SOIL REMEDIAL ACTION REPORT

Rainbow Disposal Company, Inc.
17121 Nichols Street
Huntington Beach, California 92647

prepared for

Rainbow Disposal Company, Inc.

August 27, 2007

Project No. 281-E

prepared by

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Soil Remedial Action Report
Rainbow Disposal Company, Inc.
17121 Nichols Street
Huntington Beach, CA 92647

EXECUTIVE SUMMARY

This report documents the results of Phase II Investigations, a health risk characterization (HRC), and soil remedial actions performed at Rainbow Disposal Company, Inc. (Rainbow) under the direction of the Huntington Beach Fire Department (HBFD).

Rainbow currently operates as a permitted municipal solid waste transfer and material recycling facility. Three areas of the site designated as Component 1A, 1B, and 1C are being remodeled (Figure 2). The remodeling requires the removal of the asphalt and concrete pads followed by excavation and recompaction of the underlying soils before new pads for a CNG Fuel Station (1C), a bin welding shop (1B), and a vehicle maintenance shop (1A) can be poured. Rainbow obtained conditional approval of a *Proposed Remedial Action Plan (RAP) for Soil* dated June 13, 2007 after submitting a *Response to Fire Department Conditional Approval of the Site Assessment Report and Soil Remediation Action Plan* dated June 28, 2007 (Appendix D). Rainbow then was able to obtain grading permits from the City of Huntington Beach and prepare for grading and excavation. The soil sampling and remediation described in this report was performed in accordance with the RAP and verbal and written communications from the HBFD. This Soil Remedial Action Report (SRAR) describes and provides the results of the soil sampling, remedial activities, and confirmation sampling conducted for the grading of Components 1A, 1B, and 1C.

Rainbow retained Environ Strategy Consultants, Inc. (Environ Strategy) to perform a Phase II environmental soil investigation in February and March 2007. Following the subsurface investigations it was determined that arsenic was a chemical of potential concern (COPC) for Rainbow. Environ Strategy retained a toxicologist to prepare a *Health Risk Characterization Future Excavation/Construction Scenario Exposure to Arsenic in Soil* dated April 30, 2007 (Appendix A). The HRC determined that the incremental lifetime cancer risk (ILCR) for downwind residents and on-site construction/excavation workers for the short-term excavation was considered *de minimis* (of no concern). The hazard index (HI) for the short-term construction/excavation receptor was also less than the United States Environmental Protection Agency's acceptable HI, thus there is no potential for noncancer health effects (Appendix A). The HBFD responded with comments on the HRC in a letter dated May 10, 2007. A response to the comments was prepared by the toxicologist and submitted to HBFD in a letter dated May 17, 2007 (Appendix B).

Based on verbal negations between HBFD and Rainbow, it was suggested that Rainbow follow the format of a previously approved plan by Blasland, Bouck & Lee, Inc. (BBL) titled *"Proposed Arsenic Remedial Action Plan for Residential Development Properties in Huntington Beach, California"* dated July 11, 1996 (Appendix C). The subject report determined, after performing a profile of naturally occurring arsenic concentrations found in residential development properties in Huntington Beach, that a proposed cleanup level of 10 parts per million (ppm) was adequate to protect human health. The standard of 10 ppm for arsenic was used by the HBFD to approve the remediation and allow site development to proceed.

In accordance with a conditionally approved RAP dated June 13, 2007, seven (7) additional shallow soil samples (FDSS-1 to FDSS-7) were collected in Components 1A and 1B as illustrated on Figures 3 and 4. A hand auger was used to pothole the sampling locations and facilitate sample collection performed on June 27, 2007. Discrete soil samples were then submitted to a State-certified environmental laboratory for arsenic analysis by Environmental Protection Agency (EPA) Method 6010B (Appendix E).

Two soil samples at depths of 9 feet or shallower had arsenic concentrations in excess of the established remedial threshold value of 10 ppm: FDSS-1 collected at a depth of 1 foot below ground surface (bgs) from Component 1A; and FDB-4-5 collected at a depth of five feet bgs in Component 1B (Table 2). These locations were remediated by excavating and mixing the soil via discing within Grids 1 and 3 illustrated on Figures 3 and 4. Remediated soil was then replaced and recompacted.

Following the remediation, three confirmation samples (FDCS-1 to FDCS-3) were collected from a depth of approximately 6 to 12 inches in each remediated grid. The confirmation soil samples were analyzed by a State-certified environmental laboratory for arsenic by EPA Method 6010B (Appendix F). The arsenic results of the initial and confirmation soil samples are summarized in Table 2. None of the confirmation samples were found to have arsenic results that exceeded the established remedial threshold value of 10 ppm. No additional remediation activities were required or performed.

Rainbow hopes this report will satisfy the City of Huntington Beach requirements for assessment and remediation of soil beneath the new buildings and allow them to move forward with the construction and occupancy of the CNG Fuel Station and shop buildings. In addition Rainbow would like to use this soil arsenic sampling and remediation protocol for all future development plans at the site.

1.0 INTRODUCTION

Environ Strategy Consultants, Inc. (Environ Strategy) is pleased to present this *Soil Remedial Action Report (SRAR)* for soils in proposed development areas at the Rainbow Disposal Company, Inc. (Rainbow). This SRAR is for three areas of the site designated as Component 1A, 1B, and 1C that are being remodeled (Figure 2). The remodeling requires the removal of the asphalt and concrete pads followed by excavation and recompaction of the underlying soils before new pads for a CNG Fuel Station (1C), a bin welding shop (1B), and a vehicle maintenance shop (1A) can be poured.

A remedial action plan (RAP) was developed in response to verbal and written communications from the Huntington Beach Fire Department (HBFD) regarding subsurface soil investigations performed in February and March 2007 and a Health Risk Characterization (HRC) dated April 30, 2007. Following the subsurface investigations it was determined that arsenic was a chemical of potential concern (COPC) at the Rainbow site. HBFD suggested that Rainbow follow the format of a previously approved plan by Blasland, Bouck & Lee, Inc. (BBL) entitled "*Proposed Arsenic Remedial Action Plan for Residential Development Properties in Huntington Beach, California*" and dated July 11, 1996 (Appendix C).

Rainbow obtained conditional approval of a *Proposed Remedial Action Plan (RAP) for Soil* dated June 13, 2007 after submitting a *Response to Fire Department Conditional Approval of the Site Assessment Report and Soil Remediation Action Plan* dated June 28, 2007. Rainbow then took out grading permits from the City of Huntington Beach and notified the HBFD before grading was commenced. This SRAR describes and provides the results of the soil sampling, remedial activities, and confirmation sampling. Rainbow hopes this report will satisfy the HBFD regarding the soil beneath the new buildings and allow them to move forward with the construction and occupation of the CNG Fuel Station, maintenance building, and bin repair shop. In addition, Rainbow would like the HBFD to approve this protocol for all future development at the Rainbow site.

2.0 SITE BACKGROUND

Rainbow currently occupies 17.59 acres of land located at 17121 Nichols Street within the City of Huntington Beach in Orange County, California (Figure 1). The site property is located 500 feet south of Warner Avenue near the intersection of Nichols Street and Belsito Drive. The site is bounded by Nichols Street on the east, the Southern Pacific Railroad on the west, and commercial and industrial facilities on the north and south.

Rainbow currently operates as an active permitted municipal solid waste transfer and material recycling facility with a household hazardous materials collection center at the site. Current Site structures include an administration building, a vehicle repair shop, a welding shop, a material recycling facility (MRF), a transfer building, several trailers, and ancillary sheds and canopies.

The site has had a long history of a variety of commercial and industrial uses. The property was originally used as farm land. Around 1938 a two-story building in the southwest corner of the site operated as a meat packing facility, followed by later use as a lumberyard and a used oil filter processing facility. This building and a maintenance storage building located on the south end of the site were removed in 2006. Commercial and industrial use in the northern portion of the site, started in the 1950s with the Orange County Ice facility. Other offices and maintenance buildings operated on the site through the late 1970s when Rainbow acquired a portion of the property. The current administration building, vehicle repair shop, and transfer building were built around 1983 and the MRF was added in 1994 (Figure 2).

3.0 PREVIOUS ENVIRONMENTAL STUDIES

A Phase I Environmental Site Assessment (ESA) was prepared in June 2004 for Rainbow. The Phase I ESA revealed that a release of diesel fuel occurred in 1984 from a diesel fuel pipeline near the transfer building (Figure 2). After remediation and extensive soil and groundwater monitoring investigations, it was determined in 1996 that contamination levels had reached acceptable levels. As a result, the UST case (No. 083000371) for the subject site was closed based on a closure letter dated October 15, 1996 by the California Regional Water Quality Control Board, Santa Ana Region.

Given the history of industrial activities at the site and the proximity of potential pollutants from facilities located upgradient, a Phase II site investigation was conducted at the site in 2004. Environ Strategy performed 30 soil borings and 3 hydropunches, collecting a total of three (3) ground water samples and ninety (90) soil samples ranging from depths of 5 feet to 15 feet below ground surface (bgs) in areas of concern around the site (Figure 2). The samples were analyzed for the full list of volatile organic compounds (VOCs) by EPA Method 8260B, and for total petroleum hydrocarbons as gasoline and diesel (TPHg and TPHd) by Modified EPA Method 8015. The results are summarized in the *Phase II Environmental Site Assessment* dated June 24, 2004.

Additional soil investigations were conducted in 2007 in three proposed construction areas of the site identified as Component 1A, 1B, and 1C (Figure 2). These soil investigations were performed to comply with the HBFD City Specification No. 431-92 and in response to meetings and correspondence with the HBFD. These soil results are documented in the three *Phase II Environmental Site Assessment* reports: Component 1A dated April 3, 2007, Component 1B dated April 5, 2007, and Component 1C dated April 9, 2007. The data from these reports is summarized in the next section.

4.0 SOIL SAMPLING CONDUCTED IN 2007

4.1 Field Activities and Sample Collection

Field activities in the Component 1A, 1B, and 1C areas (Figure 2) were conducted on February 22 and March 26, 2007 (Environ Strategy, 2007). Borings FDB-1, FDB-2, FDB-4, and FDB-5 were drilled to depths of 20-feet below ground surface (bgs) on February 22, 2007 using a direct push 6600 GeoProbe rig equipped with a hydraulic hammer. Soil samples were collected at five-foot intervals in 1.125-inch diameter by 2-foot long acetate liners using a solid-barrel sampler. All the soil samples were analyzed for pH by EPA Method 9045C, total CAM Metals by EPA Method 6010B and 7471A, semi-volatile organic compounds (SVOCs) by EPA Method 8270C, and polychlorinated biphenyls (PCBs) by EPA Method 8082. Soil samples collected from FDB-1 and FDB-2 were also analyzed for VOCs by EPA Method 8260B, total recoverable petroleum hydrocarbons (TRPH) by EPA Method 418.1, and TPHg and TPHd by Modified EPA Method 8015.

Borings FDB-6 to FDB-13 were drilled on March 26, 2007 using a CME 75 hollow stem auger rig. All the samples were collected in 6-inch long brass rings enclosed in a 3-inch outer diameter, 2.44-inch inner diameter split barrel that was driven a total of 12-inches into the materials at the bottom of the drill hole. All the soil samples collected were analyzed for pH by EPA Method 9045C, total CAM

Metals by EPA Method 6010B and 7471A, TPHg and TPHd by Modified EPA Method 8015, and TRPH by EPA Method 418.1. The soil samples collected from borings FDB-7 and FDB-10 were also analyzed for PCBs by EPA Method 8082. The soil sample FDB-6-3 collected at a depth of 3 feet bgs was also analyzed for chlorinated pesticides and herbicides by EPA Methods 8081A and 8151A, respectively. Soil samples FDB-12-8 and FDB-12-13 were also analyzed for SVOCs by EPA Method 8270C (Environ Strategy, 2007).

4.2 Soil Sample Analytical Results

TPHd was detected in seven soil samples at concentrations ranging from 5.9 milligrams per kilogram (mg/kg) to 120 mg/kg. TRPH was detected in 21 out of the 28 soil samples collected at concentrations ranging from 11 mg/kg to 77 mg/kg. Toluene was the only VOC detected in two soil samples, FDB-1-10 and FDB-1-15, at concentrations of 5.4 micro grams per kilogram (ug/kg) and 2.0 ug/kg, respectively. Bis(2-Ethylhexyl) phthalate was the only SVOC detected in two soil samples FDB-2-5 and FDB-5-5 at concentrations of 3.5 ug/kg and 2.4 ug/kg, respectively. The chlorinated pesticides 4,4'-DDE and 4,4'-DDD were detected in sample FDB-6-3 at concentrations of 12 ug/kg and 33 ug/kg, respectively. The remaining VOCs, SVOCs, and pesticides were not detected in any of the samples and neither were TPHg, PCBs, and chlorinated herbicides (Environ Strategy, 2007).

The total metals antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, thallium, vanadium, and zinc were detected in some or all of the soil samples collected (Table 1). Selenium and silver were not detected in any of the soil samples and mercury was detected in one sample FDB-4-10, at a concentration of 5.42 mg/kg. All the detected metals concentrations, with the exception of arsenic, were well below the preliminary remediation goals (PRGs) for industrial and residential land use promulgated by EPA Region 9 (USEPA, 2004).

4.3 Soil Sample Arsenic Results

Arsenic concentrations in all the soil samples collected from Components 1A, 1B, and 1C ranged from 1.1 mg/kg to 15.9 mg/kg (Table 1). The sample locations with the arsenic and TRPH results for Components 1A, 1B, and 1C, are illustrated on Figures 3, 4, and 5, respectively. These arsenic concentrations are above the preliminary remediation goals (PRGs) for industrial and residential land use promulgated by EPA Region 9 (USEPA, 2004) and the California Human Health Screening Level (CHHSL) for soil for commerical/industrial and residential land use (CalEPA, 2005), but are well below the Total Threshold Limit Concentration value (TTLC). The average arsenic concentration for all the soil samples collected on February 22 and March 26, 2007 was 6.8 mg/kg (Table 1).

The arsenic concentrations in the shallow soil samples collected at depths of two to three feet were between 1.40 mg/kg and 4.38 mg/kg. The arsenic concentrations in samples collected at depths of five feet were between 1.86 mg/kg to 5.61 mg/kg with the exception of one sample, FDB-4 which was 14.8 mg/kg. The arsenic concentrations in samples collected at eight feet bgs were between 3.14 mg/kg to 5.45 mg/kg. Lastly, samples deeper than nine feet had arsenic concentrations ranging from 1.1 mg/kg to 15.9 mg/kg. The arsenic results arranged by sample depth are presented in Figure 6 to illustrate the distribution of the arsenic in soil. The arsenic data for the samples collected from depths of less than 10 feet bgs is summarized in Table 2.

5.0 HEALTH RISK CHARACTERIZATION

The chemicals detected in the soil samples collected from Component 1A, 1B, and 1C were well below the screening levels listed in the HBFD City Specification Number 431-92. The HBFD and their consultant from Geosyntec Consultants met with Rainbow and Environ Strategy to discuss the sampling results. The HBFD had some concerns regarding the arsenic concentrations in the soils and requested a Health Risk Assessment be prepared for Components 1A, 1B, and 1C.

A traditional chemical of potential concern (COPC) selection process was applied for all the chemicals detected in site soils by a toxicologist. It was determined that arsenic was the COPC for the site based on its toxicity and the site soil concentrations. With the onset of the planned excavation and construction activities at the site, the construction workers associated with the Rainbow renovation activities and some downwind receptors might be impacted by the arsenic in Site soils. Therefore a health risk characterization (HRC) was performed to evaluate that scenario.

The HRC for future excavation and construction was prepared by Ms. Teri Copeland and submitted to the HBFD on April 30, 2007 (Appendix A). The results of the HRC are that the Incremental Lifetime Cancer Risk (ILCR) for short-term construction/excavation worker was 1×10^{-6} and for the downwind child/adult resident was 2×10^{-9}. Thus, the ILCR was considered de minimis (of no concern) for the estimated 6 months anticipated for excavation and construciton. The hazard index (HI) for the short-term construction/excavation receptor was also less than the USEPA's acceptable HI, thus there is no potential for noncancer health effects.

The HBFD responded with comments on the HRC and a request for additional information in a letter dated May 4, 2007. The HBFD and Geosyntec met with Rainbow, Environ Strategy, and Ms. Teri Copeland on May 7, 2007 to discuss the HRC further and Ms. Copeland prepared a Technical Memorandum dated May 9, 2007 in response to questions at that meeting. The HBFD prepared a letter approving removal of the pads in Components 1A, 1B, and 1C, also dated May 9, 2007. The HBFD requested a response to additional comments regarding the HRC in another letter dated May 10, 2007. A response to the May 10, 2007 comments by the HBFD was submitted by Ms. Copeland on May 17, 2007. These documents are enclosed in Appendix B.

6.0 HEALTH-BASED CLEANUP CRITERIA

Upon further verbal negations between HBFD and Rainbow, it was suggested that Rainbow follow the format of a previously approved plan by Blasland, Bouck & Lee, Inc. (BBL Plan) titled "*Proposed Arsenic Remedial Action Plan for Residential Development Properties in Huntington Beach, California*" dated July 11, 1996 (Appendix C). The subject report determined that a proposed cleanup level of 10 parts per million (ppm) was adequate to protect human health and that standard for arsenic was provided by the HBFD. The 10 ppm concentration threshold was calculated based on three standard deviations from the mean background arsenic concentration of 4.07 ppm found after sampling six residential properties in Huntington Beach.

Environ Strategy prepared a *Proposed Remedial Action Plan (RAP)* dated June 13, 2007, which followed the BBL Plan. The RAP described planned additional soil sample collection for arsenic detection, remediation activities, and confirmation sampling. The HBFD conditionally approved the RAP in a letter dated June 21, 2007 (Appendix D). Environ Strategy prepared a letter response to the HBFD's comments on the RAP dated June 28, 2007 (Appendix D). The field activities performed in accordance with the approved RAP are described in the following Section 7.

7.0 ADDITIONAL SOIL SAMPLING AND REMEDIATION

The following sections describe the sampling and remediation activities performed to mitigate subsurface arsenic concentrations in Components 1A and 1B.

7.1 Initial Grid Soil Sampling

The shallow soil sampling locations were selected to augment the spatial distribution of the numerous soil samples that were already collected and analyzed for arsenic on February 22 and March 26, 2007. The shallow soil sample locations (FDSS-1 to FDSS-7) for Components 1A and 1B were placed in the center of square grids as illustrated on Figures 3 and 4. Component 1C (CNG fueling station area) is relatively small and four borings with a total of 12 samples were already collected at depths of 2 to 20 feet (Figure 5). Therefore, based on the density and depth distribution of arsenic samples already collected in this area in February and March 2007, no further samples were deemed necessary.

A decontaminated, triple rinsed stainless-steel hand auger was used to collect the soil samples which were transferred into laboratory provided clean glass soil jars. The collection depths of the soil samples were approximately one to three feet as detailed in the Table 2. The jars were labeled and sealed and placed in a cooler on ice until delivery to the analytical laboratory under Chain of Custody documentation. The soil samples were analyzed by a State-certified environmental laboratory for arsenic by EPA Method 6010B using quality assurance/quality control procedures. Appendix E contains the laboratory analytical report. All sampling locations were back-filled with native material awaiting the laboratory analytical results.

7.2 Remediation

In accordance with the Workplan and agreements with HBFD, soil samples at depths of 9 feet or shallower which had arsenic concentrations in excess of the established remedial threshold value of 10 ppm were identified. Two samples were identified for remediation:

1. FDB-4-5 was collected from Grid 3 in Component 1B on February 22, 2007 at a depth of five feet bgs and had 14.8 mg/kg (ppm) of arsenic.
2. FDSS-1 was collected from Grid 1 in Component 1A on June 27, 2007 at a depth of approximately 1.5 feet bgs and had 13.8 mg/kg (ppm) of arsenic.

Remediation was performed by excavating soil within these grid areas that are identified on Figures 3 and 4. All of the grids in Component 1A were excavated to depths of approximately 5 to 7 feet bgs. The soil from the "clean" grids was mixed with the soil in Grid 1 which contained sample FDSS-1 via discing (Figure 3). The soil was then recompacted in layers in accordance with geotechnical specifications with oversight by a Geotechnical Engineer retained by Rainbow.

All of the grids in Component 1B were excavated to depths of approximately 5 to 8 feet bgs. The soil from Grid 3 which contained sample FDB-4-5 was mixed via discing with soil from the "clean" grids (Figure 4). The soil was then recompacted in layers in accordance with geotechnical specifications, which are provided in a separate report prepared by Rainbow's Geotechnical Engineer. Some of the soil from the northern section (near Gate 6) was relocated to Grid 2 located in the northeast corner of Component 1A for use as fill material (Figure 3).

Upon completion of soil remediation and relocation, soil samples were collected from the affected grids as described in Section 7.3 Confirmation Sampling below.

7.3 Confirmation Sampling

Three surface confirmation samples were collected from depths of approximately 6 inches bgs. Soil sample FDCS-1 was collected on July 25, 2007 from Grid 1 of Component 1A which had been remediated. Soil sample FDCS-2 was collected on July 25, 2007 from Grid 2 of Component 1A which had received import soil from Component 1B near Gate 6. Sample FDCS-3 was collected on August 9, 2007 from Grid 3 of Component 1B which had been remediated. These sample locations are illustrated on Figures 3 and 4.

The discrete soil samples were collected using a decontaminated, triple rinsed stainless-steel hand auger. The soil was transferred to laboratory provided clean labeled glass soil jars, and placed in a cooler on ice until delivery to the analytical laboratory under Chain of Custody. The soil samples were analyzed by a State-certified environmental laboratory for arsenic by EPA Method 6010B using quality assurance/quality control procedures. Appendix F contains the laboratory analytical report with the confirmation sampling results. The arsenic confirmation sample results were all below the established remedial threshold value of 10 ppm. The results of the remediation and confirmation sampling in Components 1A and 1B, are presented in the attached Table 2.

8.0 CONCLUSIONS AND RECOMMENDATIONS

We believe that the arsenic in subsurface soils at Rainbow is naturally occurring based on the horizontal layering of the alluvial soils and the distribution of arsenic at various depths (Figure 6). The arsenic concentrations found in the Rainbow soils are typical of background soil concentrations based on our experience with other similar sites in southern California. In addition, natural background concentrations of arsenic in California are often well above the health-based, direct-exposure goals in soil of 0.07 mg/kg for residential land use and 0.24 mg/kg for commercial/industrial land use (e.g., Bradford et. al, 1996; LBNL 2002).

The HRC for future excavation and construction indicated that the ILCR for the short-term construction/excavation workers and downwind child/adult residents was considered de minimis (of no concern) during the estimated 6 months of excavation. In addition, the site is fully paved with concrete and asphalt except for some very small landscape areas which are filled with clean imported soil. The site will remain fully paved with the proposed future development and therefore we believe that the potential impact of arsenic to on-site and downwind receptors is very unlikely and would not occur during normal operations at Rainbow.

Rainbow wishes to satisfy the HBFD requirements for assessment and remediation of arsenic concentrations in site soils. Upon completion of the remediation, no concentrations of arsenic above 10 ppm were detected in confirmation soil samples collected from Components 1A and 1B. The average arsenic concentration for the shallow soil samples collected at depths less than 10 feet bgs, including the confirmation samples, was 4.04 mg/kg.

Rainbow hopes this report will satisfy the City of Huntington Beach regarding the soil beneath the new buildings and allow them to move forward with the construction and occupancy of the CNG Fuel Station, maintenance building, and bin repair shop. In addition Rainbow would like the HBFD to approve the soil arsenic sampling and remediation protocol for future development at the site.

9.0 REFERENCES CITED

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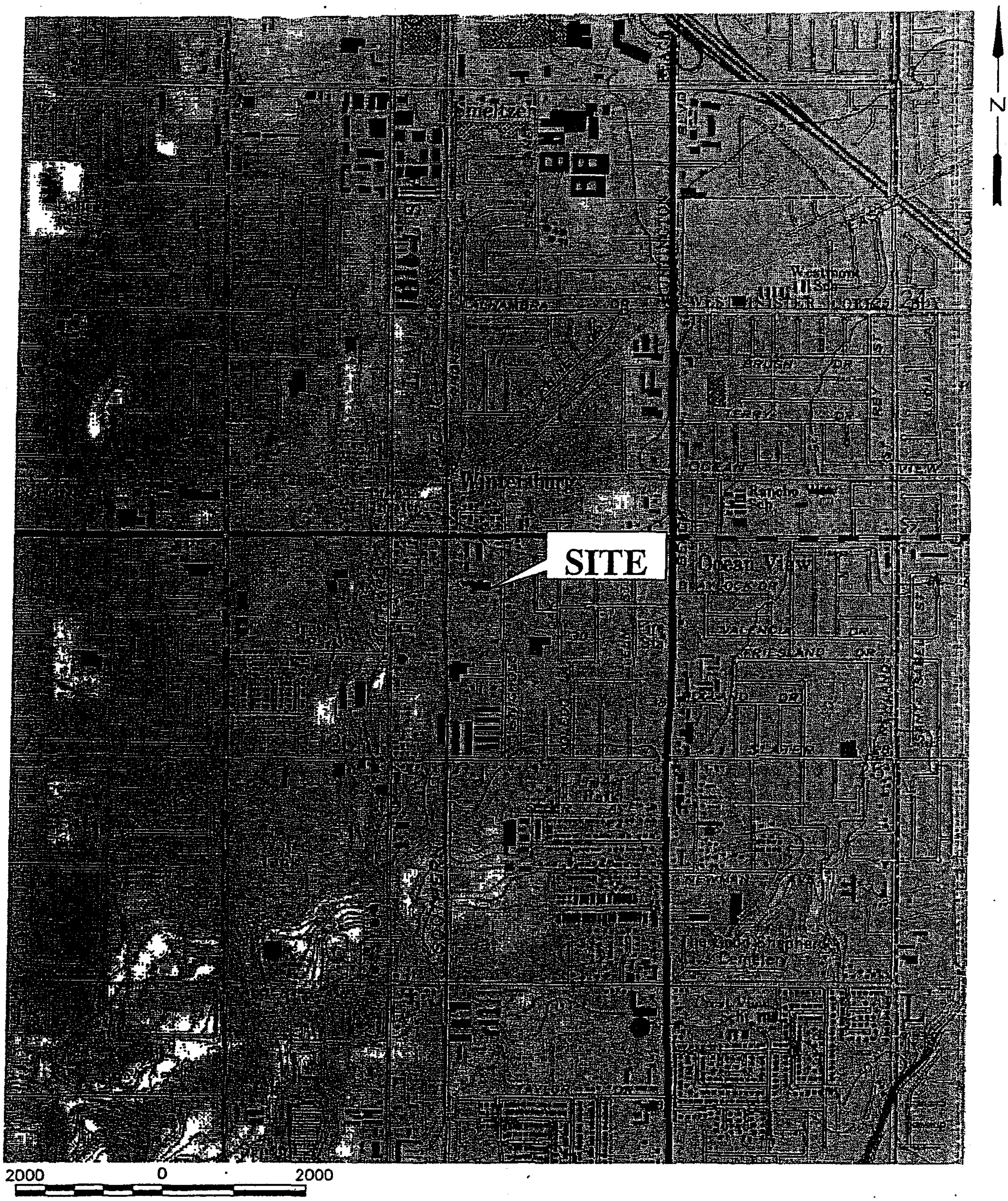
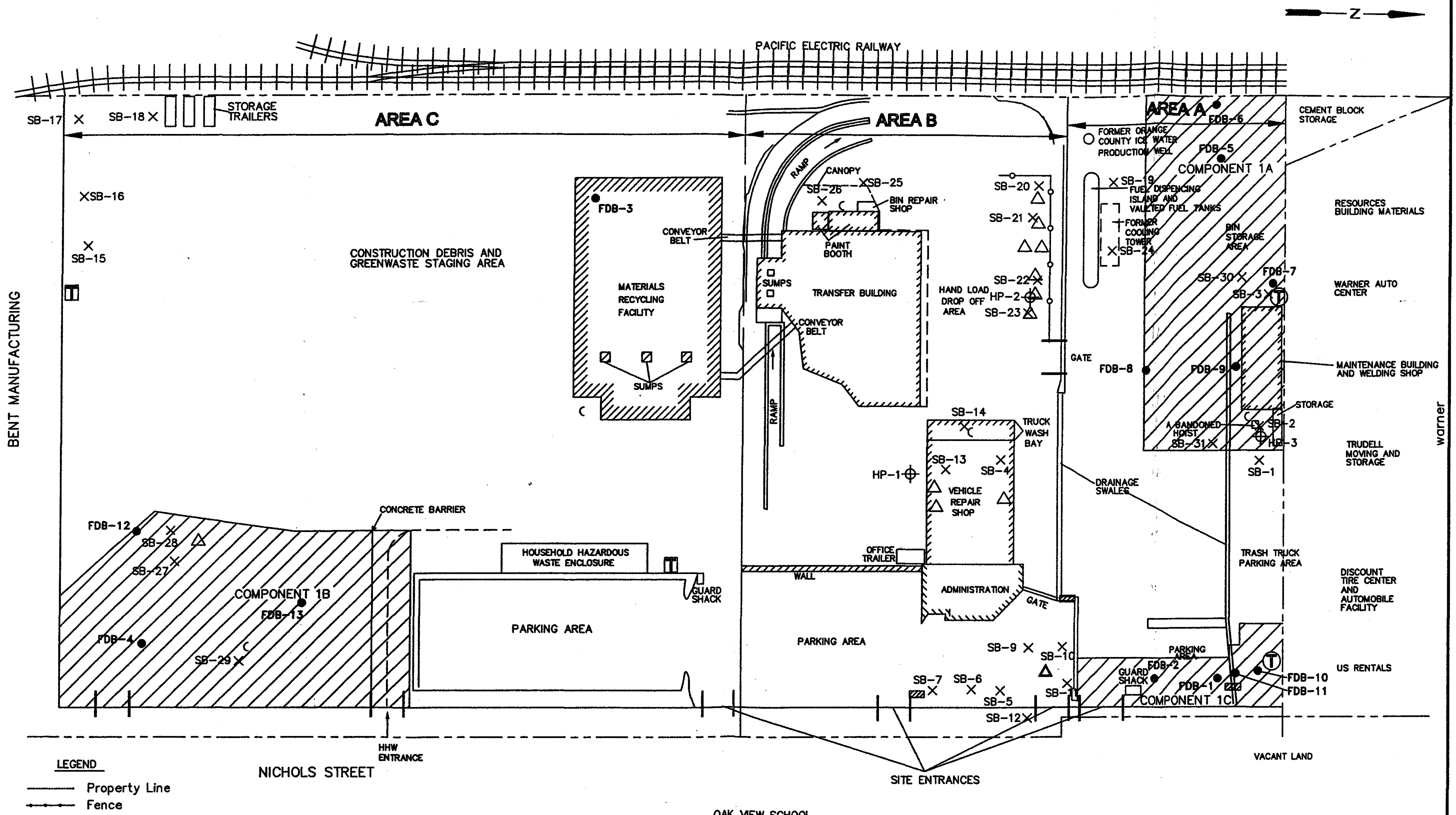
FIGURES



