subcontractor Information:

Unless otherwise noted below (or on the subcontract form), no samples were subcontracted.

Additional Comments:

Air - Sorbent-extracted air methods (EPA TO-4A, EPA TO-10, EPA TO-13A, EPA TO-17): Analytical results are converted from mass/sample basis to mass/volume basis using client-supplied air volumes.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are always reported on a wet weight basis.

Return to Contents

eurofins | Calscience

Sample Summary

Client:	Kinnetic Laboratories, Inc. 5225 Avenida Encinas, Suite H Carlsbad, CA 92008-4367	Work Order:	16-04-0376
		Project Name:	Laguna Lake
		PO Number:	
		Date/Time Received:	04/07/16 10:00
		Number of Containers:	9
Attn:	Tim Fleming		

Sample Identification	Lab Number	Collection Date and Time	Number of Containers	Matrix
LL16-PAI-MET	16-04-0376-1	04/06/16 11:00	4	Aqueous
LL16-SAI-MET	16-04-0376-2	04/06/16 11:01	5	Aqueous

Return to Contents

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	SM 2340C
		Units:	mg/L
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI-MET	**16-04-0376-1-B**	**04/06/16 11:00**	**Aqueous**	**BUR21**	**N/A**	**04/11/16 17:30**	**G0411HARB1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Hardness, Total (as CaCO3)	210	2.0	0.99	1.00	

LL16-SAI-MET	**16-04-0376-2-B**	**04/06/16 11:01**	**Aqueous**	**BUR21**	**N/A**	**04/11/16 17:30**	**G0411HARB1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Hardness, Total (as CaCO3)	230	2.0	0.99	1.00	

Method Blank	**099-14-457-614**	**N/A**	**Aqueous**	**BUR21**	**N/A**	**04/11/16 17:30**	**G0411HARB1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Hardness, Total (as CaCO3)	ND	2.0	0.99	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	SM 2540 D
		Units:	mg/L
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI-MET	**16-04-0376-1-D**	**04/06/16 11:00**	**Aqueous**	**N/A**	**04/12/16**	**04/12/16 18:30**	**G0112TSSL1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total Suspended	34	1.0	0.83	1.00	

LL16-SAI-MET	**16-04-0376-2-D**	**04/06/16 11:01**	**Aqueous**	**N/A**	**04/12/16**	**04/12/16 18:30**	**G0112TSSL1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total Suspended	43	1.0	0.83	1.00	

Method Blank	**099-09-010-7673**	**N/A**	**Aqueous**	**N/A**	**04/12/16**	**04/12/16 18:30**	**G0412TSSL1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Solids, Total Suspended	ND	1.0	0.83	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3020A Total
		Method:	EPA 6020
		Units:	mg/L
Project: Laguna Lake			Page 1 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI-MET	**16-04-0376-1-C**	**04/06/16 11:00**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 16:28**	**160411LA2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Antimony	0.000473	0.00100	0.0000995	1.00	J
Arsenic	0.00166	0.00100	0.000386	1.00	
Barium	0.106	0.00100	0.0000986	1.00	
Beryllium	ND	0.00100	0.000290	1.00	
Cadmium	ND	0.00100	0.000128	1.00	
Chromium	0.0254	0.00100	0.000402	1.00	
Cobalt	0.00354	0.00100	0.0000919	1.00	
Copper	0.0114	0.00100	0.000140	1.00	
Lead	0.00179	0.00100	0.0000898	1.00	
Molybdenum	0.00417	0.00100	0.000127	1.00	
Nickel	0.0419	0.00100	0.000132	1.00	
Selenium	0.000401	0.00100	0.000168	1.00	J
Silver	ND	0.00100	0.000111	1.00	
Thallium	ND	0.00100	0.000101	1.00	
Vanadium	0.0169	0.00100	0.000149	1.00	
Zinc	0.0215	0.00500	0.000479	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3020A Total
		Method:	EPA 6020
		Units:	mg/L
Project: Laguna Lake			Page 2 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-SAI-MET	**16-04-0376-2-C**	**04/06/16 11:01**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 16:31**	**160411LA2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Antimony	0.000563	0.00100	0.0000995	1.00	J
Arsenic	0.00232	0.00100	0.000386	1.00	
Barium	0.0957	0.00100	0.0000986	1.00	
Beryllium	ND	0.00100	0.000290	1.00	
Cadmium	ND	0.00100	0.000128	1.00	
Chromium	0.0206	0.00100	0.000402	1.00	
Cobalt	0.00319	0.00100	0.0000919	1.00	
Copper	0.00925	0.00100	0.000140	1.00	
Lead	0.00132	0.00100	0.0000898	1.00	
Molybdenum	0.00497	0.00100	0.000127	1.00	
Nickel	0.0395	0.00100	0.000132	1.00	
Selenium	0.000342	0.00100	0.000168	1.00	J
Silver	ND	0.00100	0.000111	1.00	
Thallium	ND	0.00100	0.000101	1.00	
Vanadium	0.0167	0.00100	0.000149	1.00	
Zinc	0.0129	0.00500	0.000479	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3020A Total
		Method:	EPA 6020
		Units:	mg/L
Project: Laguna Lake			Page 3 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**096-06-003-5153**	**N/A**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 14:04**	**160411LA2**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Antimony	ND	0.00100	0.0000995	1.00	
Arsenic	ND	0.00100	0.000386	1.00	
Barium	ND	0.00100	0.0000986	1.00	
Beryllium	ND	0.00100	0.000290	1.00	
Cadmium	ND	0.00100	0.000128	1.00	
Chromium	ND	0.00100	0.000402	1.00	
Cobalt	ND	0.00100	0.0000919	1.00	
Copper	ND	0.00100	0.000140	1.00	
Lead	ND	0.00100	0.0000898	1.00	
Molybdenum	ND	0.00100	0.000127	1.00	
Nickel	ND	0.00100	0.000132	1.00	
Selenium	ND	0.00100	0.000168	1.00	
Silver	ND	0.00100	0.000111	1.00	
Thallium	ND	0.00100	0.000101	1.00	
Vanadium	ND	0.00100	0.000149	1.00	
Zinc	ND	0.00500	0.000479	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3005A Filt.
		Method:	EPA 6020
		Units:	mg/L
Project: Laguna Lake			Page 1 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI-MET	**16-04-0376-1-A**	**04/06/16 11:00**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 16:23**	**160411LA3F**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Antimony	0.000573	0.00100	0.0000995	1.00	J
Arsenic	0.00132	0.00100	0.000386	1.00	
Barium	0.280	0.00100	0.0000986	1.00	
Beryllium	ND	0.00100	0.000290	1.00	
Cadmium	ND	0.00100	0.000128	1.00	
Chromium	0.00109	0.00100	0.000402	1.00	
Cobalt	0.000561	0.00100	0.0000919	1.00	J
Copper	0.00569	0.00100	0.000140	1.00	
Lead	0.000156	0.00100	0.0000898	1.00	J
Molybdenum	0.00514	0.00100	0.000127	1.00	
Nickel	0.00855	0.00100	0.000132	1.00	
Selenium	0.000329	0.00100	0.000168	1.00	J
Silver	ND	0.00100	0.000111	1.00	
Thallium	ND	0.00100	0.000101	1.00	
Vanadium	0.00693	0.00100	0.000149	1.00	
Zinc	0.0760	0.00500	0.000479	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3005A Filt.
		Method:	EPA 6020
		Units:	mg/L
Project: Laguna Lake			Page 2 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-SAI-MET	**16-04-0376-2-A**	**04/06/16 11:01**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 16:26**	**160411LA3F**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Antimony	0.000660	0.00100	0.0000995	1.00	J
Arsenic	0.00243	0.00100	0.000386	1.00	
Barium	0.0629	0.00100	0.0000986	1.00	
Beryllium	ND	0.00100	0.000290	1.00	
Cadmium	ND	0.00100	0.000128	1.00	
Chromium	0.00113	0.00100	0.000402	1.00	
Cobalt	0.000774	0.00100	0.0000919	1.00	J
Copper	0.00539	0.00100	0.000140	1.00	
Lead	0.000147	0.00100	0.0000898	1.00	J
Molybdenum	0.00554	0.00100	0.000127	1.00	
Nickel	0.0122	0.00100	0.000132	1.00	
Selenium	0.000388	0.00100	0.000168	1.00	J
Silver	ND	0.00100	0.000111	1.00	
Thallium	ND	0.00100	0.000101	1.00	
Vanadium	0.0104	0.00100	0.000149	1.00	
Zinc	0.0140	0.00500	0.000479	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3005A Filt.
		Method:	EPA 6020
		Units:	mg/L
Project: Laguna Lake			Page 3 of 3

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-15-693-1092**	**N/A**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 14:07**	**160411LA3F**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Antimony	ND	0.00100	0.0000995	1.00	
Arsenic	ND	0.00100	0.000386	1.00	
Barium	ND	0.00100	0.0000986	1.00	
Beryllium	ND	0.00100	0.000290	1.00	
Cadmium	ND	0.00100	0.000128	1.00	
Chromium	ND	0.00100	0.000402	1.00	
Cobalt	ND	0.00100	0.0000919	1.00	
Copper	ND	0.00100	0.000140	1.00	
Lead	ND	0.00100	0.0000898	1.00	
Molybdenum	ND	0.00100	0.000127	1.00	
Nickel	ND	0.00100	0.000132	1.00	
Selenium	ND	0.00100	0.000168	1.00	
Silver	ND	0.00100	0.000111	1.00	
Thallium	ND	0.00100	0.000101	1.00	
Vanadium	ND	0.00100	0.000149	1.00	
Zinc	ND	0.00500	0.000479	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 7470A Total
		Method:	EPA 7470A
		Units:	mg/L
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI-MET	**16-04-0376-1-C**	**04/06/16 11:00**	**Aqueous**	**Mercury 04**	**04/13/16**	**04/13/16 18:14**	**160413LA1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	ND	0.000500	0.0000453	1.00	

LL16-SAI-MET	**16-04-0376-2-C**	**04/06/16 11:01**	**Aqueous**	**Mercury 04**	**04/13/16**	**04/13/16 18:07**	**160413LA1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	ND	0.000500	0.0000453	1.00	

Method Blank	**099-04-008-7827**	**N/A**	**Aqueous**	**Mercury 04**	**04/13/16**	**04/13/16 18:00**	**160413LA1**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	ND	0.000500	0.0000453	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Analytical Report

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 7470A Filt.
		Method:	EPA 7470A
		Units:	mg/L
Project: Laguna Lake			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
LL16-PAI-MET	**16-04-0376-1-A**	**04/06/16 11:00**	**Aqueous**	**Mercury 04**	**04/11/16**	**04/11/16 21:08**	**160411LA4F**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	ND	0.000500	0.0000453	1.00	

LL16-SAI-MET	**16-04-0376-2-A**	**04/06/16 11:01**	**Aqueous**	**Mercury 04**	**04/11/16**	**04/11/16 21:11**	**160411LA4F**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	ND	0.000500	0.0000453	1.00	

Method Blank	**099-15-763-748**	**N/A**	**Aqueous**	**Mercury 04**	**04/11/16**	**04/11/16 20:17**	**160411LA4F**

Comment(s): - Results were evaluated to the MDL (DL), concentrations >= to the MDL (DL) but < RL (LOQ), if found, are qualified with a "J" flag.

Parameter	Result	RL	MDL	DF	Qualifiers
Mercury	ND	0.000500	0.0000453	1.00	

Return to Contents

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3020A Total
		Method:	EPA 6020
Project: Laguna Lake			Page 1 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
16-04-0374-1	**Sample**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 14:34**	**160411SA2**
16-04-0374-1	**Matrix Spike**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 14:19**	**160411SA2**
16-04-0374-1	**Matrix Spike Duplicate**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 14:22**	**160411SA2**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Antimony	0.001357	0.1000	0.1060	105	0.1030	102	85-133	3	0-11	
Arsenic	0.003330	0.1000	0.1028	99	0.1019	99	73-127	1	0-11	
Barium	0.05478	0.1000	0.1621	107	0.1573	103	74-128	3	0-10	
Beryllium	ND	0.1000	0.08774	88	0.08398	84	56-122	4	0-11	
Cadmium	ND	0.1000	0.09742	97	0.09539	95	84-114	2	0-8	
Chromium	ND	0.1000	0.1005	100	0.09647	96	73-133	4	0-11	
Cobalt	0.004668	0.1000	0.1046	100	0.1029	98	79-121	2	0-10	
Copper	0.005941	0.1000	0.1012	95	0.1010	95	72-108	0	0-10	
Lead	ND	0.1000	0.1112	111	0.1085	109	79-121	2	0-10	
Molybdenum	0.001896	0.1000	0.1218	120	0.1189	117	83-137	2	0-10	
Nickel	0.01440	0.1000	0.1100	96	0.1095	95	68-122	0	0-10	
Selenium	ND	0.1000	0.1036	104	0.09821	98	59-125	5	0-12	
Silver	ND	0.05000	0.04861	97	0.04765	95	68-128	2	0-14	
Thallium	ND	0.1000	0.1102	110	0.1071	107	73-121	3	0-11	
Vanadium	0.002863	0.1000	0.1115	109	0.1126	110	77-137	1	0-15	
Zinc	0.07608	0.1000	0.1552	79	0.1545	78	43-145	0	0-39	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3005A Filt.
		Method:	EPA 6020
Project: Laguna Lake			Page 2 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-PAI-MET	**Sample**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 16:23**	**160411SA3**
LL16-PAI-MET	**Matrix Spike**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 16:13**	**160411SA3**
LL16-PAI-MET	**Matrix Spike Duplicate**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 16:16**	**160411SA3**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Antimony	ND	0.1000	0.1069	107	0.1045	104	85-133	2	0-11	
Arsenic	0.001318	0.1000	0.1075	106	0.1052	104	73-127	2	0-11	
Barium	0.2805	0.1000	0.1580	0	0.1540	0	74-128	3	0-10	3
Beryllium	ND	0.1000	0.1048	105	0.1026	103	56-122	2	0-11	
Cadmium	ND	0.1000	0.1053	105	0.1030	103	84-114	2	0-8	
Chromium	0.001092	0.1000	0.1088	108	0.1096	109	73-133	1	0-11	
Cobalt	ND	0.1000	0.1029	103	0.09845	98	79-121	4	0-10	
Copper	0.005691	0.1000	0.1088	103	0.1058	100	72-108	3	0-10	
Lead	ND	0.1000	0.1062	106	0.1045	104	79-121	2	0-10	
Molybdenum	0.005139	0.1000	0.1161	111	0.1123	107	83-137	3	0-10	
Nickel	0.008548	0.1000	0.1112	103	0.1077	99	68-122	3	0-10	
Selenium	ND	0.1000	0.1021	102	0.09826	98	59-125	4	0-12	
Silver	ND	0.05000	0.05087	102	0.05132	103	68-128	1	0-14	
Thallium	ND	0.1000	0.1043	104	0.1018	102	73-121	3	0-11	
Vanadium	0.006929	0.1000	0.1129	106	0.1119	105	77-137	1	0-15	
Zinc	0.07602	0.1000	0.1070	31	0.1096	34	43-145	2	0-39	3

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 7470A Total
		Method:	EPA 7470A
Project: Laguna Lake			Page 3 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
LL16-SAI-MET	**Sample**	**Aqueous**	**Mercury 04**	**04/13/16**	**04/13/16 18:07**	**160413SA1**
LL16-SAI-MET	**Matrix Spike**	**Aqueous**	**Mercury 04**	**04/13/16**	**04/13/16 18:09**	**160413SA1**
LL16-SAI-MET	**Matrix Spike Duplicate**	**Aqueous**	**Mercury 04**	**04/13/16**	**04/13/16 18:12**	**160413SA1**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Mercury	ND	0.01000	0.01028	103	0.009994	100	55-133	3	0-20	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Spike/Spike Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 7470A Filt.
		Method:	EPA 7470A
Project: Laguna Lake			Page 4 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
16-04-0513-10	**Sample**	**Aqueous**	**Mercury 04**	**04/11/16**	**04/11/16 20:22**	**160411SA4**
16-04-0513-10	**Matrix Spike**	**Aqueous**	**Mercury 04**	**04/11/16**	**04/11/16 20:24**	**160411SA4**
16-04-0513-10	**Matrix Spike Duplicate**	**Aqueous**	**Mercury 04**	**04/11/16**	**04/11/16 20:26**	**160411SA4**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Mercury	ND	0.01000	0.003665	37	0.003698	37	55-133	1	0-20	3

