FOR CONTRACT NO.: 07-199634

INFORMATION HANDOUT

SUMMARY OF FOUNDATION RECOMMENDATION REPORTS

ADL INVESTIGATION REPORT

ROUTE: 07-LA-101-24.9/25.9

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: ORLANCE LEE - 07
Design Manager

Date: May 21, 2007

File: 07-LA-101-KP 24.6/25.9
07-199631
Soundwall 257.

Attention: BARNABAS VORREITER, P.E

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services - MS 5
Office of Geotechnical Design - South 2

Subject: Geotechnical Design Report For Soundwall No. 257.

Our Office completed a Geotechnical Design Report (GDR) for the proposed soundwall No. 257, located along the off-ramp Van Nuys Boulevard, on the southbound of US101 in the City of Sherman Oaks. The improvement includes removing and reconstructing a soundwall and a retaining wall, for widening the roadway to improve the traffic flow in the southbound off-ramp to the Van Nuys Boulevard.

The scope of this geotechnical report includes the following tasks:

- Literature search and review of available geologic and geotechnical reference materials.
- Site visits for geological reconnaissance and planning for any possible soil exploration.
- Performing all necessary calculations and slope stability analyses for the walls.
- Providing our design and construction recommendations and report writing.

The purpose of this report is to provide analyses of anticipated site conditions as they pertain to the project described herein, and to recommend design and construction criteria for the proposed soundwall and retaining wall of the project.

References

1) "Geotechnical Design Report for Soundwall No. 257," Office of Geotechnical Design, South=1, August 11, 2003.

2) "Foundation Report for Soundwall #250-Route 101 Between Hazeltine and Van Nuys Boulevard in Sherman Oaks," performed by URS Corporation, dated 4/2/2002.

3) "Soundwall Foundation Recommendations" Office of Geotechnical Design - South 1, December 30, 2001

4) "Log of Test Borings (LOTB) for Van Nuys Boulevard UC, BR 53-1376" California Division of Highways, Engineering Geology Branch, April 21, 1958.

Project Description

The US101 was first built in the 1950's, widened and improved recently, including earthquake retrofits. As part of a widening project, retaining wall No. 257 is proposed for construction and are summarized in the following table:

Wall Section	Begin Station	End Station	Max. Height	Est. Length	Notes
1	10+00	10+46	4.267 m	46.0 m	SW on Exist. Conc. Barrier &CIDH
2	10+46	10+70	4.267 m	24.0 m	SW on Barrier & CIDH Piles
3	10+70	12+00	4.267 m	130.0 m	SW on Retaining Wall
4	12+00	12+64	4.267 m	64.0 m	SW on Barrier & CIDH Piles

The proposed improvements in the southbound off-ramp include constructing a vertical extension of up to 1.829-m wall height on top of an existing, 46-m long, soundwall No. 431, a nearly 130m soundwall on top of a retaining wall, and the remaining 64m soundwall on the original ground with pile footing.

Existing Facilities

The existing soundwall No. 431 with CIDH pile was built in 1982, has been performing well since then. The subject area was initially constructed on a cut. A 1.2-m high, 60-m long retaining wall with CIDH pile foundation was also built in 1982 to support the embankment steep slope.

Drilling and Sampling

Since the available LOTB's provide enough information for soil investigation, no additional drilling and sampling was performed for this report. There were two LOTB taken within 250-m radius of the project site. Among them is a borehole that was conducted within 100 m from the project site by Geology Branch in 1957, and another hole across the freeway, performed by the

URS Consultant in 2002. Besides, a CPT was also taken at the east end of the newly proposed soundwall in 2003, near the Van Nuys Boulevard.

The summary of two previous LOTB's and CPT chart with local frictions, tip resistances and graphics chart will be prepared by our Drafting Unit and sent to your office when completed. .

Site Geology

The project location is at approximately 34° 09' 24.33" N and 118° 26' 58.46" W. Based on the Geologic Map of California, Division of Mines and Geology, State of California, 1977, the proposed site is located near the northerly end of the Monterey (or Modelo) Formation consisting mainly of soft diatomaceous siltstone, fragments of sandstone and laminated shale, which are weathering into silty clay and sandy clay or clayey sand. Based on our CPT results and Log of Test Borings, the top 5-m soil is generally comprised of stiff to very stiff, sandy clay and clayey silt. From 5-m to 10 -m depth is mostly soft to loose, silty clay to clayey sand. Below 10 –m depth is dense fine to coarse sand and gravelly silty sand as shown in our reference.

According to the previous LOTB performed in the 1957, ground water was recorded at around elevation 193.6 m. However, no ground water was observed above elevation 185.0 m in the 2001 soil exploration and in our recent subsurface explorations. Perched water from the surface water runoff may be expected during rain season.

Erosion is not a major concern at this site, provided that embankment slopes should be vegetated and well compacted.