ENVIRON STRATEGY CONSULTANTS, INC. 30 Hughes, Suite 209 Irvine, California 92618	FIGURE 1 SITE VICINITY MAP RAINBOW DISPOSAL 17121 NICHOLS ST. HUNTINGTON BEACH, CA	DATE: 06/10/04 PROJECT NO. 281-A FILE NO. 281AFig1

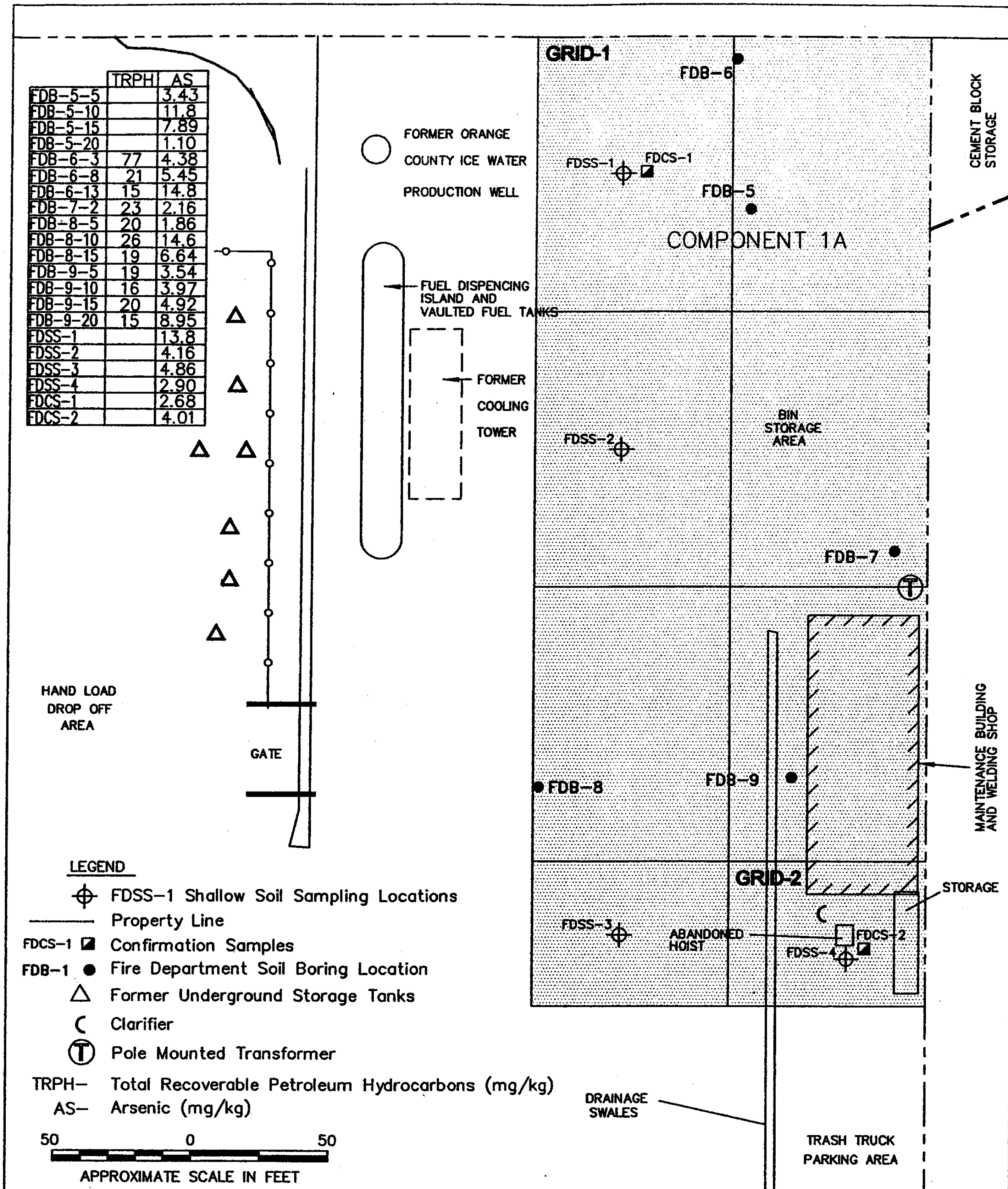


LEGEND

- Property Line
- Fence
- SB-2 × 2004 Soil Boring Location
- HP-2 ⊕ 2004 Hydropunch Location
- FDB-1 ● Fire Department Soil Boring Location
- C Clarifier
- Pad Mounted Transformer
- △ Former Underground Storage Tanks
- Ⓣ Pole Mounted Transformer

100 0 100
APPROXIMATE SCALE IN FEET

DATE: 6/6/07	environ strategy consultants, inc.	FIGURE 2
PROJECT NO. 281-A		SITE PLAN SHOWING COMPONENTS 1A, 1B & 1C BORING LOCATIONS
FILE NO. 217AFIG2AdA	30 Hughes, Suite 209 Irvine, California 92618	RAINBOW DISPOSAL 17121 NICHOLS ST. HUNTINGTON BEACH, CA



	TRPH	AS
FDB-5-5		3.43
FDB-5-10		11.8
FDB-5-15		7.89
FDB-5-20		1.10
FDB-6-3	77	4.38
FDB-6-8	21	5.45
FDB-6-13	15	14.8
FDB-7-2	23	2.16
FDB-8-5	20	1.86
FDB-8-10	26	14.6
FDB-8-15	19	6.64
FDB-9-5	19	3.54
FDB-9-10	16	3.97
FDB-9-15	20	4.92
FDB-9-20	15	8.95
FDSS-1		13.8
FDSS-2		4.16
FDSS-3		4.86
FDSS-4		2.90
FDCS-1		2.68
FDCS-2		4.01

environ strategy consultants, inc. es

30 HUGHES SUIT 209
IRVINE, CALIFORNIA 92618

FIGURE 3

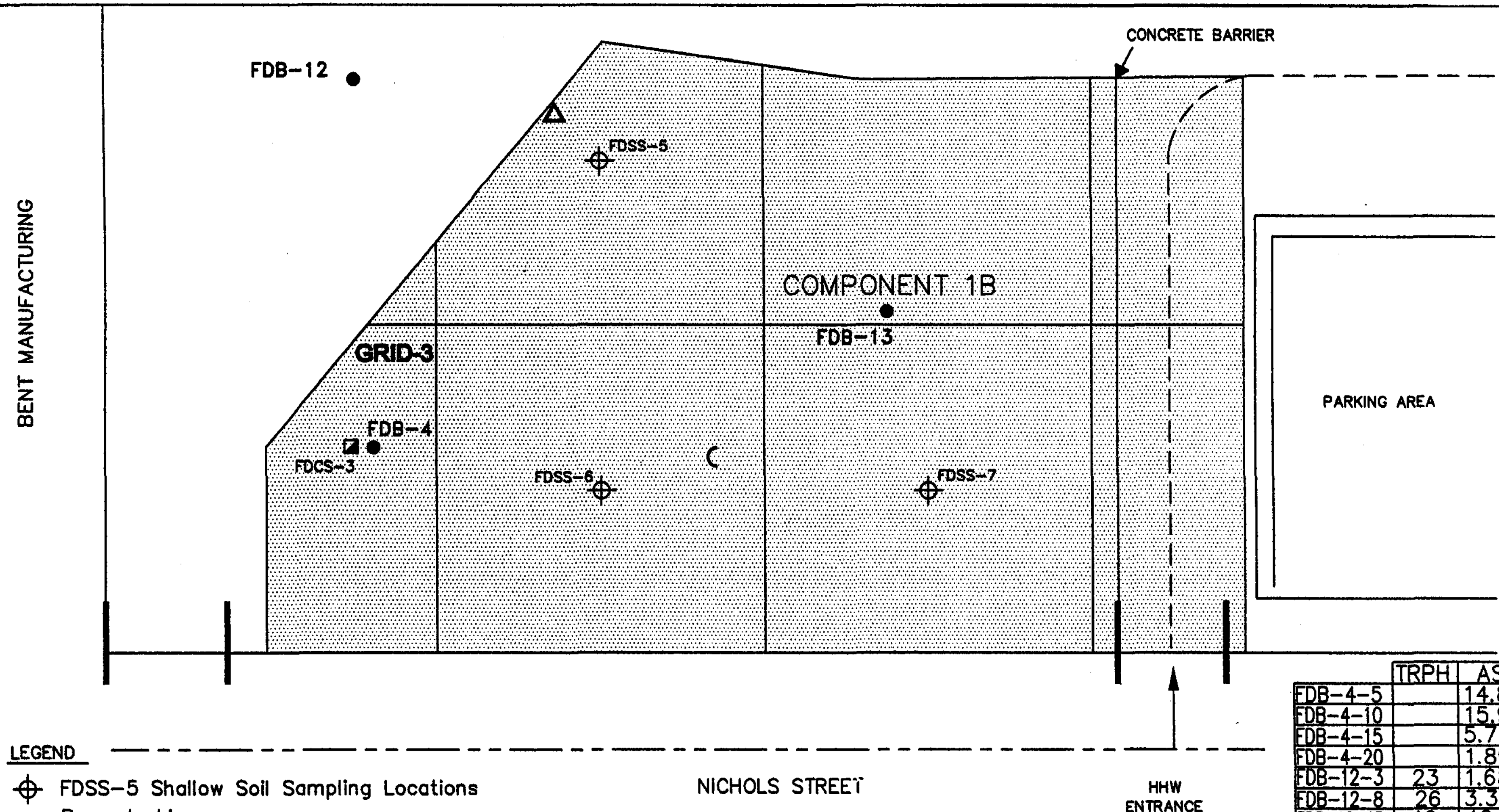
COMPONENT 1A SHOWING SOIL SAMPLING LOCATIONS

RAINBOW DISPOSAL
17121 NICHOLS ST.
HUNTINGTON BEACH, CA

DATE: 8/20/07

PROJECT NO. 281-A

FILE NO. 217AFIG2Acc



	TRPH	AS
FDB-4-5		14.8
FDB-4-10		15.9
FDB-4-15		5.73
FDB-4-20		1.89
FDB-12-3	23	1.68
FDB-12-8	26	3.37
FDB-12-13	19	12.1
FDB-13-5	14	1.91
FDB-13-10	47	3.92
FDSS-5		2.69
FDSS-6		3.00
FDSS-7		2.35
FDCS-3		2.13

LEGEND

- ⌖ FDSS-5 Shallow Soil Sampling Locations
- ——— Property Line
- FDCS-3 ◪ Confirmation Samples
- FDB-1 ● Fire Department Soil Boring Location
- △ Former Underground Storage Tanks
- (Clarifier
- TRPH– Total Recoverable Petroleum Hydrocarbons (mg/kg)
- AS– Arsenic (mg/kg)

50 0 50
APPROXIMATE SCALE IN FEET

environ strategy consultants, inc. es

30 HUGHES SUIT 209
IRVINE, CALIFORNIA 92618

FIGURE 4

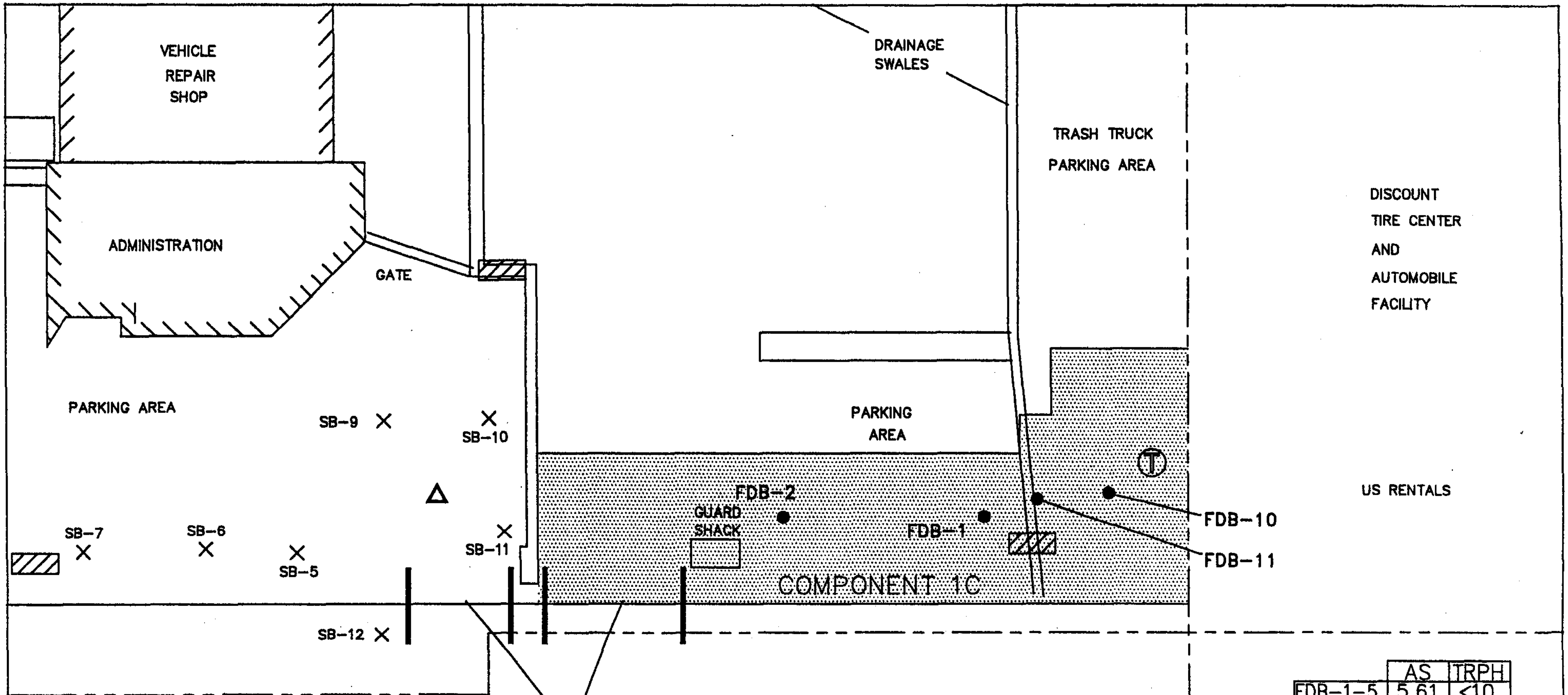
COMPONENT 1B SHOWING SOIL SAMPLING LOCATIONS

RAINBOW DISPOSAL
17121 NICHOLS ST.
HUNTINGTON BEACH, CA

DATE: 8/20/07

PROJECT NO. 281-A

FILE NO. 217AFIG2Acc



	AS	TRPH
FDB-1-5	5.61	<10
FDB-1-10	14.9	<10
FDB-1-15	6.37	<10
FDB-1-20	15.6	11
FDB-2-5	5.35	<10
FDB-2-10	4.36	<10
FDB-2-15	1.67	<10
FDB-2-20	15.8	<10
FDB-10-2	2.60	18
FDB-11-3	1.40	27
FDB-11-8	3.14	27
FDB-11-13	12.1	25

LEGEND

- Property Line
- SB-2 × 2004 Soil Boring for VOCs and TPHg & d
- FDB-1 ● Fire Department Soil Boring Location
- △ Former Underground Storage Tanks
- Ⓣ Pole Mounted Transformer
- TRPH– Total Recoverable Petroleum Hydrocarbons (mg/kg)
- AS– Arsenic (mg/kg)

50 0 50
APPROXIMATE SCALE IN FEET

environ strategy consultants, inc.

30 HUGHES SUIT 209
IRVINE, CALIFORNIA 92618

FIGURE 5

COMPONENT 1C

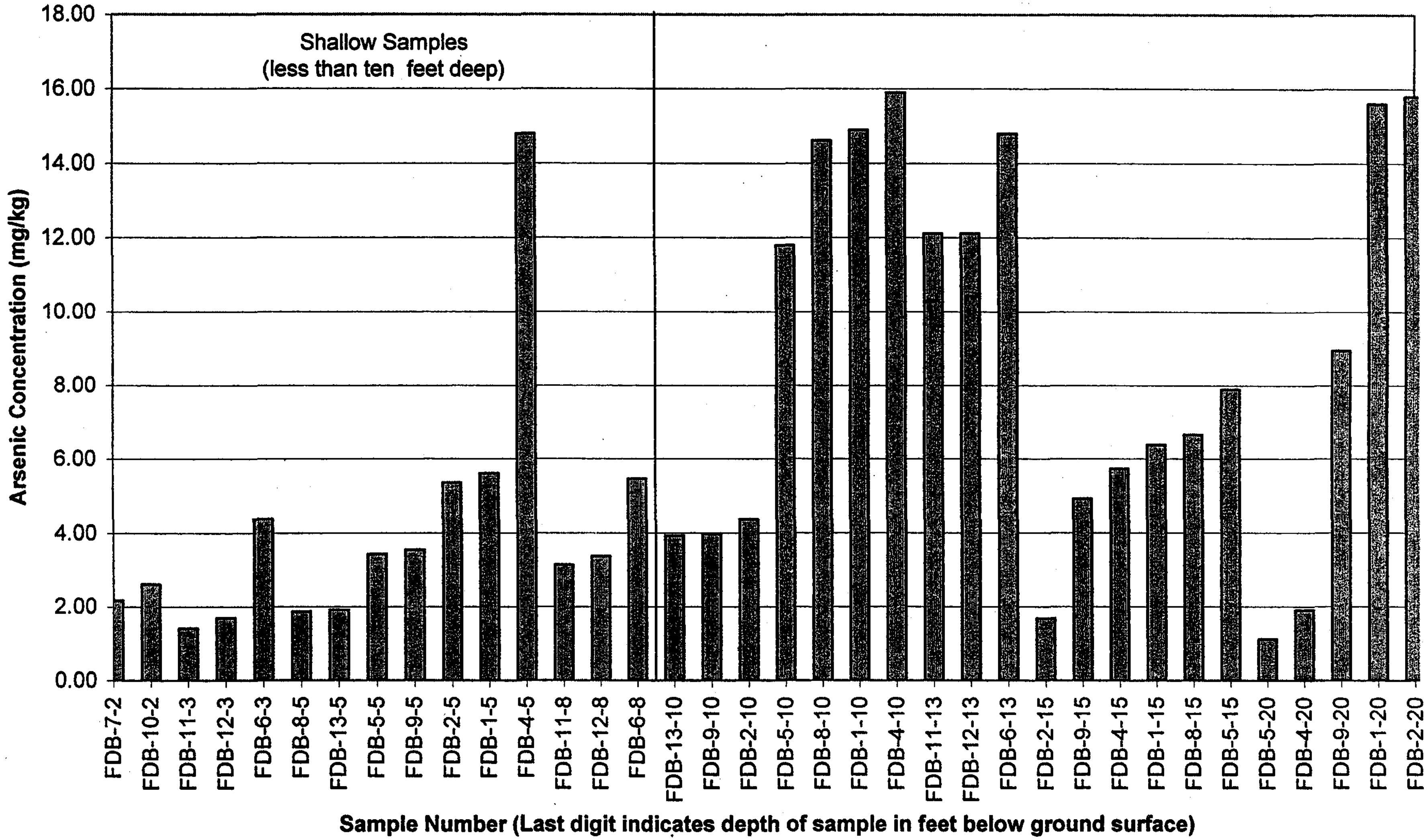
RAINBOW DISPOSAL
17121 NICHOLS ST.
HUNTINGTON BEACH, CA

DATE: 6/6/07

PROJECT NO. 281-A

FILE NO. 217AFIG2Add

FIGURE 6
RAINBOW DISPOSAL ARSENIC RESULTS FOR SOIL ARRANGED BY DEPTH



TABLES

TABLE 1
RAINBOW DISPOSAL COMPANY, INC. SOIL METALS RESULTS
(all units are mg/kg)

Sample ID	Date	Antimony	Arsenic	Barrium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead
TTLC[1] (mg/kg)		500	500	10,000	75	100	2,500	8,000	2,500	1,000
CHHSL-Ind[2]		380	0.24	63,000	1,700	7.5	100,000	3,200	38,000	3,500
CHHSL-Res[3]		30	0.07	520	150	1.7	100,000	660	3,000	150
FDB-1-5	2/22/07	**0.797**	**5.61**	**136**	**0.327**	<0.500	**19.7**	**12.0**	**16.1**	**6.2**
FDB-1-10	2/22/07	<0.750	**14.9**	**144**	**0.396**	**0.564**	**17.2**	**11.1**	**20.8**	**4.52**
FDB-1-15	2/22/07	<0.750	**6.37**	**203**	<0.250	<0.500	**18.0**	**12.0**	**18.2**	**5.95**
FDB-1-20	2/22/07	**0.800**	**15.6**	**93.5**	**0.385**	<0.500	**32.6**	**14.0**	**26.5**	**7.70**
FDB-2-5	2/22/07	<0.750	**5.35**	**69.2**	**0.591**	<0.500	**14.9**	**7.75**	**16.5**	**7.3**
FDB-2-10	2/22/07	<0.750	**4.36**	**37.7**	<0.250	<0.500	**6.96**	**4.50**	**4.93**	**2.02**
FDB-2-15	2/22/07	<0.750	**1.67**	**28.7**	<0.250	<0.500	**4.42**	**2.25**	**2.92**	**1.40**
FDB-2-20	2/22/07	**1.56**	**15.8**	**90.1**	**0.503**	**0.591**	**28.4**	**15.8**	**28.1**	**10.3**
FDB-4-5	2/22/07	**3.36**	**14.8**	**277**	**0.768**	**0.558**	**24.8**	**18.4**	**28.7**	**14.6**
FDB-4-10	2/22/07	**1.09**	**15.9**	**95.8**	**0.258**	**1.72**	**16.8**	**7.89**	**32.5**	**84.5**
FDB-4-15	2/22/07	<0.750	**5.73**	**96.7**	**0.539**	<0.500	**18.8**	**10.5**	**15.0**	**7.89**
FDB-4-20	2/22/07	<0.750	**1.89**	**70.4**	<0.250	<0.500	**15.4**	**9.48**	**15.4**	**4.98**
FDB-5-5	2/22/07	<0.750	**3.43**	**87.5**	**0.561**	<0.500	**16.2**	**9.72**	**12.4**	**7.1**
FDB-5-10	2/22/07	**2.11**	**11.8**	**81.3**	**1.04**	<0.500	**29.7**	**10.8**	**35.2**	**7.32**
FDB-5-15	2/22/07	<0.750	**7.89**	**77.0**	**0.260**	<0.500	**17.4**	**10.2**	**16.0**	**6.02**
FDB-5-20	2/22/07	<0.750	**1.10**	**19.8**	<0.250	<0.500	**4.21**	**1.84**	**3.36**	**0.84**
FDB-6-3	3/26/07	<0.750	**4.38**	**43.4**	<0.250	<0.500	**31.0**	**4.01**	**24.9**	**42.5**
FDB-6-8	3/26/07	<0.750	**5.45**	**92.2**	**0.289**	**0.510**	**15.8**	**9.47**	**16.9**	**5.92**
FDB-6-13	3/26/07	<0.750	**14.8**	**210**	**0.788**	**0.892**	**26.6**	**15.1**	**38.0**	**11.6**
FDB-7-2	3/26/07	<0.750	**2.16**	**42.8**	<0.250	<0.500	**8.71**	**4.94**	**7.63**	**3.24**
FDB-8-5	3/26/07	<0.750	**1.86**	**122**	**0.518**	<0.500	**16.3**	**8.73**	**14.6**	**7.57**
FDB-8-10	3/26/07	<0.750	**14.6**	**106**	**0.902**	**0.821**	**28.8**	**12.3**	**41.4**	**15.6**
FDB-8-15	3/26/07	<0.750	**6.64**	**106**	**0.263**	**0.645**	**22.9**	**12.2**	**20.7**	**6.10**
FDB-9-5	3/26/07	<0.750	**3.54**	**195**	**0.524**	**0.547**	**17.4**	**8.88**	**16.6**	**7.48**
FDB-9-10	3/26/07	<0.750	**3.97**	**74.4**	**0.447**	<0.500	**16.3**	**8.12**	**18.1**	**6.85**
FDB-9-15	3/26/07	<0.750	**4.92**	**228**	**0.599**	**0.837**	**27.7**	**15.8**	**30.8**	**16.2**
FDB-9-20	3/26/07	<0.750	**8.95**	**102**	**0.515**	**0.584**	**18.3**	**10.1**	**19.6**	**9.09**
FDB-10-2	3/26/07	<0.750	**2.60**	**104**	**0.627**	<0.500	**16.4**	**8.18**	**14.9**	**7.1**
FDB-11-3	3/26/07	<0.750	**1.40**	**120**	**0.465**	**0.607**	**20.9**	**9.85**	**18.3**	**6.13**
FDB-11-8	3/26/07	<0.750	**3.14**	**55.1**	**0.293**	<0.500	**13.5**	**6.42**	**13.7**	**4.1**
FDB-11-13	3/26/07	<0.750	**12.1**	**165**	**1.10**	**0.991**	**35.6**	**17.9**	**42.4**	**11.70**
FDB-12-3	3/26/07	<0.750	**1.68**	**60.3**	**0.650**	<0.500	**18.1**	**8.84**	**12.9**	**6.7**
FDB-12-8	3/26/07	<0.750	**3.37**	**51.6**	**0.611**	**0.573**	**20.0**	**10.7**	**19.6**	**7.85**
FDB-12-13	3/26/07	<0.750	**12.1**	**201**	**1.11**	**1.17**	**37.8**	**20.2**	**36.9**	**14.0**
FDB-13-5	3/26/07	<0.750	**1.91**	**58.2**	**0.626**	**0.527**	**21.4**	**8.85**	**18.6**	**6.91**
FDB-13-10	3/26/07	<0.750	**3.92**	**96.0**	**0.619**	**0.841**	**23.4**	**12.3**	**25.2**	**8.72**
Average		0.6	6.8	106.7	0.475	0.411	20.1	10.3	20.7	10.7
Minimum		<0.750	1.1	19.8	<0.250	<0.500	4.2	1.8	2.9	0.8
Maximum		3.4	15.9	277	1.1	1.7	37.8	20.2	42.4	84.5
Standard Deviation		1.0	5.1	60.9	0.2	0.3	8.0	4.2	10.1	14.4

1 TTLC - Total Threshold Limit Concentration Values for select inorganic persistent and bioaccumulative toxic substances per Title 22 Section 66261.24 Characteristic of Toxicity.
2 CHHSL California Human Health Screening Levels for soil for commerical/industrial land use.
3 CHHSL California Human Health Screening Levels for soil for residential land use (CalEPA, 2005)

Non-detect values are presented as less than (<) the reporting limit.