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - PDS

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3020A Total
		Method:	EPA 6020
Project: Laguna Lake			Page 1 of 3

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	PDS/PDSD Batch Number
16-04-0374-1	**Sample**	**Aqueous**	**ICP/MS 03**	**04/11/16 00:00**	**04/12/16 14:34**	**160411SA2**
16-04-0374-1	**PDS**	**Aqueous**	**ICP/MS 03**	**04/11/16 00:00**	**04/12/16 14:24**	**160411SA2**

Parameter	Sample Conc.	Spike Added	PDS Conc.	PDS %Rec.	%Rec. CL	Qualifiers
Antimony	0.001357	0.1000	0.1036	102	75-125	
Arsenic	0.003330	0.1000	0.1011	98	75-125	
Barium	0.05478	0.1000	0.1553	101	75-125	
Beryllium	ND	0.1000	0.08539	85	75-125	
Cadmium	ND	0.1000	0.09474	95	75-125	
Chromium	ND	0.1000	0.09755	98	75-125	
Cobalt	0.004668	0.1000	0.1027	98	75-125	
Copper	0.005941	0.1000	0.09918	93	75-125	
Lead	ND	0.1000	0.1082	108	75-125	
Molybdenum	0.001896	0.1000	0.1184	117	75-125	
Nickel	0.01440	0.1000	0.1086	94	75-125	
Selenium	ND	0.1000	0.09741	97	75-125	
Silver	ND	0.05000	0.04480	90	75-125	
Thallium	ND	0.1000	0.1064	106	75-125	
Vanadium	0.002863	0.1000	0.1113	108	75-125	
Zinc	0.07608	0.1000	0.1541	78	75-125	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - PDS

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3005A Filt.
		Method:	EPA 6020
Project: Laguna Lake			Page 2 of 3

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	PDS/PDSD Batch Number
LL16-PAI-MET	**Sample**	**Aqueous**	**ICP/MS 03**	**04/11/16 00:00**	**04/12/16 16:23**	**160411SA3**
LL16-PAI-MET	**PDS**	**Aqueous**	**ICP/MS 03**	**04/11/16 00:00**	**04/12/16 16:18**	**160411SA3**

Parameter	Sample Conc.	Spike Added	PDS Conc.	PDS %Rec.	%Rec. CL	Qualifiers
Antimony	ND	0.1000	0.1046	105	75-125	
Arsenic	0.001318	0.1000	0.1010	100	75-125	
Barium	0.2805	0.1000	0.3818	101	75-125	
Beryllium	ND	0.1000	0.1021	102	75-125	
Cadmium	ND	0.1000	0.1021	102	75-125	
Chromium	0.001092	0.1000	0.1071	106	75-125	
Cobalt	ND	0.1000	0.1000	100	75-125	
Copper	0.005691	0.1000	0.1045	99	75-125	
Lead	ND	0.1000	0.1041	104	75-125	
Molybdenum	0.005139	0.1000	0.1142	109	75-125	
Nickel	0.008548	0.1000	0.1052	97	75-125	
Selenium	ND	0.1000	0.09228	92	75-125	
Silver	ND	0.05000	0.04840	97	75-125	
Thallium	ND	0.1000	0.1014	101	75-125	
Vanadium	0.006929	0.1000	0.1096	103	75-125	
Zinc	0.07602	0.1000	0.1668	91	75-125	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - PDS/PDSD

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 7470A Filt.
		Method:	EPA 7470A
Project: Laguna Lake			Page 3 of 3

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	PDS/PDSD Batch Number
16-04-0513-10	**Sample**	**Aqueous**	**Mercury 04**	**04/11/16 00:00**	**04/11/16 20:22**	**160411SA4**
16-04-0513-10	**PDS**	**Aqueous**	**Mercury 04**	**04/11/16 00:00**	**04/14/16 15:05**	**160411SA4**
16-04-0513-10	**PDSD**	**Aqueous**	**Mercury 04**	**04/11/16 00:00**	**04/14/16 15:07**	**160411SA4**

Parameter	Sample Conc.	Spike Added	PDS Conc.	PDS %Rec.	PDSD Conc.	PDSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Mercury	ND	0.01000	0.005700	57	0.005318	53	75-125	7	0-20	5

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Sample Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	SM 2340C
Project: Laguna Lake			Page 1 of 2

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
16-04-0595-2	**Sample**	**Aqueous**	**BUR21**	**N/A**	**04/11/16 17:30**	**G0411HARD1**
16-04-0595-2	**Sample Duplicate**	**Aqueous**	**BUR21**	**N/A**	**04/11/16 17:30**	**G0411HARD1**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Hardness, Total (as CaCO3)	380.0	381.0	0	0-25	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - Sample Duplicate

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	SM 2540 D
Project: Laguna Lake			Page 2 of 2

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	Duplicate Batch Number
16-04-0254-2	**Sample**	**Aqueous**	**N/A**	**04/12/16 00:00**	**04/12/16 18:30**	**G0412TSSD1**
16-04-0254-2	**Sample Duplicate**	**Aqueous**	**N/A**	**04/12/16 00:00**	**04/12/16 18:30**	**G0412TSSD1**

Parameter	Sample Conc.	DUP Conc.	RPD	RPD CL	Qualifiers
Solids, Total Suspended	734.0	722.0	2	0-20	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS/LCSD

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	N/A
		Method:	SM 2540 D
Project: Laguna Lake			Page 1 of 5

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-09-010-7673	**LCS**	**Aqueous**	**N/A**	**04/12/16**	**04/12/16 18:30**	**G0412TSSL1**
099-09-010-7673	**LCSD**	**Aqueous**	**N/A**	**04/12/16**	**04/12/16 18:30**	**G0412TSSL1**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Solids, Total Suspended	100.0	97.00	97	94.00	94	80-120	3	0-20	

RPD: Relative Percent Difference. CL: Control Limits

Return to Contents

eurofins | Calscience

Quality Control - LCS

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3020A Total
		Method:	EPA 6020
Project: Laguna Lake			Page 2 of 5

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
096-06-003-5153	**LCS**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 14:17**	**160411LA2**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	ME CL	Qualifiers
Antimony	0.1000	0.1044	104	80-120	73-127	
Arsenic	0.1000	0.1040	104	80-120	73-127	
Barium	0.1000	0.1033	103	80-120	73-127	
Beryllium	0.1000	0.1045	105	80-120	73-127	
Cadmium	0.1000	0.1032	103	80-120	73-127	
Chromium	0.1000	0.1133	113	80-120	73-127	
Cobalt	0.1000	0.1004	100	80-120	73-127	
Copper	0.1000	0.1036	104	80-120	73-127	
Lead	0.1000	0.1002	100	80-120	73-127	
Molybdenum	0.1000	0.1014	101	80-120	73-127	
Nickel	0.1000	0.1015	102	80-120	73-127	
Selenium	0.1000	0.1187	119	80-120	73-127	
Silver	0.05000	0.04837	97	80-120	73-127	
Thallium	0.1000	0.09799	98	80-120	73-127	
Vanadium	0.1000	0.1001	100	80-120	73-127	
Zinc	0.1000	0.1056	106	80-120	73-127	

Total number of LCS compounds: 16
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - LCS

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 3005A Filt.
		Method:	EPA 6020
Project: Laguna Lake			Page 3 of 5

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-15-693-1092	**LCS**	**Aqueous**	**ICP/MS 03**	**04/11/16**	**04/12/16 14:14**	**160411LA3F**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	ME CL	Qualifiers
Antimony	0.1000	0.1042	104	80-120	73-127	
Arsenic	0.1000	0.1031	103	80-120	73-127	
Barium	0.1000	0.1024	102	80-120	73-127	
Beryllium	0.1000	0.1069	107	80-120	73-127	
Cadmium	0.1000	0.1031	103	80-120	73-127	
Chromium	0.1000	0.1029	103	80-120	73-127	
Cobalt	0.1000	0.1005	101	80-120	73-127	
Copper	0.1000	0.1033	103	80-120	73-127	
Lead	0.1000	0.1006	101	80-120	73-127	
Molybdenum	0.1000	0.09947	99	80-120	73-127	
Nickel	0.1000	0.1015	102	80-120	73-127	
Selenium	0.1000	0.1110	111	80-120	73-127	
Silver	0.05000	0.04762	95	80-120	73-127	
Thallium	0.1000	0.09897	99	80-120	73-127	
Vanadium	0.1000	0.1016	102	80-120	73-127	
Zinc	0.1000	0.1046	105	80-120	73-127	

Total number of LCS compounds: 16
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - LCS

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 7470A Total
		Method:	EPA 7470A
Project: Laguna Lake			Page 4 of 5

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-04-008-7827	**LCS**	**Aqueous**	**Mercury 04**	**04/13/16**	**04/13/16 18:05**	**160413LA1**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	Qualifiers
Mercury	0.01000	0.01017	102	80-120	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Quality Control - LCS

Kinnetic Laboratories, Inc.		Date Received:	04/07/16
5225 Avenida Encinas, Suite H		Work Order:	16-04-0376
Carlsbad, CA 92008-4367		Preparation:	EPA 7470A Filt.
		Method:	EPA 7470A
Project: Laguna Lake			Page 5 of 5

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-15-763-748	**LCS**	**Aqueous**	**Mercury 04**	**04/11/16**	**04/11/16 20:19**	**160411LA4F**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	Qualifiers
Mercury	0.01000	0.009576	96	80-120	

Return to Contents

RPD: Relative Percent Difference. CL: Control Limits

eurofins | Calscience

Glossary of Terms and Qualifiers

Work Order: 16-04-0376 Page 1 of 1

Qualifiers	Definition
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution. Therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to suspected matrix interference. The associated LCS recovery was in control.
4	The MS/MSD RPD was out of control due to suspected matrix interference.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to suspected matrix interference.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
BV	Sample received after holding time expired.
CI	See case narrative.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
HD	The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
HDH	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but heavier hydrocarbons were also present (or detected).
HDL	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but lighter hydrocarbons were also present (or detected).
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
JA	Analyte positively identified but quantitation is an estimate.
ME	LCS Recovery Percentage is within Marginal Exceedance (ME) Control Limit range (+/- 4 SD from the mean).
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
SG	The sample extract was subjected to Silica Gel treatment prior to analysis.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.
	Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.
	Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.
	A calculated total result (Example: Total Pesticides) is the summation of each component concentration and/or, if "J" flags are reported, estimated concentration. Component concentrations showing not detected (ND) are summed into the calculated total result as zero concentrations.

Return to Contents

Chain of Custody Record

To:	Date Received:	From:	Sampled By:
Eurofins Calscience 7440 Lincoln Way Garden Grove, CA 92841 Phone: (714) 895-5494 Contact: Carla Hollowell	Lab #: **16-04-0376**	Kinnetic Laboratories, Inc 5225 Avenida Encinas, Suite H Carlsbad, CA 92008 (760) 438-8968 Contact: Tim Fleming	Pacific EcoRisk 2250 Cordelia Rd. Fairfield, CA 94534 Phone: (707) 207-7760 Fax: (707) 207-7916 Contact: Jeff Cotsifas

Project: Laguna Lake **Matrix:** Freshwater **Project #:** 5720.154

Complete by: Standard TAT

SampleID	StationID	Sample Date	Sample Time	Sample Type	Analysis	Container	Pres	No. of Bottles	LabID	Condition Upon Receipt
LL16-PAI-MET	Primary Area MET	4/6/16	1100	Elutriate	TSS	1L HDPE	4° C	1		
LL16-PAI-MET	Primary Area MET	4/6/16	1100	Elutriate	EPA 6020/7470 Total Metals, CAM17	250 mL HDPE	Ultra HNO3	1	1	
LL16-PAI-MET	Primary Area MET	4/6/16	1100	Elutriate	EPA 6020/7470 Dissolved Metals, CAM17	250 mL HDPE	4° C	1		
LL16-PAI-MET	Primary Area MET	4/6/16	1100	Elutriate	Hardness	250 mL HDPE	HNO3	1		
LL16-SAI-MET	Secondary Area MET	4/6/16	1101	Elutriate	TSS	1L HDPE	4° C	1		
LL16-SAI-MET	Secondary Area MET	4/6/16	1101	Elutriate	EPA 6020/7470 Total Metals, CAM17	250 mL HDPE	Ultra HNO3	1	2	
LL16-SAI-MET	Secondary Area MET	4/6/16	1101	Elutriate	EPA 6020/7470 Dissolved Metals, CAM17	250 mL HDPE	4° C	4-6-16 1 2	extra volume	
LL16-SAI-MET	Secondary Area MET	4/6/16	1101	Elutriate	Hardness	250 mL HDPE	HNO3	1		

Data Report MUST include the following: Sample ID, Analytical Method, Detection Limit, Date of Extraction if applicable, Date of Analysis, Analytical Results and Signature of QA Reviewer.
All times on this sheet are military time. Email sample receipt confirmations, PDF reports, and EDDs to edd@kinneticlabs.net and tfleming@kinneticlabs.net.

Special Instructions/Comments: Dissolved metals need to be lab filtered. Metals: Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Ag, Tl, V, Zn. Run MS/MSD on project sample.

Sampled and Relinquished By:	Date/Time:	Transporter	Received By:	Date/Time:
[illegible]	4/6/16 / 1405		Tom Malley ECI	4/6/16 1405
Relinquished By:	**Date/Time:**	**Transporter**	**Received By:**	**Date/Time:**
Tom Malley TO GSO	4/6/16 1730		[illegible]	4/07/16 1000

v20020904

Return to Contents

GSO
GOLDEN STATE OVERNIGHT

800-322-5555 www.gso.com

0376

Ship From
CAL SCIENCE- CONCORD
ALAN KEMP
5063 COMMERCIAL CIRCLE
#H
CONCORD, CA 94520

Tracking #: 531498207

NPS

Ship To
CEL
SAMPLE RECEIVING
7440 LINCOLN WAY
GARDEN GROVE, CA 92841

ORC A
GARDEN GROVE

COD: $0.00
Weight: 0 lb(s)
Reference:
TERRA PACIFIC GROUP, PACIFIC ECORISK
Delivery Instructions:

Signature Type: REQUIRED

D92845A

50320309

Print Date: 4/6/2016 4:02 PM

LABEL INSTRUCTIONS:

Do not copy or reprint this label for additional shipments - each package must have a unique barcode.

Use the "Print Label" button on this page to print the shipping label on a laser or inkjet printer. Securely attach this label to your package, do not cover the barcode.

Return to Contents

eurofins | Calscience

WORK ORDER NUMBER: 16-04- 0376

SAMPLE RECEIPT CHECKLIST

COOLER 1 OF 1

CLIENT: Kinnetic Labs, Inc.