Project Site Seismicity

According to the California Seismic hazard map 1996, the project site is located approximate 8 km south of the nearest North Hollywood fault that would produce a seismic event of a 6.0 magnitude. Maximum horizontal ground acceleration of up to 0.50g is estimated at this site. Liquefaction is not a potential problem since groundwater was not encountered in the top 10-m layer, and soils in this area are mostly cohesive, according to LOTB' s and CPT' s taken around and near the Van Nuys Boulevard.

Soil Strength Parameters

The top 5 m soil layer consists of stiff sandy clay to clayey sand. From 5 m to 10 m depth, soil comprises mainly of soft silty clay and sandy clay, with SPT for N values varies from 5 to 15. The design soil parameters are estimated in the following table:

Soil Type	Description	SPT N values	Unit Weight kN/m3	Friction Angle Degrees	Cohesion Intercept kPa	Bearing Capacity kPa (SF = 3)
I	Stiff, Clayey Sand	20-30	20	32	4.8	55+100B*
II	Soft to stiff, Silty Clay	5-15	18	26	9.6	70+35B*

* Notes: B=Foundation base width in meters. Allowable Bearing Capacity with a safety factor of 3.

Foundation Recommendations

Wall Section	Maximum Height	Estimated Length	Foundation Type	Design Information as shown on BSDS*	Notes
1	4.267 m	46.0 m	CIDH Pile	N/A	Existing CIDH
2	4.267 m	24.0 m	CIDH Pile	* File XS15-110	Wall on OG
3	4.267 m	130.0 m	RTW/Spread	* File XS14-110	Wall on RTW
4	4.267 m	64.0 m	CIDH Pile	* File XS15-110	Wall on OG

*BSDS = Bridge Standard Detail Sheets.

Drainage

Under-drains should be installed along the storm pipelines at the toe of the walls. Drainage from behind the walls may be connected to the under-drains, through weep holes in the area where surface drainage is not suitable.

Corrosion Potential

Soil samples were not taken for this report. However, corrosion tests performed on several samples taken near the intersection 405/101 in the recent GDR's show that soils in this area are low to moderately corrosive.

Material Sources

Due to the scope of this project, imported soil is not anticipated for this project. However, in case imported borrow is required, the resident Engineer should arrange for testing of the contractor's proposed borrow site, in conformance with Section 19-7.02 of the Standard Specifications. The

recommended tests include at least the following tests: Sieve Analysis (CTM 202), Plasticity Index (CTM 204), and Corrositivity (CTM 417, 422, and 643). Test results should be sent to our office for review, prior to construction of the walls.

Material Disposal

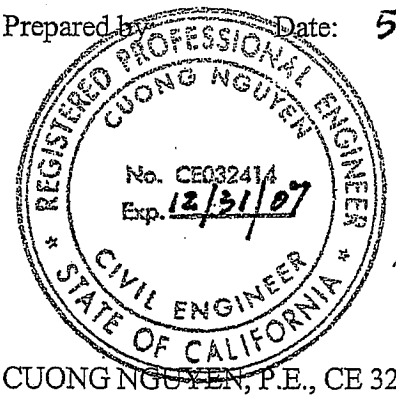
Suitable excavated materials shall be reused in wall construction. Surplus materials and (or) unsuitable materials should be disposed of, by the contractor as being outlined in Section 19-2.06 of the Standard Specifications.

Construction Considerations

- For wall construction, minimum offset from foundation to the hinge point should be provided as required by the Standard Plans.
- Excavating soil for wall foundation requires shoring when maximum vertical cut is over 1.52 m (5 feet) height. Otherwise, temporary cut slope should not steeper than 1:1 (V: H).
- Based on our current cross-section, excavation for foundation of the proposed new retaining wall may encounter difficulty without removal of the existing retaining wall.

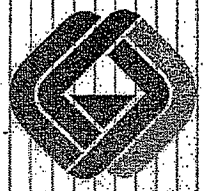
If you have any question, please call Cuong Nguyen at (916) 227-4513.

Prepared by: Date: 5/21/2007



CUONG NGUYEN, P.E., CE 32414
Associate Materials & Research Engineer
Branch C

cc: S. Wei,
GDS.2



GEOCON

CONSULTANTS, INC.

ENVIRONMENTAL
GEOTECHNICAL
MATERIALS

ADL INVESTIGATION REPORT

ROUTE 101 AT VAN NUYS BOULEVARD
LOS ANGELES, CALIFORNIA
CONTRACT NO. 43A0078
TASK ORDER NO. 07-199630-3N

PREPARED FOR

CALIFORNIA DEPARTMENT
OF TRANSPORTATION
DISTRICT 7
LOS ANGELES, CALIFORNIA

PREPARED BY

GEOCON CONSULTANTS, INC.
6970 FLANDERS DRIVE
SAN DIEGO, CALIFORNIA 92121
Tel. (858) 558-6100 Fax. (858) 558-8437
Email: environmental@geoconinc.com