TABLE 2
RAINBOW DISPOSAL COMPANY, INC.
ARSENIC RESULTS FOR SHALLOW (<10 FEET) SOIL SAMPLES
(all units are mg/kg)

Sample ID	Depth	Arsenic	Date Sampled	Location (Component Number)
Fire Department Borings (FDB) collected for additional Phase II analysis				
FDB-7-2	2	2.16	3/26/07	1A
FDB-10-2	2	2.60	3/26/07	1C
FDB-6-3	3	4.38	3/26/07	1A
FDB-11-3	3	1.40	3/26/07	1C
FDB-12-3	3	1.68	3/26/07	1B
FDB-1-5	5	5.61	2/22/07	1C
FDB-2-5	5	5.35	2/22/07	1C
FDB-4-5	5	14.8	2/22/07	1B
FDB-5-5	5	3.43	2/22/07	1A
FDB-8-5	5	1.86	3/26/07	1A
FDB-9-5	5	3.54	3/26/07	1A
FDB-13-5	5	1.91	3/26/07	1B
FDB-6-8	8	5.45	3/26/07	1A
FDB-11-8	8	3.14	3/26/07	1C
FDB-12-8	8	3.37	3/26/07	1B
Fire Department Surface Samples (FDSS) for additional arsenic analysis				
FDSS-1	1.5	13.8	6/27/07	1A
FDSS-2	1.5	4.16	6/27/07	1A
FDSS-3	1.5	4.86	6/27/07	1A
FDSS-4	1.5	2.90	6/27/07	1A
FDSS-5	3	2.69	6/27/07	1B
FDSS-6	3	3.00	6/27/07	1B
FDSS-7	3	2.35	6/27/07	1B
Fire Department Confirmation Samples (FDCS) for arsenic analysis after remediation*				
FDCS-1	0.5	2.68	7/25/07	1A Grid 1
FDCS-2	0.5	4.01	7/25/07	1A Grid 2
FDCS-3	0.5	2.13	8/9/07	1B Grid 3
Average	**4.04**	**Median**	**3.1**	
Minimum	**1.40**	**Maximum**	**14.8**	
Standard Deviation		**3.2**		

Shaded samples exceeded 10 ppm (parts per million) of arsenic in soil.

* The confirmation samples FDCS-1 and FDCS-3 were collected near sampling locations FDSS-1 and FDB-4 which had exceeded 10 ppm arsenic.
The confirmation sample FDCS-2 was collected in a grid which had received soil imported from Component 1B.

APPENDIX A

environ strategy consultants, inc.

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April 30, 2007

Project No. 281-E

Mr. Duane Olson
Fire Chief
City of Huntington Beach Fire Department
2000 Main Street-5th Floor
Huntington Beach, CA 92648

TRANSMITTAL: **HEALTH RISK CHARACTERIZATION
FUTURE EXCAVATION/CONSTRUCTION SCENARIO
EXPOSURE TO ARSENIC IN SOIL
Rainbow Disposal Co., Inc.
17121 Nichols Street
Huntington Beach, CA 92647**

Dear Mr. Olson:

Environ Strategy Consultants, Inc., on behalf of Rainbow Disposal Company Inc. (Rainbow) is pleased to present this *Health Risk Characterization Future Excavation/Construction Scenario Exposure to Arsenic in Soil.*

If you have any questions regarding this report or require additional information, please do not hesitate to contact the Environmental Toxicologist, Ms. Teri Copeland, M.S., D.A.B.T. at (818) 991-8240 or the undersigned at (949) 581-3222.

Respectfully submitted,

Margaret Patrick

Margaret Patrick, P.G. 7320
Project Geologist

Attachment

cc: Mr. Lee Caldwell, City of Huntington Beach Fire Department
Mr. Jerry Moffatt, Rainbow Disposal Company, Inc.
Mr. Eric Smalstig, Geosyntec Consultants

Teri L. Copeland, M.S., D.A.B.T
Environmental Toxicologist
5737 Kanan Rd./#182, Agoura Hills, CA 91301
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HEALTH RISK CHARACTERIZATION
FUTURE CONSTRUCTION/EXCAVATION SCENARIO
EXPOSURE TO ARSENIC IN SOIL
RAINBOW DISPOSAL COMPANY, INC.
17121 NICHOLS STREET
HUNTINGTON BEACH, CALIFORNIA

Prepared by:

Teri L. Copeland, M.S., D.A.B.T.
Environmental Toxicologist
Agoura Hills. California

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Santa Rosa, California

Prepared for:

Rainbow Disposal
17121 Nichols St.
Huntington Beach, California

April 30, 2007

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List of Acronyms

ADD:	Average Daily Dose
bgs:	Below ground surface
CalDHS:	California Department of Health Services
CalEPA:	California Environmental Protection Agency
COPC:	Chemical of Potential Concern
CSF:	Cancer Slope Factor
DTSC:	Department of Toxic Substances Control
EPC:	Exposure Point Concentration
HBFD:	City of Huntington Beach Fire Department
HI:	Hazard Index
HQ:	Hazard Quotient
HRA:	Health Risk Assessment
HRC:	Health Risk Characterization
ILCR:	Incremental Lifetime Cancer Risk
IRIS:	Integrated Risk Information System
LADD:	Lifetime Average Daily Dose
LMS:	Linearized Multistage (low dose extrapolation model)
LOAEL:	Lowest-Observed Adverse Effect Level
m^3/kg:	Cubic meters (air) per kilogram (soil) (PEF units)
mg/kg:	Milligrams per kilogram
MRL:	Minimal risk level
NOAEL:	No-Observed Adverse Effect Level
OEHHA:	Office of Environmental Health Hazard Assessment
PEF:	Particulate Emission Factor
RfD:	Reference Dose
REL:	Reference Exposure Level
RME:	Reasonable Maximum Exposure
SF:	Slope Factor
UCL:	Upper confidence limit
ug/m^3:	Micrograms per cubic meter
USEPA:	United States Environmental Protection Agency

EXECUTIVE SUMMARY

This report documents a health risk characterization (HRC) for a future short-term excavation scenario at the Rainbow Disposal Company, Inc. property located at 17121 Nichols Street, Huntington Beach, California (the site). The site currently operates as a permitted waste transfer and material recycling facility with refuse collection truck maintenance and parking areas and a county operated household hazardous materials collection center. Past activities at the site include farming, a meat packing facility, a lumberyard, a used oil filter processing facility, and an ice distribution center (Environ Strategy, 2004). Remodeling at the site is planned in three areas designated as Component 1A, 1B, and 1C (Figure 2). The planned remodeling will require removal of the cement and asphalt pads (pads) in these areas. The City of Huntington Beach Fire Department (HBFD) has requested that an assessment of potential health risks associated with arsenic in soil be conducted for the short-term pad removal scenario. Accordingly, this HRC evaluates the potential incremental lifetime cancer risks and noncancer hazards associated with the site-specific short-term pad removal in accordance with CalEPA and USEPA guidance.

Characterization of metals in site soil has been conducted (Environ Strategy Consultants, Inc, 2007). This data set was discussed with the HBFD in a meeting on April 23, 2007. Based on the toxicity and site soil concentrations, arsenic is the only chemical of potential concern (COPC) that HBFD has requested be quantitatively evaluated in the HRC. The site-specific pad removal scenario is consistent with the USEPA short-term construction/excavation scenario.

Potential receptors associated with the short-term construction/excavation scenario and assessed in this HRC are:

- An on-site construction/excavation worker exposed to the maximum reported arsenic concentration in soil for a 6-month project;
- A downwind child resident exposed to the maximum reported arsenic concentration in soil for a 6-month project; and
- A downwind adult resident exposed to the maximum reported arsenic concentration in soil for a 6-month project.

The HRC was conducted in accordance with relevant regulatory guidance (USEPA, 1989, 1996, 2002; CalEPA, 1992). Complete exposure pathways for the on-site worker were identified as dermal contact with soil, incidental soil ingestion, and inhalation of particulates emitted from soil. The complete exposure pathway for the downwind residential receptors is inhalation of particulates emitted from soil. The potential for incremental lifetime cancer risk and noncancer heath hazard was *evaluated for all three receptors listed above.*

The potential for *incremental lifetime cancer risk* is characterized as the upperbound probability[1] of an individual developing cancer over a lifetime as a result of the potential reasonable maximum exposure (RME) to site-related COPC(s) of interest (USEPA, 1989). The incremental probability of developing cancer (i.e., the incremental lifetime cancer risk [ILCR]) is that risk attributed to exposure to the COPC(s) present at the site and is independent of non-site-related cancer risks (USEPA, 1989). For example, national cancer statistics indicate that each male has a 1 in 2 chance, or 500,000 chances in one million, of developing cancer during his lifetime and that each female has a 1 in 3 chance, or 333,333 chances in one million, of developing cancer in her lifetime (American Cancer Society, 2007). Accordingly, an individual with an incremental cancer risk of 1-in-one million (denoted as 1E-06 or 1×10^{-6}) has a total cancer risk of 500,001-in-one million (male) or 333,334-in-one million (female). The site-related ILCR is characterized, for each known or potential carcinogenic COPC, by multiplying the upperbound RME exposure level

[1] As further defined by the USEPA cancer guidelines, the carcinogenic health risk lies between the upperbound probability and zero; however, for purposes of risk management, the upperbound value is reported (USEPA, 1986, 2005).

(dose) by the chemical-specific cancer slope factor.[2] The theoretical ILCR is based on highly conservative exposure and toxicity assumptions (USEPA, 1989).

The CalEPA's Safe Drinking Water and Toxic Enforcement Act of 1986 (California Department of Health Services [CalDHS], 1994) identifies a *de minimis* risk level as an ILCR of 10-in-one million (1E-05), or below, as protective of human health. The *de minimis* risk level identified by the USEPA is an ILCR range of 1-in-one million to 100-in-one million (i.e., 1E-06 to 1E-04) or below (USEPA, 1991).

The potential for *noncancer health effects* is characterized by comparing the predicted upperbound site-specific COPC dose to a safe dose (reference dose[3]) (USEPA, 1989). In order to evaluate the general acceptability of a particular dose relative to a reference dose, a hazard quotient is expressed as the site related COPC dose divided by the reference dose. The sum of the exposure pathway-specific hazard quotients is the COPC-specific Hazard Index (HI). (USEPA, 1989). HI levels of 1 or less indicate that there is no potential for noncancer health effects, even for sensitive populations (USEPA, 1989, 1991).

For the short-term construction/excavation scenario assessed in this HRC, the incremental lifetime cancer risk (ILCR) and hazard index (HI) are as follows:

Receptor	ILCR	HI
On-Site Construction/Excavation Worker, 6-month exposure	1E-06	0.03
Downwind Child Resident, 6-month exposure	NA*	0.001
Downwind Adult Resident, 6-month exposure	2E-09	0.0004
Risk Management Level	≤1E-06 to 1E-04	≤1.0

* ILCR is expressed as a lifetime (child + adult) risk, which is listed under the adult resident column.

The results of the HRC support the following conclusions:

- Incremental Lifetime Cancer Risk
  ILCRs for short-term construction/excavation receptors are less than the acceptable ILCR identified by the CalEPA Safe Drinking Water and Toxic Enforcement Act of 1986 and are within the acceptable risk range identified by USEPA (1991). Accordingly, ILCRs are considered to be *de minimis* (of no concern) for the short-term excavation (pad removal) scenario.

- Hazard Index
  HIs for the short-term construction/excavation receptors are less than the maximum acceptable HI of 1 (USEPA, 1991). Accordingly, there is no potential for noncancer health effects for the short-term excavation (pad removal) scenario.

---

[2] The slope factor characterizes the quantitative relationship between exposure level and upperbound probability of cancer.

[3] CalEPA/OEHHA expresses the inhalation reference dose (RfD) as a reference exposure level (REL).

1 INTRODUCTION

This report documents a health risk characterization (HRC) for a future short-term excavation scenario at the Rainbow Disposal property located at 17121 Nichols Street, Huntington Beach, California (the site). Past activities at the site include a variety of commercial and industrial uses.

Remodeling is planned in three areas of the site, identified as Component 1A, 1B, and 1C. Component 1A, in the northwest corner of the site, will have the old maintenance/welding shop building removed and replaced by a new larger maintenance building. Component 1B in the southeast corner of the site, will have new welding shop and bin repair building. Component 1C in the northeast corner of the site, will have a Compressed Natural Gas (CNG) fueling station. The planned remodeling will require removal of the cement and asphalt pads in these areas. The City of Huntington Beach Fire Department (HBFD) has requested that an assessment of potential health risks associated with arsenic in soil be conducted for the short-term pad removal scenario. Accordingly, this HRC evaluates the potential incremental lifetime cancer risks and noncancer hazards associated with the site-specific short-term pad removal in accordance with CalEPA and USEPA guidance.

Characterization of metals in site soil has been conducted (Environ Strategy Consultants, Inc, 2007). This data set was discussed with the HBFD in a meeting on April 23, 2007. Based on the toxicity and site soil concentrations, arsenic is the only chemical of potential concern (COPC) that HBFD has requested be quantitatively evaluated in the short-term construction/excavation HRC.

The remainder of this section presents the technical approach employed in the HRC and discusses the relevant site background.

1.1 APPROACH

A health risk assessment (HRA) is an appropriate analytical methodology for determining the potential receptor-specific health risks at a site where a chemical release has, or may have, occurred (USEPA, 1989). The receptors evaluated are assumed to have a reasonable maximum exposure (RME) by applicable exposure routes. The RME, as defined by the USEPA (1989), is the "highest exposure that is reasonably expected to occur" and is intended to best represent "a conservative exposure estimate that is within the range of possible exposures". The assumption of exposure represents a conservative approach to risk characterization.

HRA applies four evaluation components as the basis for characterizing potential health risks posed to current and/or potential future receptors at a site (USEPA, 1989). These components are:

Site Characterization/Selection of Chemicals of Potential Concern: Site characterization data are evaluated and the chemicals of potential concern (COPCs) are selected.

Toxicity Assessment: The toxicity of the COPCs is evaluated and the cancer slope factors and noncancer reference doses (toxicity criteria) are presented.

Exposure Assessment: The routes through which potential exposure to COPCs may occur are identified and the magnitude and duration of the doses that the receptors might receive as a result of their potential exposures are estimated.

Risk Characterization: Information from the toxicity assessment and exposure assessment is integrated into quantitative expressions of potential health risk. The level of confidence in the quantitative estimates is discussed.

This assessment is identified as a health risk characterization (HRC), as chemicals of potential concern (COPCs) were not formally selected. Rather, based on toxicity and site soil concentrations, the HBFD identified arsenic as the only chemical of interest for a quantitative evaluation of the proposed pad removal activities. All other steps of the HRA process (toxicity assessment, exposure assessment, and risk characterization) are included as components of the HRC.

The methodologies used in this HRC are consistent with standard risk assessment practices and information provided in the following guidance documents:

- USEPA, 1989. *Risk Assessment Guidance for Superfund (RAGS), Volume I Human Health Evaluation Manual (Part A).* December.
- USEPA, 1996. *Soil Screening Guidance: Technical Background Document.* May.
- USEPA, 2002. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.* Office of Solid Waste and Emergency Response, December.
- CalEPA, 1992. *Supplemental Guidance for Human Health Multimedia Risk Assessment of Hazardous Waste Sites and Permitted Facilities.* Department of Toxic Substances Control (DTSC), October 7.

1.2 ORGANIZATION OF REPORT

The organization of this report is as follows:

Section 2: Site Description and Environmental History: The site is described and relevant background information is provided.

Section 3: Toxicity Assessment: The toxicity criteria established by the regulatory agencies are discussed and presented.

Section 4: Exposure Assessment: The exposure scenarios and pathways, exposure parameters, dose calculations, and exposure point concentrations are discussed.

Section 5: Risk Characterization: The incremental lifetime cancer risk and noncancer hazard index are presented for each receptor evaluated.

Section 6: Limitations: The limitations associated with the preparation and use of this report are stated.

Section 7: References Cited: The references cited in the HRC are provided.

2 SITE DESCRIPTION AND ENVIRONMENTAL HISTORY

This section provides an overview regarding the property and its environmental history. Information included in this section is based on a Phase I Environmental Site Assessment performed by Environ Strategy Consultants, Inc. in 2004 (Environ Strategies, Inc., 2004).

2.1 SITE DESCRIPTION

The site is located at 17121 Nichols Street, Huntington Beach, California (Figure 1). The site consists of approximately 17.59 acres and is bounded by Nichols Street on the east, the Southern Pacific Railroad on the west, and commercial and industrial facilities on the north and south. The property currently operates as an active permitted waste transfer and material recycling facility with an overall processing capacity of 2,800 tons per day. The site also has refuse collection truck maintenance and parking areas, bin maintenance and storage areas, and a county run household hazardous materials collection center. Site structures include an administration building, a vehicle repair shop, a maintenance building and welding shop, a material recycling facility (MRF), a transfer building, several trailers, and ancillary sheds and canopies. The current site lay-out is shown on Figure 2.

2.2 ENVIRONMENTAL HISTORY

The property was originally used as farm land. Around 1938 a two-story building in the southwest corner of the site operated as a meat packing facility, followed by later use as a lumberyard and a used oil filter processing facility. This building and a maintenance storage building located on the south end of the site were removed in 2006. Commercial and industrial use in the northern portion of the site started in the 1950s with the Orange County Ice facility. Other offices and maintenance buildings operated on the site through the late 1970s when Rainbow acquired a portion of the property. The current administration building, vehicle repair shop, and transfer building were built around 1983 and the MRF was added in 1994 (Figure 2). During Rainbow's ownership and operation of the site as a transfer station, various maintenance activities using solvents, fuels and waste oils have occurred at the site. A total of twelve USTs have been documented to exist on the site, all of which have been removed (Figure 2). A release of diesel fuel occurred in 1984 from a diesel fuel pipeline near the transfer building. Rainbow purchased the parcel north of their existing site to implement clean-up. The northern half of the site went through extensive investigation and remediation during the late 1980s and early 1990s to clean up the release and UST areas. After remediation and extensive soil and groundwater monitoring investigations, it was determined in 1996 that residual concentrations had reached acceptable levels. As a result, the LUST case for the subject site was given a closure letter on October 15, 1996 by the Santa Ana Regional Water Quality Control Board..

3 TOXICITY ASSESSMENT

This step of the HRC documents the dose-response relationship for arsenic. The dose-response assessment characterizes the relationship between the dose of a chemical and the potential for an adverse health effect in the exposed population. Based on this quantitative dose-response relationship, CalEPA and USEPA have applied the results of chemical-specific toxicity assessments to derive numerical toxicity criteria to estimate the likelihood of a specific adverse health effect occurring as a function of exposure. The methods used to establish the dose-response criteria associated with evaluating potential carcinogenic and noncarcinogenic health risks are described in the following sections.

Although USEPA has developed toxicity criteria for the oral and inhalation routes of exposure, it has not developed toxicity criteria for the dermal route of exposure. USEPA has proposed a method for extrapolating oral toxicity criteria to the dermal route in the recently released *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* (USEPA, 2004). In this guidance document, USEPA states that an adjustment of the oral toxicity factor for dermal exposures should be made when the oral-gastrointestinal absorption efficiency of the chemical of interest is less than 50 percent. For arsenic, the oral bioavailability value recommended by USEPA (2001), which is 25 percent, was used in this HRA. This value is based on oral bioavailability studies of monkeys administered arsenic in a soil matrix (Roberts *et al.* 2001; cited in USEPA 2001). The arsenic oral RfD and CSF are based on a human drinking water study, which also includes a dietary contribution to the total dose (USEPA 2007). The matrix differences between the critical study (drinking water/food) versus the oral bioavailability studies (soil) contribute to the uncertainty in the risk characterization. Since it is generally assumed that oral absorption from water is essentially complete (100 percent), no adjustment to the oral toxicity criteria is necessary (USEPA 2004). In addition, Wester *et al.* (1993) demonstrated that there is no statistical difference in the dermal absorption from water and soil in monkeys (USEPA, 2001).

3.1 CARCINOGENIC HEALTH EFFECTS

The current approach to carcinogenic risk assessment used by USEPA, CalEPA, and other U.S. regulatory agencies assumes that any level of exposure to a carcinogen poses a finite probability, however small, of producing a carcinogenic response. Based on studies to date, it is believed that this assumption results in predictions that overestimate actual risk (USEPA, 1986, 2005). The default regulatory methodology assumes that there is no threshold to carcinogenic effects. The linearized multistage (LMS) low dose extrapolation model is applied to high dose data to predict carcinogenic response at low doses. The use of this model is recognized to represent an extremely conservative approach to assessing carcinogenic potency (USEPA, 1986, 2005).

Cancer slope factors (CSFs) are generally derived from the LMS or similar model. Based on the non-threshold theory for carcinogens, the modeling assumes a carcinogenic risk of zero only at zero dose (i.e., at all doses some risk is assumed to be present). The chemical-specific CSF, which is expressed in units of $(mg/kg\text{-}day)^{-1}$, represents the 95 percent upper confidence limit of the probability of carcinogenic response per unit daily intake of a substance over a lifetime. The CSF is applied in the risk characterization to estimate the potential cancer risk, as described in Section 6.1.

Arsenic is classified as a known human carcinogen by both CalEPA (CalEPA/OEHHA, 2007) and USEPA (2007). The CalEPA CSFs for arsenic used in this HRC are listed in Table 1. Summary references for these values, downloaded from the CalEPA/OEHHA website (CalEPA, 2007), are provided in Appendix A.

3.2 NONCARCINOGENIC HEALTH EFFECTS

It is widely accepted that most biological effects of chemicals occur only after a threshold dose is reached. That is to say, there is a range of doses that exists from zero to some finite value that can be tolerated by an animal or human with essentially no adverse health effects. For the evaluation of noncarcinogenic health effects, CalEPA/OEHHA Reference Exposure Levels (RELs) and USEPA Reference Doses (RfDs), that incorporate the concept of a biological threshold, are used. The REL and RfD are defined as the daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of adverse health effects during the period of exposure. For the purposes of establishing health criteria, the threshold dose is usually estimated from the no-observed adverse effect level (NOAEL) or the lowest-observed adverse effect level (LOAEL) determined from human studies, in the case of arsenic. The NOAEL is defined as the highest dose at which no adverse effects are observed, while the LOAEL is defined as the lowest dose at which adverse effects are observed. Safety factors are applied to the NOAEL or LOAEL to provide a margin of safety in establishing the chemical-specific REL or RfD. The REL or RfD is applied in the risk characterization to estimate the potential noncancer health hazard, as described in Section 5.2.

For purposes of assessing the potential for noncarcinogenic health effects associated with short-term exposure periods (i.e., up to seven years), subchronic toxicity values are employed where available (USEPA, 1989). Because CalEPA has not derived an oral RfD for arsenic, the USEPA subchronic oral RfD was used to assess the hazard quotient for the dermal contact and soil ingestion exposure pathways (USEPA, 1997a). For arsenic, the USEPA subchronic and chronic RfDs are the same. Neither the CalEPA/OEHHA toxicity database (CalEPA/OEHHA, 2007) nor the USEPA Integrated Risk Information System (IRIS) toxicity database list a subchronic inhalation RfD or REL for arsenic. Accordingly, the CalEPA/OEHHA *chronic* inhalation REL (CALEPA/OEHHA, 2007) was conservatively applied for assessment of subchronic exposure via inhalation.

The noncarcinogenic toxicity values and sources are listed in Table 1. Summary references for these values, downloaded from the CalEPA/OEHHA website (CalEPA, 2007) and the USEPA IRIS website (USEPA, 2007) are provided in Appendix A. Additionally, the page from the Health Effects Assessment Summary Tables (HEAST, USEPA, 1997a)

4 EXPOSURE ASSESSMENT

This section identifies the receptors and exposure pathways evaluated in the HRC. It also discusses the exposure parameters, the dose calculations, and the exposure point concentrations (EPCs).

4.1 RECEPTORS

The receptors evaluated for the short-term construction/excavation scenario are follows:

- An on-site construction/excavation worker exposed for a 6-month project.
- A downwind child resident exposed for a 6-month project.
- A downwind adult resident exposed for a 6-month project.

These receptors were identified based on USEPA guidance for short-term worker assessment (USEPA, 2002) and site-specific information.

4.2 EXPOSURE PATHWAYS

Pathways of exposure are the means through which an individual may come into contact with a chemical. For a complete exposure pathway to exist, each of the following elements must be present (USEPA, 1989):

- A source and mechanism for chemical release;
- An environmental transport medium (e.g., air, water, soil);
- A point of potential human contact with the medium; and
- A route of exposure (e.g., inhalation, ingestion, dermal contact).

The complete exposure pathways for the on-site construction/excavation worker receptors are:

- Dermal contact with soil,
- Incidental soil ingestion, and
- Inhalation of particulates emitted from soil.

The complete exposure pathway for the downwind residential receptors is:

- Inhalation of particulates emitted from soil.

4.3 DOSE ESTIMATION

Dose is defined as the amount of chemical absorbed into the body over a given period of time (USEPA, 1989). For carcinogenic effects, the dose is averaged over a lifetime and is referred to as the lifetime average daily dose (LADD). For noncarcinogenic effects, the dose is averaged over the period of exposure and is referred to as the average daily dose (ADD).

Consistent with current USEPA guidance, the following general dose equation is used to assess exposure:

$$\text{Dose} = \frac{C \times IR \times CF \times B \times EF \times ED}{BW \times AT}$$

where:

Dose = Lifetime Average Daily Dose (LADD) (mg/kg-day) for carcinogens; Average Daily Dose (ADD) (mg/kg-day) for noncarcinogens

C = Chemical concentration (e.g., mg/m^3, mg/kg)

IR = Intake rate (e.g., m^3/day, mg/day)

CF = Conversion factor (1E-06 kg/mg, if needed)

Bio = Bioavailability (unitless)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (period over which exposure is averaged - days) (25,550 days for carcinogens; = ED x 365 days/yr for noncarcinogens)

The exposure pathway-specific dose equations are presented below.

4.3.1 Dermal Contact with Soil

$$\text{Dose} = \frac{C_{soil} \times ABS \times SA \times AF \times CF \times EF \times ED}{BW \times AT}$$

where:

Dose = Average Daily Dose (ADD) (mg/kg-day) for noncarcinogens; Lifetime Average Daily Dose (LADD) (mg/kg-day) for carcinogens

C_{soil} = Chemical concentration in soil (mg/kg)

ABS = Absorption factor (fraction)

SA = Skin surface area available for contact (cm^2 per event)

AF = Adherence factor (mg/cm^2)

CF = Conversion factor (1E-06 kg/mg)

EF = Exposure frequency (events/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (period over which exposure is averaged - days) (= ED x 365 days/yr for noncarcinogens; 25,550 days for carcinogens)

4.3.2 Soil Ingestion:

$$\text{Dose} = \frac{C_{soil} \times IR \times B \times FI \times CF \times EF \times ED}{BW \times AT}$$

where:

Dose	=	Average Daily Dose (ADD) (mg/kg-day) for noncarcinogens; Lifetime Average Daily Dose (LADD) (mg/kg-day) for carcinogens
C_{soil}	=	Chemical concentration in soil (mg/kg)
IR	=	Ingestion rate (mg/day)
Bio	=	Bioavailability (fraction)
FI	=	Fraction ingested from site (fraction)
CF	=	Conversion factor (1E-06 kg/mg)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (period over which exposure is averaged - days) (= ED x 365 days/yr for noncarcinogens; 25,550 days for carcinogens)

4.3.3 Inhalation of Particulates:

$$Dose = \frac{C_{soil} \times IR \times EF \times ED}{PEF \times BW \times AT}$$

where:

Dose	=	Average Daily Dose (ADD) (mg/kg-day) for noncarcinogens; Lifetime Average Daily Dose (LADD) (mg/kg-day) for carcinogens
C_{soil}	=	Chemical concentration in soil (mg/kg)
IR	=	Inhalation rate (m^3/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
PEF	=	Particulate emission factor (m^3/kg)
BW	=	Body weight (kg)
AT	=	Averaging time (period over which exposure is averaged - days) (= ED x 365 days/yr for noncarcinogens; 25,550 days for carcinogens)

4.4 Exposure Point Concentrations (EPCs)

The EPC is used in the dose equation to determine chemical intake rate. The EPC is the representative concentration of a COPC in an environmental medium that is potentially contacted by a receptor. It is defined as "the arithmetic average of the concentration that is contacted over the exposure period" (USEPA, 1989). To ensure that the estimate of the arithmetic average is conservative, USEPA recommends that a statistically-based upper confidence limit (UCL) on the mean concentration be employed as the EPC. For risk assessment, either the UCL or the maximum concentration within an exposure area may be used as the basis of the EPC (USEPA, 1989).

4.4.1 Soil EPCs

As a conservative screening approach, the soil EPC for arsenic was identified as the maximum concentration reported for the site, regardless of depth. Based on the results of the HRC (acceptable cancer risk and noncancer hazard), a more refined characterization for the arsenic soil EPC (e.g., calculation of a statistically-based upper confidence limit on the area-specific mean concentration) was not warranted

The soil data for metals are provided in Table 2. The site-wide maximum arsenic concentration, 15.9 mg/kg, is located in Component 1B (Table 2, p. 2).