DATE: 04 / 07 / 2016

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC2A (CF: 0.0°C); Temperature (w/o CF): 1.6 °C (w/ CF): 1.6 °C; ☑ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter Checked by: SM6

CUSTODY SEAL:

Cooler ☑ Present and Intact ☐ Present but Not Intact ☐ Not Present ☐ N/A Checked by: SM6

Sample(s) ☐ Present and Intact ☐ Present but Not Intact ☑ Not Present ☐ N/A Checked by: 1017

SAMPLE CONDITION:	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Sampling date ☐ Sampling time ☐ Matrix ☐ Number of containers			
☐ No analysis requested ☐ Not relinquished ☐ No relinquished date ☐ No relinquished time			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and in good condition	☑	☐	☐
Proper containers for analyses requested	☑	☐	☐
Sufficient volume/mass for analyses requested	☑	☐	☐
Samples received within holding time	☑	☐	☐
Aqueous samples for certain analyses received within 15-minute holding time			
☐ pH ☐ Residual Chlorine ☐ Dissolved Sulfide ☐ Dissolved Oxygen	☐	☐	☑
Proper preservation chemical(s) noted on COC and/or sample container	☑	☐	☐
Unpreserved aqueous sample(s) received for certain analyses			
☐ Volatile Organics ☐ Total Metals ☑ Dissolved Metals			
Container(s) for certain analysis free of headspace	☐	☐	☑
☐ Volatile Organics ☐ Dissolved Gases (RSK-175) ☐ Dissolved Oxygen (SM 4500)			
☐ Carbon Dioxide (SM 4500) ☐ Ferrous Iron (SM 3500) ☐ Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE: (Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOA**h** ☐ VOA**na$_2$** ☐ 100PJ ☐ 100PJ**na$_2$** ☐ 125AGB ☐ 125AGB**h** ☐ 125AGB**p** ☐ 125PB

☐ 125PB**znna** ☐ 250AGB ☐ 250CGB ☐ 250CGB**s** ☑ 250PB ☑ 250PB**n** ☐ 500AGB ☐ 500AGJ ☐ 500AGJ**s**

☐ 500PB ☐ 1AGB ☐ 1AGB**na$_2$** ☐ 1AGB**s** ☑ 1PB ☐ 1PB**na** ☐ _____ ☐ _____ ☐ _____ ☐ _____

Solid: ☐ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve (_____) ☐ EnCores® (_____) ☐ TerraCores® (_____) ☐ _____

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ **Other Matrix** (_____): ☐ _____ ☐ _____

Container: **A** = Amber, **B** = Bottle, **C** = Clear, **E** = Envelope, **G** = Glass, **J** = Jar, **P** = Plastic, and **Z** = Ziploc/Resealable Bag

Preservative: **b** = buffered, **f** = filtered, **h** = HCl, **n** = HNO_3, **na** = NaOH, **na$_2$** = $Na_2S_2O_3$, **p** = H_3PO_4, **s** = H_2SO_4, **u** = ultra-pure, **znna** = $Zn(CH_3CO_2)_2$ + NaOH

Labeled/Checked by: 1017

Reviewed by: SM

Return to Contents

Mr. Tim Fleming
Kinnetic Laboratories, Inc.
307 Washington Street
Santa Cruz, CA 95060

April 29, 2016

Dear Mr. Fleming:

Please find attached an electronic copy of the report "Biological Testing of the Sediment Samples Collected from Laguna Lake" in PDF format. Hard copies can be provided upon request.

If you have any questions, please give me a call at (707) 207-7761. I look forward to hearing from you.

Sincerely,

Jeffrey Cotsifas
President / Special Project Director

Pacific EcoRisk is accredited in accordance with NELAP (ORELAP ID 4043). Pacific EcoRisk certifies that the test results reported herein conform to the most current NELAP requirements for parameters for which accreditation is required and available. Any exceptions to NELAP requirements are noted, where applicable, in the body of the report. This report shall not be reproduced, except in full, without the written consent of Pacific EcoRisk. This testing was performed under Lab Order 25601.

Biological Testing of the Sediment Samples Collected from Laguna Lake

Samples collected March 30 and 31, 2016

Prepared For

Kinnetic Laboratories, Inc.
307 Washington Street
Santa Cruz, CA 95060

Prepared by

Pacific EcoRisk
2250 Cordelia Rd.
Fairfield, CA 94534

April 2016

PACIFIC ECORISK
ENVIRONMENTAL CONSULTING & TESTING

Biological Testing of the Sediment Samples Collected from Laguna Lake

Samples collected March 30 and 31, 2016

Table of Contents

Page

1. INTRODUCTION 1
2. METHODS 1
   2.1 Biological Testing Procedures 1
   2.2 Receipt and Handling of Sediment Samples 1
   2.3 Modified Elutriate Test (MET) Procedures 1
      2.3.1 Preparation of MET Samples 1
      2.3.2 MET Toxicity Testing Toxicity with Larval Fathead Minnows 2
         2.3.2.1 Reference Toxicant Testing of the Larval Fathead Minnows 3
3. RESULTS 4
   3.1 Toxicity of the Laguna Lake Sediment Elutriates to Fathead Minnows 4
      3.1.1 Reference Toxicant Toxicity to Fathead Minnows 4
   3.2 Biological Testing QA/QC Summary 5

Appendices

Appendix A Chain-of-Custody Records for the Laguna Lake Samples

Appendix B Modified Sediment Elutriate Water Quality Characteristics

Appendix C Test Data and Summary of Statistics for the Toxicity Evaluation of the Laguna Lake Sediment Elutriates with Fathead Minnows

Appendix D Test Data and Summary of Statistics for the Reference Toxicant Evaluation of Fathead Minnows

Appendix E Bioassay Standard Test Conditions

List of Tables

Page

Table 3-1. Effects of Laguna Lake Modified Elutriates on Fathead Minnows 4
Table 3-2. Reference Toxicant Testing: Effects of NaCl on Fathead 4

1. INTRODUCTION

Kinnetic Laboratories, Inc. (KLI) contracted Pacific EcoRisk (PER) to perform sediment modified elutriate tests (MET) of sediment collected from Laguna Lake. The performance and results of this testing are presented in this report.

2. METHODS

2.1 Biological Testing Procedures

The biological test performed for each site composite sample MET consisted of the 96-hr standard elutriate acute fish test with fathead minnows (*Pimephales promelas*).

The methods used in conducting these tests followed established guidelines:

- Methods for Estimating the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition" (EPA-821-R-02-012); and
- USACE Technical Note EEDP-04-02. Interim Guidance for Predicting Quality of Effluent Discharged from Confined Dredged Material Disposal Areas-Test Procedures. U.S. Army Corps of Engineers, US Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS. USACE (1985).

2.2 Receipt and Handling of Sediment Samples

On March 30 and 31, 2016, sediment samples were collected from Laguna Lake by KLI staff; a ‘site water’ sample was also collected for use in preparing the sediment elutriates. These samples were delivered to the PER testing lab, on ice and under chain-of-custody, on April 1, 2016. Upon receipt at the PER testing laboratory (Fairfield, CA), all sediment samples were logged in and stored at 4°C in the dark until needed. The chain-of-custody records for the collection and delivery of these samples are provided in Appendix A.

2.3 Modified Elutriate Test (MET) Procedures

2.3.1 Preparation of MET Samples

All elutriate samples were prepared as described in USACE (1985). All elutriates samples were prepared at a sediment slurry concentration of 150 g/L dry sediment (the dry weight basis of each homogenized sediment was determined by oven-drying a known volume of sediment). The resulting dry weight concentration of each sediment was used to calculate the volume of sediment and water that would be required to prepare an elutriate slurry at a sediment concentration of 150 g/L dry wt. basis. Each elutriate slurry was prepared by mixing site water and sediment for five minutes, followed with vigorous aeration for 1 hr in a 4-L graduated

cylinder, after which any suspended material was allowed to settle for 24-hrs. After the settling period, the elutriate supernatant for each sample was collected from the cylinder by siphoning at a point midway between the water surface and settled sediment interface using clean silicone tubing. Extreme care was taken not to re-suspend any of the settled material. An aliquot of the MET supernatant was placed into pre-cleaned bottles and submitted to Eurofins Calscience, Inc., (Calscience) Garden Grove, CA as per client instruction; the remaining MET supernatant was used for initiating toxicity tests.

2.3.2 MET Toxicity Testing with Larval Fathead Minnows

The MET toxicity test with *P. promelas* consists of exposing the fathead minnows to the MET elutriate for ~ 96-hrs, after which the effects on survival are determined. The specific procedures used in this test are described below. The modified elutriate tests with *P. promelas* were initiated on April 6, 2016.

The fathead minnows used in the MET tests were obtained from a commercial supplier (Aquatox, Hot Springs, AR); upon receipt at the testing lab, the larval fish were maintained in aerated tanks of US EPA moderately-hard water at 20˚C, and were fed brine shrimp nauplii *ad libitum.*

The Lab Water Control medium for these tests consisted of US EPA synthetic moderately-hard water. The sediment MET elutriates were tested at the 100% elutriate only. The site water from the area where the sediment samples were collected was also tested (at the 100% concentration). Initial routine water quality characteristics (temperature, pH, D.O., total ammonia, and conductivity) were measured for each treatment test solution prior to use in these tests.

There were five test replicates at each treatment, each replicate consisting of a 400-mL glass beaker containing 200 mL of appropriate test solution. The tests were initiated with the allocation of 10 randomly selected 4-day old fish into each test replicate. The test replicates were then placed into a temperature-controlled room at 20°C under a 16L:8D photoperiod.

Each day, the water quality conditions were determined for one randomly selected replicate per treatment, and the test replicates were examined to determine the number of surviving organisms, with any dead organisms being removed via pipette. Each replicate was fed brine shrimp nauplii at 48-hrs.

After 96 (±2) hrs exposure, the tests were terminated. At test termination, the final water quality conditions were determined for one randomly selected replicate per treatment, after which each of the test replicates were examined to determine the number of surviving fish. The resulting survival data were then statistically analyzed and key dose-response EC point estimates determined for each site sediment elutriate using the CETIS® statistical software (TidePool Scientific, McKinleyville, CA). The results of these tests are summarized in Section 3.1.

2.3.2.1 Reference Toxicant Testing of the Larval Fathead Minnows - In order to assess the sensitivity of these test organisms to chemical stress, a reference toxicant test was performed concurrently with the elutriate tests. The reference toxicant test was performed similarly to the sediment elutriate tests, but used test solutions consisting of Lab Control water spiked with waterborne NaCl at test concentrations of 1.5, 3, 6, 9, and 12 g/L, instead of elutriate dilutions. The resulting test response data were analyzed to determine key dose-response point estimates (e.g., EC_{50}); all statistical analyses were made using the CETIS® software. These response endpoints were then compared to the typical response range established by the mean ± 2 SD of the point estimates generated by the 20 most-recent previous reference toxicant tests performed by this lab. The results of this test are summarized in Section 3.1.1.

3. RESULTS

3.1 Toxicity of the Laguna Lake Sediment Modified Elutriates to Fathead Minnows

The results of these tests are summarized below in Table 3-1. There was 98% survival in the Lab Control treatment, indicating acceptable survival responses by the test organisms; there was 100% survival in the Site Water Control treatment. There were no significant reductions in survival in any of the modified elutriates, indicating that these modified elutriates were not toxic to fathead minnows.

The test data and summary of statistical analyses for these tests are attached as Appendix C.

Table 3-1. Effects of Laguna Lake Modified Elutriates on Fathead Minnows.

Elutriate Treatment	Mean % Survival
Lab Control	98
Site Water Control	100
LL16-PAI	100
LL16-SAI	100

3.1.1 Reference Toxicant Toxicity to Fathead Minnows

The results of these tests are summarized below in Table 3-2. The LC_{50} for this test is consistent with the "typical response" range established by the reference toxicant test database for this species, indicating that these test organisms were responding to toxic stress in a typical fashion.

The test data and summary of statistical analyses for these tests are attached as Appendix D.

Table 3-2. Reference Toxicant Testing: Effects of NaCl on Fathead Minnows.

NaCl Treatment (g/L)	Mean % Survival
Lab Control	100
1.5	100
3	100
6	95
9	**0***
12	**0***
LC_{50} =	7.15 g/L NaCl
Typical Response Range (mean ± 2SD) =	6.57 – 7.79 g/L NaCl

* The response at this test treatment was significantly less than the Control treatment response at $p < 0.05$.

3.2 Biological Testing QA/QC Summary

The biological testing of the Laguna Lake sediments incorporated standard QA/QC procedures to ensure that the test results were valid, including the use of negative Lab Controls, positive Lab Controls, test replicates, and measurements of water quality during testing.

Quality assurance procedures that were used for sediment testing are consistent with methods described in the U.S.EPA (2000) and U.S.EPA/ACOE (1998). Sediments for the bioassay testing were stored appropriately at ≤4°C and were used within the 8 week holding time period. Sediment elutriates were prepared using site water. The toxicity test overlying waters consisted of reconstituted waters.

All measurements of routine water quality characteristics were performed as described in the PER Lab Standard Operating Procedures (SOPs). All biological testing water quality conditions were within the appropriate limits. Laboratory instruments were calibrated daily according to Lab SOPs, and calibration data were logged and initialed.

Negative Lab Control – The biological responses for the test organisms at the negative Lab Control treatments were within acceptable limits for the sediment elutriate tests.

Positive Lab Control – The results of the reference toxicant test was consistent with the "typical response" ranges established by the reference toxicant test database for this species, indicating that the test organisms were responding to toxic stress in a typical and consistent fashion.

Concentration Response Relationships – The concentration-response relationships for the reference toxicant test was evaluated as per EPA guidelines (EPA-821-B-00-004), and were determined to be acceptable.

Appendix A

Chain-of-Custody Records for the Laguna Lake Samples

Chain of Custody Record

To:	Date Received:	From:
Pacific EcoRisk 2250 Cordelia Rd. Fairfield, CA 94534 Phone: (707) 207-7760 Fax: (707) 207-7916 Contact: Jeff Cotsifas	Lab #:	Kinnetic Laboratories, Inc 5225 Avenida Encinas, Suite H Carlsbad, CA 92008 (760) 438-8968 (760) 438-2959 Contact: Tim Fleming

Project: Laguna Lake **Matrix:** Sediment **Project #:** 5720.154

Complete by: 3 weeks

SampleID	StationID	Sample Date	Sample Time	Sample Type	Analysis	Container	Pres	No. of Bottles	LabID	Condition Upon Receipt
11-16-PAI	Primary Area	3/31/16	8:35	Composite	(MET) Elutriate Prep*	Plastic Bags	4° C	2		
11-16-SAI	Secondary Area	3/30/16	12:30	Composite	(MET) Elutriate Prep*	Plastic Bags	4° C	2		

Data Report MUST include the following: Sample ID, Analytical Method, Detection Limit, Date of Extraction if applicable, Date of Analysis, Analytical Results and Signature of QA Reviewer.
All times on this sheet are military time. Email PDF and EDD reports to edd@kinneticlabs.net.

Special Instructions/Comments: *Modified Elutriates (MET) required for both MET chemistry and MET bioassay (Chronic Toxicity- Fathead Minnow, 100%).

Sampled and Relinquished By:	Date/Time:	Transporter	Received By:	Date/Time:
[illegible]	4/1/16 / 15:01	KLI	JESSICA OKUTSU	4/1/16 1501
Relinquished By:	**Date/Time:**	**Transporter**	**Received By:**	**Date/Time:**

v20020904

Chain of Custody Record

To:
Pacific EcoRisk
2250 Cordelia Rd.
Fairfield, CA 94534
Phone: (707) 207-7760
Fax: (707) 207-7916
Contact: Jeff Cotsifas

Date Received:

Lab #:

From:
Kinnetic Laboratories, Inc
5225 Avenida Encinas, Suite H
Carlsbad, CA 92008
(760) 438-8968
(760) 438-2959
Contact: Tim Fleming

Project: Laguna Lake

Matrix: Freshwater

Project #: 5720.154

Complete by: 3 weeks

SampleID	StationID	Sample Date	Sample Time	Sample Type	Analysis	Container	Pres	No. of Bottles	LabID	Condition Upon Receipt
LL16-BGW	Background Water	3/31/16	1020	Grab	Elutriate Prep Water	10L Cube	4° C	2		

Data Report MUST include the following: Sample ID, Analytical Method, Detection Limit, Date of Extraction if applicable, Date of Analysis, Analytical Results and Signature of QA Reviewer.
All times on this sheet are military time. Email PDF and EDD reports to edd@kinneticlabs.net.

Special Instructions/Comments: Modified Elutriates (MET) required for both MET chemistry and MET bioassay for LL16-PAI and LL16-SAI.