GEOCON PROJECT NO. 09100-06-72

JUNE 30, 2003

GEOCON
CONSULTANTS, INC.
ENVIRONMENTAL ■ GEOTECHNICAL ■ MATERIALS

Project No. 09100-06-72
Task Order No. 07-199630-3N
June 30, 2003

OVERNIGHT DELIVERY

Ms. Upa Patel
California Department of Transportation, District 7
Office of Environmental Engineering and Feasibility Studies
801 South Grand Avenue, Suite 1600
Los Angeles, California 90017-4643

Subject: ADL INVESTIGATION REPORT
ROUTE 101 AT VAN NUYS BOULEVARD
LOS ANGELES, CALIFORNIA
CONTRACT NO. 43A0078
TASK ORDER NO. 07-199630-3N

Dear Ms. Patel:

In accordance with Caltrans Contract No. 43A0078 and Task Order No. 07-199630-3N dated March 11, 2003, Geocon Consultants, Inc. has performed an aerially deposited lead (ADL) investigation at the site consisting of the exposed soil up to 2.0 meters from the edge of the existing pavement along the northbound and southbound off-ramps of Route 101 at Van Nuys Boulevard in Los Angeles, California. The accompanying report summarizes the services performed, including the advancement of hand-auger borings, limited soil sampling, laboratory analyses, statistical analyses, and Geographical Information Systems (GIS) Surveying. Please call us if you have any questions.

Sincerely,

GEOCON CONSULTANTS, INC.

Mary J. Barnes
Staff Environmental Scientist

Ronald J. Kofron, CEG 1527
Manager, Environmental Services

REGISTERED GEOLOGIST
RONALD J KOFRON
#1527
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

MJB:RJK:sc

(5) Addressee

6970 Flanders Drive ■ San Diego, California 92121-2974 ■ Telephone (858) 558-6100 ■ Fax (858) 558-8437

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ADL INVESTIGATION REPORT

I. EXECUTIVE SUMMARY

Geocon Consultants, Inc. (Geocon) has performed an aerially deposited lead (ADL) investigation at the site consisting of the exposed soil up to 2.0 meters (m) from the edge of the existing pavement along the northbound and southbound off-ramps of Route 101 at Van Nuys Boulevard in Los Angeles, California. The California Department of Transportation (Caltrans) proposes to excavate soil at the site as part of a construction project to widen the existing lanes, add an auxiliary lane to the northbound off-ramp, remove and reconstruct existing retaining walls and soundwalls, and extend the reinforced concrete box culvert, drainage work, and electrical work.

The investigation was performed to evaluate the presence of lead resulting from the historical combustion of leaded fuels from freeway traffic. Data from the investigation was used to evaluate the potential reuse or disposal considerations for soil excavated at the site, and to inform Caltrans of potential health and safety issues concerning the presence of lead in soil for workers at the site during construction activities.

Soil samples collected from the site were subsequently analyzed for total lead, soluble lead using the Waste Extraction Test method using citric acid (WET-Citric) as the extractant, and soluble lead using a modified WET method using deionized water (WET-DI) as the extractant. In addition, selected soil samples were analyzed for soluble lead using the Toxicity Characteristic Leaching Procedure (TCLP) method and soil pH. The six samples containing the highest total lead concentrations from each group were also analyzed for the CCR Title 22 metals by EPA Methods 6010B and 7471A.

Laboratory analytical results and statistical analysis using one-sided 90% upper confidence limits (UCLs) were compared to the guidelines of the Department of Toxic Substances Control (DTSC) Lead Variance issued to Caltrans, Assembly Bill 414, and the DTSC variance modification letter dated December 12, 2002, which modifies the Variance, to develop recommendations for reuse of soil from the site. Offsite disposal conclusions were based upon comparison of the total lead 95% UCLs to the California Health and Safety Code (HSC) threshold of 350 milligrams per kilogram (mg/kg) and predicted WET-Citric results to the CCR Title 22 soluble lead threshold of 5 milligrams per liter (mg/l).

Group 1 (Northbound off-ramp) and Group 2 (Southbound off-ramp)

Based upon the 90% arcsine transformed UCLs and WET-DI results, all soils up to 1.5 m beneath the surface would likely be suitable for reuse according to the DTSC Variance. Based upon the 95% arcsine transformed UCLs and predicted WET-Citric results, if any portion of the upper 1.5 m of excavated soil is to be disposed, it would likely be classified as a hazardous material with respect to lead content.

If any portion of the upper 1.5 m of soil excavated is to be reused on-site, it should be covered with at least 0.3 meters of non-hazardous soil and placed at least 1.5 m above the maximum groundwater elevation in accordance with the DTSC Variance. If any portion of the upper 1.5 m is disposed, it should be treated as a hazardous material with respect to lead content.

Other CCR Title 22 metals do not appear to be a concern; however, additional sampling and statistical analyses would be necessary to fully characterize this soil beyond the scope of this ADL investigation. Caltrans should notify the contractors performing the construction activities that hazardous concentrations of lead may be present in onsite soil and that appropriate health and safety measures should be taken to minimize the exposure to lead.

ADL INVESTIGATION REPORT

1. INTRODUCTION

1.1 Project Description and Objectives

Geocon has performed an ADL investigation at the site consisting of the exposed soil up to 2.0 m from the edge of the existing pavement of the northbound and southbound off-ramps of Route 101 at Van Nuys Boulevard in Los Angeles, California (Figure 1). The objective of the ADL investigation was to evaluate soil at the site for the presence of lead resulting from the historical combustion of leaded fuels from freeway traffic. The information obtained from the limited soil sampling and laboratory testing was used to determine the method of reuse or disposal of soil excavated during the proposed construction activities at the site. The data was also used to inform Caltrans of potential health and safety issues for workers at the site during construction activities. For the purpose of this ADL investigation, certain locations were treated as separate areas of investigation.

1.2 Scope of Work

Geocon performed the following tasks:

1.2.1 Pre-field Activities

- Attended a Task Order meeting on April 3, 2003, to discuss issues such as field methods, boring locations, health and safety measures, and the completion schedule.
- Prepared a Health and Safety Plan (H&SP) dated April 21, 2003, for the proposed activities. The Health and Safety Plan included guidelines for the use of personal protective equipment for Geocon employees during the field activities. The H&SP specifies the safety procedures for work to be performed at the site, chemical hazard information, site safety officers, and medical emergency locations. The H&SP was prepared as required by Contract 43A0078 in general accordance with 29 CFR 1910.120 and CCR Title 8.
- Contacted Underground Service Alert (USA) to notify utility companies of the field activities. The USA ticket number is A6150159.

1.2.2 Limited Soil Sampling

A 7.62-centimeter-diameter hand auger was used to collect 111 soil samples from 24 boring locations from the site on April 29, 2003. Boring locations were provided by Caltrans as specified as Attachment E of TO No. 07-199630-3N, dated March 11, 2003, for the evaluation of the subsurface condition at the site. Whenever possible borings were advanced to a maximum depth of 1.5 m below the ground surface, and soil samples were collected at 0, 0.3, 0.6, 0.9, and 1.5 m. Due to cobbles inside boreholes

590-102, 590-104, 590-105, 590-106, 590-111, 590-119, 590-121, and 590-122, samples at a depth of 1.5 m were not collected. In addition, one sample at a depth of 0.9 m from borehole 590-105 was not collected. The approximate boring locations are shown on the Boring Location Map, Figure 2. The borings were subsequently backfilled with the soil cuttings generated.

1.2.3 Laboratory Analyses

Geocon submitted the soil and water samples under chain of custody procedures to Advanced Technology Laboratories (ATL), a California Department of Health Services (CDOHS)-certified analytical laboratory. All soil samples were analyzed for total lead following United States Environmental Protection Agency (EPA) Test Method 6010B. Soil samples exhibiting total lead concentrations greater than or equal to 50 milligrams per kilograms (mg/kg) and less than 1,000 mg/kg were analyzed for soluble lead following EPA Test Method 7420 using the WET-Citric method. Samples exhibiting WET-Citric concentrations greater than or equal to 5 milligrams per liter (mg/l) were analyzed for soluble lead following EPA Test Method 7420 using the WET-DI method. Twenty-five percent of the samples collected from each group were analyzed using the TCLP method. The six samples containing the highest total lead concentrations from each group were also analyzed for the CCR Title 22 metals by EPA Methods 6010B and 7471A. In addition, 10% of the soil samples from each group were analyzed for pH following EPA Test Method 9045.

Samples of the decontamination water samples were analyzed for total lead using EPA Test Method 6010B.

1.2.4 GIS Surveying

Each boring location was recorded using a Global Positioning System (GPS) receiver. Data were recorded using the Axis III™ receiver system, using State Plane 83 coordinates, with the IMAP™ software package. Boring location coordinates, in latitude and longitude, are provided in Table I.

1.2.5 Report Preparation

This report was prepared as outlined in Contract No. 43A0078 and Task Order No. 07-199630-3N, summarizing the results of the aerially deposited lead investigation activities requested by Caltrans.

1.3 Previous Site Investigations

Geocon has not performed a previous investigation at the site. In addition, Caltrans has not notified Geocon of previous investigations performed at the site.

2. BACKGROUND

2.1 Aerially Deposited Lead in Soil

Testing by Caltrans throughout the State has shown that aerially deposited lead exists in soil along major freeway routes resulting from automobile exhaust containing lead from the combustion of leaded gasoline. Elevated lead concentrations are generally found within 9.1 m of the edge of pavement and within the top 0.15 m of soil. Elevated lead concentrations can also be present as deep as 0.60 to 0.90 m below the surface. The concentration and distribution of aerially deposited lead in soil is dependent on many variables, but in general, traffic volume and age of a highway are the primary factors.

2.2 Hazardous Waste Classification Criteria

Regulatory criteria to classify a waste as "California hazardous" for handling and disposal purposes are contained in the CCR, Title 22, Division 4.5, Chapter 11, Article 3, §66261.24. Criteria to classify a waste as "Resource, Conservation and Recovery Act (RCRA) hazardous" are contained in Chapter 40 of the Code of Federal Regulations (40 CFR), §261.

For a waste containing metals, the waste is classified as "California hazardous" when: (1) the total metal content exceeds the Total Threshold Limit Concentration (TTLC); or (2) the soluble metal content exceeds the Soluble Threshold Limit Concentration (STLC) based on a Waste Extraction Test (WET) analysis. A material is classified as "RCRA hazardous" when the soluble metal content exceeds the Federal Regulatory Level based on Toxicity Characteristic Leaching Procedure (TCLP) testing.

The above regulatory criteria are based on toxicity. Wastes may also be classified as hazardous based on other criteria including ignitability, toxicity, corrosivity, and reactivity. However, for the purposes of ADL investigations, toxicity and corrosivity (e.g., chemical concentrations and soil pH values, respectively) are the primary factors considered for waste classification. Waste that is classified as either "California hazardous" or "RCRA hazardous" requires management as a hazardous waste and disposal at an approved disposal facility.

According to §25157.8 of the HSC, after January 1, 1999, no person shall dispose of waste that contains total lead in excess of 350 mg/kg to land other than a Class I hazardous waste disposal facility.

2.3 DTSC Variance

The DTSC issued a variance to selected Caltrans Districts on September 22, 2000, to provide guidance for the disposition of soil containing ADL within Caltrans projects. The California State Assembly passed Assembly Bill (AB) 414, dated October 14, 2001, which allows Caltrans to reuse lead-impacted

soil within their right-of-way provided that total lead concentrations do not exceed 1,496 mg/kg. The DTSC further modified the variance in a letter dated December 13, 2002, allowing lead-impacted soil to be reused on-site provided that total lead concentrations do not exceed 3,397 mg/kg. Review of the original and revised variance and AB 414 indicates the following conditions regarding Caltrans' reuse and management of ADL-impacted soil as fill material for construction and maintenance operations.

2.3.1 Condition 1

Soil exhibiting soluble lead concentrations less than or equal to 0.5 mg/l (WET-DI) and total lead concentrations of 1,411 mg/kg or less may be used as fill provided that the soil containing ADL is placed a minimum of 1.5 meters above the maximum water table elevation and covered with at least 0.3 meters of non-hazardous soil. However, ADL-impacted soil with pH less than 5.0 shall only be used as fill material under the paved portion of the freeway, as specified in Condition 3 below.

2.3.2 Condition 2

Soil exhibiting soluble lead concentrations greater than 0.5 mg/l and less than 50 mg/l (WET-DI) and/or total lead concentrations more than 1,411 mg/kg but less than 3,397 mg/kg may be used as fill provided that the soil containing ADL is placed a minimum of 1.5 meters above the maximum water table elevation and protected from infiltration by a pavement structure maintained by Caltrans.

ADL-impacted soil with a pH less than 5.0 shall only be used as fill material under the paved portion of the freeway.

2.3.3 Condition 3

Contaminated soil with a pH less than 5.0 may be used as fill material only under the paved portion of the roadway. Condition 3 prevails under either Condition 1 or 2.

2.4 Criteria for Disposal of Soil Not Intended for Reuse On-site

If the excavated soil is not intended to be reused within the Caltrans right-of-way, then hazardous waste determination of the soil is based on total and soluble lead concentrations using the lead TTLC and STLC contained in Title 22 of the *CCR* Article 3, §66261.24. When the total lead concentration is greater than ten times the lead STLC, regulatory agencies typically initiate the requirement for WET using citric acid. It is the result from the WET that is compared to the STLC value. The TTLC value for lead is 1,000 mg/kg and the STLC for lead using acid extract is 5.0 mg/l. However, as previously indicated, disposal of waste that contains total lead in excess of 350 mg/kg to land other than a Class I

hazardous waste disposal facility (or other designated facility meeting all the criteria in HSC 25157.8(3)(b)) is prohibited.

3. INVESTIGATIVE METHODS

3.1 Field Methods

3.1.1 Soil Sampling

Soil sampling and handling methods used by Geocon to complete this Task Order are outlined in the following modified Geocon Standard Operating Procedures (SOPs) presented as Appendix A:

- Modified SOP No. 11 - Hand-Augering and Soil Sample Collection/Handling Procedures

3.2 Deviations from Work Plan

There were no deviations from the work plan for this TO; Geocon performed the scope of work as described in the TO.

4. INVESTIGATIVE RESULTS AND FIELD OBSERVATIONS

4.1 Site Geology and Hydrology

The soil conditions encountered consisted generally of loose to moderately dense, dry, brown to dark-brown, clayey sand, and coarse gravel to cobbles. Groundwater was not encountered in the hand-auger borings.

4.2 Analytical Laboratory Results

A summary of the results of the laboratory analyses for total lead, WET-Citric, WET-DI, TCLP, and pH is presented in Table I. Reproductions of the laboratory reports and chain-of-custody documentation are presented as Appendix C. All analyses were processed using laboratory five-business-day turn-around times. Soil sample analytical results for the groups are summarized as follows (see Section 1.2.3 for analytical methods used).

- **Total Lead** – Seventy-four soil samples were analyzed for total lead in Group 1 and thirty-seven soil samples were analyzed for total lead in Group 2. Concentrations ranged from below the detection limit of 0.005 mg/kg to 1,600 mg/kg for Group 1 and below the detection limit of 0.005 mg/kg to 1,700 mg/kg for Group 2. The maximum total lead concentration for these data sets exceeds the 350 mg/kg threshold value specified in HSC but does not exceed the 3,397

mg/kg, the threshold value specified in the DTSC variance modification letter for total lead. The average of the total data sets is 320 mg/kg and 239 mg/kg for Groups 1 and 2, respectively.

- **WET-Citric** – Forty-two soil samples in Group 1 and nineteen soil samples in Group 2 exhibited total lead concentrations greater than 50 mg/kg and less than 1,000 mg/kg, and were analyzed using the WET-Citric method. WET-Citric concentrations ranged from 3.8 mg/l to 140 mg/l and 2.6 mg/l to 360 mg/l for Group 1 and 2, respectively. CCR Title 22 specifies 5.0 mg/l as the STLC for lead.

- **WET-DI** – Thirty-eight soil samples in Group 1 and eighteen soil samples in Group 2 exhibited WET-Citric concentrations greater than the STLC of 5.0 mg/l, and were analyzed using the WET-DI method. The WET-DI concentrations ranged from 0.2 mg/l to 3.9 mg/l and 0.23 mg/l to 2.0 mg/l for Groups 1 and 2, respectively. The DTSC variance specifies conditions for re-use of soil based on a threshold of 0.5 mg/l as described in Section 2.3.

- **pH** - Eight soil samples in Group 1 and four samples in Group 2 were tested for pH. Values ranged from 6.96 to 8.58 and from 7.75 to 8.57 for Groups 1 and 2, respectively, which are above the minimum of 5.0 described in the DTSC variance.

- **TCLP** – Nineteen soil samples in Group 1 were analyzed by the TCLP method. The concentrations ranged from 0.56 mg/l to 10 mg/l. The TCLP for RCRA waste for lead is 5.0 mg/l. Nine soil samples in Group 2 were analyzed by the TCLP method. The concentrations ranged from 0.53 mg/l to 5.0 mg/l. None of the results were above 5.0 mg/l.

- **CCR Title 22 Metals** - Six soil samples from each group were analyzed for CCR Title 22 metals. Metals included in this analysis are antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc. None of the metals concentrations were detected at or above the respective TTLC. Lead was the only analyte detected above ten times the respective STLCs. See Table II for analytical results.

- **Equipment Blanks** – Twelve equipment blank water samples were analyzed for total lead in water. Ten samples were detected below the detection limit of 0.005 mg/l. One of the samples was reported equivalent to the laboratory detection limit of 0.005 mg/l, and one sample was reported at 0.0058 mg/l.

4.3 Data Validation

Geocon and ATL use QA/QC measures to minimize and control errors associated with field and laboratory methods. Field QA/QC measures consist of cleaning sampling equipment between each use with a detergent solution followed by successive rinses in tap and deionized water. Geocon considers the field investigation free from potential cross-contamination resulting from inadequate equipment decontamination.

Laboratory QA/QC measures include the use of matrix spikes, duplicates and method blanks, in addition to calculation of percent recovery and relative percentage difference (RPD). A review of the laboratory QA/QC results indicates satisfactory data reporting.

5. DATA EVALUATION

5.1 Lead Distribution Analysis

The results of the analytical testing indicates that twenty soil samples collected from Group 1 and seven soil samples collected from Group 2 are above the California disposal threshold of 350 mg/kg for total lead content, and thirty-eight samples from Group 1 and eighteen samples from Group 2 were above the STLC maximum concentration of 5 mg/l. There were nineteen samples from Group 1 and nine samples from Group 2 that exhibited total lead concentrations above the TTLC maximum threshold of 1,000 mg/kg.

5.2 Statistical Evaluation Methods

The analytical laboratory results were evaluated statistically to examine the appropriate method of reuse or off-site disposal of the soils. Prior to performing the following calculations, analytical results reported as below the detection limit were assigned a value of one-half the detection limit. Statistical methods were applied to the lead data set collected adjacent to the site to evaluate: 1) if an acceptable correlation between total and soluble lead concentrations exists that would allow the prediction of soluble lead concentrations based on calculated UCLs; 2) the total lead data population distribution; and 3) the one-sided upper-confidence limits (UCLs) on the true means of the total lead concentrations for different soil mixing scenarios.

5.3 Data Correlation

A test for data correlation is used to verify the quality of the equation used to predict soluble lead concentrations. There should be a correlation coefficient ("r") of 0.8 or greater between total and soluble lead (WET-citric) analytical results. The correlation coefficients for Group 1 and Group 2 are 0.88 and 0.94, respectively.

5.4 Regression Analysis

A linear regression analysis is necessary to create a soluble lead prediction model for use with the 90% and 95% UCLs. The model is created by plotting the total lead and soluble lead (WET-Citric) paired data points on a scatter plot chart. A linear regression line is then added to the chart using the equation:

$$y = mx + b$$

where:

y = *WET Citric result, mg/l*
x = *total lead result, mg/kg*
b = *the y-intercept*

$$m = Slope = \frac{r \times s_t}{s_s}$$

where:

r = *correlation coefficient*
s_t = *standard deviation of the total lead results*
s_s = *standard deviation of the soluble lead results*

The linear equation corresponding to the regression line is then used to predict a soluble lead concentration for the statistical total lead UCLs. The integrity of the equation is directly related to the correlation coefficient described in Section 5.3.

5.5 Population Distribution

A test for population distribution is necessary to apply the appropriate methods when examining the UCLs on the true total lead means. When evaluating the distribution of total lead concentrations, all total lead data from each area were treated as one data set. In accordance with *Chapter Nine, SW-846, 3rd Edition, U.S. Environmental Protection Agency, 1986, (Chapter Nine, SW-846),* distribution was evaluated by comparing the mean versus the variance of the total lead data sets. If the mean was greater than the variance, the data set was assumed to be normally distributed and transformation was not performed. If the mean was less than the variance, the data set was transformed using an arcsine conversion. If the mean was approximately equal to the variance, the data set was transformed using a square-root conversion.

5.6 Calculating the Upper Confidence Limits for the True Mean

Statistical confidence limits are the classical tool for addressing uncertainties of a distribution mean. The UCLs of the true mean concentration are used as the mean concentrations because it is not possible to know the true mean. The UCLs therefore account for uncertainties due to limited sampling data. As more data are available for a given site, uncertainty decreases and the UCLs move closer to the true mean.

A 90% UCL is desired if the soil is to be reused on-site and a 95% UCL is desired if the soil is to be disposed of offsite or relinquished to a contractor as described in Task Order No. 07-199630-3N. The maximum 90% UCL allowed for reuse of on-site soil is 3,397 mg/kg and the maximum 95% UCL

allowed for disposal is 350 mg/kg. The one-sided 90- and 95% UCLs of the true mean are defined as the values that, when calculated repeatedly for randomly drawn subsets of site data, equal or exceed the true mean 90 and 95% of the time, respectively. The following statistical equation (from *Chapter Nine, SW-846)* was used to calculate the UCLs:

$$UCL = \bar{x} + t_p \frac{S}{\sqrt{n}}$$

Where:

$\bar{x}$	=	sample mean
t_p	=	student's t for a one-tailed confidence interval and a probability of p
S	=	standard deviation
n	=	number of samples

For the purpose of this investigation, the samples were assumed to be collected using systematic random sampling. *Chapter Nine of SW-846* indicates that a statistical transformation should be used if the data set is not normally distributed, and statistical evaluations should be performed on the transformed scale. Based on calculation of the mean and variance of the data sets and visual interpretation of the data, the data sets should be transformed.

The mean was less than the variance for the non-transformed data indicating that the data set was not normally distributed and transformation was necessary. The raw data were transformed using the arcsine transformation. The arcsine transformation was accomplished by dividing each total lead result by the maximum concentration (this results in a data set of all numbers falling between 0 and 1), calculating the arcsine of the quotient (yi = arcsine(xi/xmax)), performing the statistical calculations on the transformed data, and finally re-converting the result to real numbers (zi = xmaxsin yi).

In order to evaluate different soil excavation scenarios, different UCLs were calculated. Data from Groups 1 and 2 were each divided into the following two data sets:

6. CONCLUSIONS

As with the laboratory analytical results, the data was categorized and evaluated based upon two unique investigation areas. Regression analysis charts of total lead vs. soluble lead and UCLs with corresponding soil excavation scenarios shown in block diagrams are presented as a portion of Appendix C. The correlation factor "r" was calculated to be above the minimum requirement of 0.8 for each of the groups. For reference, the regression analysis chart (see Appendix C) for each segment contains the equation for the regression line and the "r" value. Separate conclusions regarding Caltrans right-of-way reuse and off-site disposal were then developed for each group. Reuse conclusions were based upon comparison of the referenced 90% transformed UCLs and average WET-DI analytical results for each group to the DTSC Variance and AB 414. Conclusions for surplus material and material relinquished to the contractor was based upon comparison of the total lead 95% transformed UCLs to the HSC disposal limit of 350 mg/kg and predicted WET-Citric results to the CCR Title 22 soluble lead threshold of 5 mg/l. Although 3 out of 74 samples from Group 1 exhibited TCLP results above 5 mg/l, it is unlikely that the soils at each of the segments would be classified as a RCRA waste; however, additional testing would be required to fully characterize the soil. A summary of the statistical evaluation results and conclusions for each of the fourteen areas is provided in the following sections.

6.1 Group 1 and Group 2

Based upon the 90% arcsine transformed UCLs and WET-DI results, all soils up to 1.5 m beneath the surface would likely be suitable for reuse according to the DTSC Variance. Based upon the 95% arcsine-transformed UCLs and predicted WET-Citric results, if any portion of the upper 1.5 m of excavated soil is to be disposed, it would likely be classified as a hazardous material with respect to lead content.

7. RECOMMENDATIONS

7.1 Group 1 and Group 2

If any portion of the upper 1.5 m of soil excavated is to be reused on-site, it should be covered with at least 0.3 meters of non-hazardous soil and placed at least 1.5 m above the maximum groundwater elevation in accordance with the DTSC Variance. If any portion of the upper 1.5 m is disposed, it should be treated as a hazardous material with respect to lead content.

Other CCR Title 22 metals do not appear to be a concern; however, additional sampling and statistical analyses would be necessary to fully characterize this soil. Caltrans should notify the contractors performing the construction activities that hazardous concentrations of lead may be present in onsite soil and that appropriate health and safety measures should be taken to minimize the exposure to lead.

- Total lead concentrations for soil samples collected from 0 to 0.15 m (Data Set A);
- Total lead concentrations for soil samples collected from 0.15 to 0.30 m (Data Set B);
- Total lead concentrations for soil samples collected from 0.45 to 0.60 m (Data Set C);
- Total lead concentrations for soil samples collected from 0.75 to 0.90 m (Data Set D); and
- Total lead concentrations for soil samples collected from 1.35 to 1.5 m (Data Set E).

Using the data sets above, the following UCLs for the true means were calculated:

- UCL for the top 0.15 m of soil (Data Set A) and the UCL for the underlying soil (Data Sets B, C, D, and E);
- UCL for the top 0.3 m of soil (Data Sets A and B) and the UCL for the underlying soil (Data Sets C, D, and E);
- UCL for the top 0.6 m of soil (Data Sets A, B, and C) and the UCL for the underlying soil (Data Sets D and E);
- UCL for the top 0.9 m of soil (Data Sets A, B, C, and D) and the UCL for the underlying soil (Data Set E); and
- UCL for the entire 1.5 m soil column (Data Sets A, B, C, D, and E).

For reference, tables summarizing the results of the 90% and 95% UCLs and predicted soluble lead concentrations are presented below along with reuse and disposal conditions. Predicted soluble lead concentrations are calculated by using the statistical average of the WET-DI concentrations for each group. Additional soil excavation and mixing scenarios can be found on the Block Diagram in Appendix C.

90% UCL Lead Analysis and Soil Management Summary

Location	Soil Interval (m)	Total Lead 90% UCL (mg/kg)	Within Variance?	*Average Soluble Lead WET-DI (mg/l)	DTSC Variance Condition
Group 1-NB Off-ramp	0 – 1.5	405.62	Yes	0.40	Condition 1
Group 2-SB Off-ramp	0 – 1.5	378.34	Yes	0.38	Condition 1

* Soluble lead values presented are the average value of all soluble lead (WET-DI) results for each group.

95% UCL Lead Analysis and Soil Management Summary

Location	Soil Interval (m)	Total Lead 95% UCL (mg/kg)	Predicted Soluble Lead-95% UCL (mg/l)	Relinquish	Disposal
Group 1-NB Off-ramp	0 – 1.5	426.51	43.21	No	Class I
Group 2-SB Off-ramp	0 – 1.5	409.42	42.22	No	Class I

8. REPORT LIMITATIONS

This report has been prepared exclusively for Caltrans. The information obtained is only relevant as of the date of the latest site visit. The information contained herein is only valid as of the date of the report and will require an update to reflect additional information obtained.

The conclusions and recommendations presented herein are based on a limited number of samples collected from in-place soil and from widely spaced locations according to Caltrans-prescribed protocol. The purpose of these sampling and characterization activities was to reasonably predict the character of soil to be disturbed for planned construction activities within the described limits of the Caltrans right-of-way. The disposition and handling of the soil are governed by the California regulations cited above. Characterization of the soil in the study areas for Federal waste criteria was beyond the scope of work in this task order.

Only a limited number of samples were analyzed using the TCLP method used to classify Federal waste. It is possible that soil disturbed, excavated and stockpiled could exceed Federal standards for hazardous waste and may require handling as a RCRA waste.

The Client should recognize that this report is not a comprehensive site characterization and should not be construed as such. The appropriate regulatory agency may require additional investigations. The findings and conclusions as presented in this report are predicated on the results of the limited soil sampling and laboratory analyses performed. In addition, the information obtained is not intended to address potential impacts related to sources other than those specified herein.

Therefore, the report should only be deemed conclusive with respect to the information obtained. No guarantee or warranty of the results of the report is implied within the intent of this report or any subsequent reports, correspondence, or consultation, either express or implied. Geocon strived to perform the services summarized herein in accordance with the local standard of care in the geographic region at the time the services were rendered.