4.4.2 Air EPCs

The soil EPC is used as the source term for EPCs of particulate-bound metals in air. In accordance with USEPA guidance (USEPA, 2002), the USEPA default construction/excavation particulate emission factor (PEF) was employed to conservatively estimate the arsenic EPC in on-site air based on the maximum soil concentration. The PEF relates the concentration of chemical in soil with the concentration of respirable dust particles in air due to fugitive dust emissions from soil during construction/excavation activities. The HRC conservatively assumes that downwind dust concentrations during the pad removal activities are equal to those derived for on-site air. This is a very conservative assumption, as dilution occurs as dust is transported down wind. Based on the USEPA default PEF of 4.4×10^8 and the maximum soil EPC (15.9 mg/kg), the air EPC for arsenic is $(15.9\ mg/kg)/\ (4.4 \times 10^8\ m^3/kg) = 3.6 \times 10^{-8}\ mg/m^3$.

4.5 Exposure Parameter Values

The exposure parameter values (e.g., breathing rate and exposure time) are input into the dose equations, along with the EPC concentrations, to yield dose estimates for each receptor. The exposure parameter values used in this HRC are default values recommended by USEPA (USEPA, 1997b, 2002). A site-specific exposure duration of six months was used, based on an upperbound estimate of pad removal activities. Actual open soil conditions will occur during only a portion of that time; however, it was conservatively assumed that excavation-related dust would be present each day for 6 months. The pathway-specific exposure parameter values are presented in Table 3.

5 RISK CHARACTERIZATION

The risk characterization combines outputs of the exposure and dose-response assessments to characterize the potential health risks for the short-term construction/excavation scenario receptors. The risk characterization endpoints, incremental lifetime cancer risk and hazard index, are discussed below. The calculation sheets are provided in Appendix B. Uncertainties associated with the cancer risk and hazard index estimates are discussed in Section 6.

5.1 INCREMENTAL LIFETIME CANCER RISK (ILCR)

The ILCR is characterized as the upperbound probability of an individual developing cancer over a lifetime as a result of the potential reasonable maximum exposure to the site related COPC(s) (USEPA, 1989). The incremental probability of developing cancer (i.e., the theoretical excess cancer risk) is that risk attributed to exposure to the COPC(s) present at the site and is independent of non-site-related cancer risks (USEPA, 1989). For example, national cancer statistics indicate that each male has a 1 in 2 chance, or 500,000 chances in one million, of developing cancer during his lifetime and that each female has a 1 in 3 chance, or 333,333 chances in one million, of developing cancer in her lifetime (American Cancer Society, 2007). Accordingly, an individual with an incremental cancer risk of 1-in-one million (denoted as 1E-06 or 1×10^{-6}) has a total cancer risk of 500,001-in-one million (male) or 333,334-in-one million (female). The theoretical incremental lifetime cancer risk is based on the total incremental lifetime average daily dose (LADD) of the COPC received as a result of the assumed site-specific exposure over a 70-year (25,550 days) lifetime (USEPA, 1989). The ILCRs were calculated for each receptor evaluated as follows:

1. A cancer risk estimate for each exposure pathway was obtained by multiplying the lifetime average daily dose (LADD) for that pathway by the pathway-specific CalEPA cancer slope factor (SF)[4].
2. The pathway-specific cancer risk estimates were summed for each receptor.

In accordance with USEPA guidance (USEPA, 1986, 2005), ILCRs are rounded to one significant figure for final reporting. As defined by the USEPA cancer guidelines, the carcinogenic health risk lies between the upperbound probability and zero; however, for purposes of risk management, the upperbound value is reported (USEPA, 1986, 2005).

The ILCRs are summarized in Table 4. The calculation spreadsheets are presented in Appendix B, Tables B-1 and B-3.

5.2 NONCANCER HAZARD INDEX (HI)

The potential for noncarcinogenic health effects is characterized by comparing the predicted average daily dose (ADD) to a safe dose ("reference dose") (RfD) (USEPA, 1989). In accordance with USEPA guidance (1989, 2002), subchronic RfDs (and chronic RfDs for chemicals lacking subchronic RfDs) are used for the short-term construction/excavation worker scenario[5]. As discussed in Section 4, RfDs are identified as exposure levels at which no adverse health effects are expected to occur throughout the period of exposure, even for sensitive individuals.

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[4] CalEPA and USEPA have not developed toxicity criteria for the dermal route of exposure, but have identified a method for extrapolating oral toxicity criteria to the dermal route (USEPA, 2004).

[5] As discussed in Section 3.2, the CalEPA/OEHHA *chronic* inhalation REL (CALEPA/OEHHA, 2007) was conservatively applied for assessment of subchronic exposure via inhalation.

In order to evaluate the general acceptability of a particular dose relative to a reference dose, a hazard quotient (HQ) is calculated for each COPC exposure pathway. The HQ is the ADD divided by the RfD. The HI is the sum of the hazard quotients for each chemical (USEPA, 1989).

HIs were calculated as follows:

1. A HQ for each exposure pathway was obtained by dividing the ADD for that pathway by the pathway-specific RfD[6].
2. The pathway-specific HQs were summed to calculate the total HI.

The HIs are summarized in Table 4. The calculation spreadsheets are presented in Appendix B, Tables B-2 and B-4.

5.3 Risk Characterization Summary

The ILCR and HI estimated for the site-specific receptors are as follows:

On-Site Construction/Excavation Worker Receptor Exposed for 6 Months

- The ILCR is 1E-06 (1-in-one million).
- The HI is 0.03.

Downwind Residential Receptor Exposed for 6 Months

- The ILCR is 2E-09 (0.002-in-one million).
- The HI for the child is 0.001
- The HI for the adult is 0.0004.

The ILCRs for the short-term construction/excavation scenario receptors are less than the acceptable ILCR identified by the CalEPA Safe Drinking Water and Toxic Enforcement Act of 1986 and are within the USEPA acceptable risk range. Accordingly, ILCRs for these receptors are considered to be *de minimis* (of no concern). The noncancer HIs for the short-term construction/excavation scenario receptors are less than the maximum acceptable HI of 1, indicating that there is no potential for noncancer health effects.

[6] USEPA has not developed toxicity criteria for the dermal route of exposure, but has proposed a method for extrapolating oral toxicity criteria to the dermal route (USEPA, 2004).

6 UNCERTAINTY ANALYSIS

USEPA guidance recommends that the risk characterization include an assessment of the level of confidence in the risk descriptor values (the incremental lifetime cancer risk and the hazard index) (USEPA, 1989, 2000). Because the risk descriptors are conditional estimates based on a number of assumptions, the level of confidence in the assumptions and the related impact on the risk estimators are discussed. As discussed by USEPA, this key information should be addressed in the uncertainty analysis (USEPA, 2000).

6.1 Chemicals of Potential Concern

HBFD identified arsenic as the only COPC requiring assessment at this time for the short-term construction/excavation scenario. Although a formal COPC selection process was not conducted, this selection is supported based on the toxicity of arsenic and concentrations of arsenic in site soils relative to other metals that be emitted adhered to dust during pad removal activities. Accordingly, the potential for underestimation of risk associated with COPC selection is low.

6.2 Toxicity Assessment

Sources of uncertainty associated with toxicity values may include (USEPA, 1989):

- Use of dose-response data from animal studies to predict effects in humans;
- Use of dose-response data from effects observed at high doses to predict the adverse health effects that may occur following exposure to low levels expected from human contact in the environment;
- The extrapolation of short-term study data to longer term exposures;
- The use of long-term (chronic) toxicity criteria for short-term (subchronic) exposure scenarios; and
- The extrapolation of toxicity data from one route of exposure to another route of exposure.

These areas of uncertainty are further discussed below in regard to arsenic.

Animal-to-Human Extrapolation

The cancer slope factors and chronic inhalation REL derived by CalEPA, as well as the subchronic oral reference dose derived by USEPA, are based on human studies. Therefore, uncertainties regarding the extrapolation of animal data are not a concern.

High-to-Low Dose Extrapolation

For arsenic, CalEPA and USEPA consider their methods of identifying relevant data from workplace and epidemiological exposure studies, and extrapolating those data to lower doses that humans may be exposed to in risk assessment scenarios, to be health protective based on the following[7]:

- For cancer risk characterization, CalEPA employs the LMS low-dose extrapolation model and uses the 95 percent upper confidence limit of the slope of the predicted dose-response as the basis for the cancer slope factor (i.e., there is only a 5 percent chance that the probability of a response could be greater than the estimated value on the basis

[7] Details regarding the conservative assumptions employed by CalEPA and USEPA in deriving toxicity criteria for arsenic are provided in the toxicity databases (CalEPA/OEHHA, 2007; USEPA, 2007).

of the experimental data and model used). The LMS model has been generally recognized to be one of the most conservative low dose extrapolation models available. It is generally accepted that LMS-based high-to-low dose extrapolation modeling does not lead to the underestimation of risk (USEPA, 1986, 1989, 2005).

- The basis for the noncancer reference dose is the identification of a dose below which no adverse effects are seen. Safety factors are applied to this dose, as deemed appropriate, to ensure that a reference dose does not underestimate the human toxicity of a particular chemical. Accordingly, the potential to underestimate the noncancer hazard is low.

Extrapolation of Short-Term Exposure Data to Longer Term Exposure Scenarios

This type of extrapolation was not conducted in this HRA.

Use of Chronic Exposure Toxicity Criteria for Subchronic Exposure Scenarios

Neither a subchronic REL nor subchronic inhalation RfD are listed in the primary toxicity databases by CalEPA/OEHHA (2007) or USEPA (2007)[8]. Therefore, the CalEPA *chronic* inhalation REL (CalEPA/OEHHA, 2007) was applied for the subchronic exposure scenarios evaluated in the HRA. This approach is conservative, as subchronic toxicity values are generally less stringent than chronic values.

It is noted that the USEPA Hazard Identification Assessment Review Committee identified toxicological endpoints for 1-30 day and 1-6 month inhalation exposure periods in support of a Reregistration Eligibility Document for the non-food use of pentavalent arsenic (As^{+5}) as contained in the wood preservative Chromated Copper Arsenate (CCA) (USEPA, 2001). Based on that assessment, USEPA identified 0.0005 mg/kg-day as a safe level for inhalation exposure for both exposure periods, for noncancer endpoints. This short-term value, which is applicable to residential receptors (including children) and worker receptors, is 58 times higher (less stringent) than the chronic REL used in this HRA, lending further support to the conservatism associated with use of the chronic REL for the short-term exposures evaluated.

Route-to-Route Extrapolation

Dermal toxicity criteria are not available from the USEPA. Typically, a simple route-to-route (oral-to-dermal) extrapolation is assumed and oral toxicity criteria (RfD and CSF) are used to quantify potential systemic effects associated with dermal exposure. However, as noted in USEPA's RAGS Part E, Supplemental Guidance for Dermal Risk Assessment (USEPA, 2004), there is uncertainty associated with this approach because the oral toxicity criteria are based on an administered dose and not an absorbed dose. In general, USEPA (2004) recommends an adjustment to the oral toxicity criteria to convert an administered dose into an absorbed dose. The adjustment accounts for the absorption efficiency of the chemical in the "critical study" that is the basis of the oral toxicity criterion. If the oral absorption in the critical study is 100 percent, then the absorbed dose is equivalent to the administered dose and no adjustment is necessary. If the oral absorption of a chemical in the critical study is poor (less than 50 percent), then the absorbed dose is much smaller than the administered dose. In this situation, an adjustment to the oral toxicity criteria is recommended.

For arsenic, the oral bioavailability value recommended by USEPA (2001), which is 25 percent, was used in this HRA. This value is based on oral bioavailability studies of monkeys

[8] Additionally, ATSDR has not derived an intermediate inhalation Minimum Risk Level (MRL) for arsenic (ATSDR, 2004).

administered arsenic in a soil matrix (Roberts *et al.* 2001; cited in USEPA, 2001). The arsenic oral RfD and CSF are based on a human drinking water study, which also includes a dietary contribution to the total dose (USEPA 2007). The matrix differences between the critical study (drinking water/food) versus the oral bioavailability studies (soil) contribute to the uncertainty in the risk characterization. However, it is generally assumed that oral absorption from water is essentially complete (100 percent). Therefore, no adjustment to the oral toxicity criteria is necessary (USEPA 2004). In addition, Wester *et al.* (1993) demonstrated that there is no statistical difference in the dermal absorption from water and soil in monkeys (USEPA, 2001). Thus, the magnitude of arsenic absorption is considered equivalent for water and soil and no adjustment to the oral toxicity criteria is necessary for arsenic. Therefore, the uncertainty associated with the dermal risks/hazards presented in this risk assessment is considered low and toxicity is not likely underestimated.

6.3 EXPOSURE ASSESSMENT

Uncertainties in the exposure assessment can be related to representativeness of site characterization data, exposure scenarios, exposure parameter values, and exposure point concentrations (EPCs).

<u>Representativeness of Site Characterization Data for Exposure Concentration</u>

Exposure may be underestimated if site characterization data for COPCs are not representative of the potential exposure points. Representativeness is evaluated by (1) spatial coverage of sample locations relative to potential sources and potential exposure locations and (2) laboratory quality control data. These are discussed further below.

Based on the location of soil samples analyzed for arsenic and arsenic concentrations relative to health-based concentrations for construction/excavation scenario receptors, site soil has been adequately characterized for purposes of the HRC. Additionally, the maximum concentration of arsenic detected in site soil was used as the exposure concentration for arsenic in soil and in air. This was a highly conservative approach to exposure assessment, as area-specific average concentrations are generally used as the basis of exposure assessment. Further, the maximum concentration of arsenic in site soil was located at 10 feet below ground surface (bgs). It is unlikely that removal of the pads will involve excavation of soil to that depth.

Laboratory reports for arsenic analysis by EPA Method 6010B were reviewed for quality control parameters related to representativeness (USEPA, 1992) and data were deemed complete and representative for the site. Chain-of-custody, holding time, analytical procedure, and laboratory control spike recoveries all met data usability criteria for risk assessment (USEPA, 1992). Accordingly, there is acceptable confidence that the arsenic data for site soils are representative.

<u>Exposure Scenarios and Input Parameter Values</u>

Assumptions regarding land use and receptor activities influence the selection of input parameters employed in the exposure assessment (e.g., time spent at a particular location, weight, age, breathing rate of potential receptors, environmental media contacted by the receptors). Default RME exposure parameter values (USEPA, 1997b, 2002) were used for the short-term construction/excavation worker receptor scenario, with the exception of the exposure duration of six months. Based on site-specific information, it is unlikely that removal of the three pads will require soil disturbance activities for six months. Accordingly, the potential for underestimation of risk due to the period assumed for exposure duration is low.

In summary, the potential for underestimation of exposure for the short-term construction/excavation scenario is low.

6.4 RISK CHARACTERIZATION

Uncertainties in risk characterization results (e.g., incremental lifetime cancer risk and noncancer hazard index) may result from uncertainties in individual steps of the risk assessment (discussed above). The risk assessment components that most likely contribute to uncertainty were identified and discussed. Based on these analyses, and the results of the HRA, the most noteworthy information regarding the risk characterization is summarized below.

COPCs – Although a formal COPC selection process was not conducted, the selection of arsenic as the key COPC is supported based on the toxicity of arsenic and concentrations of arsenic in site soils relative to other metals that be emitted adhered to dust during pad removal activities. Accordingly, the potential for underestimation of risk associated with COPC selection is low.

Toxicity Assessment – The toxicity values employed in the HRC to characterize dose-response relationships, are acknowledged to be health-protective. In order to avoid uncertainties associated with exposure route extrapolation, a chronic (more conservative) REL was used to characterize noncancer health hazard for the inhalation pathway. Additionally, the toxicity criteria used in this HRC are based on human data. Accordingly, uncertainties associated with the toxicity assessment are not likely to lead to underestimations in the risk estimates.

Exposure Assessment – The selection of receptors was based on site-specific information. USEPA reasonable maximum exposure (RME) values were employed for all parameters. The RME, as defined by the USEPA, is the "highest exposure that is reasonably expected to occur" and is intended to best represent a conservative exposure estimate that is within the range of possible exposures (USEPA, 1989, 1991). Site-specific assumptions were deemed conservative. Accordingly, the potential for underestimation of exposure for all potential receptors is deemed to be low.

Risk Characterization – Standard risk characterization equations were applied to estimate the cancer risk and hazard index for the site-specific receptors. In general, cancer risk estimates are characterized for chronic exposure scenarios. However, cancer risks were calculated for the short-term worker scenarios evaluated in this HRC to provide the information to the risk manager. Recent USEPA guidance (USEPA, 2005) suggests that "Unless there is evidence to the contrary in a particular case, the cumulative dose received over a lifetime, expressed as average daily exposure prorated over a lifetime, is recommended as an appropriate measure of exposure to a carcinogen." This method was used in the HRC. Based on the conservative methods employed in all steps of the HRC, the likelihood that cancer risk has been underestimated is low.

While it is recognized that uncertainties are inherent in the health risk assessment process, USEPA and CalEPA are confident that health risk assessment serves as a health-protective analytical framework that can be used to support environmental decisions having the objective of protecting human health (USEPA, 1989; NAS, 1983).

7 LIMITATIONS

This HRC is applicable only to the site-specific exposure scenarios identified. Additional exposure scenarios (e.g., long-term onsite workers) are not addressed in this assessment.

The services described in this report were performed consistent with current regulatory guidance and generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client. Any reliance on this report by a third party is at such party's sole risk.

The assessments contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulation subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

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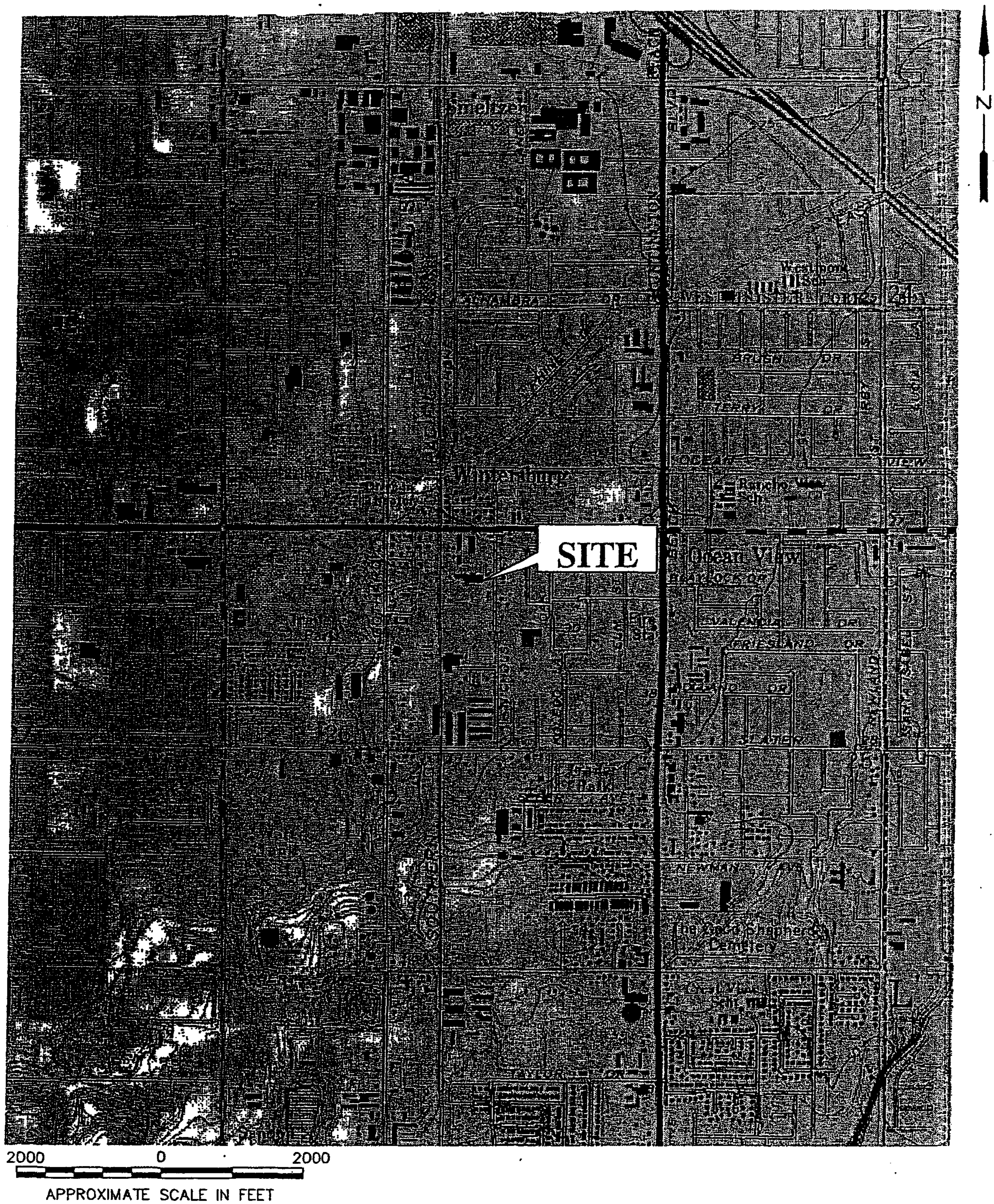
FIGURES



ENVIRON STRATEGY CONSULTANTS, INC.

30 Hughes, Suite 209
Irvine, California 92618

FIGURE 1
SITE VICINITY MAP

RAINBOW DISPOSAL
17121 NICHOLS ST.
HUNTINGTON BEACH, CA

DATE: 06/10/04

PROJECT NO. 281–A

FILE NO. 281AFig1

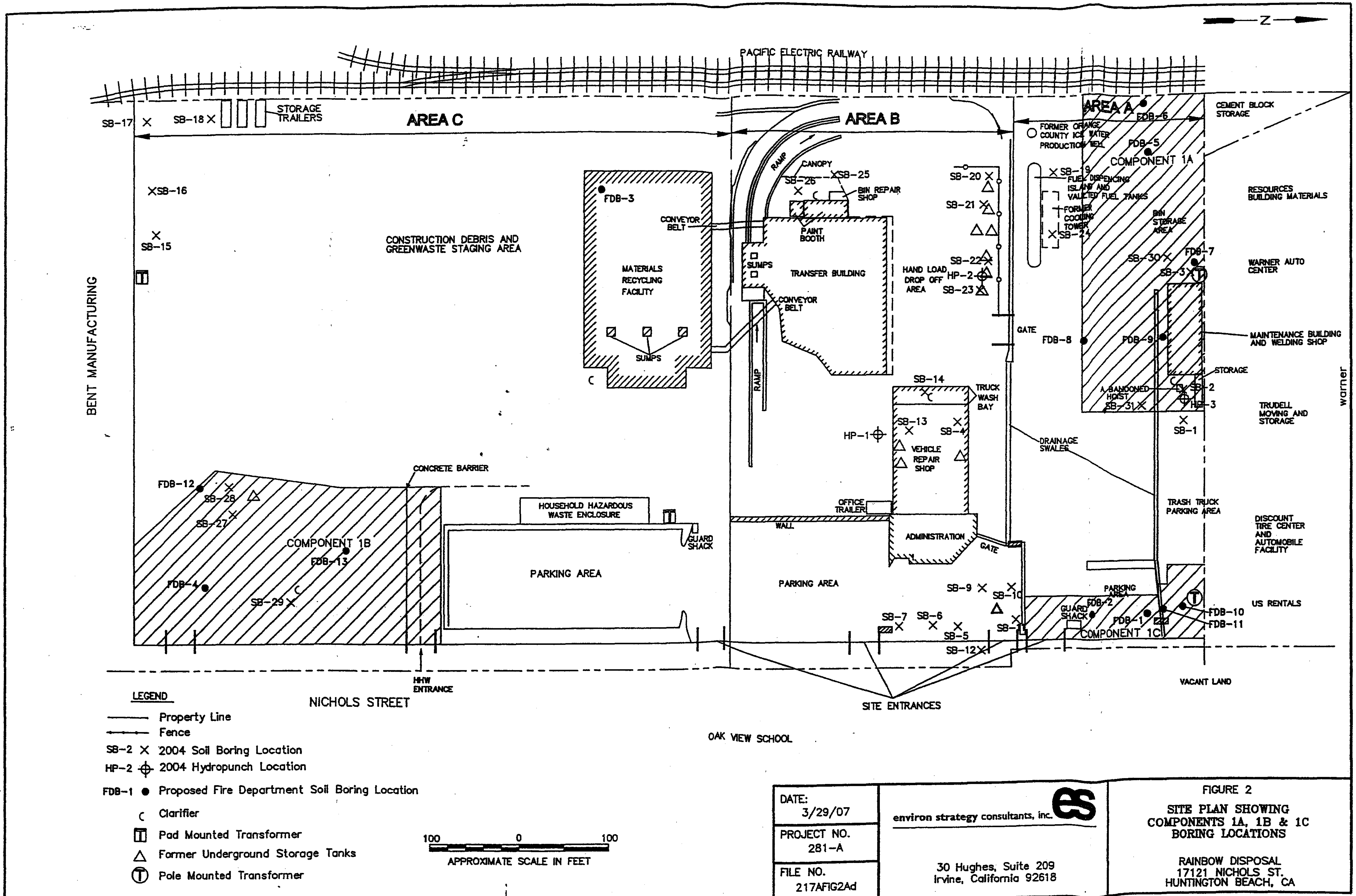


FIGURE 2
SITE PLAN SHOWING COMPONENTS 1A, 1B & 1C BORING LOCATIONS

TABLES

TABLE 1. TOXICITY CRITERIA FOR ARSENIC

Rainbow Disposal, 17121 Nichols Street, Huntington Beach, CA

Chemical	CSFo 1/(mg/kg-d)	Source	RfDo (mg/kg-d)	Source	CSFi 1/(mg/kg-d)	Source	RfDi (mg/kg-d)	Source
Arsenic	9.45E+00	c	3.0E-04	i, h	1.2E+01	c	8.6E-06	c

Source notes: "i" = IRIS (USEPA, 2006), "h" = Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997), "c"=California EPA (CalEPA/OEHHA, 2006)

CSFo = Oral cancer slope factor; RfDo = Oral reference dose; CSFi = Inhalation cancer slope factor; and RfDi = Inhalation reference dose.

The subchronic RfDo is equal to the chronic RfDo (USEPA, 1997). The chronic RfDo is documented in detail in USEPA, 2007.

RfDi is based on the CalEPA/OEHHA Reference Exposure Level (REL) of 0.03 ug/m^3, 20m^3/day inhalation rate and 70 kg body weight (CALEPA/OEHHA, 2007; USEPA, 1989).

TABLE 2
RAINBOW DISPOSAL COMPANY, INC. SOIL METALS RESULTS - COMPONENT 1A
(all units are mg/kg)

Sample ID	Date	Antimony	Arsenic	Barrium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
TTLC[1] (mg/kg)		500	500	10,000	75	100	2,500	8,000	2,500	1,000	20	3,600	2,000	100	500	700	2,400	5,000
STLC[2] (mg/L)		15	6.0	100	0.75	1.0	5	80	25	5.0	0.2	350	20	1.0	5	7.0	24	250
PRG-Ind[3] (mg/kg)		410	0.25	67,000	1,900	450	450	1,900	41,000	800	310	5,100	20,000	5,100	5,100	67	7,200	100,000
PRG-Res[4] (mg/kg)		31	0.062	5,400	150	37	210	900	3,100	150	23	390	1,600	390	390	5.2	550	23,000
FDB-5-5	2/22/07	<0.750	3.43	87.5	0.561	<0.500	16.2	9.72	12.4	7.1	<0.0835	0.511	15.2	<0.750	<0.250	<0.750	33.8	40.6
FDB-5-10	2/22/07	2.11	11.8	81.3	1.04	<0.500	29.7	10.8	35.2	7.32	<0.0835	0.546	26.4	<0.750	<0.250	<0.750	50.7	85.6
FDB-5-15	2/22/07	<0.750	7.89	77.0	0.260	<0.500	17.4	10.2	16.0	6.02	<0.0835	<0.250	18.5	<0.750	<0.250	<0.750	36.7	46.3
FDB-5-20	2/22/07	<0.750	1.10	19.8	<0.250	<0.500	4.21	1.84	3.36	0.840	<0.0835	<0.250	2.74	<0.750	<0.250	<0.750	6.78	10.7
FDB-6-3	3/26/07	<0.750	4.38	43.4	<0.250	<0.500	31.0	4.01	24.9	42.5	<0.0835	0.522	5.56	<0.750	<0.250	<0.750	48.7	48.0
FDB-6-8	3/26/07	<0.750	5.45	92.2	0.289	0.510	15.8	9.47	16.9	5.92	<0.0835	0.294	14.2	<0.750	<0.250	<0.750	41.2	45.4
FDB-6-13	3/26/07	<0.750	14.8	210	0.788	0.892	26.6	15.1	38.0	11.6	<0.0835	0.767	27.6	<0.750	<0.250	<0.750	66.9	74.1
FDB-7-2	3/26/07	<0.750	2.16	42.8	<0.250	<0.500	8.71	4.94	7.63	3.24	<0.0835	0.315	7.07	<0.750	<0.250	<0.750	21.4	25.0
FDB-8-5	3/26/07	<0.750	1.86	122	0.518	<0.500	16.3	8.73	14.6	7.57	<0.0835	<0.250	14.7	<0.750	<0.250	<0.750	29.1	40.5
FDB-8-10	3/26/07	<0.750	14.6	106	0.902	0.821	28.8	12.3	41.4	15.6	<0.0835	0.766	32.3	<0.750	<0.250	0.950	60.4	72.4
FDB-8-15	3/26/07	<0.750	6.64	106	0.263	0.645	22.9	12.2	20.7	6.10	<0.0835	0.324	18.5	<0.750	<0.250	<0.750	47.9	63.2
FDB-9-5	3/26/07	<0.750	3.54	195	0.524	0.547	17.4	8.88	16.6	7.48	<0.0835	0.459	15.9	<0.750	<0.250	<0.750	33.8	44.9
FDB-9-10	3/26/07	<0.750	3.97	74.4	0.447	<0.500	16.3	8.12	18.1	6.85	<0.0835	1.20	15.0	<0.750	<0.250	<0.750	37.1	50.7
FDB-9-15	3/26/07	<0.750	4.92	228	0.599	0.837	27.7	15.8	30.8	16.2	<0.0835	0.562	24.7	<0.750	<0.250	<0.750	49.3	69.0
FDB-9-20	3/26/07	<0.750	8.95	102	0.515	0.584	18.3	10.1	19.6	9.09	<0.0835	<0.250	16.5	<0.750	<0.250	<0.750	40.7	56.6

1 TTLC - Total Threshold Limit Concentration Values for select inorganic persistent and bioaccumulative toxic substances per Title 22 Section 66261.24 Characteristic of Toxicity.