Sampled and Relinquished By:	Date/Time:	Transporter	Received By:	Date/Time:
[signature]	4/1/16 1500	KLI	JESSICA OKUTSU	4/1/16 1500
Relinquished By:	**Date/Time:**	**Transporter**	**Received By:**	**Date/Time:**

v20020904

Appendix B

Modified Sediment Elutriate Water Quality Characteristics

Table B-1. Total Ammonia Levels for Modified Elutriate Test (MET) Samples.

Sample ID	Total Ammonia (mg/L N)
	MET
LL16-PAI SET	2.51
LL16-SAI SET	1.49

Appendix C

Test Data and Summary of Statistics for the Toxicity Evaluation of the Laguna Lake Sediment Elutriates with Fathead Minnows

CETIS Summary Report

Report Date: 19 Apr-16 17:11 (p 1 of 1)
Test Code: 67251-67252 | 14-7252-3913

Acute Fish Survival Test — **Pacific EcoRisk**

Batch ID:	10-4619-9569	**Test Type:**	Survival (96h)	**Analyst:**	Natalie Lynch
Start Date:	06 Apr-16 16:20	**Protocol:**	EPA-821-R-02-012 (2002)	**Diluent:**	Not Applicable
Ending Date:	10 Apr-16 14:00	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	94h	**Source:**	Aquatox, AR	**Age:**	

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
Lab Control	10-7144-4678	06 Apr-16 16:20	06 Apr-16 16:20	NA (19.8 °C)	Kinnetic Laboratories, Inc	25601
Site Water	18-4252-7910	31 Mar-16 10:20	01 Apr-16 15:01	6d 6h (2.2 °C)		
LL16PAI	05-8142-7116	31 Mar-16 08:35	01 Apr-16 15:01	6d 8h (0.4 °C)		
LL16SAI	18-2058-5212	30 Mar-16 12:50	01 Apr-16 15:01	7d 4h (0.4 °C)		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
Lab Control	Elutriate	Laguna Lake	LABQA		
Site Water	Elutriate	Laguna Lake	LL16-BGW		
LL16PAI	Elutriate	Laguna Lake	LL16PAI		
LL16SAI	Elutriate	Laguna Lake	LL16SAI		

96h Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Lab Control	5	0.98	0.924	1	0.9	1	0.02	0.0447	4.56%	0.0%
Site Water	5	1	1	1	1	1	0	0	0.0%	-2.04%
LL16PAI	5	1	1	1	1	1	0	0	0.0%	-2.04%
LL16SAI	5	1	1	1	1	1	0	0	0.0%	-2.04%

96h Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	1	0.9	1	1	1
Site Water	1	1	1	1	1
LL16PAI	1	1	1	1	1
LL16SAI	1	1	1	1	1

96h Survival Rate Binomials

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Lab Control	10/10	9/10	10/10	10/10	10/10
Site Water	10/10	10/10	10/10	10/10	10/10
LL16PAI	10/10	10/10	10/10	10/10	10/10
LL16SAI	10/10	10/10	10/10	10/10	10/10

CETIS Analytical Report

Report Date: 19 Apr-16 17:11 (p 1 of 3)
Test Code: 67251-67252 | 14-7252-3913

Acute Fish Survival Test — **Pacific EcoRisk**

Analysis ID:	05-6708-8058	**Endpoint:**	96h Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Apr-16 17:11	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	4.3%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		Site Water	30	NA	1	8	1.0000	Exact	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.002655933	0.002655933	1	1	0.3466	Non-Significant Effect
Error	0.02124747	0.002655933	8			
Total	0.0239034		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	1	13.7	0.3559	Equal Variances
Variances	Levene Equality of Variance	7.11	11.3	0.0285	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.625	0.741	0.0001	Non-normal Distribution

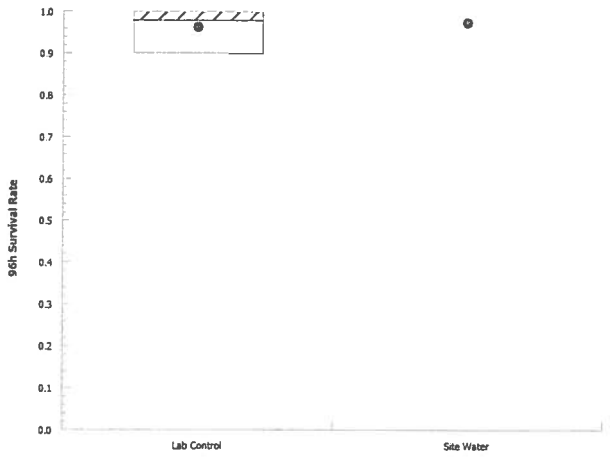
96h Survival Rate Summary

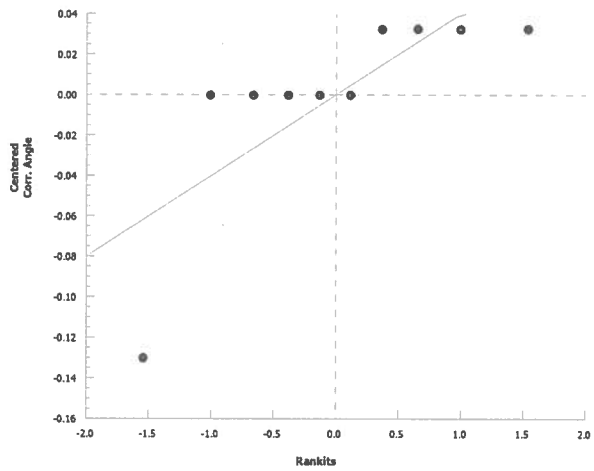
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	5	0.98	0.924	1	1	0.9	1	0.02	4.56%	0.0%
Site Water	5	1	1	1	1	1	1	0	0.0%	-2.04%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	5	1.38	1.29	1.47	1.41	1.25	1.41	0.0326	5.28%	0.0%
Site Water	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	-2.36%

Graphics





Acute Fish Survival Test — Pacific EcoRisk

Analysis ID:	01-7258-4379	**Endpoint:**	96h Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Apr-16 17:11	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	4.3%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		LL16PAI	30	NA	1	8	1.0000	Exact	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.002655933	0.002655933	1	1	0.3466	Non-Significant Effect
Error	0.02124747	0.002655933	8			
Total	0.0239034		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	1	13.7	0.3559	Equal Variances
Variances	Levene Equality of Variance	7.11	11.3	0.0285	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.625	0.741	0.0001	Non-normal Distribution

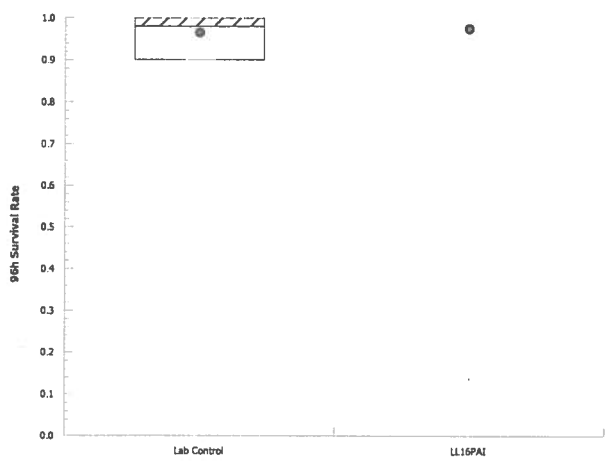
96h Survival Rate Summary

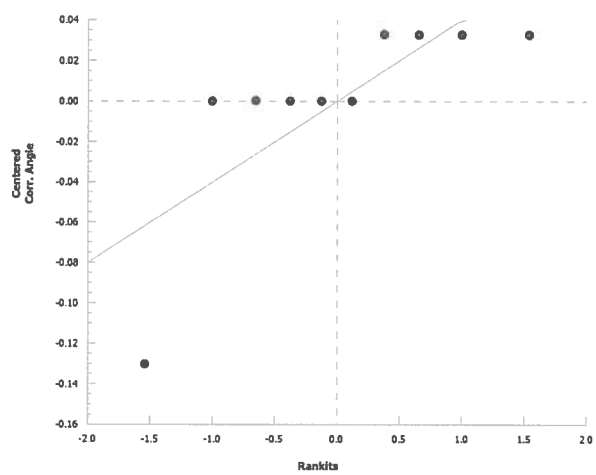
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	5	0.98	0.924	1	1	0.9	1	0.02	4.56%	0.0%
LL16PAI	5	1	1	1	1	1	1	0	0.0%	-2.04%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	5	1.38	1.29	1.47	1.41	1.25	1.41	0.0326	5.28%	0.0%
LL16PAI	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	-2.36%

Graphics





Acute Fish Survival Test — **Pacific EcoRisk**

Analysis ID:	04-0978-8692	**Endpoint:**	96h Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Apr-16 17:11	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	4.3%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Control		LL16SAI	30	NA	1	8	1.0000	Exact	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.002655933	0.002655933	1	1	0.3466	Non-Significant Effect
Error	0.02124747	0.002655933	8			
Total	0.0239034		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	1	13.7	0.3559	Equal Variances
Variances	Levene Equality of Variance	7.11	11.3	0.0285	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.625	0.741	0.0001	Non-normal Distribution

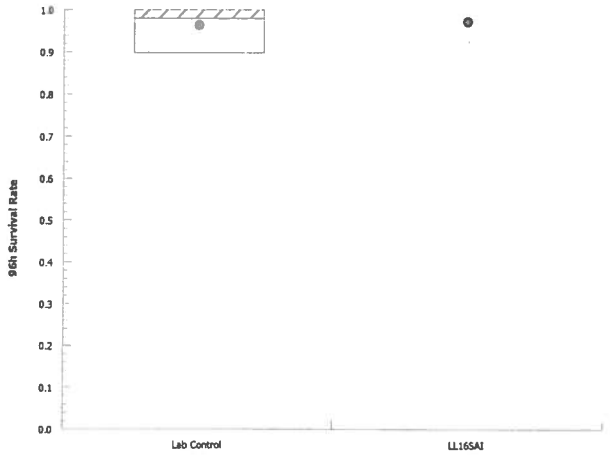
96h Survival Rate Summary

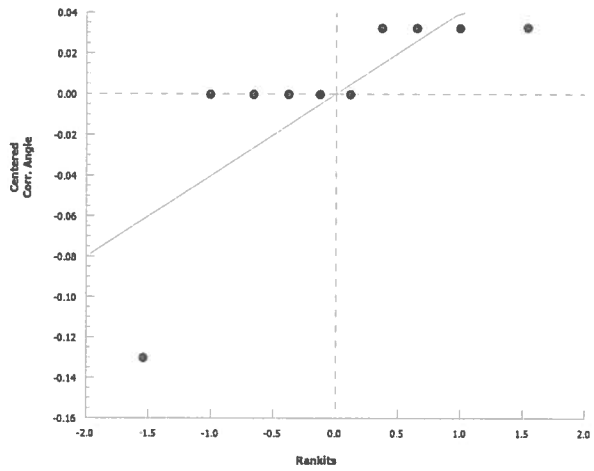
Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	5	0.98	0.924	1	1	0.9	1	0.02	4.56%	0.0%
LL16SAI	5	1	1	1	1	1	1	0	0.0%	-2.04%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Lab Control	5	1.38	1.29	1.47	1.41	1.25	1.41	0.0326	5.28%	0.0%
LL16SAI	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	-2.36%

Graphics





96 Hour Acute Fathead Minnow Toxicity Test

Client: Kinnetic - Laguna Lake
Test Material: Site Water
Test ID#: 67251-52 Project # 25601
Test Date: 4-6-16 Randomization: 4.5, 4.2
Feeding T_0 Time: 0900 Initials: SH APF 4-6-16

Organism Log #: 9495 Age: 4 days
Organism Supplier: Aquatox
Control/Diluent: EPAMH
Control Water Batch: 1869
Feeding T-46-hr Time: 0900 Initials: RG

Treatment (% Elutriate)	Temp (°C)	pH new	pH old	D.O. (mg/L) new	D.O. (mg/L) old	Conductivity (µS/cm) new	Conductivity (µS/cm) old	# Live Organisms Rep A	Rep B	Rep C	Rep D	Rep E	SIGN-OFF
Lab Control	19.8	7.27		8.0		286		10	10	10	10	10	Test Solution Prep: MM
Site Water	19.8	7.10		8.5		521		10	10	10	10	10	New WQ: LF
													Initiation Date: 4-6-16
													Initiation Time: 1620
													Initiation Signoff: APF
Meter ID	59A	pH19		RD12		EC10							
Lab Control	19.8		8.02		8.7		299	10	9	10	10	10	Count Date: 4/7/16
Site Water	19.8		8.03		8.1		534	10	10	10	10	10	Count Time: 1035
													Count Signoff: JO
													Old WQ: DC
Meter ID	59A		PH21		RD09		EC08						
Lab Control	19.7		7.76		7.8		375	10	9	10	10	10	Count Date: 4/8/16
Site Water	19.7		7.68		8.3		575	10	10	10	10	10	Count Time: 1059
													Count Signoff: RG
													Old WQ: SH
Meter ID	59A		PH22		RD11		EC10						
Lab Control	19.9		8.15		8.0		350	10	9	10	10	10	Count Date: 4/9/16
Site Water	19.9		8.01		8.0		569	10	10	10	10	10	Count Time: 0955
													Count Signoff: RG
													Old WQ: CL
Meter ID	59A		PH19		RD10		EC08						
Lab Control	19.9		7.72		7.4		351	10	9	10	10	10	Termination Date: 4/10/16
Site Water	19.9		7.65		7.8		645	10	10	10	10	10	Termination Time: 1400
													Termination Signoff: TK
													Old WQ: AR
Meter ID	59A		pH19		RD10		EC08						

96 Hour Acute Fathead Minnow Toxicity Test

Client: Kinnetic - Laguna Lake
Test Material: LL16-PAI MET
Test ID#: 67251 Project # 25601
Test Date: 4-6-16 Randomization: 514.2
Feeding T_0 Time: 0900 Initials: SH

Organism Log #: 9495 Age: 4 days
Organism Supplier: Aquatox
Control/Diluent: EPAMH
Control Water Batch: 1869
Feeding T46-hr Time: 0900 Initials: RG

Treatment (% Elutriate)	Temp (°C)	pH new	pH old	D.O. (mg/L) new	D.O. old	Conductivity (µS/cm) new	Conductivity old	NH_3 new	# Live Organisms Rep A	Rep B	Rep C	Rep D	Rep E	SIGN-OFF
Lab Control	19.8	7.27		8.0		286			10	10	10	10	10	Test Solution Prep: [illegible]
100%	19.8	7.64		7.2		590			10	10	10	10	10	New WQ: WF
														Initiation Date: 4-6-16
														Initiation Time: 1620
														Initiation Signoff: APF
Meter ID	59A	PH19		RD12		EC10		2.51						
Lab Control	19.8		8.02		8.7		299	~~10.50~~ 4/7/16	10	9	10	10	10	Count Date: 4/7/16
100%	19.8		8.12		8.3		596	—	10	10	10	10	10	Count Time: 1035
														Count Signoff: JD
														Old WQ: DC
Meter ID	59A		PH21		RD09		EC08							
Lab Control	19.7		~~7.76~~ ~~7.91~~ 4/13		~~8.7~~ ~~8.1~~ 4/13		~~325~~ 4/13 ~~652~~ **	—	10	9	10	10	10	Count Date: 4/8/16
100%	19.7		7.99		8.1		652	—	10	10	10	10	10	Count Time: 1059
														Count Signoff: RG
														Old WQ: SH
Meter ID	59A		PH22		RD11		EC10							
Lab Control	19.9		8.15		8.0		350	—	10	9	10	10	10	Count Date: 4/9/16
100%	19.9		8.05		8.1		636	—	10	10	10	10	10	Count Time: 0955
														Count Signoff: RG
														Old WQ: CL
Meter ID	59A		PH19		RD10		EC08							
Lab Control	19.9		7.72		7.4		351	—	10	9	10	10	10	Termination Date: 4/10/16
100%	19.9		7.77		7.4		654	—	10	10	10	10	10	Termination Time: 1400
														Termination Signoff: TK
														Old WQ: AR
Meter ID	59A		pH19		RD10		EC08	—						