2 STLC - Soluble Threshold Limit Concentration Values for select inorganic persistent and bioaccumative toxic substances per Title 22 Section 66261.24 Characteristic of Toxicity.

3 PRG-Ind - Preliminary Remediation Goals for Industrial land use promulgated by EPA Region 9 (USEPA, 2004)

4 PRG-Res - Preliminary Remediation Goals for Residential land use promulgated by EPA Region 9 (USEPA, 2004).

Non-detect values are presented as less than (<) the reporting limit.

TABLE 2

RAINBOW DISPOSAL COMPANY, INC., SOIL METALS RESULTS - COMPONENT 1B

(all units are mg/kg)

Sample ID	Date	Antimony	Arsenic	Barrium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
TTLC[1] (mg/kg)		500	500	10,000	75	100	2,500	8,000	2,500	1,000	20	3,500	2,000	100	500	700	2,400	5,000
STLC[2] (mg/L)		15	5.0	100	0.75	1.0	5	80	25	5.0	0.2	350	20	1.0	5	7.0	24	250
PRG-Ind[3] (mg/kg)		410	0.25	67,000	1,900	450	450	1,900	41,000	800	310	5,100	20,000	5,100	5,100	67	7,200	100,000
PRG-Res[4] (mg/kg)		31	0.062	5,400	150	37	210	900	3,100	150	23	390	1,600	390	390	5.2	550	23,000
FDB-4-5	2/22/07	3.36	14.8	277	0.768	0.558	24.8	18.4	28.7	14.6	<0.0835	0.778	25.4	<0.750	<0.250	<0.750	59.4	103
FDB-4-10	2/22/07	1.09	15.9	95.8	0.258	1.72	16.8	7.89	32.5	84.5	5.42	<0.250	12.9	<0.750	<0.250	<0.750	32.0	947
FDB-4-15	2/22/07	<0.750	5.73	96.7	0.539	<0.500	18.8	10.5	15.0	7.89	<0.0835	<0.250	15.7	<0.750	<0.250	<0.750	38.9	48.0
FDB-4-20	2/22/07	<0.750	1.89	70.4	<0.250	<0.500	15.4	9.48	15.4	4.980	<0.0835	<0.250	14.2	<0.750	<0.250	<0.750	32.80	49.7
FDB-12-3	3/26/07	<0.750	1.68	60.3	0.650	<0.500	18.1	8.84	12.9	6.7	<0.0835	<0.250	13.5	<0.750	<0.250	<0.750	33.2	40.1
FDB-12-8	3/26/07	<0.750	3.37	51.6	0.611	0.573	20.0	10.7	19.6	7.85	<0.0835	<0.250	17.9	<0.750	<0.250	<0.750	43.6	53.5
FDB-12-13	3/26/07	<0.750	12.1	201	1.11	1.17	37.8	20.2	36.9	14.0	<0.0835	0.449	37.3	<0.750	<0.250	0.981	63.1	93.7
FDB-13-5	3/26/07	<0.750	1.91	58.2	0.626	0.527	21.4	8.85	18.6	6.91	<0.0835	<0.250	14.2	<0.750	<0.250	<0.750	33.9	60.3
FDB-13-10	3/26/07	<0.750	3.92	96.0	0.619	0.841	23.4	12.3	25.2	8.72	<0.0835	<0.250	20.6	<0.750	<0.250	<0.750	44.2	62.6

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2 STLC - Soluble Threshold Limit Concentration Values for select inorganic persistent and bioaccumative toxic substances per Title 22 Section 66261.24 Characteristic of Toxicity.
3 PRG-Ind - Preliminary Remediation Goals for Industrial land use promulgated by EPA Region 9 (USEPA, 2004).
4 PRG-Res - Preliminary Remediation Goals for Residential land use promulgated by EPA Region 9 (USEPA, 2004).

Non-detect values are presneted as less than (<) the reoprting limit.

TABLE 2

RAINBOW DISPOSAL COMPANY, INC. SOIL METALS RESULTS - COMPONENT 1C

(all units are mg/kg)

Sample ID	Date	Antimony	Arsenic	Barrium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
TTLC (mg/kg)		500	500	10,000	75	100	2,500	8,000	2,500	1,000	20	3,500	2,000	100	500	700	2,400	5,000
STLC (mg/L)		15	5.0	100	0.75	1.0	5	80	25	5.0	0.2	350	20	1.0	5	7.0	24	250
PRG-Ind (mg/kg)		410	0.25	67,000	1,900	450	450	1,900	41,000	800	310	5,100	20,000	5,100	5,100	67	7,200	100,000
PRG-Res (mg/kg)		31	0.062	5,400	150	37	210	900	3,100	150	23	390	1,600	390	390	5.2	550	23,000
FDB-1-5	2/22/07	0.797	5.61	136	0.327	<0.500	19.7	12.0	16.1	6.2	<0.0835	<0.250	16.2	<0.750	<0.250	<0.750	42.8	54.3
FDB-1-10	2/22/07	<0.750	14.9	144	0.396	0.564	17.2	11.1	20.8	4.52	<0.0835	0.341	15.5	<0.750	<0.250	<0.750	39.6	44.0
FDB-1-15	2/22/07	<0.750	6.37	203	<0.250	<0.500	18.0	12.0	18.2	5.95	<0.0835	0.480	21.2	<0.750	<0.250	<0.750	34.7	67.0
FDB-1-20	2/22/07	0.800	15.6	93.5	0.385	<0.500	32.6	14.0	26.5	7.70	<0.0835	0.304	28.5	<0.750	<0.250	<0.750	49.1	67.1
FDB-2-5	2/22/07	<0.750	5.35	69.2	0.591	<0.500	14.9	7.75	16.5	7.3	<0.0835	<0.250	14.0	<0.750	<0.250	<0.750	31.2	43.6
FDB-2-10	2/22/07	<0.750	4.36	37.7	<0.250	<0.500	6.96	4.50	4.93	2.02	<0.0835	<0.250	4.69	<0.750	<0.250	<0.750	19.2	24.3
FDB-2-15	2/22/07	<0.750	1.67	28.7	<0.250	<0.500	4.42	2.25	2.92	1.40	<0.0835	0.342	2.89	<0.750	<0.250	<0.750	8.60	11.5
FDB-2-20	2/22/07	1.56	15.8	90.1	0.503	0.591	28.4	15.8	28.1	10.3	<0.0835	0.399	27.1	<0.750	<0.250	<0.750	53.8	71.5
FDB-10-2	3/26/07	<0.750	2.60	104	0.627	<0.500	16.4	8.18	14.9	7.1	<0.0835	0.266	15.1	<0.750	<0.250	<0.750	27.2	38.3
FDB-11-3	3/26/07	<0.750	1.40	120	0.465	0.607	20.9	9.85	18.3	6.13	<0.0835	<0.250	16.2	<0.750	<0.250	<0.750	45.1	54.3
FDB-11-8	3/26/07	<0.750	3.14	55.1	0.293	<0.500	13.5	6.42	13.7	4.1	<0.0835	<0.250	10.8	<0.750	<0.250	<0.750	35.0	37.5
FDB-11-13	3/26/07	<0.750	12.1	165	1.10	0.991	35.6	17.9	42.4	11.70	<0.0835	0.604	31.3	<0.750	<0.250	1.07	62.0	81.1

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2 STLC - Soluble Threshold Limit Concentration Values for select inorganic persistent and bioaccumative toxic substances per Title 22 Section 66261.24 Characteristic of Toxicity.

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4 PRG-Res - Preliminary Remediation Goals for Residential land use promulgated by EPA Region 9 (USEPA, 2004).

Non-detect values are presented as less than (<) the reporting limit.

TABLE 3
EXPOSURE PARAMETER VALUES

General Parameters	On-Site Short-Term Construction Worker	Downwind Child Resident	Downwind Adult Resident
Exposure Frequency (EF)	125 days/year (site-specific)	175 days (site-specific)	175 days (site-specific)
Exposure Duration (ED)	1 year (USEPA, 2002)	1 year (USEPA, 2002)	1 year (USEPA, 2002)
Body Weight (BW)	70 kg (USEPA, 2002)	15 kg (USEPA, 2002)	70 kg (USEPA, 2002)
Averaging Time (AT)	70 years (25,550 days) (for cancer endpoint)(USEPA, 1989) 1 year (365 days) (for noncancer endpoint) (USEPA, 1989)	70 years (25,550 days) (for cancer endpoint)(USEPA, 1989) 1 year (365 days) (for noncancer endpoint) (USEPA, 1989)	70 years (25,550 days) (for cancer endpoint)(USEPA, 1989) 1 year (365 days) (for noncancer endpoint) (USEPA, 1989)

Inhalation (Particulates)	On-Site Short-Term Construction Worker	Downwind Child Resident	Downwind Adult Resident
Inhalation Rate (IR)	20 m^3/day (USEPA, 2002)	8.3 m^3/day (USEPA, 1997b)	13.2 m^3/day (USEPA, 1997b)
Particulate Emission Factor (PEF)	4.4 x 10^8 m^3/kg (USEPA, 2002)	4.4 x 10^8 m^3/kg (USEPA, 2002)	4.4 x 10^8 m^3/kg (USEPA, 2002)

Dermal Contact	On-Site Short-Term Construction Worker
Absorption Fraction (ABS)	Arsenic: 0.03 (USEPA, 2004)
Surface Area (SA)	3300 cm^2/event (USEPA, 2002)
Adherence Factor (AF)	0.3 mg/cm^2 (USEPA, 2002)
Event Frequency (EF)	125 events/year (site-specific)

Soil Ingestion	On-Site Short-Term Construction Worker
Ingestion Rate (IR)	330 mg/day (USEPA, 2002)
Fraction Ingested (FI)	1 (default)
Bioavailability (Bio)	Arsenic: 0.25 (Roberts et al., 2001; USEPA, 2001)

TABLE 4. HEALTH RISK CHARACTERIZATION SUMMARY
RAINBOW DISPOSAL

Receptor	Hazard Index	Cancer Risk
On-Site Short-Term Worker	**3.0E-02**	**1E-06**
Downwind Resident - Adult	**3.8E-04**	6E-10
Downwind Resident - Child	**1.1E-03**	2E-09
Downwind Resident - Child + Adult	NA	**2E-09**

APPENDIX A

TOXICITY CRITERIA FOR ARSENIC

Cancer Potency Information

OEHHA   My CA

Toxicity Criteria Database: Cancer Potency

New Search:

Chemical Name

Arsenic

OR

CAS Number

7440382

Inhalation Unit Risk (μg/cubic meter)$^{-1}$	0.0033
Inhalation Slope Factor (mg/kg-day)$^{-1}$	12
Oral Slope Factor (mg/kg-day)$^{-1}$	9.45
USEPA Classification	A: Human carcinogen
IARC Classification	1
Comments	
Reference	OEHHA, 2002 Technical Support Document for Describing Available Cancer Potency Factors OEHHA, 2004 Public Health Goal for Arsenic in Drinking Water

Chronic Reference Exposure Levels (RELs)

OEHHA / My CA

Toxicity Criteria Database: Chronic RELs

New Search:

Chemical Name

Arsenic

OR

CAS Number

7440382

New Search

Chronic Inhalation REL (µg/m3):	0.03
Listed in CAPCOA:	Yes
US EPA RfC:	No
Target Organ(s):	development, cardiovascular system, nervous system
Human data:	No

U.S. Environmental Protection Agency

Integrated Risk Information System

Arsenic, inorganic (CASRN 7440-38-2)

Health assessment information on a chemical substance is included in IRIS only after a comprehensive review of toxicity data by U.S. EPA health scientists from several Program Offices, Regional Offices, and the Office of Research and Development.

Disclaimer: This QuickView represents a snapshot of key information. We suggest that you read the Full IRIS Summary to put this information into complete context.

For definitions of terms in the IRIS Web site, refer to the IRIS Glossary.

Status of Data for Arsenic, inorganic

File First On-Line: 02/10/1988
Last Significant Revision: 06/01/1995

Category	Status	Last Revised
Oral RfD Assessment	On-line	02/01/1993
Inhalation RfC Assessment	No data	
Carcinogenicity Assessment	On-line	04/10/1998

Chronic Health Hazard Assessments for Noncarcinogenic Effects

Reference Dose for Chronic Oral Exposure (RfD)

Critical Effect	Point of Departure	UF	MF	RfD
Hyperpigmentation, keratosis and possible vascular complications	NOAEL : 0.0008 mg/kg-day	3	1	3×10^{-4} mg/kg-day

The Point of Departure listed serves as a basis from which the Oral RfD was derived. See Discussion of Conversion Factors and Assumptions for more details.

Principal Study
Human chronic oral exposure, Tseng, 1977; Tseng et al., 1968

Confidence in the Oral RfD
Study -- Medium
Database -- Medium
RfD -- Medium

Reference Concentration for Chronic Inhalation Exposure (RfC)

Not Assessed under the IRIS Program.

Carcinogenicity Assessment for Lifetime Exposure

Weight of Evidence Characterization

Weight of Evidence (1986 US EPA Guidelines):
A (Human carcinogen)

Weight of Evidence Narrative:
Based on sufficient evidence from human data. An increased lung cancer mortality was observed in multiple human populations exposed primarily through inhalation. Also, increased mortality from multiple internal organ cancers (liver, kidney, lung, and bladder) and an increased incidence of skin cancer were observed in populations consuming drinking water high in inorganic arsenic.

This may be a synopsis of the full weight-of-evidence narrative. See Full IRIS Summary.

Quantitative Estimate of Carcinogenic Risk from Oral Exposure

Oral Slope Factor(s)	Extrapolation Method
1.5 per mg/kg-day	Time- and dose-related formulation of the multistage model

Drinking Water Unit Risk(s):
$5x10^{-5}$ per ug/L

Drinking Water Concentrations at Specified Risk Levels

Risk Level	Concentration
E-4 (1 in 10,000)	2 ug/L
E-5 (1 in 100,000)	$2x10^{-1}$ ug/L
E-6 (1 in 1,000,000)	$2x10^{-2}$ ug/L

Dose-Response Data (Carcinogenicity, Oral Exposure)
Tumor Type: Skin cancer
Test Species: Human
Route: Oral, Drinking water
Reference: Tseng, 1977; Tseng et al., 1968; U.S. EPA, 1988

Quantitative Estimate of Carcinogenic Risk from Inhalation Exposure

Air Unit Risk(s)	Extrapolation Method
$4.3x10^{-3}$ per ug/m3	Absolute-risk linear model

Air Concentrations at Specified Risk Levels

Risk Level	Concentration
E-4 (1 in 10,000)	$2x10^{-2}$ ug/m3
E-5 (1 in 100,000)	$2x10^{-3}$ ug/m3
E-6 (1 in 1,000,000)	$2x10^{-4}$ ug/m3

Dose-Response Data (Carcinogenicity, Inhalation Exposure)
Tumor Type: Lung cancer
Test Species: Human, male
Route: Inhalation, Occupational exposure
Reference: Brown and Chu, 1983a,b,c; Lee-Feldstein, 1983; Higgins, 1982; Enterline and Marsh, 1982

Revision History

Review Full IRIS Summary for complete Revision History.

Synonyms

Arsenic
Arsenic, inorganic
7440-38-2
Gray-arsenic
Arsenic, inorganic

APPENDIX B

INCREMENTAL LIFETIME CANCER RISK AND HAZARD INDEX CALCULATION SPREADSHEETS

Table B-1. On-Site Short-Term Worker Incremental Lifetime Cancer Risk (ILCR)
Rainbow Disposal, 17121 Nichols St., Huntington Beach, CA

INGESTION

Chemical	C_s* (mg/kg)	IR (mg/d)	FI (u)	Bio (u)	CF (kg/mg)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	SFo (mg/kg-d)-1	ILCR (u)
Arsenic	1.59E+01	330	1	0.25	1E-06	125	1.0	70	25,550	9.17E-08	9.45E+00	8.66E-07
											Total:	8.66E-07

DERMAL CONTACT

Chemical	C_s* (mg/kg)	ABS (u)	SA (cm^2/event)	AF (mg/cm^2)	CF (kg/mg)	EF (events/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	SFo (mg/kg-d)-1	ILCR (u)
Arsenic	1.59E+01	3.00E-02	3.30E+03	3.00E-01	1.00E-06	125	1.0	70	25,550	3.30E-08	9.45E+00	3.12E-07
											Total:	3.12E-07

PARTICULATE INHALATION

Chemical	C_s* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	SFi (mg/kg-d)-1	Cancer Risk (u)
Arsenic	1.59E+01	4.40E+08	20	125	1.0	70	25,550	5 05E-11	1.2E+01	6.06E-10
									Total	6.06E-10

Summary	Ingestion	Dermal Contact	Part. Inhal.	Cancer Risk
On-Site Short-Term Worker	9E-07	3E-07	6E-10	1E-06

* EPC based on the maximum detected arsenic concentration in soil.

Acronyms:
ABS - Dermal absorption factor (u - unitless)
AF - Soil-to-skin adherence factor (mg/cm2 - milligram per square centimeter)
AT - Averaging time (days)
Bio. - Bioavailability (oral) (u - unitless)
BW - Body weight (kg - kilograms)
CF - Conversion factor (kg/mg - kilograms per milligram)
Cs - EPC in soil (mg/kg - milligrams per kilogram)
ED - Exposure duration (yrs - years)
EF - Exposure frequency (days/yr - days per year)
EPC - Exposure point concentration (i.e., Cs)
FI - Fraction ingested (u - unitless)
ILCR - Incremental lifetime cancer risk
IR - Intake rate (e.g., soil ingestion rate, inhalation rate) (mg/day - milligrams per day, m3/day - cubic meter per day)
LADD - Lifetime average daily dose (mg/kg-d - milligrams per kilogram per day)
PEF - Particulate emission factor (m3/kg - cubic meter per kilogram)
SA - Exposed skin surface area (cm2/event - square centimeter per event)
SFi - Inhalation cancer slope factor {[mg/kg-d]-1 - kilogram per day per milligram}
SFo - Oral cancer slope factor {[mg/kg-d]-1 - kilogram per day per milligram}

Table B-2. On-Site Short-Term Worker Hazard Index (HI)
Rainbow Disposal, 17121 Nichols St., Huntington Beach, CA

INGESTION

Chemical	C_s^* (mg/kg)	IR (mg/d)	FI (u)	Bio (u)	CF (kg/mg)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient (u)
Arsenic	1.59E+01	330	1	0.25	1E-06	125	1.0	70	365	6.42E-06	3.0E-04	2.14E-02
											Total:	2.14E-02

DERMAL CONTACT

Chemical	C_s^* (mg/kg)	ABS (u)	SA (cm^2/event)	AF (mg/cm^2)	CF (kg/mg)	EF (events/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient (u)
Arsenic	1.59E+01	3.00E-02	3.30E+03	3.00E-01	1.00E-06	125	1.0	70	365	2.31E-06	3.0E-04	7.70E-03
											Total:	7.70E-03

PARTICULATE INHALATION

Chemical	C_s^* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	RfDi (mg/kg-d)	Hazard Quotient (u)
Arsenic	1.59E+01	4.40E+08	20	125	1.0	70	365	3.54E-09	8.60E-06	4.11E-04
									Total:	4.11E-04

Summary	Ingestion	Dermal Contact	Part. Inhal.	TOTAL HI
On-Site Short-Term Worker	2.1E-02	7.7E-03	4.1E-04	3.0E-02

* EPC based on the maximum detected arsenic concentration in soil.

Acronyms:
ABS - Dermal absorption factor (u - unitless)
ADD - Average daily dose (mg/kg-day)
AF - Soil-to-skin adherence factor (mg/cm2 - milligram per square centimeter)
AT - Averaging time (days)
Bio. - Bioavailability (oral) (u - unitless)
BW - Body weight (kg - kilograms)
CF - Conversion factor (kg/mg - kilograms per milligram)
Cs - EPC in soil (mg/kg - milligrams per kilogram)
ED - Exposure duration (yrs - years)
EF - Exposure frequency (days/yr - days per year)
EPC - Exposure point concentration (i.e., Cs)
FI - Fraction ingested (u - unitless)
IR - Intake rate (e.g., soil ingestion rate, inhalation rate) (mg/day - milligrams per day, m3/day - cubic meter per day)
PEF - Particulate emission factor (m3/kg - cubic meter per kilogram)
RfDi - Inhalation reference dose (mg/kg-day)
RfDo - Oral reference dose (mg/kg-day)
SA - Exposed skin surface area (cm2/event - square centimeter per event)

Table B-3. Downwind Resident Incremental Cancer Risk (ILCR)
Rainbow Disposal, 17121 Nichols St., Huntington Beach, CA

DOWNWIND PARTICULATE INHALATION*

Adult:

Chemical	C_s^* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	SFi (mg/kg-d)-1	ILCR (u)
Arsenic	1.59E+01	4.40E+08	13.2	175	1	70	25,550	4.67E-11	1.2E+01	5.60E-10

Child:

Chemical	C_s^* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	SFi (mg/kg-d)-1	ILCR (u)
Arsenic	1.59E+01	4.40E+08	8.3	175	1	15	25,550	1.37E-10	1.2E+01	1.64E-09

Summary	Part. Inhal.	Cancer Risk
Downwind Adult Resident	6E-10	**6E-10**
Downwind Child Resident	2E-09	**2E-09**
	Total Resident:	**2E-09**

* EPC based on the maximum detected arsenic concentration in soil.

Acronyms:

ABS - Dermal absorption factor (u - unitless)
AF - Soil-to-skin adherence factor (mg/cm2 - milligram per square centimeter)
AT - Averaging time (days)
Bio. - Bioavailability (oral) (u - unitless)
BW - Body weight (kg - kilograms)
Ca - Exposure point concentration (EPC) in air (mg/m3 - milligrams per cubic meter)
CF - Conversion factor (kg/mg - kilograms per milligram)
Cs - EPC in soil (mg/kg - milligrams per kilogram)
ED - Exposure duration (yrs - years)
EF - Exposure frequency (days/yr - days per year)
EPC - Exposure point concentration (i.e., Cs)
FI - Fraction ingested (u - unitless)
ILCR - Incremental lifetime cancer risk
IR - Intake rate (e.g., soil ingestion rate, inhalation rate) (mg/day - milligrams per day, m3/day - cubic meter per day)
LADD - Lifetime average daily dose (mg/kg-d - milligrams per kilogram per day)
PEF - Particulate emission factor (m3/kg - cubic meter per kilogram).
SA - Exposed skin surface area (cm2/event - square centimeter per event)
SFI - Inhalation cancer slope factor ([mg/kg-d]-1 - kilogram per day per milligram)
SFo - Oral cancer slope factor ([mg/kg-d]-1 - kilogram per day per milligram)
UCL - Upper confidence limit

Table B-4. Downwind Resident Hazard Index (HI)
Rainbow Disposal, 17121 Nichols St., Huntington Beach, CA

DOWNWIND PARTICULATE INHALATION*

Adult:

Chemical	C_s* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	RfDi (mg/kg-d)	Hazard Quotient (u)
Arsenic	1.59E+01	4.40E+08	13.2	175	1	70	365	3.27E-09	8.60E-06	3.80E-04

Child:

Chemical	C_s* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	RfDi (mg/kg-d)	Hazard Quotient (u)
Arsenic	1.59E+01	4.40E+08	8 3	175	1	15	365	9.59E-09	8.60E-06	1.11E-03

Summary	Part. Inhal.	TOTAL HI
Downwind Adult Resident	3.80E-04	**3.8E-04**
Downwind Child Resident	1.1E-03	**1.1E-03**

* EPC based on the maximum detected arsenic concentration in soil.

Acronyms:

ADD - Average daily dose (mg/kg-day)
AT - Averaging time (days)
BW - Body weight (kg - kilograms)
Cs - EPC in soil (mg/kg - milligrams per kilogram)
ED - Exposure duration (yrs - years)
EF - Exposure frequency (days/yr - days per year)
EPC - Exposure point concentration (i.e., Cs)
IR - Intake rate (e.g., inhalation rate) (m3/day - cubic meter per day)
PEF - Particulate emission factor (m3/kg - cubic meter per kilogram)
RfDi - Inhalation reference dose (mg/kg-day)

APPENDIX B

CITY OF HUNTINGTON BEACH

2000 MAIN STREET CALIFORNIA 92648

FIRE DEPARTMENT

May 4, 2007

Mr. Ron Shenkman
17121 Nichols Street
Huntington Beach, CA 92647

Dear Mr. Shenkman:

SUBJECT: RAINBOW DISPOSAL COMPANY - HEALTH RISK CHARACTERIZATION

In an effort to address soil contamination issues and protect the health and safety of the community, the Huntington Beach Fire Department maintains standards for soil clean-up. These standards are based on research and studies that have been performed for our City, and include recommendations and findings of other Federal, State and County regulatory agencies. In order to obtain approvals for your development project, you have provided us with soil sampling information. We appreciate your efforts in making health and safety a priority in your project objectives and are dedicated to providing a high level of service to you and all members of the community.

The Fire Department and our environmental consultant have reviewed the April 30, 2007 Health Risk Assessment Characterization, Future Excavation/Construction Scenario, submitted by Environ Strategy Consultants, Inc. on behalf of Rainbow Disposal Company Inc. Geosyntec Consultant, Inc., the Fire Department's consultant for this project, has provided preliminary comments and is in the process of a more detailed toxicological review. The results of the continued review will be provided to you as soon as completed. Environ Strategy Consultants' health risk assessment (HRA) was written in response to an April 23, 2007 meeting regarding soil conditions at the Huntington Beach Rainbow Disposal Company site.

While the HRA document provides some of the information required for decision making purposes, additional information is required. The outstanding elements that will need to be addressed are:

- Statistical analysis of naturally occurring background arsenic concentrations in the area and/or region.

- Comparison information regarding other State and County agencies that allow threshold levels of arsenic contaminates at varying soil depths (such as 1-3 feet, 6-9 feet, and greater than 10 feet below grade).

- The City currently requires excavation and remediation or removal of contaminated soils containing arsenic levels exceeding 10 parts per million.

- The City has **not** defined a level of acceptable cancer risk at 1:1,000,000 nor 10:1,000,000. This tolerance rate is referenced in pages 4 and 5 of the HRA. The health risk characterization report is one element of City consideration for site approval. The project proponent needs to substantiate the appropriate level of risk associated with on-site contaminates of potential concern (COPC's) based on current and future land-use and exposure scenarios. This may include references to similar projects and/or written regulatory guidance on acceptable risk levels.

- Provide analysis of exposure protection by infrastructure elements such as pavement/concrete pads.

- Provide information that will allow analysis of acceptable COPC levels in residential and commercial/industrial developments.

- Provide comparisons and citations of other applicable regulatory arsenic standards from agencies including and not limited to; the United States Environmental Protection Agency (EPA), California Environmental Protection Agency/Department of Toxic Substances Control (DTSC), California Department of Health Services (CDHS), Orange County Health Care Agency (OCHCA) and California Regional Water Quality Control Board (RWQCB).

- A written Remedial Action Plan (RAP) may be necessary for the project. The RAP would describe the actions required to comply with all Federal, State, County and City clean-up regulatory standards.

The focus of this request is to provide a greater scope of information to the Fire Department regarding this development project. This information will be the basis of our overall evaluation and decision making process for project approval consideration. The protection of public health is a primary mission of the Fire Department and we believe that you share this mission as well. In closing, I appreciate your commitment concerning resolve of this issue and am available to answer questions and provide information regarding this request.

Sincerely,

Eric G. Engberg
Division Chief/Fire Marshal

EE:sm

c: Penny Culbreth-Graft, City Administrator
Paul Emery, Deputy City Administrator
Duane Olson, Fire Chief
Jerry Moffatt, Rainbow Disposal Company
John E. McNamara, Environ Strategy Consultants, Inc.
Margaret Patrick, Environ Strategy Consultants, Inc.
Teri L. Copeland, Environmental Toxicologist
Richard Harlow, Richard A. Harlow & Associates
Eric Smalstig, Geosyntec Consultants, Inc.
Terri Elliott, Public Works Principal Civil Engineer
Lee Caldwell, Fire Development Specialist

Teri L. Copeland, M.S., DABT
Environmental Toxicologist

5737 Kanan Rd. #182, Agoura Hills, CA 91301 * (818) 991-8240 phone (818) 991-8140 fax

Technical Memorandum

To: Fire Chief Duane Olson
City of Huntington Beach Fire Department (HBFD)

From: Teri L. Copeland, M.S., DABT and Joanne Otani Fehling R.N., M.S.N., P.H.N.

Date: May 9, 2007

Re: Health Risk Characterization, Future Construction/Excavation Scenario, Exposure to Arsenic in Soil, Rainbow Disposal Company, Inc., 17121 Nichols Street, Huntington Beach, California

Response to HBFD Questions Regarding Arsenic

This technical memorandum presents responses to comments provided by the HBFD during a meeting held on May 7, 2007 regarding the *Health Risk Characterization, Future Construction/Excavation Scenario, Exposure to Arsenic in Soil, Rainbow Disposal Company, Inc., 17121 Nichols Street, Huntington Beach, California* (Copeland and Otani Fehling, April 30, 2007) (HRC). The HBFD comments were as follows:

(1) Please provide information regarding uncertainties in animal-to-human data extrapolation for arsenic.
(2) Please provide information regarding the use of an oral bioavailability factor of 25% for arsenic in soil.
(3) Please provide information regarding the use of the cancer slope factors for arsenic and the 25% oral bioavailability factor in health risk assessments conducted for CalEPA and other agencies.

Responses to these comments are provided below.

I. Uncertainties Regarding the Extrapolation of Animal Data to Humans

As discussed during the meeting, the CalEPA (as well as USEPA) cancer slope factors for arsenic that were used in the HRC are based on human data. Accordingly, it was not necessary for CalEPA to rely on animal data for the derivation of these values.

The CalEPA oral cancer slope factor for arsenic was derived using the most comprehensive study of human oral exposure to arsenic (Tseng, 1977 and Tseng et al., 1968, cited in CalEPA/OEHHA, 2002 and USEPA, 2007). This study involved over 40,000 Taiwanese residents who were exposed to arsenic in artesian well water that was used as the drinking water source for long periods of time (more than 45 years) and 7,500 individuals that served as controls. A clear dose-response relationship for skin cancer was observed. The human data were considered reliable for the following reasons (CalEPA/OEHHA, 2002):

- The study and control populations (40,421 and 7,500, respectively) were large enough to provide reliable estimates of the skin cancer incidence rates;

- A statistically significant elevation in skin cancer incidence in the exposed population compared to the control population was observed many years after exposure onset;
- A pronounced skin cancer dose-response by exposure level was demonstrated;
- The exposed and control populations were similar in occupational and socioeconomic status, with ingestion of arsenic-contaminated drinking water the only apparent difference between the two populations;
- Over 70 percent of the observed skin cancer cases were pathologically confirmed; and
- Other human studies of chronic arsenic exposure resulting in increased skin cancer or internal organ cancer incidence provide supportive data.

CalEPA/OEHHA applied a conservative multistage low-dose extrapolation model to the skin incidence data for Taiwanese males (the subgroup with the highest skin cancer prevalence) as the basis for the oral cancer slope factor. The results of the low-dose extrapolation model were reported as a range (based on using linear as well as quadratic model fitting). CalEPA/OEHHA selected the highest value within the range for the oral cancer slope factor (1.5 per mg/kg-day). USEPA, in an independent assessment, derived the same value for the oral cancer slope factor (USEPA, 2007). The chemical-specific cancer slope factor, which is expressed in units of $(mg/kg\text{-}day)^{-1}$ (or risk-per-dose), represents the 95 percent upper confidence limit of the probability of carcinogenic response per unit daily intake (daily dose) of a chemical over a lifetime. It is multiplied by the estimated dose in order to characterize upper bound incremental lifetime cancer risk. It is generally accepted that high-to-low dose extrapolation modeling used by CalEPA and USEPA does not result in underestimation of risk (USEPA, 1986, 1989, 2005).

The CalEPA/OEHHA inhalation cancer slope factor for arsenic is based on data from two human studies of smelter workers in Anaconda, Montana (Welch et al., 1982; Higgins et al., 1985; and Lee-Feldstein, 1986 [cited in CalEPA/OEHHA, 2002]) and in Tacoma, Washington (Enterline et al., 1987 [cited in CalEPA/OEHHA, 2002]). Although the dose-response relationships reported for these studies indicated less-than-linear trends, CalEPA/OEHHA conservatively applied a linear low-dose extrapolation model to derive an inhalation cancer slope factor of 0.0033 per ug/m^3 air (which converts to 12 per mg/kg-day). USEPA, in an independent assessment, derived a similar value for the inhalation cancer slope factor (USEPA, 2007).

II. Use of an Oral Bioavailability Factor of 25% for Arsenic in Soil

In August of 2001, the USEPA Health Effects Division's Hazard Identification Assessment Review Committee (HIARC) evaluated the toxicology data base for inorganic arsenic and established toxicological endpoints for incidental residential and commercial/industrial exposure risk assessments (USEPA, 2001). As a key component of that assessment, HIARC established the appropriate relative bioavailability of arsenic in soil versus arsenic in water. This value is summarized below.

Oral bioavailability, an important parameter for health risk assessment, is a term used to describe the percentage of a chemical in an environmental medium (e.g., soil, water, food) which is absorbed by humans following exposure via ingestion. The National Research Council (NRC) defines the bioavailability processes as the "individual physical, chemical, and biological interactions that determine the exposure of organisms to chemicals associated with soils and sediments" (NRC, 2003). An oral bioavailability factor accounts for the difference between absorption in the studies upon which the toxicity values are based and the actual absorption likely to occur when humans are exposed to soil. While most arsenic in water is in a soluble form and easily absorbed after ingestion, this is not the case for arsenic in soil, which is chemically bound to soil and must dissociate from ingested soil particles and be in the soluble form before it can be absorbed across the gastrointestinal lining. When conducting a health risk assessment using toxicity values derived from studies in which arsenic exposure was due to ingestion of water, it is appropriate to make an adjustment when predicting internal doses associated with exposure to arsenic in soil. The concept of relative bioavailability is used to make this adjustment. The relative bioavailability of arsenic in soil versus arsenic in water is defined as the percentage of arsenic absorbed into the body after exposure to arsenic in soil compared to the percentage of arsenic absorbed into the body after exposure to arsenic in water.

For purposes of health risk assessment, USEPA evaluated a number of studies of relative bioavailability of arsenic (USEPA, 2001). After careful consideration of data reported in the various bioavailability studies, USEPA determined that the monkey was considered an appropriate study model for humans due to its similarity in excretion and gastrointestinal absorption characteristics (USEPA, 2001). The comprehensive monkey study conducted by Roberts et al. on the behalf of the Florida Department of Environmental Protection (DEP) (Roberts et al., 2002) was identified by USEPA as the study of choice. That study identified the maximum of the arithmetic mean value for relative bioavailability for each of five soil types, 24.7%, as a "conservative, upper bound case for any particular soil type". While the maximum individual value reported in the study was 32.4%, the authors did not recommend this value for use as a "reasonable maximum exposure (RME) value for risk assessment on the basis that "Only under highly specific, rare circumstances is the maximum value for a particular parameter used in environmental characterization, exposure assessment and risk assessment." USEPA agreed with Florida DEP and selected 25% as a RME value for relative bioavailability for health risk assessments of arsenic in soil (USEPA, 2001).

III. Agency Acceptance of Cancer Slope Factors and Oral Bioavailability for Arsenic in Health Risk Assessments

Cancer Slope Factors – CalEPA (all divisions) *requires* the use of its oral and inhalation cancer slope factors for health risk assessments of both residential and non-residential exposure scenarios. The cancer slope factors are also the basis for the CalEPA Proposition 65 No-Significant-Risk-Level (NSRL) for arsenic (CalEPA/OEHHA, 2006). Other regulatory agencies that the authors of the HRC have worked with require the use of the USEPA cancer slope factors for arsenic. These agencies include, but are not limited to: USEPA, Nevada Division of Environmental Protection (NDEP), Arizona Department of Environmental Quality (ADEQ), Utah Department of Environmental Quality, Pennsylvania Department of Environmental Protection, Ohio Environmental Protection Agency, and South Carolina Department of Health and Environmental Control.

Oral Bioavailability for Arsenic – Regulatory agencies which have provided oversight for risk assessments that have employed the value of 25% for oral bioavailability of arsenic in soil include: USEPA, NDEP, ADEQ, DTSC, RWQCB, San Luis Obispo County Environmental Health, Santa Cruz County Environmental Health Services, Los Angeles Fire Department, and City of Torrance Fire Department.

IV. References Cited

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CITY OF HUNTINGTON BEACH

2000 MAIN STREET   FIRE DEPARTMENT   CALIFORNIA 92648

May 9, 2007

Ron Shenkman
17121 Nichols Street
Huntington Beach, CA 92647

Dear Mr. Shenkman:

SUBJECT: HEALTH RISK CHARACTERIZATION, FUTURE EXCAVATION / CONSTRUCTION SCENARIO, EXPOSURE TO ARSENIC SOIL, RAINBOW DISPOSAL COMPANY, 17121 NICHOLS STREET, HUNTINGTON BEACH, CA, 92647

The Huntington Beach Fire Department, in conjunction with our environmental consultant, Geosyntec Consultants, Inc., have reviewed the above referenced import health risk characterization report. The report, which was submitted by Margaret Patrick of Environ Strategy Consultants on behalf of Rainbow Disposal Company, demonstrates an acceptable level of risk for the scope of the work to remove three concrete pads at the facility. Based on the health risk characterization report submitted, the Fire Department approves the removal of the pads. Any work, outside the scope of this approval, will need to be submitted to the Fire Department for additional review and approval. Also, we look forward to receiving your future submittal of a complete health risk assessment for the entire site.

PLEASE NOTE:

- Conformance to City Specifications **DOES NOT** relieve the developer's responsibility regarding other concerned agency notification and/or approval (California Regional Water Quality Control Board (Santa Ana Region), South Coast Air Quality Management District, Department of Toxic Substance Control, County of Orange Health Care Agency, etc.).

- Prior to any on site activity, the Huntington Beach Public Works Department must be contacted and any necessary permits must be obtained, including haul route approvals. Additionally, the designated Public Works Inspector must be notified at (714) 536-5431 of all proposed work.

If you have any questions, you may contact me at (714) 536-5411.

Sincerely,

Eric G. Engberg,
Division Chief / Fire Marshal

c: Penny Culbreth-Graft, City Administrator
Paul Emery, Deputy City Administrator
Duane Olson, Fire Chief
Jerry Moffatt, Rainbow Disposal Company
John E. McNamara, Environ Strategy Consultants, Inc.
Margaret Patrick, Environ Strategy Consultants, Inc.
Teri L. Copeland, Environmental Toxicologist
Richard Harlow, Richard A. Harlow & Associates
Eric Smalstig, Geosyntec Consultants, Inc.
Terri Elliott, Public Works Principal Civil Engineer
Lee Caldwell, Fire Development Specialist

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CITY OF HUNTINGTON BEACH
2000 MAIN STREET FIRE DEPARTMENT CALIFORNIA 92648

May 10, 2007

Ron Shenkman
17121 Nichols Street
Huntington Beach, CA 92647

Dear Mr. Shenkman:

SUBJECT: FIRE DEPARTMENT COMMENTS TO THE HEALTH RISK CHARACTERIZATION, FUTURE EXCAVATION / CONSTRUCTION SCENARIO, EXPOSURE TO ARSENIC SOIL, RAINBOW DISPOSAL COMPANY, 17121 NICHOLS STREET, HUNTINGTON BEACH, CA 92647

The Huntington Beach Fire Department, in conjunction with our environmental consultant, Geosyntec Consultants, Inc., reviewed the above referenced health risk characterization (HRC) report, which was submitted by Margaret Patrick of Environ Strategy Consultants on behalf of Rainbow Disposal Company. Based on the information contained in the initial report, approval has been given for the removal of three paved pads at the site.

The City of Huntington Beach requested and received written comments regarding the HRC from a staff toxicologist at Geosyntec Consultants. During a May 8, 2007 meeting held at the City, Ms. Teri Copeland, M.S., DABT, stated that a site-wide human health risk assessment would be completed for the project. The Fire Department accepts this general approach and is requesting a written response to the specific comments listed below. The response to these comments will suffice until a Risk Assessment Workplan and Remedial Action Workplan are submitted.

General Comments:

- Overall, the human health risk characterization was performed according to contemporary U.S. EPA and Cal EPA guidance. Use of the maximum reported arsenic concentration as the exposure point concentration, along with the conservative nature of the default input assumptions for construction/excavation workers provide some confidence that the calculated risks are conservative. However, some aspects of the characterization use less conservative assumptions that might lead to questions on the overall conservatism of the results.

Specific Comments:

- An arsenic soil bioavailability adjustment factor was used to account for the decreased absorption of arsenic from soil as compared to the drinking water studies used to derive the toxicity information. To our knowledge, few regulatory agencies have adopted the inclusion of the monkey bioavailability study, and associated adjustment factors. For example, the State of Florida has adopted this study but used a 33% adjustment factor in its regulatory guidance. The factor of 25% used in this risk assessment is the mean bioavailability in the monkey studies and may not reflect the form of arsenic complexes present at the Rainbow Disposal site or variations in human and monkey absorption.

- An assumption of six (6) months was made for the construction/excavation exposure period. For non-cancer risk an averaging period of 12 month was selected. Because the time frame of toxicity from arsenic exposure is relatively short, the appropriate averaging time should match exposure period. However, it is appropriate to adjust the exposure to account for a five (5) day work-week.

- The particulate emission factor (PEF) for dusts generated from excavation and construction scenarios were presumably derived from the EPA Soil Screening Guidance using location specific dispersion terms (please cite exact reference). The level is approximately equal to 2.3 ug/m^3 of air. The utility of that value for exposure assessment for workers exposed while excavating may be questioned, as the levels of dust generated through construction and excavation activities, especially those involving demolition and removal as well as excavation, may exceed this level.

- While this characterization is not intended to encompass a broad suite of contaminants, it should be recognized that cumulative risk posed by arsenic *and* other constituents might collectively pose additional risks not captured in this characterization, even for the short term exposure scenario modeled. U.S. EPA and CalEPA risk assessment guidance was developed to evaluate the cumulative effects from multiple chemicals. This is particularly important when evaluating the cancer endpoint. Although a brief review of the metals data presented in this report does not seem to indicate that significant additional risk from other metals, no data or rationale is provided to account for other potential contaminants present in the soils at this site.

The Fire Department appreciates your efforts in the safe development of this site. In addition, we look forward to receiving a written response to these comments and your future submittal of the site-wide Risk Assessment and Remedial Action Workplans.

If you have any questions, you may contact me at (714) 536-5411.

Sincerely,

Eric G. Engberg,
Division Chief / Fire Marshal

EGE:sm

c: Penny Culbreth-Graft, City Administrator
Paul Emery, Deputy City Administrator
Duane Olson, Fire Chief
Jerry Moffatt, Rainbow Disposal Company
John E. McNamara, Environ Strategy Consultants, Inc.
Margaret Patrick, Environ Strategy Consultants, Inc.
Teri L. Copeland, Environmental Toxicologist
Richard Harlow, Richard A. Harlow & Associates
Eric Smalstig, Geosyntec Consultants, Inc.
Terri Elliott, Public Works Principal Civil Engineer
Lee Caldwell, Fire Development Specialist

environ strategy consultants, inc.

30 Hughes, Suite 209
Irvine, California 92618
tel 949.581.3222
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May 17, 2007

Project No. 281-E

Mr. Eric G. Engberg
Division Chief / Fire Marshal
City of Huntington Beach Fire Department
2000 Main Street-5th Floor
Huntington Beach, CA 92648

TRANSMITTAL:
Response to Comments Provided by Huntington Beach Fire Department Regarding *Health Risk Characterization, Future Construction/Excavation Scenario, Exposure to Arsenic in Soil*
Rainbow Disposal Co., Inc.
17121 Nichols Street
Huntington Beach, CA 92647

Dear Mr. Engberg:

Environ Strategy Consultants, Inc., on behalf of Rainbow Disposal Company Inc. (Rainbow) is pleased to present this *Response to Comments Provided by Huntington Beach Fire Department.*

If you have any questions regarding this report or require additional information, please do not hesitate to contact the Environmental Toxicologist, Ms. Teri Copeland, M.S., D.A.B.T. at (818) 991-8240 or the undersigned at (949) 581-3222.

Respectfully submitted,

Margaret Patrick

Margaret Patrick, P.G. 7320
Project Geologist

Attachment

cc: Mr. Duane Olson, City of Huntington Beach Fire Department
Mr. Jerry Moffatt, Rainbow Disposal Company, Inc.
Mr. Eric Smalstig, Geosyntec Consultants

Teri L. Copeland, DABT 5737 Kanan Rd / #182, Agoura Hills, CA 91301
Environmental Toxicologist (818) 991-8240 (818) 991-8140 fax

May 17, 2007

Mr. Eric G. Engberg, Division Chief / Fire Marshall
City of Huntington Beach Fire Department
2000 Main Street, Huntington Beach,

Re: Response to Comments Provided by Huntington Beach Fire Department Regarding *Health Risk Characterization, Future Construction/Excavation Scenario, Exposure to Arsenic in Soil, Rainbow Disposal Company, Inc., 17121 Nichols Street, Huntington Beach, California* (Copeland and Otani Fehling, April, 30, 2007)

Dear Chief Engberg,

On the behalf of Rainbow Disposal Company and Environ Strategy Consultants, Inc. (Environ Strategy), I am pleased to provide responses to comments from your agency (HBFD) provided in a letter to Mr. Ron Shenkman dated May 10, 2007. The comments are based on your review of our recently submitted *Health Risk Characterization, Future Construction/Excavation Scenario, Exposure to Arsenic in Soil, Rainbow Disposal Company, Inc., 17121 Nichols Street, Huntington Beach, California ("HRC").*

A meeting was held on May 8, 2007 with the HBFD and representatives from Rainbow Disposal and Environ Strategy. During this meeting, the HBFD requested supplemental information regarding arsenic toxicity and toxicokinetics as follows:

(1) Please provide information regarding uncertainties in animal-to-human data extrapolation for arsenic.
(2) Please provide information regarding the use of an oral bioavailability factor of 25% for arsenic in soil.
(3) Please provide information regarding the use of the cancer slope factors for arsenic and the 25% oral bioavailability factor in health risk assessments conducted for CalEPA and other agencies.

Following HBFD's receipt and review of our responses to the above, HBFD issued a letter to Mr. Shenkman dated May 9, 2007. This letter stated that the April 30, 2007 HRC report, "...demonstrates an acceptable level of risk for the scope of the work to remove three concrete pads at the facility. Based on the health risk characterization report submitted, the Fire Department approves the removal of the pads."

Responses to additional comments provided by the HBFD in the May 10, 2007 letter are provided below, following restatement of each comment.

General Comment:

Overall, the human health risk characterization was performed according to contemporary U.S.EPA and Cal EPA guidance. Use of the maximum reported arsenic concentration as the exposure point concentration, along with the conservative nature of the default input assumptions for construction/excavation workers provide some confidence that the calculated risks were conservative. However, some aspects of the characterization use less conservative assumptions that might lead to questions on the overall conservatism of the results.

Response to General Comment:

All exposure input parameters used in the HRC are default, reasonable maximum exposure (RME) values established by USEPA and/or CalEPA. This approach is even more conservative than the methodology identified by USEPA for upper bound, RME risk characterization, which advises that high end values should be used for *one or a few of* the sensitive input variables and mean values should be used for other input values (USEPA, 1992, p. 25). As documented by USEPA, "Maximizing all variables will in virtually all cases result in an estimate that is above the actual values seen in the population" (USEPA, 1992, p. 25).

The HRC not only used all upper bound RME input values, but also discussed uncertainties and the level of confidence regarding the most sensitive risk parameters, as recommended by USEPA (USEPA, 2000). Based on the results of the uncertainty analysis, the confidence is high that risks have not been underestimated in the HRC.

On a final note, it should be recognized that the maximum average daily dose in the HRC was 1.7 E-05 mg/kg-day, is less than 3% of the average arsenic intake from the diet of 5.7 E-04 mg/kg-day (40 ug/day divided by 70 kg body weight) (ATSDR, 2005).

Specific Comment (1)

An arsenic soil bioavailability adjustment factor was used to account for the decreased absorption of arsenic from soil as compared to the drinking water studies used to derive the toxicity information. To our knowledge, few regulatory agencies have adopted the inclusion of the monkey bioavailability study, and associated adjustment factors. For example, the State of Florida has adopted this study but used a 33% adjustment factor in its regulatory guidance. The factor of 25% used in this risk assessment is the mean bioavailability in the monkey studies and may not reflect the form of arsenic complexes present at the Rainbow disposal site or variations in human and monkey absorption.

Response to Specific Comment (1):

Based on the fact that USEPA has issued guidance for the use of an oral bioavailability factor derived from the Roberts et al. study (Roberts et al., 2002), many agencies have accepted the use of this factor in human health risk assessments. We have never had this factor rejected from an HRA submitted to a regulatory agency. The following agencies that we have experience with have accepted the USEPA-recommended value of 25%:

- USEPA
- CalEPA (DTSC, RWQCB)
- San Luis Obispo County Environmental Health Department
- Santa Cruz County Environmental Health Services
- San Diego County Department of Environmental Health
- Los Angeles Fire Department
- Nevada Division of Environmental Protection
- Arizona Department of Environmental Quality

The State of Florida identifies an oral bioavailability value of 25% as "the upper bound value to represent soil arsenic bioavailability" and states that this value is "The highest reported bioavailability factor for an individual soil reported in the study". (Florida Department of Environmental Protection, 2003, p. 6). This value is the same value that USEPA has recommended as a reasonable maximum exposure (RME) value for use in human health risk assessments (USEPA, 2001).

As discussed in the Florida Department of Environmental Protection 2003 guidance document, the value of 25% is not the mean value from the Roberts et al. study. It is based on the maximum result for the 5 soil types. The values (which are means of the 5 animals for each group, not for the 5 soil types) were reported as follows (Roberts et al., 2002, Table 3):

Soil Type	Five-Animal Mean (%)
1	14.6
2	24.7
3	10.7
4	16.3
5	17.0.

Specific Comment (2)

An assumption of six (6) months was made for the construction/excavation exposure period. For non-cancer risk an averaging period of 12 month was selected. Because the time frame of toxicity from arsenic exposure is relatively short, the appropriate averaging time should match exposure period. However, it is appropriate to adjust the exposure to account for a five (5) day week.

Response to Specific Comment (2):

The six month exposure time used in the HRC for the short-term worker (125 days per year) is based on the default USEPA annual worker exposure frequency of 5 days per week, 50 weeks per year (250 days per year; USEPA 2002, Exhibit 4-1). Since the exposure duration for the HRC is only 6 months (rather than 12 months), one half of the 250 days per year (125 days per year) was used as the exposure frequency. An exposure duration of 1 year was used in the risk equation as a place holder for units (125 days per each [1] year, times 1 year. If 0.5 year was used as the exposure duration value in the equation, then 125 days per year x 0.5 yr would cancel to 62.5 days, which is not correct). The averaging time was set equal to the exposure duration in years times 365 days/year in accordance with USEPA guidance (USEPA, 1989, Exhibit 6-14). This is the standard approach for noncancer hazard quotient calculations for subchronic and chronic exposures. When evaluating acute exposure, or exposure to a developmental toxicant, dose is calculated by averaging over an exposure event or a day (USEPA, 1989, p. 6-23).

__Specific Comment (3)__

The particulate emission factor (PEF) for dusts generated from excavation and construction scenarios were presumably derived from the EPA Soil Screening Guidance using location specific dispersion terms (please cite the exact reference). The level is approximately equal to 2.3 ug/m³ of air. The utility of that value for exposure assessment for workers exposed while excavating may be questioned, as the levels of dust generated through construction and excavation activities, especially those involving demolition and removal as well as excavation may exceed this level.

Response to Specific Comment (3):

The default construction PEF used in the HRC has been used in many HRAs approved by regulatory agencies. Using a worst case PEF, which is based on the assumption that dust is present in the air at the level of nuisance dust (10 mg/m^3), does not change the ILCR or HI results for the onsite short-term construction worker, as shown in Attachment A, Tables A-1 and A-2. The worst case PEF, based on the assumption that dust levels are 10 mg/m^3, was derived by CalEPA (CalEPA/DTSC, 2005).

__Specific Comment (4)__

While this characterization is not intended to encompass a broad suite of contaminants, it should be recognized that cumulative risk posed by arsenic and other constituents might collectively pose additional risks not captured in this characterization, even for the sort term exposure scenario modeled. U.S. EPA and CalEPA risk assessment guidance was developed to evaluate the cumulative effects from multiple chemicals. This is particularly important when evaluating the cancer endpoint. Although a brief review of the metals data presented in this report does not seem to indicate that significant additional risk from other metals, no data or rationale is provided to account for other potential contaminants present in soils at this site.

Response to Specific Comment (4):

During the meeting held on April 23, 2007 with the HBFD and representatives from Rainbow Disposal and Environ Strategy, the HBFD clearly stated that arsenic was the only chemical of concern in regard to the proposed pad removal scenario. Based on my experience and familiarity with the site data, it was evident to me that arsenic was the only chemical that might pose a health risk to a short-term construction/excavation worker. Based on this professional judgment, and the HBFD request for assessment of arsenic only, arsenic was the only chemical evaluated in the assessment. Because a formal Chemical of Potential Concern (COPC) selection process was not conducted, the document was presented as a Health Risk Characterization (HRC) for arsenic.

In order to document that arsenic is the only chemical that could pose a health risk for the pad removal scenario, a traditional COPC selection process (USEPA, 1989) was applied for all chemicals detected in the Component 1A, 1B, and 1C areas at the site (see Attachment B, Tables B-1 and B-2). A conservative toxicity/exposure screen was conducted by comparing the maximum detected concentration with one-tenth of the risk-based screening value (CHHSL or PRG). For all detected chemicals other than arsenic and cadmium, the maximum detected concentration was less than one-tenth the CHHSL (or PRG if a CHHSL was not derived). Accordingly, the ILCRs and HIs for cadmium were calculated as a component of this response letter to document that the inclusion of cadmium (or any chemical detected at the site other than arsenic) does not significantly contribute to the ILCR or HI, and cumulative risk has been addressed (see Attachment A, Tables A-1 through A-4). It should be noted that the current CHHSL for cadmium is based on an oral slope factor that was subsequently removed from the OEHHA toxicity criteria database based on a re-evaluation of the weight-of-evidence for oral carcinogenicity of cadmium (OEHHA, 2007). An adjusted CHHSL that does not include oral (and dermal) cancer endpoints (which has not yet been derived by CalEPA/OEHHA) would be much higher than the unadjusted value of 7.5 mg/kg currently listed in the CHHSL guidance (CalEPA, 2005).

CLOSING

I appreciate the comments provided by the HBFD and trust that the responses provided herein satisfy the outstanding issues regarding the HRC.

Sincerely,

Teri L. Copeland, M.S.
Principal Toxicologist
Diplomate American Board of Toxicology

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Table A-1. SENSITIVITY ANALYSIS for On-Site Short-Term Worker Incremental Lifetime Cancer Risk (ILCR)
Rainbow Disposal, 17121 Nichols St., Huntington Beach, CA

INGESTION

Chemical	Cs* (mg/kg)	IR (mg/d)	FI (u)	Bio (u)	CF (kg/mg)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	SFo (mg/kg-d)-1	ILCR (u)
Arsenic	1.59E+01	330	1	0.25	1E-06	125	1.0	70	25,550	9.17E-08	9.45E+00	8.66E-07
[redacted]												
											Total:	8.66E-07

DERMAL CONTACT

Chemical	Cs* (mg/kg)	ABS (u)	SA (cm²/event)	AF (mg/cm²)	CF (kg/mg)	EF (events/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	SFo (mg/kg-d)-1	ILCR (u)
Arsenic	1.59E+01	3.00E-02	3.30E+03	3.00E-01	1.00E-06	125	1.0	70	25,550	3.30E-08	9.45E+00	3.12E-07
[redacted]												
											Total:	3.12E-07

PARTICULATE INHALATION

Chemical	Cs* (mg/kg)	PEF (m³/kg)	IR (m³/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	SFi (mg/kg-d)-1	Cancer Risk (u)
Arsenic	1.59E+01	[redacted]	20	125	1.0	70	25,550	2.22E-08	1.2E+01	2.67E-07
[redacted]										
									Total:	3.03E-07

Summary	Ingestion	Dermal Contact	Part. Inhal.	Cancer Risk
On-Site Short-Term Worker	9E-07	3E-07	3E-07	1E-06

* EPC based on the maximum detected arsenic concentration in soil.