96 Hour Acute Fathead Minnow Toxicity Test

Client: Kinnetic - Laguna Lake
Test Material: LL16-SAI MET
Test ID#: 67252 Project # 25601
Test Date: 4-6-16 Randomization: 5, 4, 2
Feeding T_0 Time: 0900 Initials: SH

Organism Log #: 9495 Age: 4 days
Organism Supplier: Aquatox
Control/Diluent: EPAMH
Control Water Batch: 1869
Feeding T46-hr Time: 0900 Initials: RG

Treatment (% Elutriate)	Temp (°C)	pH new	pH old	D.O. (mg/L) new	D.O. (mg/L) old	Conductivity (µS/cm) new	Conductivity (µS/cm) old	NH_3 new	# Live Organisms Rep A	Rep B	Rep C	Rep D	Rep E	SIGN-OFF
Lab Control	19.8	7.27		8.0		286			10	10	10	10	10	Test Solution Prep:
100%	19.8	7.58		7.2		609			10	10	10	10	10	New WQ: LF
														Initiation Date: 4-6-16
														Initiation Time: 1620
														Initiation Signoff: AFF
Meter ID	59A	pH19		RD12		EC10		1.49						
Lab Control	19.8		8.02		8.7		299	—	10	9	10	10	10	Count Date: 4/7/16
100%	19.8		8.19		8.3		612	—	10	10	10	10	10	Count Time: 1035
														Count Signoff: JO
														Old WQ: RC
Meter ID	59A		pH21		RD09		EC08							
Lab Control	19.7		7.78		7.8		325	—	10	9	10	10	10	Count Date: 4/8/16
100%	19.7		8.01		8.3		625	—	10	10	10	10	10	Count Time: 1059
														Count Signoff: RG
														Old WQ: SH
Meter ID	59A		pH22		RD11		EC10							
Lab Control	19.9		8.15		8.0		350	—	10	9	10	10	10	Count Date: 4/9/16
100%	19.9		8.09		8.2		667	—	10	10	10	10	10	Count Time: 0955
														Count Signoff: RG
														Old WQ: CL
Meter ID	59A		pH19		RD10		EC08							
Lab Control	19.9		7.72		7.4		351	—	10	9	10	10	10	Termination Date: 4/10/16
100%	19.9		7.86		7.8		674	—	10	10	10	10	10	Termination Time: 1400
														Termination Signoff: TK
														Old WQ: AR
Meter ID	59A		pH19		RD10		EC08	—						

Appendix D

Test Data and Summary of Statistics for the Reference Toxicant Evaluation of the Fathead Minnows

CETIS Summary Report

Report Date: 12 Apr-16 08:34 (p 1 of 1)
Test Code: 67239 | 17-9943-9399

Acute Fish Survival Test — **Pacific EcoRisk**

Batch ID:	20-3624-6228	**Test Type:**	Survival (96h)	**Analyst:**	Natalie Lynch
Start Date:	06 Apr-16 16:35	**Protocol:**	EPA-821-R-02-012 (2002)	**Diluent:**	Laboratory Water
Ending Date:	10 Apr-16 14:15	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	94h	**Source:**	Aquatox, AR	**Age:**	4

Sample ID:	05-2236-8306	**Code:**	NaCl	**Client:**	Pacific Ecorisk
Sample Date:	06 Apr-16 16:35	**Material:**	Sodium chloride	**Project:**	25586
Receive Date:	06 Apr-16 16:35	**Source:**	Reference Toxicant		
Sample Age:	NA (19.8 °C)	**Station:**	In House		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
04-7295-9359	96h Survival Rate	6	9	7.348	NA		Fisher Exact Test

Point Estimate Summary

Analysis ID	Endpoint	Level	g/L	95% LCL	95% UCL	TU	Method
13-2085-1637	96h Survival Rate	EC50	7.15	6.78	7.54		Spearman-Kärber

96h Survival Rate Summary

C-g/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	2	1	1	1	1	1	0	0	0.0%	0.0%
1.5		2	1	1	1	1	1	0	0	0.0%	0.0%
3		2	1	1	1	1	1	0	0	0.0%	0.0%
6		2	0.95	0.315	1	0.9	1	0.05	0.0707	7.44%	5.0%
9		2	0	0	0	0	0	0	0		100.0%
12		2	0	0	0	0	0	0	0		100.0%

96h Survival Rate Detail

C-g/L	Control Type	Rep 1	Rep 2
0	Lab Water Contr	1	1
1.5		1	1
3		1	1
6		1	0.9
9		0	0
12		0	0

96h Survival Rate Binomials

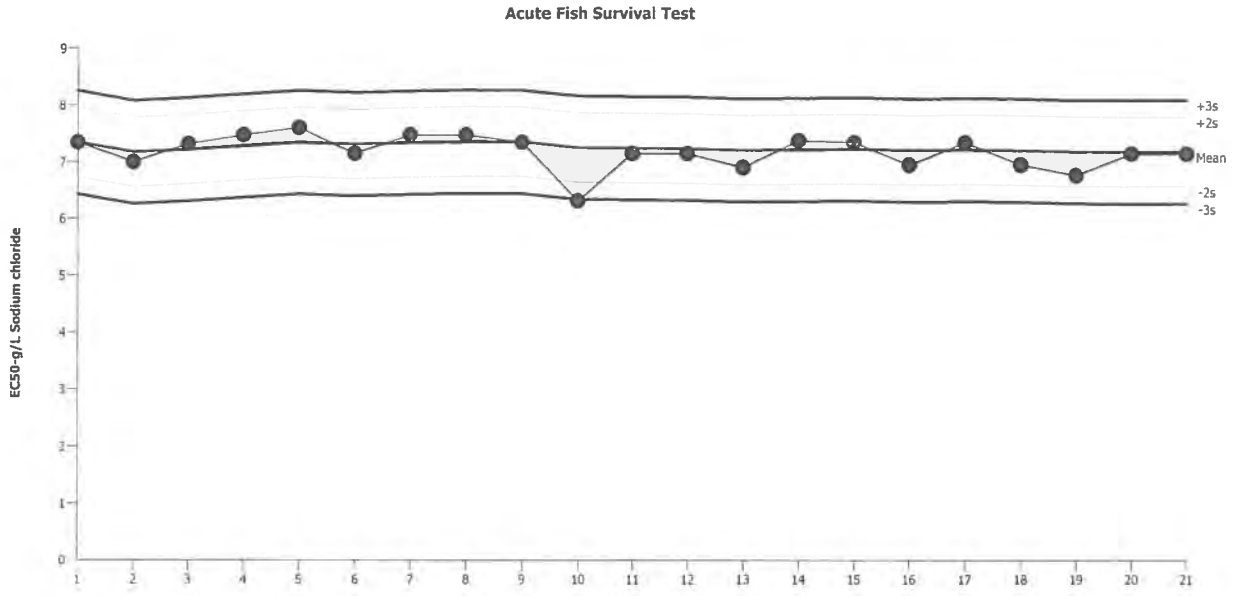
C-g/L	Control Type	Rep 1	Rep 2
0	Lab Water Contr	10/10	10/10
1.5		10/10	10/10
3		10/10	10/10
6		10/10	9/10
9		0/10	0/10
12		0/10	0/10

CETIS QC Plot

Report Date: 12 Apr-16 08:34 (1 of 1)

Acute Fish Survival Test — Pacific EcoRisk

Test Type:	Survival (96h)	**Organism:**	Pimephales promelas (Fathead Minn	**Material:**	Sodium chloride
Protocol:	EPA-821-R-02-012 (2002)	**Endpoint:**	96h Survival Rate	**Source:**	Reference Toxicant-REF



Mean:	7.182	**Count:**	20	**-2s Warning Limit:**	6.574	**-3s Action Limit:**	6.271
Sigma:	0.3037	**CV:**	4.23%	**+2s Warning Limit:**	7.789	**+3s Action Limit:**	8.093

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2014	Dec	5	17:40	7.348	0.1665	0.5481			10-9941-9540	14-2780-9781
2	2015	Jan	7	15:06	7	-0.1818	-0.5986			18-6101-2270	04-9047-8636
3			14	15:30	7.323	0.1413	0.4651			00-1349-1903	09-9358-1253
4		Feb	11	16:50	7.477	0.2949	0.9711			21-4234-7534	11-6876-4296
5		Mar	11	17:10	7.608	0.4256	1.401			08-1607-4277	00-8340-8060
6		Apr	15	16:15	7.149	-0.03261	-0.1074			21-1930-7268	03-9450-1533
7		May	12	17:30	7.477	0.2949	0.9711			02-7386-1482	02-6912-2062
8		Jun	10	15:20	7.477	0.2949	0.9711			11-9763-0262	09-7549-0220
9		Jul	1	16:15	7.348	0.1665	0.5481			16-3328-0849	16-3648-4946
10			15	15:00	6.315	-0.8668	-2.854	(-)		03-5535-1701	07-0195-5365
11			22	17:25	7.149	-0.03261	-0.1074			05-8968-5132	19-8654-3289
12		Aug	12	15:15	7.149	-0.03261	-0.1074			21-2762-0086	18-7428-9361
13		Sep	15	16:30	6.906	-0.2761	-0.9093			21-0902-3294	13-7744-6774
14		Oct	6	15:30	7.381	0.1994	0.6567			17-0040-4502	19-8082-6480
15		Nov	17	17:20	7.348	0.1665	0.5481			19-9631-5340	17-9980-8926
16		Dec	10	18:00	6.956	-0.2263	-0.7451			09-6041-6680	19-6688-1047
17	2016	Jan	8	17:30	7.348	0.1665	0.5481			09-4754-5309	04-7703-0523
18		Feb	3	16:36	6.956	-0.2263	-0.7451			14-4800-2200	04-4847-9816
19			23	14:45	6.767	-0.4147	-1.366			16-5801-5694	08-0168-0535
20		Mar	9	11:40	7.149	-0.03261	-0.1074			08-7019-9488	17-7267-1861
21		Apr	6	16:35	7.149	-0.03261	-0.1074			17-9943-9399	13-2085-1637

96 Hour Acute Fathead Minnow Reference Toxicant Test

Client: **Reference Toxicant**
Test Material: Sodium Chloride
Test ID#: 67239 Project # 25586
Test Date: 4/6/16 Randomization: 2.6.1
Feeding To Time: 0900 Initials: SH

Organism Log #: 9495 Age: 4 days
Organism Supplier: Aquatox Inc.
Control/Diluent: EPAMH
Control Water Batch: 1869
Feeding T46-hr Time: 0900 Initials: RG

Treatment (g NaCl /L)	Temp (°C)	pH new	pH old	D.O. (mg/L) new	D.O. (mg/L) old	Conductivity (µS/cm) new	Conductivity (µS/cm) old	# Live Organisms A	# Live Organisms B	SIGN-OFF
Control	19.8	7.38		8.3		295		10	10	Date: 4/6/16
1.5	19.8	7.51		8.6		2980		10	10	Test Solution Prep: TK
3	19.8	7.56		9.0		5710		10	10	RT Batch ID: 284
6	19.8	7.61		8.9		10890		10	10	New WQ: SMC
9	19.8	7.61		9.0		15590		10	10	Initiation Time: 1635
12	19.8	7.60		9.1		20270		10	10	Initiation Signoff: MOM
Meter ID:	59A	pH21		RD11		EC04				
Control	19.7		6.91		8.2		SH 307 ~~7464~~	10	10	Date: 4/7/16
1.5	19.7		7.08		8.3		3045	10	10	Count Time: 1130
3	19.7		7.11		8.1		5804	10	10	Count Signoff: JO
6	19.7		7.10		8.3		10970	10	10	Old WQ: LF
9	19.7		7.15		8.4		15600	2	4	
12	19.7		7.13		8.5		20510	4	4	
Meter ID:	59A		pH19		RD11		EC11			
Control	19.9	8.19	7.94	9.8	7.6	327	311	10	10	Date: 4/8/16
1.5	19.9	8.04	7.86	9.9	7.5	3434	3062	10	10	Test Solution Prep: SD
3	19.9	8.02	7.82	10.0	7.5	6044	5869	10	10	RT Batch ID: ~~1860~~ 284
6	19.9	7.97	7.78	10.1	7.8	10800	11510	10 SD 4/8/16	9	New WQ: HR
9	19.9	7.94	7.74	10.5	8.0	15220	16230	0	0	Renewal Time: 1320
12	19.9	7.88	7.71	10.6	8.9	20960	20970	0	0	Renewal Signoff: SD
Meter ID:	59A	pH21	pH21	RD12	RD12	EC11	EC11			Old WQ: WC
Control	19.7		7.47		7.2		317	10	10	Date: 4/9/16
1.5	19.7		7.45		7.3		3450	10	10	Count Time: 0920
3	19.7		7.55		7.3		6130	10	10	Count Signoff: YJ
6	19.7		7.52		7.1		11020	10	9	Old WQ: CL
9	—		—		—		—	—	—	
12	—		—		—		—	—	—	
Meter ID:	59A		pH19		RD10		EC08			
Control	19.9		8.02		6.6		323	10	10	Date: 4/10/16
1.5	19.9		7.90		7.0		3470	10	10	Termination Time: 1415
3	19.9		7.86		7.7		6050	10	10	Termination Signoff: TK
6	19.9		7.82		7.4		11050	10	9	Old WQ: HR
9	—		—		—		—	—	—	
12	—		—		—		—	—	—	
Meter ID:	59A		pH19		RD10		EC08			

Appendix E

Bioassay Standard Test Condition

Summary of Test Conditions and Acceptability Criteria for the Fathead Minnow (*Pimephales promelas*) Water Column Toxicity Test.		
1.	Test type	Static non-renewal
2.	Test duration	96 hours
3.	Salinity	0 ppt
4.	Temperature	20 ± 1°C
5.	Light quality	Ambient Laboratory
6.	Light intensity	50 – 100 ft c.
7.	Photoperiod	16L/8D
8.	Test chamber size	400 mL beaker
9.	Test solution volume	200 mL
10.	Renewal of test solutions	None
11.	Age of test organisms	4 days
12.	# of organisms per test chamber	10
13.	# of replicate chambers per concentration	5
14.	# of organisms per concentration	50
15.	Feeding regime	*Artemia* nauplii are made available while holding prior to the test; *Artermia* nauplii concentrate at 48 h
16.	Test chamber cleaning	Lab washing prior to test
17.	Test chamber aeration	If needed to maintain >40% saturation
18.	Elutriate preparation water	Site Water
19.	Test concentrations	Five concentrations for site sediment, and Lab Control water
20.	Dilution series	100% and a Lab Control.
21.	Dilution water	EPA Moderately Hard Water
22.	Endpoints	% Survival
23.	Sampling holding requirements	< 8 weeks, elutriates are to be used within 24 h of preparation
24.	Sample volume required	4L per site
25.	Test acceptability criteria	≥90% survival in the Lab Controls

APPENDIX H
LANDFILL GUIDELINES

Waste Connections, Inc.
Chiquita Canyon Landfill

SPECIAL WASTE ACCEPTANCE GUIDELINES
March 2016

ACCEPTANCE PROCEDURES

The following information summarizes acceptance procedures for the Chiquita Canyon Landfill (CCL):

- Contact CCL to determine required laboratory analyses.
- Complete a "Special Waste Profile" (supplied by CCL).
- Submit completed Special Waste Profile, required certified laboratory analyses (including Chain-of-Custody and QA/QC data) and any other supportive documentation (e.g. SDS) to CCL.
  Note: Additional waste stream information may be required.
- Obtain approval from CCL. Upon receipt of <u>all</u> necessary documents, disposal requests will be approved within 3 working days. For RUSH approvals, please notify Landfill Sales Representative.
- Set up method of payment <u>prior</u> to transport of material.
- A Waste Connections manifest will be generated upon approval and sent to transporter.
  Note: Each truck must have a manifest, signed by the Generator prior to arriving at the landfill. These manifests are used for tracking purposes when the shipment arrives at the landfill.
- Certified weigh tags are given to the drivers upon weighing out of the landfill. CCL is not responsible nor will be made responsible for missing weigh tags.

  - **<u>No special waste shall be accepted unless that waste is approved prior to disposal.</u>**

  - **<u>Expired special waste permits will not be accepted.</u>**

<u>Unacceptable Materials</u>

- NO Asbestos Containing Material (friable or non-friable)
- NO Liquids, Oils, Waxes, Tars, Soaps, Solvents
- NO Readily Water-Soluble Solids such as Salts, Borax, Lye, Caustic, or Acids
- NO Sludges, Sludge Components, or Semi-Solid Wastes*
- NO Dead Animals (greater than 35 lbs)
- NO Septic Tank or Chemical Toilet Wastes
- NO Drummed Materials (drums must be emptied at working face)
- NO Toxic Materials, such as Insecticides, Pesticides, Poisons, or Radioactives
- NO Infectious Materials including Hospital Wastes and Laboratory Wastes
- NO Decommissioned and/or Residual Radioactive Materials

**The term "Sludge" per SWRCB §2601 applies to residual solids and semi-solids from the treatment of water, wastewater, and other liquids not including liquid effluent discharged from such treatment processes. "Semi-solid waste" per Title 27 §20200 means waste containing less than 50 percent solids.*

ACCEPTANCE CRITERIA

Analytical Review

The generator has the primary responsibility to make the determination whether a waste is appropriate for disposal at a Class III non-hazardous waste landfill. The generator is the most familiar with the process generating the waste and should be familiar with the federal, state, and local regulations that govern their generating process.

Report Submittal Requirements

The following should be considered when submitting data to Chiquita Canyon Landfill for review:

- The analytical report must be no more than 12 months old.
- The analytical report must be legible, typed on the laboratory letterhead, include the address and phone number of the laboratory and signed by an authorized representative of the laboratory. *Note:* Draft or preliminary reports will not be accepted.
- The analytical results must have been analyzed within required holding times.
- The analytical results must also identify the units of measure and analytical method performed.
- The analytical report must include Chain of custody documentation and Laboratory Quality Assurance / Quality Control documentation for each analytical data set.
- Results reported as "non-detect" must indicate a reporting limit or minimum detection limit. Laboratory detection limits must be less than regulatory thresholds.

Term of Approval

The extent of the special waste approval shall be 1 (ONE) year. If the term of approval has expired but the waste has not changed in composition, the waste may be recertified for up to 3 (THREE) years under the original Special Waste Profile with a new analytical report submitted at least annually.

Alternatively, the generator or customer as listed on the Special Waste Profile may provide written confirmation stating the waste material has not changed since the date of approval. If a change has occurred in the characteristics of an approved waste stream, a new Special Waste Profile and a new analytical report must be submitted for acceptance as a new waste stream. New analytical reports are required at least annually. New Special Waste Profiles are required once every 3 (THREE) years for each special waste stream approved.

Laboratory Analysis

Petroleum Contaminated Soils

**The Chiquita Canyon Landfill is not permitted to accept VOC contaminated soil as regulated by the South Coast Air Quality Management District (SCAQMD), Rule 1166. VOC contaminated soil which registers a concentration of 50 ppm or greater of VOCs measured with an organic vapor analyzer will not be accepted. **

Product specific knowledge can be utilized to determine the appropriate analytical requirements for petroleum contaminated soils. Below is a list of petroleum hydrocarbons that are typically released, and the analyses that may address the regulated compounds under CCR Title 22 and 40 CFR.

Gasoline:	TPH (EPA 8015M), BTEX (8015B/8021B), Total Lead (EPA 6010)
Diesel Fuel:	TPH, BTEX or VOCS (EPA 8260)
Used Hydraulic Oil:	TPH, BTEX or VOCs, CAM-17 Metals (EPA 6010)
Motor Oil / Bunker Oil:	TPH, BTEX or VOCs, CAM-17 Metals
Used Motor Oil:	TPH, BTEX or VOCs, CAM-17 Metals

Note: Due to hydrogen sulfide induced odor concerns, wastes derived from manufacturing and/or industrial activities must undergo additional testing for Sulfide (EPA 376.2M) and Sulfate (EPA 300.0). Examples of wastes requiring Sulfide and Sulfate testing include crushed construction and demolition (C&D) debris, wastes containing gypsum wallboard material, industrial boiler ash, crude oil refining wastes, and oil & gas exploratory & production (E&P) wastes. Drilling muds which containing Barium Sulfate (aka Barite) are exempt.

Constituent	**"Subtitle D" Lined Disposal**	**Unrestricted "Clean" Use**
Volatile Organic Compounds (VOCs):	50 mg/kg	50 mg/kg
Gasoline Range Hydrocarbons (C4 – C12):	1,000 mg/kg (averaged)	10 mg/kg
Diesel Range Hydrocarbons (C13 – C22):	10,000 mg/kg (averaged)	10 mg/kg
Total Petroleum Hydrocarbons:	50,000 mg/kg (averaged)	500 mg/kg

Solvent Contaminated Wastes / Soils

- If the contaminant is known, run the method(s) which target that contaminant.
- If specific contaminant is unknown, run the full EPA 8260 analysis.
- Must address any RCRA (K, U, P or F codes) or TSCA listings, in writing.
- Metals, RCI, and/or Semi-volatile (EPA 8270), among other analyses may also be required depending on the nature of the contaminants or the process generating the waste.

Former Dry Cleaners: VOCs (EPA 8260), CAM-17 Metals

Constituent	**TTLC (mg/kg)**	**STLC (mg/L)**	**TCLP(mg/L)**
Benzene	Not Specified	0.34	0.5
Toluene	Not Specified	51	- -
Ethylbenzene	Not Specified	238	- -
Xylene	Not Specified	595	- -

Hazardous Waste Characteristics

The characteristics of reactivity, corrosivity, ignitability, and aquatic toxicity are unlikely in petroleum contaminated soils below certain TPH levels. In certain instances, additional testing may be required.

Ignitability: Flash point greater than 140° F (60° C) or capable under standard temperature and pressure of causing fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited, burn so vigorously and persistently that it creates a hazard.

Corrosivity: When mixed with an equivalent weight of water produces a solution having a pH ≤ 2.0 or ≥ 12.5

Reactivity: Reacts violently with water

Toxicity: The waste has an Acute Oral LD50 < 2,500 mg/kg,
The waste has an Acute Dermal LD50 < 4,300 mg/kg,
The waste has an Acute Inhalation LC50 < 10,000 ppm, or
The waste has an Acute Aquatic 96 hour LC50 < 500 mg/l.

Moisture: Wastes with moisture content greater than 50 percent will require a Paint Filter Liquids Test to determine the presence of free liquids
Note: Wastes testing positive for free liquids may not be not accepted for disposal at CCL.

Carcinogens: Toxic because it contains one or more carcinogenic substances. CCR 66261.24(a)(7) defines a waste as being toxic if it contains any of the specified carcinogens at a concentration of greater than or equal to 0.001 percent by weight (10 ppmw).

Used Oil: Used oil and materials that contain or are contaminated with used oil are regulated as hazardous wastes even if they do not exhibit any of the characteristics of hazardous waste.

Sampling Frequency

Representative samples are required for all incoming special waste streams. In general, a four point composite sample (four individual grab samples composited at the laboratory into one equally represented sample) is required to satisfy the requirements for a "representative" sample.

CONTAMINANTS	Volume	Frequency
CAM-17 Metals (EPA 6010) TPH (EPA 8015M / 8021B) VOCs (EPA 8260)	1-1,000 cubic yards	1 (ONE) 4-Point Composite Sample per 250 cubic yards
SVOCs (EPA 8270) PCB's (8080) Pesticides (8080)	1,000 - 5,000 cubic yards	4 (FOUR) 4-Point Composite Samples plus one sample for each additional 500 cubic yds
Herbicides (8150)	5,000+ cubic yards	12 (TWELVE) 4-Point Composite Samples plus one for each additional 1,000 cubic yds

Constituent Limits for "Subtitle D" Lined Cell Disposal

Chiquita Canyon Landfill will only accept material that is represented by analytical results indicating concentrations below the listed values. CCL will base approvals on total results where the total threshold limit concentration (TTLC) of a particular constituent does not equal or exceed 20 times (TCLP dilution factor) or 10 times (WET/STLC dilution factor) the listed soluble threshold for organic and inorganic compounds. If a particular constituent exceeds total threshold limit concentrations, additional extraction tests will be required.

Metals / Inorganics Constituent Limits (Subtitle D):

	TTLC Limit (mg/kg)	STLC Required	**STLC Limit (mg/L)**	TCLP Required	**TCLP Limit (mg/L)**
Antimony	500	≥ 20	2.0		
Arsenic	500	≥ 50	5.0	≥ 100	5.0
Barium	10,000	≥ 1,000	100	≥ 2,000	100.0
Beryllium	75	≥ 7.5	0.75		
Cadmium	100	≥ 10	1.0	≥ 20	1.0
Chromium*	2,500	≥ 170	5.0	≥ 100	5.0
Chromium +6	500	≥ 50	5.0		
Cobalt	8,000	≥ 800	80		
Copper	2,500	≥ 250	25		
Lead	1,000	≥ 50	5.0	≥ 100	5.0
Mercury	20	≥ 2	0.2	≥ 4	0.2
Molybdenum	3,500	≥ 3,500	350		
Nickel	2,000	≥ 200	20		
Selenium	100	≥ 10	1.0	≥ 20	1.0
Silver	500	≥ 50	5.0	≥ 100	5.0
Thallium	700	≥ 6.8	0.68		
Vanadium	2,400	≥ 240	24		
Zinc	5,000	≥ 2,500	250		
Fluoride Salts	18,000	≥ 1,800	180		
Cyanide	250				
Sulfate / Sulfide	500				

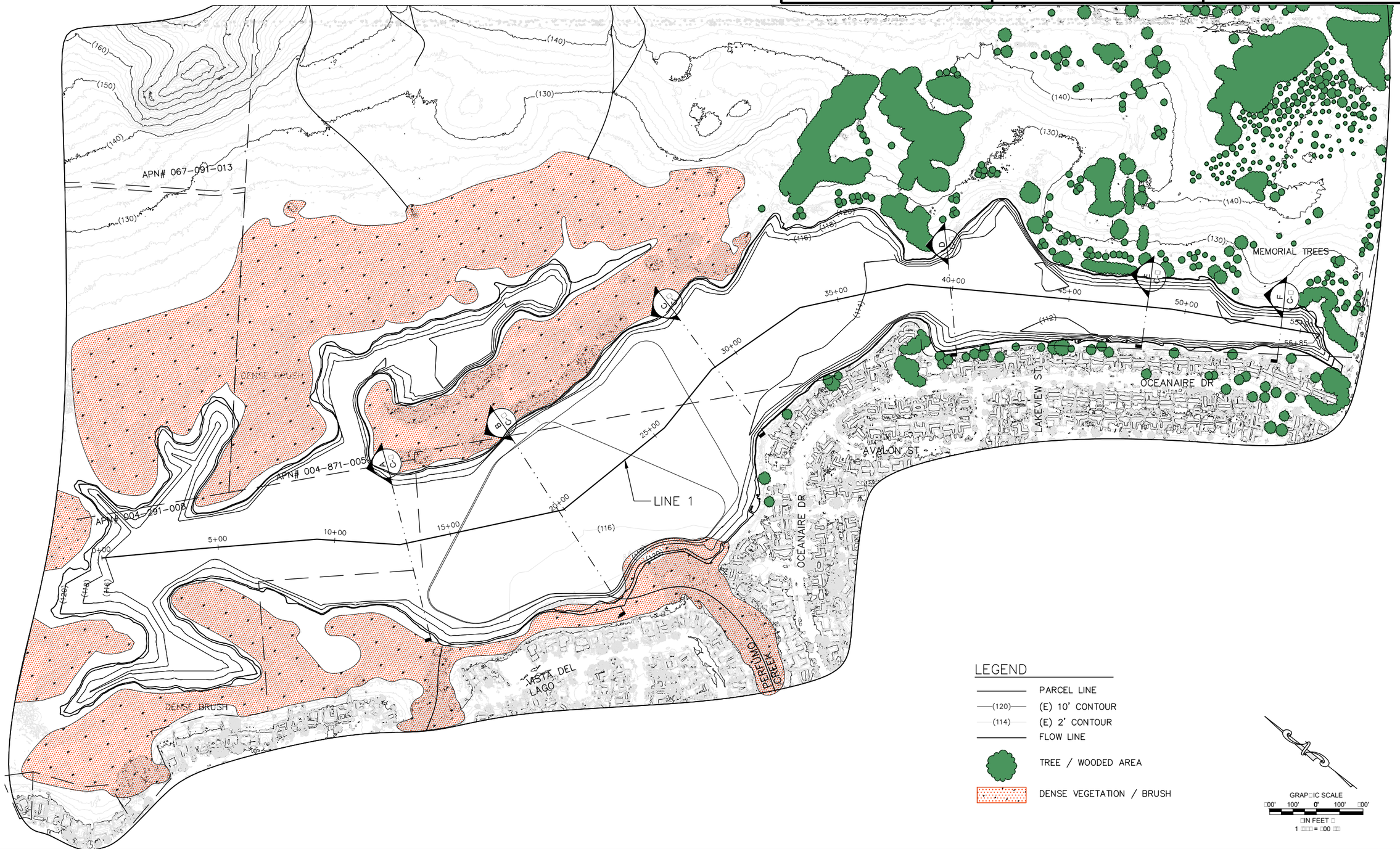
***If Total Chromium > 100 mg/kg, a TCLP extraction test is required. If Total Chromium > 170 mg/kg, both WET/STLC <u>and</u> TCLP extraction tests are required. If either STLC or TCLP tests detect Chromium > 5 mg/L, the material is considered hazardous and will not be accepted for disposal at CCL.**

Volatiles / Semi-Volatiles / Pesticides / Herbicides Constituent Limits (Subtitle D):

	TTLC Limit (mg/kg)	STLC Required	**STLC Limit (mg/L)**	TCLP Required	**TCLP Limit (mg/L)**
Aldrin	1.4	≥ 1.4	0.14		
Benzene		≥ 3.4	0.34	≥ 10	0.5
Carbon Tetrachloride		≥ 1.7	0.17	≥ 10	0.5
Chlordane	2.5	≥ 2.5	0.25	≥ 0.6	0.03
Chlorobenzene		≥ 1,000	100	≥ 2,000	100
Chloroform		≥ 60	6.0	≥ 120	6.0
Cresols		≥ 2,000	200	≥ 2,000	200
2,4-D	100	≥ 100	10	≥ 200	10
DDT/DDE/DDD	1.0	≥ 1.0	0.10		
1,4 Dichlorobenzene		≥ 17	1.7	≥ 15	7.5
1,2 Dichloroethane		≥ 1.7	0.17	≥ 10	0.5
1,1 Dichloroethylene		≥ 7.0	0.7	≥ 14	0.7
2,4 Dinitrotoluene		≥ 1.3	0.13	≥ 2.6	0.13
Dieldrin	8.0	≥ 8.0	0.8		
Dioxin	0.01	≥ 0.01	0.001		
Endrin	0.2	≥ 0.2	0.02		0.02
Heptachlor	4.7	≥ 0.034	0.0034	≥ 0.16	0.008
Hexachlorobenzene		≥ 1.3	0.13	≥ 2.6	0.13
Hexachlorobutadiene		≥ 5.0	0.5	≥ 10	0.5
Hexachloroethane		≥ 30	3.0	≥ 60	3.0
Kepone	21	≥ 21	2.1		
Lindane	4.0	≥ 0.7	0.068	≥ 8.0	0.4
Methoxychlor	100	≥ 100	10	≥ 200	10
Methyl Ethyl Ketone		≥ 2,000	200	≥ 4,000	200
Mirex	21	≥ 21	2.1		
Nitrobenzene		≥ 20	2.0	≥ 40	2.0
Pentachlorophenol	17	≥ 3.4	0.34	≥ 2,000	100
Polychlorinated Biphenyls (PCBs)	50	≥ 1.70	0.17		
Pyridine		≥ 50	5.0	≥ 100	5.0
Tetrachloroethylene (PCE)		≥ 7.0	0.7	≥ 14	0.7
Toxaphene	5.0	≥ 5.0	0.5	≥ 10	0.5
Trichloroethylene (TCE)	2,040	≥ 5.0	0.5	≥ 10	0.5
2,4,5 TP (Silvex)	10	≥ 10	1.0	≥ 20	1.0
2,4,5 Trichlorophenol				≥ 8,000	400
2,4,6 Trichlorophenol				≥ 40	2.0
Vinyl Chloride		≥ 1.7	0.17	≥ 4.0	0.2

Appendix E - Lake Plan and Cross-section Views

REVIEWED:	SUBMITTED:	APPROVED FOR CONSTRUCTION BY:
DATE	DATE	################ DATE



REV	DATE	BY	DESCRIPTION

MNS ENGINEERS INC
2231 Broad Street
San Luis Obispo, CA 93401
805.787.0326 Phone

ENGINEERING
PLANNING
SURVEYING
CONSTRUCTION MANAGEMENT

DESIGNED:
DRAWN:
CHECKED:
QA/QC:
CONSTRUCTABILITY:

PROJECT ENGINEER: R.C.E. EXP. DATE

0 1/2 1 2
THIS BAR IS 2 INCHES AT FULL SCALE. IF NOT 2 INCHES, THEN SCALE ACCORDINGLY.

SCALE:
############
###########

PLAN VIEW
EXISTING LAYOUT

CITY OF SAN LUIS OBISPO
LAGUNA LAKE
DREDGING PROJECT

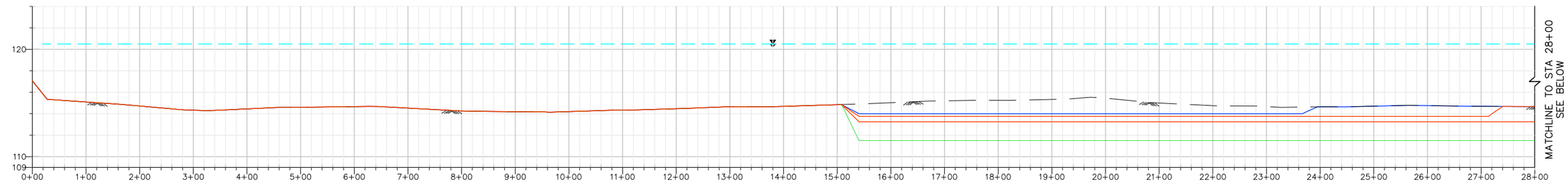
PROJECT NUMBER
CISLO150 1

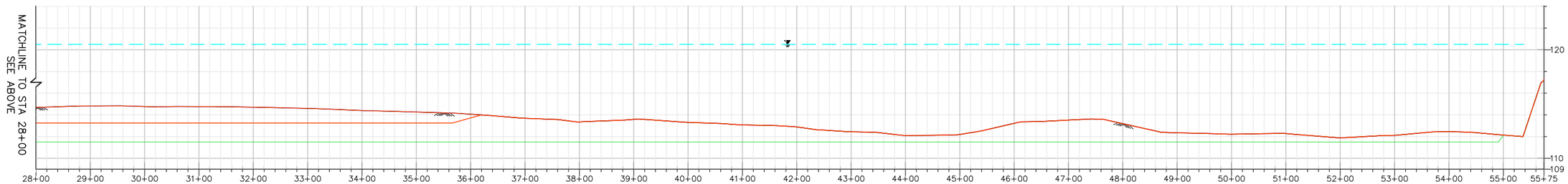
DRAWING NUMBER
C-1

SHEET NUMBER
1 OF -

P:\CISLO San Luis Obispo\CISLO.150317 Laguna Lake Dredging\Engineering\CAD\3 Plot\CISLO.150317-Dredging Plan.dwg
Wed 13-Jul-16 05:05:53 PM mnorthrup P:\CISLO San Luis Obispo\CISLO.150317 Laguna Lake Dredging\Engineering\CAD\3 Plot\CISLO.150317-Dredging Plan.dwg
7/30/2015

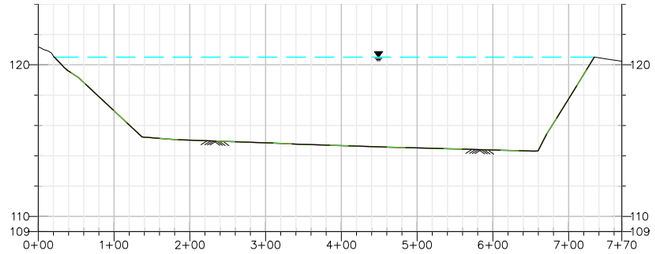
REVIEWED:	SUBMITTED:	APPROVED FOR CONSTRUCTION
DATE	DATE	BY: ############### DATE



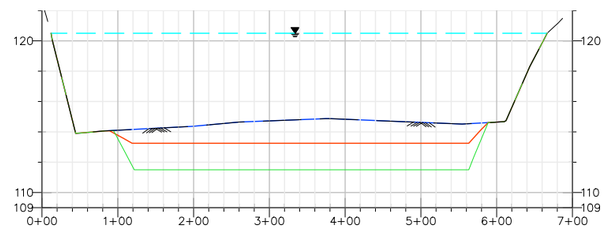


LINE 1 PROFILE

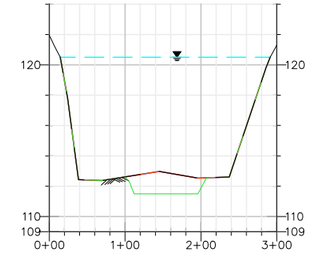
SCALE: HORIZ 1" = 100'
VERT 1" = 5'



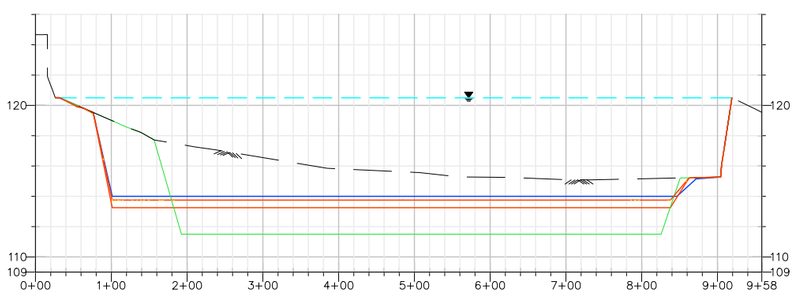
A / C-1 **SECTION**
SCALE: HORIZ 1" = 100'
VERT 1" = 5'



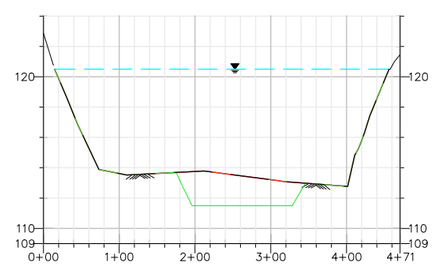
C / C-1 **SECTION**
SCALE: HORIZ 1" = 100'
VERT 1" = 5'



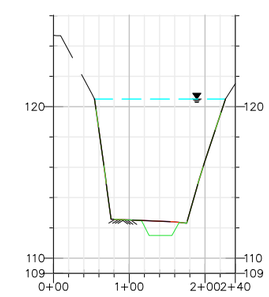
E / C-1 **SECTION**
SCALE: HORIZ 1" = 100'
VERT 1" = 5'



B / C-1 **SECTION**
SCALE: HORIZ 1" = 100'
VERT 1" = 5'



D / C-1 **SECTION**
SCALE: HORIZ 1" = 100'
VERT 1" = 5'



F / C-1 **SECTION**
SCALE: HORIZ 1" = 100'
VERT 1" = 5'

LEGEND

- WATER SURFACE ELEVATION
- WATER SURFACE AT ELEV 120.5'
- (E) GRADE
- ALTERNATE 1
- ALTERNATE 2 LOW
- ALTERNATE 2 HIGH
- ALTERNATE 3

REV	DATE	BY	DESCRIPTION

MNS ENGINEERS INC
2231 Broad Street
San Luis Obispo, CA 93401
805.787.0326 Phone

ENGINEERING
PLANNING
SURVEYING
CONSTRUCTION MANAGEMENT

DESIGNED:
DRAWN:
CHECKED:
QA/QC:
CONSTRUCTABILITY:

PROJECT ENGINEER:
R.C.E. EXP.
DATE

0 1/2 1 2
THIS BAR IS 2 INCHES AT FULL SCALE. IF NOT 2 INCHES, THEN SCALE ACCORDINGLY.

SCALE:
############
###########

LAKE PROFILE AND CROSS SECTIONS
EXISTING

CITY OF SAN LUIS OBISPO
LAGUNA LAKE
DREDGING PROJECT

PROJECT NUMBER
CISLO.150317

DRAWING NUMBER
C-2

SHEET NUMBER
2 OF **-**

P:\CISLO San Luis Obispo\CISLO.150317 Laguna Lake Dredging\Engineering\CAD\3 Plot\CISLO.150317-Dredging Plan.dwg 7/30/2015
P:\CISLO San Luis Obispo\CISLO.150317 Laguna Lake Dredging\Engineering\CAD\3 Plot\CISLO.150317-Dredging Plan.dwg 7/30/2015

Appendix F - Construction Cost Estimates

OPINION OF PROBABLE CONSTRUCTION COST

MNS ENGINEERS INC

Project: Laguna Lake Dredging and Sediment Management Project

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317

Description: Dredging Alternative 1 - Hydraulic Dredging with Dewatering Basins

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	365,000	365,000		0			365,000
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	36,500	CY	3.00	109,500		0			109,500
	5	Hydraulic Dredging	36,500	CY	30.48	1,112,520		0			1,112,520
	6	Dewatering - Dewatering Basin	36,500	CY	3.00	109,500		0			109,500
	7	Hauling (to Cold Canyon Landfill)	36,500	CY	3.40	124,100		0			124,100
	8	Landfill Disposal Fee	36,500	CY	33.75	1,231,875		0			1,231,875
	9	Environmental Monitoring (if required)	150	HR	110.00	16,500					16,500
	10	Environmental Mitigation Measures	1	LS	172,502	172,502					172,502
	11										0
	12					0					0
						0					0
		Subtotals				3253497.00					3253497.00
		Division 1 Costs	@	5.00%							0.00
		Subtotals				3253497.00		0.00			3253497.00
		Taxes - Materials Costs	@	9.00%		292814.73					292,814.73
		Subtotals				3546311.73		0.00			3,546,311.73
		Contractor Markup for Sub	@								
		Subtotals				3546311.73		0.00			3,546,311.73
		Contractor OH&P	@	20.00%		709262.346		0		0	709,262.35
		Subtotals				4255574.08		0.00		0.00	4,255,574.08
		Estimate Contingency	@	20.00%							851,114.82
		Subtotals									5,106,688.89
		Escalate to Midpoint of Construct	@	3.00%							153,200.67
		Estimated Bid Cost									5,259,889.56
		Total Estimate									**5,259,890**

OPINION OF PROBABLE CONSTRUCTION COST

Project: Laguna Lake Dredging and Sediment Management Project

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317

Description: Dredging Alternative 1 - Hydraulic Dredging with Mechanical Dewatering

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	292,000	292,000		0			292,000
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	36,500	CY	3.00	109,500		0			109,500
	5	Hydraulic Dredging	36,500	CY	30.48	1,112,520		0			1,112,520
	6	Dewatering - Mechanical	36,500	CY	21.68	791,320		0			791,320
	7	Hauling (to Cold Canyon Landfill)	36,500	CY	3.40	124,100		0			124,100
	8	Landfill Disposal Fee	36,500	CY	33.75	1,231,875		0			1,231,875
	9	Environmental Monitoring (if required)	150	HR	110.00	16,500					16,500
	10	Environmental Mitigation Measures	1	LS	233,384	233,384					233,384
	11										0
	12					0					0
						0					0
		Subtotals				3923199.00					3923199.00
		Division 1 Costs	@	5.00%							0.00
		Subtotals				3923199.00		0.00			3923199.00
		Taxes - Materials Costs	@	9.00%		353087.91					353,087.91
		Subtotals				4276286.91		0.00			4,276,286.91
		Contractor Markup for Sub	@								
		Subtotals				4276286.91		0.00			4,276,286.91
		Contractor OH&P	@	20.00%		855257.382		0		0	855,257.38
		Subtotals				5131544.29		0.00		0.00	5,131,544.29
		Estimate Contingency	@	20.00%							1,026,308.86
		Subtotals									6,157,853.15
		Escalate to Midpoint of Construct	@	3.00%							184,735.59
		Estimated Bid Cost									6,342,588.74
		Total Estimate									**6,342,590**

OPINION OF PROBABLE CONSTRUCTION COST

Project: Laguna Lake Dredging and Sediment Management Project

Description: Dredging Alternative 1 - Mechanical Dredging

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317
Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	182,744	182,744		0			182,744
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	36,500	CY	3.00	109,500		0			109,500
	5	Mechanical Dredging	36,500	CY	50.63	1,848,068		0			1,848,068
	6	Hauling (to Cold Canyon Landfill)	36,500	CY	3.40	124,100		0			124,100
	7	Landfill Disposal Fee	36,500	CY	33.75	1,231,875		0			1,231,875
	8	Environmental Monitoring (if required)	150	HR	110.00	16,500		0			16,500
	9	Environmental Mitigation Measures	1	LS	216,881	216,881					216,881
	10										0
	11										0
	12										0
						0					0
		Subtotals				3741668.20					3741668.20
		Division 1 Costs	@	5.00%							0.00
		Subtotals				3741668.20		0.00			3741668.20
		Taxes - Materials Costs	@	9.00%		336750.14					336,750.14
		Subtotals				4078418.34		0.00			4,078,418.34
		Contractor Markup for Sub	@								
		Subtotals				4078418.34		0.00			4,078,418.34
		Contractor OH&P	@	20.00%		815683.6676		0		0	815,683.67
		Subtotals				4894102.01		0.00		0.00	4,894,102.01
		Estimate Contingency	@	20.00%							978,820.40
		Subtotals									5,872,922.41
		Escalate to Midpoint of Construct	@	3.00%							176,187.67
		Estimated Bid Cost									6,049,110.08
		Total Estimate									**6,049,120**

OPINION OF PROBABLE CONSTRUCTION COST

Project: Laguna Lake Dredging and Sediment Management Project

Description: Dredging Alternative 2 - Hydraulic Dredging with Dewatering Basins (50,000 CY)

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317
Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	365,000	365,000		0			365,000
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	50,000	CY	3.00	150,000		0			150,000
	5	Hydraulic Dredging	50,000	CY	30.48	1,524,000		0			1,524,000
	6	Dewatering - Dewatering Basin	50,000	CY	3.00	150,000		0			150,000
	7	Hauling (to Cold Canyon Landfill)	50,000	CY	3.40	170,000		0			170,000
	8	Landfill Disposal Fee	50,000	CY	33.75	1,687,500					1,687,500
	9	Environmental Monitoring (if required)	150	HR	110.00	16,500					16,500
	10	Environmental Mitigation Measures	1	LS	221,750	221,750					221,750
	11					0					0
	12					0					0
						0					0
		Subtotals				4296750.00					4296750.00
		Division 1 Costs	@	5.00%							0.00
		Subtotals				4296750.00		0.00			4296750.00
		Taxes - Materials Costs	@	9.00%		386707.50					386,707.50
		Subtotals				4683457.50		0.00			4,683,457.50
		Contractor Markup for Sub	@								
		Subtotals				4683457.50		0.00			4,683,457.50
		Contractor OH&P	@	20.00%		936691.5		0		0	936,691.50
		Subtotals				5620149.00		0.00		0.00	5,620,149.00
		Estimate Contingency	@	20.00%							1,124,029.80
		Subtotals									6,744,178.80
		Escalate to Midpoint of Construct	@	3.00%							202,325.36
		Estimated Bid Cost									6,946,504.16
		Total Estimate									**6,946,510**

OPINION OF PROBABLE CONSTRUCTION COST

Project: Laguna Lake Dredging and Sediment Management Project

Description: Dredging Alternative 2 - Hydraulic Dredging with Mechanical Dewatering (50,000 CY)

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317
Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	292,000	292,000		0			292,000
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	50,000	CY	3.00	150,000		0			150,000
	5	Hydraulic Dredging	50,000	CY	30.48	1,524,000		0			1,524,000
	6	Dewatering - Mechanical	50,000	CY	24.00	1,200,000		0			1,200,000
	7	Hauling (to Cold Canyon Landfill)	50,000	CY	3.40	170,000		0			170,000
	8	Landfill Disposal Fee	50,000	CY	33.75	1,687,500					1,687,500
	9	Environmental Monitoring (if required)	150	HR	110.00	16,500					16,500
	10	Environmental Mitigation Measures	1	LS	319,450	319,450					319,450
	11					0					0
	12					0					0
						0					0
		Subtotals				5371450.00					5371450.00
		Division 1 Costs	@	5.00%							0.00
		Subtotals				5371450.00		0.00			5371450.00
		Taxes - Materials Costs	@	9.00%		483430.50					483,430.50
		Subtotals				5854880.50		0.00			5,854,880.50
		Contractor Markup for Sub	@								
		Subtotals				5854880.50		0.00			5,854,880.50
		Contractor OH&P	@	20.00%		1170976.1		0		0	1,170,976.10
		Subtotals				7025856.60		0.00		0.00	7,025,856.60
		Estimate Contingency	@	20.00%							1,405,171.32
		Subtotals									8,431,027.92
		Escalate to Midpoint of Construct	@	3.00%							252,930.84
		Estimated Bid Cost									8,683,958.76
		Total Estimate									**8,683,960**

OPINION OF PROBABLE CONSTRUCTION COST

MNS ENGINEERS INC

Project: Laguna Lake Dredging and Sediment Management Project

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317

Description: Dredging Alternative 2 - Mechanical Dredging (50,000 CY)

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	182,744	182,744		0			182,744
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	50,000	CY	3.00	150,000		0			150,000
	5	Mechanical Dredging	50,000	CY	42.56	2,128,000		0			2,128,000
	6	Hauling (to Cold Canyon Landfill)	50,000	CY	3.40	170,000		0			170,000
	7	Landfill Disposal Fee	50,000	CY	33.75	1,687,500		0			1,687,500
	8	Environmental Monitoring (if required)	150	HR	110.00	16,500		0			16,500
	9	Environmental Mitigation Measures	1	LS	248,924	248,924					248,924
	10										0
	11										0
	12										0
						0					0
		Subtotals				4595668.40					4595668.40
		Division 1 Costs	@	5.00%							0.00
		Subtotals				4595668.40		0.00			4595668.40
		Taxes - Materials Costs	@	9.00%		413610.16					413,610.16
		Subtotals				5009278.56		0.00			5,009,278.56
		Contractor Markup for Sub	@								
		Subtotals				5009278.56		0.00			5,009,278.56
		Contractor OH&P	@	20.00%		1001855.711		0		0	1,001,855.71
		Subtotals				6011134.27		0.00		0.00	6,011,134.27
		Estimate Contingency	@	20.00%							1,202,226.85
		Subtotals									7,213,361.12
		Escalate to Midpoint of Construct	@	3.00%							216,400.83
		Estimated Bid Cost									7,429,761.95
		Total Estimate									**7,429,770**

OPINION OF PROBABLE CONSTRUCTION COST

MNS ENGINEERS INC

Project: Laguna Lake Dredging and Sediment Management Project

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317

Description: Dredging Alternative 2 - Hydraulic Dredging with Dewatering Basins (85,000 CY)

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	365,000	365,000		0			365,000
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	85,000	CY	3.00	255,000		0			255,000
	5	Hydraulic Dredging	85,000	CY	30.48	2,590,800		0			2,590,800
	6	Dewatering - Dewatering Basin	85,000	CY	3.00	255,000		0			255,000
	7	Hauling (to Cold Canyon Landfill)	85,000	CY	3.40	289,000		0			289,000
	8	Landfill Disposal Fee	85,000	CY	33.75	2,868,750					2,868,750
	9	Environmental Monitoring (if required)	150	HR	110.00	16,500					16,500
	10	Environmental Mitigation Measures	1	LS	349,430	349,430					349,430
	11					0					0
	12					0					0
						0					0
		Subtotals				7001480.00					7001480.00
		Division 1 Costs	@	5.00%							0.00
		Subtotals				7001480.00		0.00			7001480.00
		Taxes - Materials Costs	@	9.00%		630133.20					630,133.20
		Subtotals				7631613.20		0.00			7,631,613.20
		Contractor Markup for Sub	@								
		Subtotals				7631613.20		0.00			7,631,613.20
		Contractor OH&P	@	20.00%		1526322.64		0		0	1,526,322.64
		Subtotals				9157935.84		0.00		0.00	9,157,935.84
		Estimate Contingency	@	20.00%							1,831,587.17
		Subtotals									10,989,523.01
		Escalate to Midpoint of Construct	@	3.00%							329,685.69
		Estimated Bid Cost									11,319,208.70
		Total Estimate									**11,319,210**

OPINION OF PROBABLE CONSTRUCTION COST

Project: Laguna Lake Dredging and Sediment Management Project

Description: Dredging Alternative 2 - Hydraulic Dredging with Mechanical Dewatering (85,000 CY)

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317
Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	292,000	292,000		0			292,000
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	85,000	CY	3.00	255,000		0			255,000
	5	Hydraulic Dredging	85,000	CY	30.48	2,590,800		0			2,590,800
	6	Dewatering - Mechanical	85,000	CY	25.26	2,146,760		0			2,146,760
	7	Hauling (to Cold Canyon Landfill)	85,000	CY	3.40	289,000		0			289,000
	8	Landfill Disposal Fee	85,000	CY	33.75	2,868,750					2,868,750
	9	Environmental Monitoring (if required)	150	HR	110.00	16,500					16,500
	10	Environmental Mitigation Measures	1	LS	531,306	531,306					531,306
	11					0					0
	12					0					0
						0					0
		Subtotals				9002116.00					9002116.00
		Division 1 Costs	@	5.00%							0.00
		Subtotals				9002116.00		0.00			9002116.00
		Taxes - Materials Costs	@	9.00%		810190.44					810,190.44
		Subtotals				9812306.44		0.00			9,812,306.44
		Contractor Markup for Sub	@								
		Subtotals				9812306.44		0.00			9,812,306.44
		Contractor OH&P	@	20.00%		1962461.288		0		0	1,962,461.29
		Subtotals				11774767.73		0.00		0.00	11,774,767.73
		Estimate Contingency	@	20.00%							2,354,953.55
		Subtotals									14,129,721.27
		Escalate to Midpoint of Construct	@	3.00%							423,891.64
		Estimated Bid Cost									14,553,612.91
		Total Estimate									**14,553,620**

OPINION OF PROBABLE CONSTRUCTION COST

MNS ENGINEERS INC

Project: Laguna Lake Dredging and Sediment Management Project

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317

Description: Dredging Alternative 2 - Mechanical Dredging (85,000 CY)

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	182,744	182,744		0			182,744
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	85,000	CY	3.00	255,000		0			255,000
	5	Mechanical Dredging	85,000	CY	42.56	3,617,600		0			3,617,600
	6	Hauling (to Cold Canyon Landfill)	85,000	CY	3.40	289,000		0			289,000
	7	Landfill Disposal Fee	85,000	CY	33.75	2,868,750		0			2,868,750
	8	Environmental Monitoring (if required)	150	HR	110.00	16,500		0			16,500
	9	Environmental Mitigation Measures	1	LS	408,384	408,384					408,384
	10										0
	11										0
	12										0
						0					0
		Subtotals				7649978.40					7649978.40
		Division 1 Costs	@	5.00%							0.00
		Subtotals				7649978.40		0.00			7649978.40
		Taxes - Materials Costs	@	9.00%		688498.06					688,498.06
		Subtotals				8338476.46		0.00			8,338,476.46
		Contractor Markup for Sub	@								
		Subtotals				8338476.46		0.00			8,338,476.46
		Contractor OH&P	@	20.00%		1667695.291		0		0	1,667,695.29
		Subtotals				10006171.75		0.00		0.00	10,006,171.75
		Estimate Contingency	@	20.00%							2,001,234.35
		Subtotals									12,007,406.10
		Escalate to Midpoint of Construct	@	3.00%							360,222.18
		Estimated Bid Cost									12,367,628.28
		Total Estimate									**12,367,630**

OPINION OF PROBABLE CONSTRUCTION COST

Project: Laguna Lake Dredging and Sediment Management Project

Description: Dredging Alternative 3 - Hydraulic Dredging with Dewatering Basins

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317
Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	365,000	365,000		0			365,000
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	167,000	CY	3.00	501,000		0			501,000
	5	Hydraulic Dredging	167,000	CY	30.48	5,090,160		0			5,090,160
	6	Dewatering - Dewatering Basin	167,000	CY	3.00	501,000		0			501,000
	7	Hauling (to Cold Canyon Landfill)	167,000	CY	3.40	567,800		0			567,800
	8	Landfill Disposal Fee	167,000	CY	33.75	5,636,250		0			5,636,250
	9	Environmental Monitoring (if required)	150	HR	110.00	16,500		0			16,500
	10	Environmental Mitigation Measures	1	LS	648,566	648,566					648,566
	11										0
	12										0
						0					0
		Subtotals				13338276.00					13338276.00
		Division 1 Costs	@	5.00%							0.00
		Subtotals				13338276.00		0.00			13338276.00
		Taxes - Materials Costs	@	9.00%		1200444.84					1,200,444.84
		Subtotals				14538720.84		0.00			14,538,720.84
		Contractor Markup for Sub	@								
		Subtotals				14538720.84		0.00			14,538,720.84
		Contractor OH&P	@	20.00%		2907744.168		0		0	2,907,744.17
		Subtotals				17446465.01		0.00		0.00	17,446,465.01
		Estimate Contingency	@	20.00%							3,489,293.00
		Subtotals									20,935,758.01
		Escalate to Midpoint of Construct	@	3.00%							628,072.74
		Estimated Bid Cost									21,563,830.75
		Total Estimate									**21,563,840**

OPINION OF PROBABLE CONSTRUCTION COST

MNS ENGINEERS INC

Project: Laguna Lake Dredging and Sediment Management Project

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317

Description: Dredging Alternative 3 - Hydraulic Dredging with Mechanical Dewatering

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	292,000	292,000		0			292,000
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	167,000	CY	3.00	501,000		0			501,000
	5	Hydraulic Dredging	167,000	CY	30.48	5,090,160		0			5,090,160
	6	Dewatering - Mechanical	167,000	CY	22.77	3,802,256		0			3,802,256
	7	Hauling (to Cold Canyon Landfill)	167,000	CY	3.40	567,800		0			567,800
	8	Landfill Disposal Fee	167,000	CY	33.75	5,636,250		0			5,636,250
	9	Environmental Monitoring (if required)	150	HR	110.00	16,500		0			16,500
	10	Environmental Mitigation Measures	1	LS	971,392	971,392					971,392
	11										0
	12										0
						0					0
		Subtotals				16889357.60					16889357.60
		Division 1 Costs	@	5.00%							0.00
		Subtotals				16889357.60		0.00			16889357.60
		Taxes - Materials Costs	@	9.00%		1520042.18					1,520,042.18
		Subtotals				18409399.78		0.00			18,409,399.78
		Contractor Markup for Sub	@								
		Subtotals				18409399.78		0.00			18,409,399.78
		Contractor OH&P	@	20.00%		3681879.957		0		0	3,681,879.96
		Subtotals				22091279.74		0.00		0.00	22,091,279.74
		Estimate Contingency	@	20.00%							4,418,255.95
		Subtotals									26,509,535.69
		Escalate to Midpoint of Construct	@	3.00%							795,286.07
		Estimated Bid Cost									27,304,821.76
		Total Estimate									**27,304,830**

OPINION OF PROBABLE CONSTRUCTION COST

Project: Laguna Lake Dredging and Sediment Management Project

Description: Dredging Alternative 3 - Mechanical Dredging

Estimate Type:
- [x] Conceptual
- [ ] Preliminary (w/o plans)
- [ ] Design Development @
- [ ] Construction
- [ ] Change Order
- ____ % complete

Prepared By: SPP
Date Prepared: 7/14/2016
MNS Proj. No. CISLO.150317
Current at ENR
Escalated to ENR
Months to Midpoint of Construction

Spec. No.	Item No.	Description	Qty.	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
	1	Mobilization, Bonds, & Insurance	1	LS	182,744	182,744		0			182,744
	2	SWPPP	1	LS	5,000.00	5,000		0			5,000
	3	Water Quality BMPs for Heavy Equipment	1	LS	7,000.00	7,000		0			7,000
	4	Site Prep and Restoration	167,000	CY	3.00	501,000		0			501,000
	5	Mechanical Dredging	167,000	CY	40.20	6,713,400		0			6,713,400
	6	Hauling (to Cold Canyon Landfill)	167,000	CY	3.40	567,800		0			567,800
	7	Landfill Disposal Fee	167,000	CY	33.75	5,636,250		0			5,636,250
	8	Environmental Monitoring (if required)	150	HR	110.00	16,500		0			16,500
	9	Environmental Mitigation Measures	1	LS	742,564	742,564					742,564
	10										0
	11										0
	12										0
						0					0
		Subtotals				14372258.40					14372258.40
		Division 1 Costs	@	5.00%							0.00
		Subtotals				14372258.40		0.00			14372258.40
		Taxes - Materials Costs	@	9.00%		1293503.26					1,293,503.26
		Subtotals				15665761.66		0.00			15,665,761.66
		Contractor Markup for Sub	@								
		Subtotals				15665761.66		0.00			15,665,761.66
		Contractor OH&P	@	20.00%		3133152.331		0		0	3,133,152.33
		Subtotals				18798913.99		0.00		0.00	18,798,913.99
		Estimate Contingency	@	20.00%							3,759,782.80
		Subtotals									22,558,696.78
		Escalate to Midpoint of Construct	@	3.00%							676,760.90
		Estimated Bid Cost									23,235,457.69
		Total Estimate									**23,235,460**

Appendix G - On-Site Deposition Analysis

The area directly to the east and northeast of Laguna Lake is part of the Laguna Lake Natural Reserve and the Laguna Lake Park, both City-owned properties with open land available for sediment deposition. These areas have been identified in Figure A. The areas lie outside of the 100-year flood zone, provide a 50-foot offset from drainage flowlines, and avoid sensitive biological resources and developed Park areas. In total, approximately 25.83 acres of land has been identified as potential sediment deposition area. Each site would receive between 18 and 36 inches of cover for a maximum volume of 85,000 cubic yards (CY) of sediment. Grading and other improvements would be necessary to maintain the habitat, the aesthetic, and the recreational value of the Reserve and Park. Detailed deposition, grading and improvement plans are necessary.

MNS ENGINEERS INC
ENGINEERING | SURVEYING
CONSTRUCTION MANAGEMENT

811 El Capitan Way, Ste. 130
San Luis Obispo, CA 93401
805.787.0326 Phone

FIGURE A: POTENTIAL ON-SITE DEPOSITION AREAS

LAGUNA LAKE DREDGING AND SEDIMENT MANAGEMENT PROJECT
CITY OF SAN LUIS OBISPO, CA

400' 0' 400'
1" = 400'