Acronyms:
ABS - Dermal absorption factor (u - unitless)
AF - Soil-to-skin adherence factor (mg/cm2 - milligram per square centimeter)
AT - Averaging time (days)
Bio. - Bioavailability (oral) (u - unitless)
BW - Body weight (kg - kilograms)
CF - Conversion factor (kg/mg - kilograms per milligram)
Cs - EPC in soil (mg/kg - milligrams per kilogram)
ED - Exposure duration (yrs - years)
EF - Exposure frequency (days/yr - days per year)
EPC - Exposure point concentration (i.e., Cs)
FI - Fraction ingested (u - unitless)
ILCR - Incremental lifetime cancer risk
IR - Intake rate (e.g., soil ingestion rate, inhalation rate) (mg/day - milligrams per day, m3/day - cubic meter per day)
LADD - Lifetime average daily dose (mg/kg-d - milligrams per kilogram per day)
PEF - Particulate emission factor (m3/kg - cubic meter per kilogram)
SA - Exposed skin surface area (cm2/event - square centimeter per event)
SFi - Inhalation cancer slope factor ([mg/kg-d]-1 - kilogram per day per milligram)
SFo - Oral cancer slope factor ([mg/kg-d]-1 - kilogram per day per milligram)

Table A-2. SENSITIVITY ANALYSIS for On-Site Short-Term Worker Hazard Index (HI)
Rainbow Disposal, 17121 Nichols St., Huntington Beach, CA

INGESTION

Chemical	C_s^* (mg/kg)	IR (mg/d)	FI (u)	Bio (u)	CF (kg/mg)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient (u)
Arsenic	1.59E+01	100	1	0.25	1E-06	125	1.0	70	365	1.94E-06	3.0E-04	6.48E-03
Cadmium	1.72E+00	100	1	1.00	1E-06	125	1.0	70	365	8.41E-07	5.0E-04	1.68E-03
											Total:	6.48E-03

DERMAL CONTACT

Chemical	C_s^* (mg/kg)	ABS (u)	SA (cm^2/event)	AF (mg/cm^2)	CF (kg/mg)	EF (events/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	RfDo (mg/kg-d)	Hazard Quotient (u)
Arsenic	1.59E+01	3.00E-02	3.30E+03	3.00E-01	1.00E-06	125	1.0	70	365	2.31E-06	3.0E-04	7.70E-03
Cadmium	1.72E+00	3.00E-02	3.30E+03	3.00E-01	1.00E-06	125	1.0	70	365	2.50E-07	5.0E-04	5.00E-04
											Total:	7.70E-03

PARTICULATE INHALATION

Chemical	C_s^* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	RfDi (mg/kg-d)	Hazard Quotient (u)
Arsenic	1.59E+01	1.0E+06	20	125	1.0	70	365	1.56E-06	8.60E-06	1.81E-01
Cadmium	1.72E+00	1.0E+06	20	125	1.0	70	365	1.68E-07	5.0E-04	3.37E-04
									Total:	1.81E-01

Summary	Ingestion	Dermal Contact	Part. Inhal.	TOTAL HI
On-Site Short-Term Worker	6.5E-03	7.7E-03	1.8E-01	1.95E-01

* EPC based on the maximum detected arsenic concentration in soil.

Acronyms:
ABS - Dermal absorption factor (u - unitless)
ADD - Average daily dose (mg/kg-day)
AF - Soil-to-skin adherence factor (mg/cm2 - milligram per square centimeter)
AT - Averaging time (days)
Bio. - Bioavailability (oral) (u - unitless)
BW - Body weight (kg - kilograms)
CF - Conversion factor (kg/mg - kilograms per milligram)
Cs - EPC in soil (mg/kg - milligrams per kilogram)
ED - Exposure duration (yrs - years)
EF - Exposure frequency (days/yr - days per year)
EPC - Exposure point concentration (i.e., Cs)
FI - Fraction ingested (u - unitless)
IR - Intake rate (e.g., soil ingestion rate, inhalation rate) (mg/day - milligrams per day, m3/day - cubic meter per day)
PEF - Particulate emission factor (m3/kg - cubic meter per kilogram)
RfDi - Inhalation reference dose (mg/kg-day)
RfDo - Oral reference dose (mg/kg-day)
SA - Exposed skin surface area (cm2/event - square centimeter per event)

Table A-3. SENSITIVITY ANALYSIS for Downwind Resident Incremental Cancer Risk (ILCR)
Rainbow Disposal, 17121 Nichols St., Huntington Beach, CA

DOWNWIND PARTICULATE INHALATION*

Adult:

Chemical	C_s^* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	SFi (mg/kg-d)-1	ILCR (u)
Arsenic	1.59E+01	4.40E+08	13.2	175	1	70	25,550	4.67E-11	1.2E+01	5.60E-10
Chromium	1.72E+00	4.40E+08	13.2	175	1	70	25,550	5.05E-12	1.5E+01	7.57E-11
									Total:	6.36E-10

Child:

Chemical	C_s^* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	SFi (mg/kg-d)-1	ILCR (u)
Arsenic	1.59E+01	4.40E+08	8.3	175	1	15	25,550	1.37E-10	1.2E+01	1.64E-09
Chromium	1.72E+00	4.40E+08	8.3	175	1	15	25,550	1.48E-11	1.5E+01	2.22E-10
									Total:	1.87E-09

Summary	Part. Inhal.	Cancer Risk
Downwind Adult Resident	6E-10	**6E-10**
Downwind Child Resident	2E-09	**2E-09**
	Total Resident:	**2E-09**

* EPC based on the maximum detected arsenic concentration in soil.

Acronyms:

ABS - Dermal absorption factor (u - unitless)
AF - Soil-to-skin adherence factor (mg/cm2 - milligram per square centimeter)
AT - Averaging time (days)
Bio. - Bioavailability (oral) (u - unitless)
BW - Body weight (kg - kilograms)
Ca - Exposure point concentration (EPC) in air (mg/m3 - milligrams per cubic meter)
CF - Conversion factor (kg/mg - kilograms per milligram)
Cs - EPC in soil (mg/kg - milligrams per kilogram)
ED - Exposure duration (yrs - years)
EF - Exposure frequency (days/yr - days per year)
EPC - Exposure point concentration (i.e., Cs)
FI - Fraction ingested (u - unitless)
ILCR - Incremental lifetime cancer risk
IR - Intake rate (e.g., soil ingestion rate, inhalation rate) (mg/day - milligrams per day, m3/day - cubic meter per day)
LADD - Lifetime average daily dose (mg/kg-d - milligrams per kilogram per day)
PEF - Particulate emission factor (m3/kg - cubic meter per kilogram).
SA - Exposed skin surface area (cm2/event - square centimeter per event)
SFi - Inhalation cancer slope factor {[mg/kg-d]-1 - kilogram per day per milligram)
SFo - Oral cancer slope factor {[mg/kg-d]-1 - kilogram per day per milligram)
UCL - Upper confidence limit

Table A-4. SENSITIVITY ANALYSIS for Downwind Resident Hazard Index (HI)
Rainbow Disposal, 17121 Nichols St., Huntington Beach, CA

DOWNWIND PARTICULATE INHALATION*

Adult:

Chemical	C_s^* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	RfDi (mg/kg-d)	Hazard Quotient (u)
Arsenic	1.59E+01	4.40E+08	13.2	175	1	70	365	3.27E-09	8.60E-06	3.80E-04
Cadmium	1.72E+00	4.40E+08	13.2	175	1	70	365	3.53E-10	5.0E-04	7.07E-07
									Total:	3.81E-04

Child:

Chemical	C_s^* (mg/kg)	PEF (m^3/kg)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	RfDi (mg/kg-d)	Hazard Quotient (u)
Arsenic	1.59E+01	4.40E+08	8.3	175	1	15	365	9.59E-09	8.60E-06	1.11E-03
Cadmium	1.72E+00	4.40E+08	8.3	175	1	15	365	1.04E-09	5.0E-04	2.07E-06
									Total:	1.12E-03

Summary	Part. Inhal.	TOTAL HI
Downwind Adult Resident	3.81E-04	**3.8E-04**
Downwind Child Resident	1.1E-03	**1.1E-03**

* EPC based on the maximum detected arsenic concentration in soil.

Acronyms:

ADD - Average daily dose (mg/kg-day)
AT - Averaging time (days)
BW - Body weight (kg - kilograms)
Cs - EPC in soil (mg/kg - milligrams per kilogram)
ED - Exposure duration (yrs - years)
EF - Exposure frequency (days/yr - days per year)
EPC - Exposure point concentration (i.e., Cs)
IR - Intake rate (e.g., inhalation rate) (m3/day - cubic meter per day)
PEF - Particulate emission factor (m3/kg - cubic meter per kilogram)
RfDi - Inhalation reference dose (mg/kg-day)

TABLE B-1. DETECTED METALS DATA SUMMARY AND POTENTIAL COPCs
Short-Term Construction/Excavtion Scenario for Comp 1A, 1B, and 1C Areas
Rainbow Disposal Site, 17121 Nichols Street, Huntington Beach, CA
(Units in mg/kg)

Chemical	No. Samples	No. of Detections	Max. Detected	Indust. CHHSL or Reg. 9 Indus. PRG	Potential COPC?	Comments
Antimony	36	6	3.36	380	No	Max ≤ one-tenth CHHSL
Arsenic	36	36	15.9	0.24	**Yes**	Max > one-tenth CHHSL
Barium	36	36	277	63,000	No	Max ≤ one-tenth CHHSL
Beryllium	36	29	1.11	1700	No	Max ≤ one-tenth CHHSL
Cadmium	36	17	1.72	7.5	**Yes**	Max > one-tenth CHHSL
Chromium	36	36	38	450[A *]	No	Max ≤ one-tenth CHHSL
Cobalt	36	36	20.2	3200	No	Max ≤ one-tenth CHHSL
Copper	36	36	42.4	38,000	No	Max ≤ one-tenth CHHSL
Lead	36	36	84.5	3500	No	≤ residential screening level of 130 mg/kg (CalEPA/DTSC,
Mercury	36	1	5.42	180	No	Max ≤ one-tenth CHHSL
Molybdenum	36	20	1.2	4800	No	Max ≤ one-tenth CHHSL
Nickel	36	36	37.3	16,000	No	Max > one-tenth CHHSL
Selenium	36	0	<0.75	4800	No	Max ≤ one-tenth CHHSL
Silver	36	0	<0.25	4800	No	Max ≤ one-tenth CHHSL
Thallium	36	3	1.07	63	No	Max ≤ one-tenth CHHSL
Vanadium	36	36	66.9	6700	No	Max ≤ one-tenth CHHSL
Zinc	36	36	947	100,000	No	Max ≤ one-tenth CHHSL

CHHSL - California Human Health Screening Level; long-term industrial soil level (CalEPA, 2005)

* No CHHSL established; USEPA Region 9 Preliminary Remediation Goal used (USEPA, 2004)

Max. - Maximum

mg/kg - Milligrams per kilogram

COPC - Chemical of potential concern

A - Based on assumption that the ratio of Cr+6 to total chromium = 1:6 (USEPA, 2004)

TABLE B-2 DETECTED ORGANICS DATA SUMMARY AND POTENTIAL COPCs
Short-Term Construction/Excavtion Scenario for Comp 1A, 1B, and 1C Areas
Rainbow Disposal Site, 17121 Nichols Street, Huntington Beach, CA
(Units in mg/kg)

Chemical	No. Samples	No. of Detections	Max. Detected	Indus.CHHSL or Region 9 Indust. PRG	Potential COPC?	Comments
Benzene	32	2	0.004	1.4*	No	Max < one-tenth PRG
Bis(2-ethylhexyl)phthalate	16	2	0.004	120*	No	Max < one-tenth PRG
DDD	1	1	0.033	9	No	Max < one-tenth PRG
DDE	1	1	0.012	6.3	No	Max < one-tenth PRG
MTBE	32	2	0.013	70*	No	Max < one-tenth PRG
PCE	32	1	0.009	1.3*	No	Max < one-tenth PRG
Toluene	32	7	0.005	520*	No	Max < one-tenth PRG

CHHSL (California Human Health Screenng Level) (CalEPA, 2005)
* No CHHSL established; USEPA Region 9 soil preliminary remediation goal used (USEPA, 2004).
Max. - Maximum
mg/kg - Milligrams per kilogram

APPENDIX C

CITY OF HUNTINGTON BEACH
INTER-DEPARTMENT COMMUNICATION

To: MICHAEL P. DOLDER

From: Tim Greaves, Deputy Fire Marshal Petro Chem

Date: 09/18/96

SUBJECT: ARSENIC CLEANUP - CHEVRON LAND & DEVELOPMENT

As you know, many of the CL&D properties contain elevated levels of arsenic as well as the more common metals like mercury, lead, etc.. CL&D and Blasland, Bouck & Lee have submitted a study to determine the background levels of arsenic in Huntington Beach. They have done this to set a scientific, risk-based, and attainable cleanup level.

After my initial reading of the study, I sent copies to Mel Wright, ORCO EMA, and DTSC. From their comments, I challenged CL&D and Blasland, Bouck & Lee to back up their results with the Federal EPA risk-based software used on the Long Beach Naval Shipyard cleanup. The results were nearly identical, and CL&D's background numbers were actually slightly more conservative that the Federal guidelines. I would recommend acknowledgment of the CL&D and Blasland, Bouck & Lee determined arsenic background level and permit cleanup to that level.

Attached please find a remediation action plan, a similar study for portions of Lakewood, CA, and Mel Wright's comments. If you agree, I would like this memo initialed as approval for CL&D to move forward in the cleanup process. If you need the entire study, I will furnish it upon your asking.

Thanks,

Tim

greaves ARSENIC.DOC

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Transmitted Via Mail

July 11, 1996

Mr. Mike Stafford
Chevron Land and Development Company
3100 South Harbor Blvd, Suite #340
Santa Ana, California 92704

Re: Proposed Arsenic Remedial Action Plan for Residential Development Properties in Huntington Beach, California
BBL Project Number: 47224.01

Dear Mr. Stafford:

Chevron Land and Development Company (CL&D) retained Blasland, Bouck & Lee, Inc. (BBL) to develop a remedial action plan for the mitigation of arsenic impacted soils located on Residential Development Properties in Huntington Beach, California. The remedial action plan was developed in response to the Huntington Beach Fire Department and to fulfill the intent of City Specification CS 431-92 Soil Clean-up Standards. The subject properties are comprised of approximately 400 acres of land and was at one time part of a producing oil field.

Subsurface Arsenic Profile

BBL performed a profile of naturally occurring arsenic concentrations found in residential development properties in Huntington Beach. This findings of this study was documented in the "Background Arsenic Profile, Residential Development Properties, Huntington Beach, California", dated June 6, 1996 and summarized below. Six separate properties, located within an approximately 2 mile radius of the "5-Point" intersection of Main Street, Garfield Avenue, and Gothard Street, were investigated. With the use of a mobil drilling rig equipped with hollow-stem augers, a total of forty-three soil samples were collected for total arsenic concentration analysis. Soil samples were collected within the initial twenty feet of undisturbed native soil column. To obtain a background arsenic concentration for subsurface soil it was necessary to collect soil samples which had not been impacted by previous oil production activities at the properties. Therefore, the soil boring locations were placed in areas removed from previously producing wells, oil sumps, and other structures related to oil production based on historical site reviews and field observations.

Analytical laboratory results for the forty-three soil samples collected indicated total arsenic concentrations ranging froma low of 1.3 milligrams per kilograms or parts per million (ppm) to a high of 22 ppm.

Statistical Determination of Arsenic Background Concentration

Using the statistical method developed by the US EPA, represented in EPA SW-846 (Test Methods for Evaluating Solid Waste) BBL determined a mean background arsenic concentration of 4.07 ppm on the six properties investigated in Huntington Beach. A standard deviation for the background sample population was calculated to be 2.1. Therefore, three standard deviations from the mean concentration would be approximately 10 ppm. Statistically, there is a 99% probability that background arsenic concentrations in soil on the subject properties will fall within the range of three standard deviations from the mean (in other words 10 ppm or less). Proposed soil removal will occur when arsenic concentrations exceed 10 ppm. It should be noted that during analysis of the data, it was observed that one sample had an unusually high arsenic value at 22 ppm. This value was conservatively eliminated from the data set to as it is over 8.5 standard deviations from the mean concentration and not considered statistically valid.

Health-Based Cleanup Criteria

The County of Orange Health Care Agency (COHCA) and the State of California Environmental Protection Agency, Department of Toxic Substances Control (CAL-EPA) have adopted the use of health-risk based cleanup criteria for arsenic in soil as promulgated in the U.S. environmental Protection Agency (EPA), "Region IX, Preliminary Remediation Goals" (PRGs) dated September 1, 1995. The PRGs reflect the most current EPA toxicological and risk assessment data available, however, they are not final and their suggested use is for "Planning Purposes" for site cleanup goals and associated health risk.

Using both the published non-cancer endpoint PRG of 22 ppm, and the cancer endpoint RPG of 0.38, the EPA Hazard Index and carcinogenic risk values were calculated. A Hazard Index of 1 or less is considered adequate to protect human health, while a ration in excess of 1 suggests the need for further evaluation. The calculated Hazard Index for the proposed cleanup level of 10 ppm (three standard deviations from the mean background arsenic concentration) is 0.45 and adequate to protect human health. The EPA's acceptable carcinogenic risk range is from 10^{-4} to 10^{-6}. The calculated carcinogenic risk using the cleanup level of 10 ppm is 2.6×10^{-5} which falls within the acceptable range. It should also be noted that cleanup standards of 10 ppm to 15 ppm for arsenic in soil, on property designated for residential use, have been accepted by other regulatory agencies. These agencies include the County of Los Angeles Department of Health Services, and the California Regional Water Control Board.

Development of Sampling Plan

A sampling plan will be prepared for the Huntington Beach Properties and presented to the Huntington Beach Fire Department. The sampling plan will be based on the subsurface arsenic profile performed, the statistical determination of arsenic background concentrations, and in consideration of health-based cleanup criteria.

Using an average arsenic concentration calculated of soil samples previously collected on the properties, a threshold concentration (background) of 4.07 ppm, and assuming the samples are representative of soil on the site, the EPA SW-846 method will be employed to determine the necessary number of samples required to conclude whether the arsenic concentrations for a particular Huntington Beach property is above the established background threshold value of 4.07 ppm. The EPA suggests that an 80 % confidence level is necessary for an acceptable analysis, therefore, the necessary number of samples will be collected to meet this standard at a minimum.

With the implementation of the sampling plan, the appropriate number of soil samples will be collected to determine arsenic concentrations on site. The samples will be collected in the center of pre-established random sampling grids and submitted to a state-certified laboratory for total arsenic analysis using EPA Method 6010. Any sampling location determined to contain total arsenic concentrations in excess of 10 ppm (three standard deviations from the previously determined background arsenic concentration) will be subject to removal and remediation. This arsenic mitigation is outlined on the attached remedial action plan.

If you have any questions, or require additional information, please do not hesitate to contact us.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

Schaun M. Smith

Schaun M. Smith, R.E.A.
Associate, Geosciences

Attachments

cc: Dennis O'Conner; CL&D
Doug Ely; CL&D
Jeff Rulon; PLC
Anthony F. Severini; BBL

REMEDIAL ACTION PLAN
ARSENIC IMPACTED SOILS

SITE NAME: **Residential Development Properties, Huntington Beach, California**

PROPOSED REMEDIATION STRATEGY:

TASK 1 - Implementation of Sampling Plan

- The soil samples will be collected in the center of computer-generated random sampling grids. Grid size will be determined based on the statistically significant number of soil samples required for analysis.
- Each boring will be drilled to a depth of approximately one (1) foot. A total of one (1) soil sample will be collected from each boring.
- Sample collection will follow industry standard quality assurance/quality control procedures. Discrete soil samples will be collected at the target intervals by advancing a stainless-steel hand auger, and containing the soil samples in laboratory provided glassware.
- Soil samples will be transported to a California state-certified laboratory using industry standard chain-of-custody protocol. , One (1) soil sample from each boring, will be subjected to laboratory analysis. Samples will be analyzed for arsenic total threshold limit concentrations using EPA Method 6010.
- All borings will be back-filled with native material upon completion of sampling activities.

TASK 2 - Remediation Strategy

- Using the analytical laboratory results for total arsenic concentrations, soil samples in grids which have concentrations in excess of the established remedial threshold value of 10 ppm will be identified. The entire grid will then be considered to have arsenic concentrations above acceptable levels and will be remediated.
- Remediation will be performed by excavating soil within the grid area to a depth of 18 inches where possible exposure routes exist. Chevron has determined through past health risk assessments that 18 inches is an adequate depth for mitigation of contaminant exposure pathways (ingestion) in residential settings. Exposure pathways (ingestion) include root up-take in vegetables, and children play activities. Arsenic concentrations below depths of 18 inches are not considered to have significant exposure routes to potential receptors.
- If the sample collected in a specific grid falls within an area which is designated for improvement, such as a street, and that sample exceeds the arsenic threshold value for remediation, then the remainder of the grid which is not a portion of the street will be removed for remediation.
- Soil removals will be categorized based on the total arsenic concentrations reported by the analytical laboratory.

<u>Category 1.</u> If the grid contains arsenic concentrations greater than 10 ppm but less than 20 ppm, then the soils will be excavated and remediated on site in a designated area until the

pothole backhoe/bobcate

concentrations are below the 10 ppm threshold value. Remediation will occur via discing and mixing with clean soil. Remediated soil or other clean soil will then be replaced and recompacted on the grid.

Category 2. If the grid contains arsenic concentrations greater than 20 ppm, then the soils will be excavated and placed in street sections or fill areas deeper than 18 inches. Soil from a previous remediation area or other clean fill will be used as backfill on the grid and recompacted.

- Prior to importing remediated soil or other clean soil to a grid for re-use, confirmation samples will be collected and analyzed for total arsenic concentrations to document that the soil is "verified clean" and that appropriate levels have been attained (arsenic concentrations below 10 ppm). Additionally, a confirmation sample will be collected and analyzed for total arsenic concentrations of the fill material once it is "in-place" on the receiving grid.

- If the "in-place" confirmation sample exceeds the total arsenic threshold value for remediation (Category 1 or Category 2), then the remediation strategy as described above will be repeated until the grid meets cleanup standards.

Chevron

September 9, 1996

3100 South Harbor Boulevard, Suite 340
Santa Ana, CA 92704

M. J. Stafford
Senior Environmental Engineer
714-427-1215

Mr. Tim Greaves
Deputy Fire Marshall/PetroChem Section
City Of Huntington Beach Fire Department
2000 Main Street
Huntington Beach, CA 92648

Re: Huntington Beach Background Arsenic Study

Dear Tim:

Thanks again for taking time to meet with Mr. Schaun Smith and myself last Friday to discuss the results of the arsenic comparison study. I trust that we were successful in demonstrating that our original methodology was appropriate and that the two methods yield virtually the same results.

Per your request I have forwarded to you pertinent sections of the arsenic background study that was performed at the Hynes Station development in Lakewood. The results of this study are similar to the Huntington Beach study.

I hope that these documents provide you with the necessary information you need to submit your recommendation to Chief Dolder. If you require additional information do not hesitate to call.

Thanks for your review and consideration.

Very truly yours,

M. J. Stafford

Chevron

September 9, 1996

3100 South Harbor Boulevard, Suite 340
Santa Ana, CA 92704

M. J. Stafford
Senior Environmental Engineer
714-427-1215

Mr. Tim Greaves
Deputy Fire Marshall/PetroChem Section
City Of Huntington Beach Fire Department
2000 Main Street
Huntington Beach, CA 92648

Re: Huntington Beach Background Arsenic Study

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Per your request I have forwarded to you pertinent sections of the arsenic background study that was performed at the Hynes Station development in Lakewood. The results of this study are similar to the Huntington Beach study.

I hope that these documents provide you with the necessary information you need to submit your recommendation to Chief Dolder. If you require additional information do not hesitate to call.

Thanks for your review and consideration.

Very truly yours,

M. J. Stafford

20th Anniversary
RADIAN CORPORATION

10395 Old Placerville Road
Sacramento, CA 95827
(916)362-5332

TECHNICAL MEMORANDUM

Hynes Station

Results of Background Soil Arsenic Sampling

Prepared for:

Elizabeth Johnke
Chevron Real Estate Management Company

Doug Ely
Chevron Land and Development Company

Russ Lines
Huntington Beach Company

Prepared by:

John Clark
Radian Corporation
10395 Old Placerville Road
Sacramento, CA 95826

November 27, 1989

Results of Background Soil Arsenic Sampling

The background soil arsenic concentrations for the 0 to 6-inch depth ranged from 8.0 to 13 mg/kg, with an average concentration of 10 mg/kg and a standard deviation of 1.6 mg/kg. For the 6 to 36-inch depth, the background soil arsenic concentrations ranged from 7.1 to 15 mg/kg, with an average concentration of 9.5 mg/kg and a standard deviation of 2.2 mg/kg. (The larger value for each field duplicate sampling location was used for calculation). The result for each sampling location is as follows:

	Location	0 to 6-inch	6 to 36-inch
1	Biscailus Park	13 mg/kg	9.6 mg/kg
2	Simon Bolivar Park	9.4 mg/kg	7.1 mg/kg
3	Mayfair Park	9.2 mg/kg	8.3 mg/kg
4	Downey/Hardwick	13 mg/kg	15 mg/kg
5	Downey/Michelson	9.0 mg/kg	7.4 mg/kg
6	Candlewood/Obispo	8.6 mg/kg	8.5 mg/kg
	field duplicate	11 mg/kg	9.5 mg/kg
7	Candlewood/Hayter	10 mg/kg	9.7 mg/kg
8	South Street	8.0 mg/kg	9.3 mg/kg
9	Downey/Candlewood	10 mg/kg	10 mg/kg
10	City Hall	10 mg/kg	9.2 mg/kg

In addition, "background" on-site samples were previously collected in the northeastern portion of the site. A surface sample (0 to 2-inch deep) was collected near the northeast corner of the site (Hynes Station Site Assessment, Final Report, Radian Corporation, March 1988), and deeper samples at 12, 18, 24, 36, and 48-inches were collected just outside of the firewall in the northeastern portion of the site (Hynes Station Site Assessment Addendum, Final Report, Radian

Corporation, March 1989). These locations are shown on Figure 2. The results for these samples were:

0 to 2-inch	17 mg/kg
12-inch	21 mg/kg
18-inch	12 mg/kg
24-inch	12 mg/kg
36-inch	8 mg/kg
48-inch	12 mg/kg

These data are generally within the range of the off-site background arsenic concentrations.

The above data indicate that background soil arsenic in the vicinity of Hynes Station has a concentration of approximately 10 mg/kg. As stated in the Hynes Station Site Assessment Addendum Final Report (Radian Corporation, March 1989), on-site soil samples collected from 2 to 4 feet below land surface had arsenic concentrations ranging from 6.9 to 36 mg/kg with an average value of 15 mg/kg. These data indicate that the on-site soil arsenic contamination is limited to the surface soil.

RISK ASSESSMENT UPDATE

The carcinogen potency factor for ingested arsenic has recently been reduced by the U.S. Environmental Protection Agency (Health Effects Assessment Summary Tables, Third Quarter, FY 1989, U.S. EPA). The previous factor of 15 mg/kg-day has been reduced to 1.75 mg/kg-day. This reduction effects two parts of the risk assessment: potential health impacts to on-site construction workers, and potential health impacts to residential end users of the site.

For on-site construction workers, the previously estimated potential health risk was 3.8×10^{-6} for the tank demolition scenario and 6.8×10^{-6} for the tank demolition and surface soil mixing scenario (Hynes Station Site Assessment Addendum, Final Report, Radian Corporation, March 1989). These risk estimates were based on a combination of the potential risks from inhalation of dust and

APPENDIX D

CITY OF HUNTINGTON BEACH

2000 MAIN STREET FIRE DEPARTMENT CALIFORNIA 92648

June 21, 2007

Mr. Jerry Moffatt
17121 Nichols Street
Huntington Beach, CA 92647

Dear Mr. Moffatt:

SUBJECT: FIRE DEPARTMENT CONDITIONAL APPROVAL OF THE SITE ASSESSMENT REPORT AND SOIL REMEDIATION ACTION PLAN – COMPONETS 1a, 1b, 1c, RAINBOW DISPOSAL FACILITY UPGRADE PROJECT

The Huntington Beach Fire Department, in conjunction with our consultant Geosyntec, Inc., has reviewed and conditionally approved the above referenced "SITE ASSESSMENT REPORT AND SOIL REMEDIATION ACTION PLAN" submitted by John McNamara and Margaret Patrick of Environ Strategy Consultants (ES). The work plan is in general conformance with remediation standards per City Specification 431-92, Soil Clean-up Standards. However, the following items are conditions of approval for this work plan.

Remediation Action Plan - Conditions of Approval

1. Import soil (i.e., the source of the proposed "clean soil" referenced in the RAP) needs to be tested prior to use as fill on the property. The source should be described, as well as the soil sample results from the import source.

2. No new samples are proposed for Area 1C; therefore, this area will not have any remediation associated with it, including placement of remediated soil from other excavations.

3. The soil excavation plan should be clarified. The RAP should specify how much soil will be removed from each grid area (quantity or dimensions of excavation) if arsenic is detected in a soil sample in excess of the 10 ppm and 20 ppm criteria. Critical items to include:

   - Over-excavation depth
   - How ES will document that the arsenic-impacted material has been completely removed from the grid area
   - Identify whether material shallower than the sample depth will be included in the remediation

4. The RAP indicates that "*a confirmation sample will be collected from a depth of approximately 6 inches in each grid that has been remediated*" [sec. 7.4]. ES references the Blasland, Bouck & Lee, Inc. (BBL) report titled *Remedial Action Plan, Arsenic Impacted Soils*, dated July 11, 1996. Similar to the referenced BBL remedial action plan, confirmation sampling should include the following item:

- *Prior to importing remediated soil or other clean soil to a grid for re-use, confirmation samples will be collected and analyzed for total arsenic concentrations to document that the soil is "verified clean" and that appropriate levels have been attained (arsenic concentrations below 10 ppm). Additionally, a confirmation sample will be collected and analyzed for total arsenic concentrations of the fill material once it is "in-place" on the receiving grid.*

5. Please provide the full references for the RAP [Sec. 8.0] references (Bradford et al., 1996; LBNL 2002).

6. Soil samples within Huntington Beach, as well as vicinity import soil testing, have rarely shown values of arsenic to exceed 20 ppm. Soil samples in excess of 20 ppm should be reported to the Huntington Beach Fire Department as soon as the data are available from the laboratory (i.e., the proponent should not wait for a report submittal to transmit the information) so that the Fire Department may evaluate the appropriateness, or not, of replacing this material on-site, regardless of depth.

Once soil remediation and testing has been completed, a conformation results document for the referenced areas shall be submitted to the Huntington Beach Fire Department for review and approval. Documentation shall demonstrate that prior to grading or building plan approval, all soils meet City Specification 431-92 standards.

PLEASE NOTE:

- The Soil Remediation Action Plan described in the subject document has been conditionally approved. Any new soil imported to the site or discovery of additional contamination requires additional testing, documentation and Fire Department approval.

- Prior to any on-site activity, the Huntington Beach Public Works Department must be contacted and any necessary permits must be obtained. Additionally, the designated Public Works Inspector must be notified at (714) 536-5431 of all proposed work.

- Conformance to City Specifications **DOES NOT** relieve the developer's responsibility regarding other concerned agency notification and/or approval.

If you have any questions, you may contact me at (714) 536-5564.

Sincerely,

Eric G. Engberg
Division Chief / Fire Marshal

EGE:sm

c: Penny Culbreth-Graft, City Administrator
Paul Emery, Deputy City Administrator
Duane S. Olson, Fire Chief
Ron Shenkman, Rainbow Disposal Company
John E. McNamara, Environ Strategy Consultants, Inc.
Margaret Patrick, Environ Strategy Consultants, Inc.
Teri L. Copeland, Environmental Toxicologist
Richard Harlow, Richard A. Harlow & Associates
Eric Smalstig, Geosyntec Consultants, Inc.
Terri Elliott, Public Works Principal Civil Engineer
Lee Caldwell, Fire Development Specialist

environ strategy consultants, inc.

30 Hughes, Suite 209
Irvine, California 92618
tel 949.581.3222
fax 949.581.3207

June 28, 2007

Mr. Eric G. Engberg
Division Chief / Fire Marshal
City of Huntington Beach Fire Department
2000 Main Street-5th Floor
Huntington Beach, CA 92648

Project No. 281-E

Response to
Fire Department Conditional Approval of the Site Assessment Report and Soil Remediation Action Plan - Components 1A, 1B, 1C, Rainbow Disposal Facility Upgrade Project

Dear Chief Engberg:

Environ Strategy Consultants, Inc. (Environ Strategy) on behalf of Rainbow Disposal Company, Inc. (Rainbow) appreciates your conditional approval of the *Site Assessment Reports* dated April 3, 5, and 9, 2007 and the *Proposed Remedial Action Plan* dated June13, 2007. We agree to your conditions as outlined below:

1. Import soil (i.e., the source of the proposed "clean soil" referenced in the RAP) needs to be tested prior to use as fill on the property. The source should be described, as well as the soil sample results from the import source.

It is anticipated that import soil obtained from an off-site source will be less than 500 cubic yards. The soil will be source-identified and tested prior to use as fill on the property. The analytical results will be included in the Remediation Report.

2. No new samples are proposed for Area 1C; therefore, this area will not have any remediation associated with it, including placement of remediated soil from other excavation.

Duly Noted.

3. The soil excavation plan should be clarified. The RAP should specify how much soil will be removed from each grid area (quantity or dimensions of excavation (if arsenic is detected in a soil sample in excess of the 10 ppm and 20 ppm criteria. Critical items to include:

- *Over-excavation depth*

The over-excavation depth will be 5 feet for all grid areas that exceed the 10 ppm criteria. The quantity of soil will depend on the dimensions of the grid. For example, the grids in Component 1B are approximately 100 feet wide by 100 feet long. Therefore, the total volume of soil that will be overexcavated and mixed for remediation will be approximately 1,852 cubic yards.

- *How ES will document that the arsenic-impacted material has been completely removed from the grid area*

A State-Certified Geologist will be present during sampling and remediation activities and will be taking detailed field notes. The geologist will measure and identify the grids in the field prior to sampling and remediation. If the grid sample returns arsenic results that are greater than 20 ppm then Rainbow and/or Environ Strategy will contact the Huntington Beach Fire Department as requested in Item 6. The Geologist will collect confirmation samples from the grids where remediation has been completed.

- *Identify whether material shallower than the sample depth will be included in the remediation.*

All material down to the sample depth will be overexcavated and mixed to remediate the arsenic concentrations. Therefore, the material overlying the sample depth will also be mixed.

4. The RAP indicates that "a confirmation sample will be collected from a depth of approximately 6 inches in each grid that has been remediated" [sec. 7.4]. ES references the Blasland, Bouck & Lee, Inc. (BBL) report titled Remedial Action Plan, Arsenic Impacted Soils, dated July 11, 1996. Similar to the referenced BBL remedial action plan, confirmation sampling should include the following item:

- *Prior to importing remediated soil or other clean soil to a grid for re-use, confirmation samples will be collected and analyzed for total arsenic concentrations to document that the soil is "verified clean" and that appropriate levels have been attained (arsenic concentrations below 10 ppm). Additionally, a confirmation sample will be collected and analyzed for total arsenic concentrations of the fill material once it is "in-place" on the receiving grid.*

Duly Noted

5. Please provide the full references for the RAP [Sec. 8.0] references (Bradford et al., 1996; LBNL 2002).

The references are:

Bradford, G.R., Chang, A.C., Page, A.L., 1996. Background concentrations of trace and major elements in California soils. Kearney Foundation Special Report, University of California, Riverside, March 1996, pp. 1–52.

LBNL, 2002. Ernest Orlando Lawrence Berkeley National Laboratory Environment, Health, and Safety Division, Site Environmental Report for 2002.

6. Soil samples within Huntington Beach, as well as vicinity import soil testing, have rarely shown values of arsenic to exceed 20 ppm. Soil sample in excess of 20 ppm should be reported to the Huntington Beach Fire Department as soon as the data are available from the laboratory (i.e., the proponent should not wait for a report submittal to transmit the information) so that the Fire Department may evaluate the appropriateness, or not, of replacing this material on-site, regardless of depth.

Rainbow and/or Environ Strategy will contact the Huntington Beach Fire Department as soon as data becomes available that indicates arsenic concentrations in excess of 20 ppm.

Once soil remediation and testing has been completed, a conformation results document for the referenced areas shall be submitted to the Huntington Beach Fire Department for review and approval. Documentation shall demonstrate that prior to grading or building plan approval, all soils meet City Specification 431-92 standards.

A final report with the analytical results of the initial and confirmation sampling, a description of the remedial activities performed, and a demonstration of compliance with City Specification 431-92 will be submitted to the Huntington Beach Fire Department upon completion.

If you have any questions or require additional information, please do not hesitate to contact John McNamara or the undersigned at (949) 581-3222.

Respectfully submitted,

Margaret Patrick, P.G. 7320
Project Geologist

Attachment

cc: Chief Duane Olson, City of Huntington Beach Fire Department
Mr. Lee Caldwell, City of Huntington Beach Fire Department
Mr. Jerry Moffatt, Rainbow Disposal Company, Inc.

APPENDIX E

Calscience Environmental Laboratories, Inc.

June 29, 2007

Margaret Patrick
Environ Strategy Consultants, Inc.
30 Hughes, Suite 209
Irvine, CA 92618-1916

Subject:	**Calscience Work Order No.:**	**07-06-2053**
	Client Reference:	**Rainbow Disposal**

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 6/27/2007 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Systems Manual, applicable standard operating procedures, and other related documentation. The original report of subcontracted analysis, if any, is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Ranjit K. K. Clarke

Calscience Environmental
Laboratories, Inc.
Ranjit Clarke
Project Manager

Calscience Environmental Laboratories, Inc.

Analytical Report

Environ Strategy Consultants, Inc.	Date Received: 06/27/07
30 Hughes, Suite 209	Work Order No: 07-06-2053
Irvine, CA 92618-1916	Preparation: EPA 3050B
	Method: EPA 6010B

Project: Rainbow Disposal

Page 1 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
FDSS-1	07-06-2053-1	06/27/07	Solid	ICP 5300	06/27/07	06/27/07	070627L10A

Parameter	Result	RL	DF	Qual	Units
Arsenic	13.8	0.750	1		mg/kg

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
FDSS-2	07-06-2053-2	06/27/07	Solid	ICP 5300	06/27/07	06/27/07	070627L10A

Parameter	Result	RL	DF	Qual	Units
Arsenic	4.16	0.750	1		mg/kg

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
FDSS-3	07-06-2053-3	06/27/07	Solid	ICP 5300	06/27/07	06/27/07	070627L10A

Parameter	Result	RL	DF	Qual	Units
Arsenic	4.86	0.750	1		mg/kg

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
FDSS-4	07-06-2053-4	06/27/07	Solid	ICP 5300	06/27/07	06/27/07	070627L10A

Parameter	Result	RL	DF	Qual	Units
Arsenic	2.90	0.750	1		mg/kg

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
FDSS-5	07-06-2053-5	06/27/07	Solid	ICP 5300	06/27/07	06/27/07	070627L10A

Parameter	Result	RL	DF	Qual	Units
Arsenic	2.69	0.750	1		mg/kg

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
FDSS-6	07-06-2053-6	06/27/07	Solid	ICP 5300	06/27/07	06/27/07	070627L10A

Parameter	Result	RL	DF	Qual	Units
Arsenic	3.00	0.750	1		mg/kg

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

Environ Strategy Consultants, Inc.		Date Received:	06/27/07
30 Hughes, Suite 209		Work Order No:	07-06-2053
Irvine, CA 92618-1916		Preparation:	EPA 3050B
		Method:	EPA 6010B

Project: Rainbow Disposal

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
FDSS-7	07-06-2053-7	06/27/07	Solid	ICP 5300	06/27/07	06/27/07	070627L10A

Parameter	Result	RL	DF	Qual	Units
Arsenic	2.35	0.750	1		mg/kg

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	097-01-002-9,464	N/A	Solid	ICP 5300	06/27/07	06/27/07	070627L10A

Parameter	Result	RL	DF	Qual	Units
Arsenic	ND	0.750	1		mg/kg

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Environ Strategy Consultants, Inc.	Date Received: 06/27/07
30 Hughes, Suite 209	Work Order No: 07-06-2053
Irvine, CA 92618-1916	Preparation: EPA 3050B
	Method: EPA 6010B

Project Rainbow Disposal

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
07-06-1990-1	Solid	ICP 5300	06/27/07	06/29/07	070627S10

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Arsenic	110	108	75-125	2	0-20	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

Environ Strategy Consultants, Inc.	Date Received: N/A
30 Hughes, Suite 209	Work Order No: 07-06-2053
Irvine, CA 92618-1916	Preparation: EPA 3050B
	Method: EPA 6010B

Project: Rainbow Disposal

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
097-01-002-9,464	Solid	ICP 5300	06/27/07	070627-I-10	070627L10A

Parameter	Conc Added	Conc Recovered	LCS %Rec	%Rec CL	Qualifiers
Arsenic	25.0	24.7	99	80-120	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Glossary of Terms and Qualifiers

Work Order Number: 07-06-2053

Qualifier	Definition
*	See applicable analysis comment.
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 or Matrix Spike Duplicate compound was out of control due to matrix interference. The associated LCS and/or LCSD was in control and, therefore, the sample data was reported without further clarification.
4	The MS/MSD RPD was out of control due to matrix interference. The LCS/LCSD RPD was in control and, therefore, the sample data was reported without further clarification.
5	The PDS/PDSD associated with this batch of samples was out of control due to a matrix interference effect. The associated batch LCS/LCSD was in control and, hence, the associated sample data was reported with no further corrective action required.
A	Result is the average of all dilutions, as defined by the method.
B	Analyte was present in the associated method blank.
C	Analyte presence was not confirmed on primary column.
E	Concentration exceeds the calibration range.
H	Sample received and/or analyzed past the recommended holding time.
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
N	Nontarget Analyte.
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.
U	Undetected at the laboratory method detection limit.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.

[illegible] LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 6/27/07

Page 1 of 1

LABORATORY CLIENT: Environ Strategy	CLIENT PROJECT NAME / NUMBER: Rainbow Disposal
ADDRESS: 30 Hughes Ste 209	P.O. NO.: 281 E
CITY: Irvine STATE: CA ZIP: 92618	PROJECT CONTACT: Margaret Patrick
TEL: 949-581-3222 FAX: 949 581-3207 E-MAIL: marg@environstrategy.com	LAB USE ONLY: 06-2053
	SAMPLER(S): (SIGNATURE) [signature]
	COELT LOG CODE ☐ ☐ ☐ ☐
	COOLER RECEIPT TEMP = °C

TURNAROUND TIME: ☐ SAME DAY ☐ 24 HR (circled) ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY): ☐ RWQCB REPORTING ☐ COELT REPORTING

SPECIAL INSTRUCTIONS:

Rush

REQUESTED ANALYSES

LAB USE ONLY	GEIMS ID	SAMPLE ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or ___	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EOB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)	Arsenic by 6010B				
		FDSS-1	6/27/07	10:45	S	1														X				
		FDSS-2	↓	11:35	S	1														X				
		FDSS-3		11:30	S	1														X				
		FDSS-4		11:50	S	1														X				
		FDSS-5		14:04	S	1														X				
		FDSS-6		13:45	S	1														X				
		FDSS-7		12:15	S	1														X				

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
[signature]	[signature]	062707	1450
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received for Laboratory by: (Signature)	Date:	Time:

DISTRIBUTION: White with final report, Green to File, Yellow and Pink to Client.
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the Yellow and Pink copies respectively.

09/10/01 Revision

Q&Q Graphic (714) 898-9702

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 07 - 0 6 - 2 0 5 3

Cooler 1 of 1

SAMPLE RECEIPT FORM

CLIENT: Environ Strategy

DATE: 06.27.07

TEMPERATURE – SAMPLES RECEIVED BY:

CALSCIENCE COURIER:

_____ Chilled, cooler with temperature blank provided.
_____ Chilled, cooler without temperature blank.
_____ Chilled and placed in cooler with wet ice.
_____ Ambient and placed in cooler with wet ice.
_____ Ambient temperature.
_____ °C Temperature blank.

LABORATORY (Other than Calscience Courier):

_____ °C Temperature blank.
6.0 °C IR thermometer.
_____ Ambient temperature.

Initial: [initials]

CUSTODY SEAL INTACT:

Sample(s): _____ Cooler: _____ No (Not Intact) : _____ Not Present: ✓

Initial: [initials]

SAMPLE CONDITION:

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples	✓		
Sampler's name indicated on COC	✓		
Sample container label(s) consistent with custody papers	✓		
Sample container(s) intact and good condition	✓		
Correct containers and volume for analyses requested	✓		
Proper preservation noted on sample label(s)			✓
VOA vial(s) free of headspace.			✓
Tedlar bag(s) free of condensation			✓

Initial: [initials]

COMMENTS:

APPENDIX F

Calscience Environmental Laboratories, Inc.

July 27, 2007

Margaret Patrick
Environ Strategy Consultants, Inc.
30 Hughes, Suite 209
Irvine, CA 92618-1916

Subject: **Calscience Work Order No.:** **07-07-1697**
Client Reference: **Rainbow Disposal / 281E**

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 7/25/2007 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Systems Manual, applicable standard operating procedures, and other related documentation. The original report of subcontracted analysis, if any, is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Ranjit K. K. Clarke

Calscience Environmental
Laboratories, Inc.
Ranjit Clarke
Project Manager

Calscience Environmental Laboratories, Inc.

Analytical Report

nelac ACCREDITED IN ACCORDANCE WITH

Environ Strategy Consultants, Inc.		Date Received:	07/25/07
30 Hughes, Suite 209		Work Order No:	07-07-1697
Irvine, CA 92618-1916		Preparation:	EPA 3050B
		Method:	EPA 6010B

Project: Rainbow Disposal / 281E

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
FDCS-1	**07-07-1697-1**	**07/25/07**	**Solid**	**ICP 5300**	**07/25/07**	**07/25/07**	**070725L05**

Parameter	Result	RL	DF	Qual	Units
Arsenic	2.68	0.750	1		mg/kg

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
FDCS-2	**07-07-1697-2**	**07/25/07**	**Solid**	**ICP 5300**	**07/25/07**	**07/25/07**	**070725L05**

Parameter	Result	RL	DF	Qual	Units
Arsenic	4.01	0.750	1		mg/kg

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	**097-01-002-9,642**	**N/A**	**Solid**	**ICP 5300**	**07/25/07**	**07/25/07**	**070725L05**

Parameter	Result	RL	DF	Qual	Units
Arsenic	ND	0.750	1		mg/kg

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Environ Strategy Consultants, Inc.
30 Hughes, Suite 209
Irvine, CA 92618-1916

Date Received:	07/25/07
Work Order No:	07-07-1697
Preparation:	EPA 3050B
Method:	EPA 6010B

Project Rainbow Disposal / 281E

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
07-07-1603-1	Solid	ICP 5300	07/25/07	07/26/07	070725S05

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Arsenic	93	98	75-125	5	0-20	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

Environ Strategy Consultants, Inc.
30 Hughes, Suite 209
Irvine, CA 92618-1916

Date Received:	N/A
Work Order No:	07-07-1697
Preparation:	EPA 3050B
Method:	EPA 6010B

Project: Rainbow Disposal / 281E

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
097-01-002-9,642	Solid	ICP 5300	07/25/07	070725-I-05	070725L05

Parameter	Conc Added	Conc Recovered	LCS %Rec	%Rec CL	Qualifiers
Arsenic	25.0	25.3	101	80-120	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Glossary of Terms and Qualifiers

Work Order Number: 07-07-1697

Qualifier	Definition
*	See applicable analysis comment.
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 or Matrix Spike Duplicate compound was out of control due to matrix interference. The associated LCS and/or LCSD was in control and, therefore, the sample data was reported without further clarification.
4	The MS/MSD RPD was out of control due to matrix interference. The LCS/LCSD RPD was in control and, therefore, the sample data was reported without further clarification.
5	The PDS/PDSD associated with this batch of samples was out of control due to a matrix interference effect. The associated batch LCS/LCSD was in control and, hence, the associated sample data was reported with no further corrective action required.
A	Result is the average of all dilutions, as defined by the method.
B	Analyte was present in the associated method blank.
C	Analyte presence was not confirmed on primary column.
E	Concentration exceeds the calibration range.
H	Sample received and/or analyzed past the recommended holding time.
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
N	Nontarget Analyte.
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.
U	Undetected at the laboratory method detection limit.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.

CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1427
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 7/25/07

Page 1 of 1

LABORATORY CLIENT: Environ Strategy
ADDRESS: 30 Hughes Suite 209
CITY: Irvine STATE: CA ZIP: 92618
TEL: 949 581-3222 E-MAIL: marg@environstrategy.com

TURNAROUND TIME: ☐ SAME DAY ☒ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY): ☐ RWQCB REPORTING FORMS ☐ COELT EDF ☐

SPECIAL INSTRUCTIONS: Rush

CLIENT PROJECT NAME / NUMBER: Rainbow Disposal
P.O. NO.: 281E
PROJECT CONTACT: Margaret Patrick
LAB USE ONLY: 07-07-0697
SAMPLER(S): (PRINT) Margaret Patrick
COELT LOG CODE: ☐☐☐☐
COOLER RECEIPT TEMP = ____ °C

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	FIELD POINT NAME (FOR COELT EDF)	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or ___	BTEX / MTBE (8260B) or ___	OXYGENATES (8260B)	VOCs (8260B)	5035 ENCORE PREP	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	CAC, T22 METALS (6010B) / 747___	PNAs (8310) or (8270C)	VOCs (TO-14A) or (TO-15)	TPH(G) (TO-3M)	6010 arsenic only				
	FDCS-1		7/25/07	9:30	S	2														X				
	FDCS-2		7/25/07	9:15	S	2														X				

Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
Margaret Patrick	[signature] (CEL)	07.25.07	1109
Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:

DISTRIBUTION: White with final report, Green and Yellow to Client.
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the Green and Yellow copies respectively.

05/10/06 Revision

Q&Q Graphic 714-898-9702

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 07 - 0 7 - 1 6 9 7

Cooler 1 of 1

SAMPLE RECEIPT FORM

CLIENT: Environ Strategy DATE: 07-25-07

TEMPERATURE – SAMPLES RECEIVED BY:

CALSCIENCE COURIER:

_____ Chilled, cooler with temperature blank provided.
_____ Chilled, cooler without temperature blank.
_____ Chilled and placed in cooler with wet ice.
_____ Ambient and placed in cooler with wet ice.
_____ Ambient temperature.

_____ °C Temperature blank.

LABORATORY (Other than Calscience Courier):

_____ °C Temperature blank.
5.4 °C IR thermometer.
_____ Ambient temperature.

Initial: [initials]

CUSTODY SEAL INTACT:

Sample(s): _____ Cooler: _____ No (Not Intact) : _____ Not Present: ✓

Initial: [initials]

SAMPLE CONDITION:

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples	✓		
Sampler's name indicated on COC	✓		
Sample container label(s) consistent with custody papers	✓		
Sample container(s) intact and good condition	✓		
Correct containers and volume for analyses requested	✓		
Proper preservation noted on sample label(s)			✓
VOA vial(s) free of headspace.			✓
Tedlar bag(s) free of condensation			✓

Initial: [initials]

COMMENTS:

Calscience Environmental Laboratories, Inc.

August 10, 2007

Margaret Patrick
Environ Strategy Consultants, Inc.
30 Hughes, Suite 209
Irvine, CA 92618-1916

Subject: **Calscience Work Order No.: 07-08-0679**
Client Reference: Rainbow Disposal Comp. 1B / 281E

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 8/9/2007 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Systems Manual, applicable standard operating procedures, and other related documentation. The original report of subcontracted analysis, if any, is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Ranjit K. K. Clarke

Calscience Environmental
Laboratories, Inc.
Ranjit Clarke
Project Manager

Calscience Environmental Laboratories, Inc.

Analytical Report

Environ Strategy Consultants, Inc.	Date Received: 08/09/07
30 Hughes, Suite 209	Work Order No: 07-08-0679
Irvine, CA 92618-1916	Preparation: EPA 3050B
	Method: EPA 6010B

Project: Rainbow Disposal Comp. 1B / 281E

Page 1 of 1

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
FDCS-3	07-08-0679-1	08/09/07	Solid	ICP 5300	08/09/07	08/09/07	070809L02

Parameter	Result	RL	DF	Qual	Units
Arsenic	2.13	0.750	1		mg/kg

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	097-01-002-9,697	N/A	Solid	ICP 5300	08/09/07	08/09/07	070809L02

Parameter	Result	RL	DF	Qual	Units
Arsenic	ND	0.750	1		mg/kg

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Environ Strategy Consultants, Inc.
30 Hughes, Suite 209
Irvine, CA 92618-1916

Date Received: 08/09/07
Work Order No: 07-08-0679
Preparation: EPA 3050B
Method: EPA 6010B

Project Rainbow Disposal Comp. 1B / 281E

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
07-08-0634-1	Solid	ICP 5300	08/09/07	08/09/07	070809S02

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Arsenic	106	96	75-125	8	0-20	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

Environ Strategy Consultants, Inc.		Date Received:	N/A
30 Hughes, Suite 209		Work Order No:	07-08-0679
Irvine, CA 92618-1916		Preparation:	EPA 3050B
		Method:	EPA 6010B

Project: Rainbow Disposal Comp. 1B / 281E

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
097-01-002-9,697	Solid	ICP 5300	08/09/07	070809-1-02	070809L02

Parameter	Conc Added	Conc Recovered	LCS %Rec	%Rec CL	Qualifiers
Arsenic	25.0	25.5	102	80-120	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Glossary of Terms and Qualifiers

Work Order Number: 07-08-0679

Qualifier	Definition
*	See applicable analysis comment.
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 or Matrix Spike Duplicate compound was out of control due to matrix interference. The associated LCS and/or LCSD was in control and, therefore, the sample data was reported without further clarification.
4	The MS/MSD RPD was out of control due to matrix interference. The LCS/LCSD RPD was in control and, therefore, the sample data was reported without further clarification.
5	The PDS/PDSD associated with this batch of samples was out of control due to a matrix interference effect. The associated batch LCS/LCSD was in control and, hence, the associated sample data was reported with no further corrective action required.
A	Result is the average of all dilutions, as defined by the method.
B	Analyte was present in the associated method blank.
C	Analyte presence was not confirmed on primary column.
E	Concentration exceeds the calibration range.
H	Sample received and/or analyzed past the recommended holding time.
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
N	Nontarget Analyte.
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.
U	Undetected at the laboratory method detection limit.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.

CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 8/9/07

Page 1 of 1

LABORATORY CLIENT: Environ Strategy Consultants	CLIENT PROJECT NAME / NUMBER: Rainbow Disposal Comp. 18
ADDRESS: 30 Hughes Suite 209	P.O. NO.: 281E
CITY: Irvine STATE: CA ZIP: 92618	PROJECT CONTACT: Margaret Patrick
TEL: 949 581 3222 FAX: 949 581-3207 E-MAIL: marg@environstrategy.com	LAB USE ONLY: 08-0679
SAMPLER(S): (SIGNATURE) [signature]	COELT LOG CODE: ☐☐☐☐
COOLER RECEIPT TEMP = ____ °C	

TURNAROUND TIME:
☐ SAME DAY ☑ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING ☐ COELT REPORTING

SPECIAL INSTRUCTIONS:

REQUESTED ANALYSES

LAB USE ONLY	GEIMS ID	SAMPLE ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or ___	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EOB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)	6010B arsenic				
		FDCS-3	8/9/07	8:38	S	1														X				

Relinquished by: (Signature) [signature]	Received by: (Signature) [signature] (CEL)	Date: 080907	Time: 1126
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received for Laboratory by: (Signature)	Date:	Time:

DISTRIBUTION: White with final report, Green to File, Yellow and Pink to Client.
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the Yellow and Pink copies respectively.

09/10/01 Revision

Q&Q Graphic (714) 898-9702

Calscience Environmental Laboratories, Inc.

WORK ORDER #: **07** - 0 8 - 0 6 7 9

Cooler 1 of 1

SAMPLE RECEIPT FORM

CLIENT: Environ Strategy DATE: 08·09·07

TEMPERATURE – SAMPLES RECEIVED BY:

CALSCIENCE COURIER:

_______ Chilled, cooler with temperature blank provided.
_______ Chilled, cooler without temperature blank.
_______ Chilled and placed in cooler with wet ice.
_______ Ambient and placed in cooler with wet ice.
_______ Ambient temperature.
_______ °C Temperature blank.

LABORATORY (Other than Calscience Courier):

_______ °C Temperature blank.
7.6 °C IR thermometer.
_______ Ambient temperature.

Initial: [initials]

CUSTODY SEAL INTACT:

Sample(s): _______ Cooler: _______ No (Not Intact) : _______ Not Present: ✓

Initial: [initials]

SAMPLE CONDITION:

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples	✓		
Sampler's name indicated on COC	✓		
Sample container label(s) consistent with custody papers	✓		
Sample container(s) intact and good condition	✓		
Correct containers and volume for analyses requested	✓		
Proper preservation noted on sample label(s)			✓
VOA vial(s) free of headspace			✓
Tedlar bag(s) free of condensation			✓

Initial: [initials]

COMMENTS: