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1200 Pennsylvania Avenue, N.W.
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Support Document for the Revised National Priorities List Final Rule – Jervis B. Webb Co.

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Site Assessment and Remedy Decisions Branch
Office of Superfund Remediation and Technology Innovation
Office of Solid Waste and Emergency Response
U.S. Environmental Protection Agency
Washington, DC 20460

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Executive Summary

Section 105(a)(8)(B) of CERCLA, as amended by SARA, requires that the EPA prepare a list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States. An original National Priorities List (NPL) was promulgated on September 8, 1983 (48 FR 40658). CERCLA requires that the EPA update the list at least annually.

This document provides responses to public comments received on the Jervis B. Webb Co. site, proposed on September 16, 2011 (76 FR 57702). This site is being added to the NPL based on an evaluation under the EPA's Hazard Ranking System (HRS) in a final rule published in the *Federal Register* in May 2012.

Introduction

This document explains the rationale for adding the Jervis B. Webb Co. site in South Gate, California, to the National Priorities List (NPL) of uncontrolled hazardous waste sites and also provides the responses to public comments received on this site. The EPA proposed this site on September 16, 2011 (76 FR 57702). This site is being added to the NPL based on an evaluation under the Hazard Ranking System (HRS) in a final rule published in the *Federal Register* in May 2012.

Background of the NPL

In 1980, Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Sections 9601 *et seq.* in response to the dangers of uncontrolled hazardous waste sites. CERCLA was amended on October 17, 1986, by the Superfund Amendments and Reauthorization Act (SARA), Public Law No. 99-499, stat., 1613 *et seq.* To implement CERCLA, the EPA promulgated the revised National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300, on July 16, 1982 (47 FR 31180), pursuant to CERCLA Section 105 and Executive Order 12316 (46 FR 42237, August 20, 1981). The NCP, further revised by the EPA on September 16, 1985 (50 FR 37624) and November 20, 1985 (50 FR 47912), sets forth guidelines and procedures needed to respond under CERCLA to releases and threatened releases of hazardous substances, pollutants, or contaminants. On March 8, 1990 (55 FR 8666), the EPA further revised the NCP in response to SARA.

Section 105(a)(8)(A) of CERCLA, as amended by SARA, requires that the NCP include

> criteria for determining priorities among releases or threatened releases throughout the United States for the purpose of taking remedial action and, to the extent practicable, take into account the potential urgency of such action, for the purpose of taking removal action.

Removal action involves cleanup or other actions that are taken in response to emergency conditions or on a short-term or temporary basis (CERCLA Section 101). Remedial action is generally long-term in nature and involves response actions that are consistent with a permanent remedy for a release (CERCLA Section 101). Criteria for placing sites on the NPL, which makes them eligible for remedial actions financed by the Trust Fund established under CERCLA, were included in the HRS. The EPA promulgated the HRS as Appendix A of the NCP (47 FR 31219, July 16, 1982). On December 14, 1990 (56 FR 51532), the EPA promulgated revisions to the HRS in response to SARA, and established the effective date for the HRS revisions as March 15, 1991.

Section 105(a)(8)(B) of CERCLA, as amended, requires that the statutory criteria provided by the HRS be used to prepare a list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States. The list, which is Appendix B of the NCP, is the NPL.

An original NPL of 406 sites was promulgated on September 8, 1983 (48 FR 40658). At that time, an HRS score of 28.50 was established as the cutoff for listing because it yielded an initial NPL of at least 400 sites, as suggested by CERCLA. The NPL has been expanded several times since then, most recently on March 15, 2012 (77 FR 15276). The Agency also has published a number of proposed rulemakings to add sites to the NPL. The most recent proposal was on March 15, 2012 (77 FR 15344).

Development of the NPL

The primary purpose of the NPL is stated in the legislative history of CERCLA (Report of the Committee on Environment and Public Works, Senate Report No. 96-848, 96th Cong., 2d Sess. 60 [1980]).

> The priority list serves primarily informational purposes, identifying for the States and the public those facilities and sites or other releases which appear to warrant remedial actions. Inclusion of a facility or site on the list does not in itself reflect a judgment of the activities of its owner or operator, it does not require those persons to undertake any action, nor does it assign liability to any person. Subsequent government actions will be necessary in order to do so, and these actions will be attended by all appropriate procedural safeguards.

The NPL, therefore, is primarily an informational and management tool. The identification of a site for the NPL is intended primarily to guide the EPA in determining which sites warrant further investigation to assess the nature and extent of the human health and environmental risks associated with the site and to determine what CERCLA-financed remedial action(s), if any, may be appropriate. The NPL also serves to notify the public of sites the EPA believes warrant further investigation. Finally, listing a site may, to the extent potentially responsible parties are identifiable at the time of listing, serve as notice to such parties that the Agency may initiate CERCLA-financed remedial action.

CERCLA Section 105(a)(8)(B) directs the EPA to list priority sites among the known releases or threatened release of hazardous substances, pollutants, or contaminants, and Section 105(a)(8)(A) directs the EPA to consider certain enumerated and other appropriate factors in doing so. Thus, as a matter of policy, the EPA has the discretion not to use CERCLA to respond to certain types of releases. Where other authorities exist, placing sites on the NPL for possible remedial action under CERCLA may not be appropriate. Therefore, the EPA has chosen not to place certain types of sites on the NPL even though CERCLA does not exclude such action. If, however, the Agency later determines that sites not listed as a matter of policy are not being properly responded to, the Agency may consider placing them on the NPL.

Hazard Ranking System

The HRS is the principle mechanism the EPA uses to place uncontrolled waste sites on the NPL. It is a numerically based screening system that uses information from initial, limited investigations -- the preliminary assessment and site inspection -- to assess the relative potential of sites to pose a threat to human health or the environment. HRS scores, however, do not determine the sequence in which the EPA funds remedial response actions, because the information collected to develop HRS scores is not sufficient in itself to determine either the extent of contamination or the appropriate response for a particular site. Moreover, the sites with the highest scores do not necessarily come to the Agency's attention first, so that addressing sites strictly on the basis of ranking would in some cases require stopping work at sites where it was already underway. Thus, the EPA relies on further, more detailed studies in the remedial investigation/feasibility study that typically follows listing.

The HRS uses a structured value analysis approach to scoring sites. This approach assigns numerical values to factors that relate to or indicate risk, based on conditions at the site. The factors are grouped into three categories. Each category has a maximum value. The categories are:

- likelihood that a site has released or has the potential to release hazardous substances into the environment;
- characteristics of the waste (toxicity and waste quantity); and
- people or sensitive environments (targets) affected by the release.

Under the HRS, four pathways can be scored for one or more threats as identified below:

- Ground Water Migration (S_{gw})

- drinking water

- Surface Water Migration (S_{sw})
  The following threats are evaluated for two separate migration components, overland/flood migration and ground water to surface water.
  - drinking water
  - human food chain
  - sensitive environments

- Soil Exposure (S_s)
  - resident population
  - nearby population
  - sensitive environments

- Air Migration (S_a)
  - population
  - sensitive environments

After scores are calculated for one or more pathways according to prescribed guidelines, they are combined using the following root-mean-square equation to determine the overall site score (S), which ranges from 0 to 100:

$$S = \frac{S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2}{4}$$

If all pathway scores are low, the HRS score is low. However, the HRS score can be relatively high even if only one pathway score is high. This is an important requirement for HRS scoring because some extremely dangerous sites pose threats through only one pathway. For example, buried leaking drums of hazardous substances can contaminate drinking water wells, but -- if the drums are buried deep enough and the substances not very volatile -- not surface water or air.

Other Mechanisms for Listing

There are two mechanisms other than the HRS by which sites can be placed on the NPL. The first of these mechanisms, authorized by the NCP at 40 CFR 300.425(c)(2), allows each State and Territory to designate one site as its highest priority regardless of score. The last mechanism, authorized by the NCP at 40 CFR 300.425(c)(3), allows listing a site if it meets the following three requirements:

- Agency for Toxic Substances and Disease Registry (ATSDR) of the U.S. Public Health Service has issued a health advisory that recommends dissociation of individuals from the release;
- EPA determines the site poses a significant threat to public health; and
- EPA anticipates it will be more cost-effective to use its remedial authority than to use its emergency removal authority to respond to the site.
-

Organization of this Document

The following section contains the EPA responses to site-specific public comments received on the proposal of the Jervis B. Webb Co. site on September 16, 2011 (76 FR 57702). The site discussion begins with a list of

commenters, followed by a site description, a summary of comments, and Agency responses to each comment. A concluding statement indicates the effect of the comments on the HRS score for the site.

Glossary

The following acronyms and abbreviations are used throughout the text:

1,1-DCE	1,1-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane
Agency	U.S. Environmental Protection Agency
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. Sections 9601 *et seq*., also known as Superfund
cis-1,2-DCE	cis-1,2-dichloroethene
CFR	Code of federal regulations
cm/sec	centimeters per second
CPT	Cone penetrometer test
D.C. Cir	U.S. Court of Appeals for the District of Columbia Circuit
°C	degrees Celcius
DNAPL	Dense non-aqueous phase liquid
Dragun	Dragun Corporation
EKI	Erler and Kalinowski
EPA	U.S. Environmental Protection Agency, also USEPA
FR	Federal register
g/L	gram per liter
HRS	Hazard Ranking System, Appendix A of the NCP
HRS score	Overall site score calculated using the Hazard Ranking System; ranges from 0 to 100
IRIS	Integrated Risk Information System
MCL	Maximum contaminant level
MDL	Method detection limit
mg/kg	milligrams per kilogram
µg/L	micrograms per liter
mm Hg	millimeters of mercury
NCP	National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300
NFA	No further action

NPL	National Priorities List, Appendix B of the NCP
OSWER	USEPA's Office of Solid Waste and Emergency Response
PCE	Tetrachloroethene
ppmv	parts per million by volume
RI/FS	Remedial Investigation/Feasibility Study
SARA	Superfund Amendments and Reauthorization Act
SVE	Soil vapor extraction
SVOC	Semi-volatile organic compound
TCE	Trichloroethene
TDL	Target distance limit
trans-1,2-DCE	trans-1,2-dichloroethene
VOC	Volatile organic compound
WRDOSC	Water Replenishment District of Southern California

1. List of Commenters and Correspondence

EPA-HQ-SFUND-2011-0644-0005	Comment, dated November 3, 2011, from Carlos Velasquez.
EPA-HQ-SFUND-2011-0644-0006	Comment, dated November 5, 2011, from Maritza Velasquez.
EPA-HQ-SFUND-2011-0644-0007	Comment, dated November 5, 2011, from Mehnoosh Anwar.
EPA-HQ-SFUND-2011-0644-0008	Comment, dated November 15, 2011, from Michael Sklash, Senior Hydrogeologist and Jeffrey A. Bolin, Vice President-Technical Operations, Dragun Corporation. Comment attachment, submitted November 15, 2011, from Michael Sklash, Senior Hydrogeologist and Jeffrey A. Bolin, Vice President-Technical Operations, Dragun Corporation. Groundwater and Soil Evaluation, 5030 Firestone Boulevard and 9301 Rayo Avenue, South Gate, California, May 22, 2001. Prepared by The Dragun Corporation and IT Corporation for Jervis B. Webb Company of California.

2. Site Description

The Jervis B. Webb Co. site (the Site; the Jervis Webb site) is located in the general area of two contiguous properties: 9301 Rayo Avenue and 5030 Firestone Boulevard, South Gate, Los Angeles County, California. The Site includes a soil source contaminated with chlorinated solvents trichloroethene (TCE) and tetrachloroethene (PCE) adjacent to and underneath the north facility building on the Firestone Boulevard property, and a release of chlorinated solvents to the ground water.

The properties occupy approximately 3.82 acres. Starting in the 1950s, the Jervis B. Webb Co. operated a custom conveyor and crane manufacturing facility at the 9301 Rayo Avenue property, which consisted of cutting, drilling, assembling, welding, and painting the steel pieces that comprised the final product. Chlorinated solvents were known to be used as part of this manufacturing process. The 5030 Firestone Boulevard property was acquired by the Jervis B. Webb Co. in 1960, and was occupied by the Blake Rivet Company from the 1950s until approximately 1980. The Blake Rivet Company manufactured aircraft rivets; the manufacturing process included an above-ground anodizing operation that generated wastewater and included storing and using metal stock and anodizing solutions. Wastewater was discharged to a three-stage clarifier and then to a sanitary sewer. The Jervis B. Webb Co. also used the 5030 Firestone Boulevard property for storage of metal stock equipment and other materials including hazardous waste (Ref. 10, p. 6).

Hazardous waste manifests from the 1980s indicate that solvents existed on the Jervis B. Webb Co. property at 9301 Rayo Avenue. In 1986, approximately 1,500 pounds of soil contaminated with oil and solvents were transported offsite; in 1988, 385 gallons of waste 1,1,1-trichloroethane (1,1,1-TCA) were transported offsite; and in 1989, 385 gallons of oil-based paints containing chlorinated solvents were transported offsite. Additionally, beginning in March 2000 and until October 2001, a soil vapor extraction system was operated on the Jervis B. Webb Co. property. This system removed approximately 177 pounds of volatile organic compounds, primarily TCE, from the soil on the Jervis B. Webb Co. property at 9301 Rayo Avenue.

The source evaluated for the HRS documentation record at proposal, Source 1, is composed of chlorinated solvent-contaminated soil located in the northwest portion of the property. Several soil samples at various depths exhibited TCE and PCE contamination. The greatest contamination was detected at concentrations of 140

milligrams per kilogram (mg/kg) TCE and 270 mg/kg PCE in a sample collected approximately 20 feet below ground surface (bgs) in the vicinity of the former clarifier on the northwest portion of the Jervis B. Webb Co. property at 9301 Rayo Avenue.

The Bellflower Aquiclude[1] extends from the surface to a depth of approximately 55 to 70 feet bgs and consists of sandy silts, clayey silts, and lesser amounts of silty clay. A semi-perched aquifer is present within the Bellflower Aquiclude. Water levels are generally found in a laterally continuous 5-foot-thick silty/sandy unit at approximately 35 to 40 feet bgs, which is underlain by finer materials of the Bellflower Aquiclude. The Bellflower Aquiclude does not restrict ground water movement between the strata composing the aquifer. A discontinuous clay layer is present at the Site beginning at approximately 26 ft bgs. Below the Bellflower Aquiclude, ground water beneath the Site is present in the Gaspur Aquifer, the Exposition Aquifer and, the Gage Aquifer (from shallowest to deepest), and these aquifers have been documented to be interconnected within 2 miles of the Site source. Additionally, the ground water flow at the Site is toward the south-southeast.

An observed release of chlorinated solvents including TCE, PCE, 1,1-dichloroethene (1,1-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE) in ground water was identified in a monitoring well (MW-1) screened within the Gaspur aquifer below the Firestone Boulevard property; TCE concentrations in observed release samples were detected from 24,000 to 24,979 micrograms per liter (µg/L), well above background concentrations between 1,865.7 and 3,000 µg/L detected in monitoring well MW-2.

The Jervis Webb site is located in an urban area in which numerous drinking water wells are located. Eight drinking water wells located within four miles of the Site and screened within the Gage and Exposition aquifers were evaluated as subject to potential contamination.

[1] An aquiclude is a formation that, although porous and capable of storing water, does not transmit it at rates sufficient to furnish an appreciable supply for a well or spring (as defined in EPA's *A Lexicon of Cave and Karst Terminology with Special Reference to Environmental Karst Hydrology*, February 2002, available at http://www.epa.gov/nscep/index.html).

Ground Water Flow

Monitoring Well

CPT Ground Water Sample

5030 Firestone Blvd Property

9301 Rayo Ave Property

Figure 1 – Site Area Showing Ground Water Sample Approximate Locations[2].

[2] Base map: Google Earth Monitoring well locations and approximated property boundaries: page 26 of Reference 11 of the HRS documentation record at proposal (Erler & Kalinowski, Inc., Phase II Groundwater Investigation Report, June 30, 1998). CPT sample locations: page 29 of Attachment 2, Excerpt of January 1999 Additional Groundwater Investigation Report, of this support document.

Ground Water Flow

Monitoring Well

CPT Ground Water Sample

Source 1 Soil Boring Location

Other Soil Boring Locations

Select Soil Gas Sample Locations

5030 Firestone Blvd Property

9301 Rayo Ave Property

Figure 2 – Soil Sample and Select Soil Gas Sample Approximate Locations[3].

[3] Base map: Google Earth. Soil boring and soil gas sample locations: page 36 of Reference 10 of the HRS documentation record at proposal (Erler & Kalinowski, Inc., Phase II Groundwater Investigation Report, February 18, 1998). Monitoring well locations and approximated property boundaries: page 26 of Reference 11 of the HRS documentation record at proposal (Erler & Kalinowski, Inc., Phase II Groundwater Investigation Report, June 30, 1998). CPT sample locations: page 29 of Attachment 2, Excerpt of January 1999 Additional Groundwater Investigation Report, of this support document.

3. Summary of Comments

Three commenters submitted comments in support of placing the Jervis B. Webb Co. site (the Site) on the NPL. The commenters supported the listing decision based on the proximity of the Site to residential areas, a desire for the Site to be remediated, concerns of possible impacts on public health due to the Site, and concerns that if the Site does not get cleaned up then remedial actions to nearby facilities may not be effective.

One commenter, Dragun Corporation (Dragun), submitted comments in opposition to placing the Jervis Webb site on the NPL. Dragun disagreed with the site name of "Jervis B. Webb Co." as assigned by the EPA and requested that if the site is listed, it should be listed as the "Jervis B. Webb of California" site. Dragon commented specifically on the following topics:

- Adequacy of the Public docket
- Hydraulic connection of the underlying aquifers and ground water flow conditions
- Attribution of the chlorinated solvents to the facility including:
    - Contamination in upgradient wells
    - Presence of a clay layer
    - Magnitude of soil contamination
    - Distribution of PCE/TCE degradation products
    - Ratio of TCE/PCE, and
    - Downward contaminant migration.

On the adequacy of the public docket, Dragun identified that a May 22, 2001, report prepared by Dragun and IT Corporation for the Jervis B. Webb Company of California (hereafter referred to as the 2001 Dragun Report) was not included in the HRS documentation record references and commented that "the data and analyses in Dragun's report were not discussed and did not appear to have been considered" in the HRS documentation record. Dragun considered that the data in this report was relevant to the HRS evaluation.

Regarding local hydrogeology, the 2001 Dragun Report stated that according to a Water Replenishment District of Southern California document, the Gaspur Aquifer is not hydraulically connected to the deeper drinking water aquifers as stated in the HRS documentation record at proposal. Dragun also stated that ground water at the Site flows from north to south, which means that Firestone Boulevard represents the upgradient property boundary, not from the north-northwest to the south-southeast as stated in the HRS documentation record at proposal.

Regarding attribution of the contamination in the aquifer under the Jervis B. Webb Co. facility, Dragun claimed that available evidence indicates that the chlorinated solvent contamination in the ground water and deep soil at the Site has been caused by contaminated ground water migration from an offsite upgradient source, not from downward migration from the onsite source, Source 1, surficial soil contamination. In support of this argument, Dragun made the following arguments:

- Dragun asserted that chlorinated solvent concentrations found in ground water near the north end of the 5030 Firestone Boulevard property, coupled with a lack of soil contamination at those locations, indicates there is an offsite upgradient source of the contamination in ground water. Dragun pointed to TCE found in ground water detected in upgradient background well MW-2 and direct-push sample locations CPT-6 and CPT-7, but claimed that soil gas and soil chemistry concentrations of TCE are insufficient in these areas to explain the ground water TCE contamination levels.

- Dragun contended that Source 1 soil contaminant levels of TCE are too low to account for the ground water contamination at the Site. Dragun identified that TCE has been found in ground water at levels above 25,000 µg/L in monitoring well MW-1 and direct-push locations CPT-6 and CPT-7. Dragun stated

that contamination levels this high indicate the presence of dense non-aqueous phase liquid (DNAPL). Dragun contended that the soils only contained low levels of chlorinated solvents, and no indications of DNAPL concentrations. Thus, Dragun argued that TCE concentrations in soil cannot explain TCE levels in ground water, and that the DNAPL affecting ground water must have entered the ground water upgradient of the Site.

- Dragun argued that a clay layer at the Site approximately 25 ft. below ground surface (bgs) would limit surface contaminant migration, and that the clay layer should have exhibited higher contaminant concentrations above the clay layer if indeed the source of ground water contamination was a surface soil TCE/PCE release moving downward toward the water table.

- As further evidence of its assertion that the distribution of chemicals in ground water cannot be explained by the chemicals in soil, Dragun also pointed to the distribution of TCE/PCE breakdown products 1,1-DCE, 1,1-DCA and cis-1,2-dichoroethene (cis-1,2-DCE) at the Site. Dragun concluded that "the distribution of chemicals in groundwater cannot be accounted for by the observed distribution of chemicals in soil and the observed groundwater flow direction," and that this evidence instead indicates an upgradient offsite source.

- Dragun asserted that the TCE/PCE ratios in soil, soil gas, and ground water contradict the HRS documentation record scenario in which ground water has been contaminated by Source 1 contaminated soils. Dragun stated that the TCE/PCE ratios in "soil gas and soil are similar to each other; however, they are strikingly different from the TCE to PCE ratio in the groundwater." Dragun stated that the ratio increases below the clay layer, and that ratios in the soils near the water table are closer to the ratios observed in the ground water; this, Dragun argued, indicates that the TCE and PCE in soil have not caused the TCE and PCE in ground water.

- Dragun concluded that the deeper soil below the clayey layer has been contaminated by chlorinated solvents in the ground water, not from a surface release of chemicals at the Site. Dragun stated that soil TCE and PCE levels are low above the clayey unit and stated that the contaminant concentrations increasing with depth in soils below the clayey unit are "not nearly high enough to produce the observed groundwater concentrations." Dragun argued that TCE in soil just above the water table is due to the impacted ground water (off-gassing or smear zone) and not the overlying soil. Therefore, Dragun concluded that the origin of the TCE and PCE must be from an offsite upgradient source.

3.1 Support for Listing and Other Non-opposition Comments

Three commenters (Carlos Velasquez, Maritza Velasquez and Mehnoosh Anwar) submitted comments in support of placing the Jervis B. Webb Co. site (the Site; the Jervis Webb site) on the NPL. The reasons for this support included:

- A desire for the Site to be remediated.
- The Site's proximity to residential areas.
- The number of polluted sites in the general area.
- Concerns for the possible impacts on public health due to the Site.
- Concern that failure to list the Site may jeopardize cleanup at the nearby Southern Avenue Industrial Area site (formerly known as the Seam Master Industries site) located south of the Site, because the ground water in the area generally flows to the south, and migrating contamination from the Site may make remediation at the Southern Avenue Industrial Area site ineffectual.

Response: The Jervis B. Webb Co. site has been added to the NPL. Listing makes a site eligible for remedial action funding under CERCLA. The Jervis B. Webb Co. site will be further investigated during the remedial investigation/feasibility study (RI/FS) phase of the Superfund process to determine what response, if any, is appropriate. Actual funding may not necessarily be undertaken in the precise order of HRS scores, however, and upon more detailed investigation may not be necessary at all in some cases. EPA determines the need for using Superfund monies for remedial activities on a site-by-site basis, taking into account the NPL ranking, State priorities, further site investigation, other response alternatives, and other factors as appropriate.

3.2 Site Name

Comment: Dragun Corporation (Dragun) disagreed with the site name of "Jervis B. Webb Co." as assigned by EPA. Dragun explained that it was retained by "Jervis B. Webb of California," a separate entity from Jervis B. Webb Co.; Dragun argued that if the site is listed it should be listed as the "Jervis B. Webb of California" site.

Response: The site name has not been revised. While neither CERCLA nor the NCP establishes a required procedure for assigning a site name to a proposed listing, in this case it is reasonable to have named the site the Jervis B. Webb Co. site. Since the primary purpose of an NPL listing is to inform the public that the EPA has determined that the site warrants further investigation, the attempt is made to select the name that most clearly informs the public as to the location of the site, what appears to be the primary source(s) of the problems at the site, and/or considers assigning a geographic name. The attempt is also made to select names that do not offend local sensitivities (see OSWER Directive 9345.1-08, Regional Quality Control Guidance for NPL Candidate Sites, 12/26/91).

The site was named after Jervis B. Webb Co., which operated at the site for several decades from the 1950s on at the Rayo Avenue property and would be expected to have some degree of name-association to the public. Furthermore, the name is consistent with that used at times during investigation by the California Department of Toxic Substance Control, prior to referral of the site to the EPA.

Importantly, the name of the site does not in any way restrict the evaluation of the site, its sources, its releases, or extent of contamination to only the practices of the Jervis B. Webb Co. As the *Federal Register* in which the Jervis B. Webb Co. site was proposed to the NPL (76 FR 57704, Section F) states, "the precise nature and extent of the site are typically not known at the time of listing." Any and all areas of contamination associated with the site will be explored during further investigation activities.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.3 Adequacy of Public Docket

Comment: Dragun identified that a May 22, 2001, report prepared by Dragun and IT Corporation for the Jervis B. Webb Company of California titled *Groundwater and Soil Evaluation, 5030 Firestone Boulevard and 9301 Rayo Avenue, South Gate, California*, (attached to its comment document, and hereafter referred to as the 2001 Dragun Report) was not included in the HRS documentation record references; Dragun commented that "the data and analyses in Dragun's report were not discussed and did not appear to have been considered" in the HRS documentation record. Dragun stated that the report had been submitted in 2001 to the Los Angeles Regional Water Quality Control Board, and should therefore have been available to the EPA. As further detailed in subsequent sections of this support document, Dragun contends that the information in the 2001 Dragun Report indicate the contaminated soil at the Site is not the source of the contamination found in ground water at the Site; rather, this ground water contamination is the result of contaminated ground water migrating from an upgradient source. The 2001 Dragun Report also highlighted several specific references used in its analysis of the Site, including:

- *Phase I Environmental Site Assessment of the Jervis B. Webb Company Properties at 9301 Rayo Avenue and 5030 Firestone Boulevard, South Gate, California*, prepared by Erler and Kalinowski, Inc. (EKI), dated June 20, 1996.
- *Phase II Soil Investigation Report for the Jervis B. Webb Company Property, 5030 Firestone Boulevard, South Gate, California*, prepared by EKI, dated February 18, 1998.
- *Phase II Groundwater Investigation Report, Jervis B. Webb Company Property, 5030 Firestone Boulevard, South Gate, California*, prepared by EKI, dated June 30, 1998.
- *Additional Groundwater Investigation and Quarterly Monitoring Report for October to December 1998, Jervis B. Webb Company Property, 5030 Firestone Boulevard, South Gate, California*, prepared by EKI, dated January 13, 1999.
- *Report on Site Conditions, Local Hydrogeology, and Offsite Groundwater Production and Work Plan for Groundwater Remediation, Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California*, prepared by EKI, dated November 30, 2000.
- *Regional Groundwater Monitoring Report, Central and West Coast Basins, Los Angeles County, California, Water Year 1998-1999*, prepared by the Water Replenishment District of Southern California (WRDOSC), dated July 2000.

Response: The information contained in HRS documentation record references was sufficient to score the site for HRS purposes; none of the additional information in the 2001 Dragun Report contradicts the HRS documentation record characterization of the Site, source, observed releases, or targets. The conclusions drawn in the 2001 Dragun Report that challenge the HRS scoring evaluation are addressed in the other sections of this support document.

The 2001 Dragun Report was an analysis of existing data, and most of that data was also contained in the HRS documentation record references at proposal and was considered by the EPA during the HRS evaluation of the Site. These data include:

- Monitoring well results though 2005 analyzed by Dragun are contained in HRS documentation record Reference 30.
- Soil chemistry results analyzed by Dragun are contained in HRS documentation record Reference 10 and Reference 11.
- Soil gas results analyzed by Dragun are contained in HRS documentation record Reference 10.

Furthermore, as shown in other parts of this support document, the data in the 2001 Dragon Report does not contradict or document errors in the data used to generate the HRS score for the Site.

The 2001 Dragun Report included one dataset from an Erler and Kalinowski (EKI) report (*Additional Groundwater Investigation and Quarterly Monitoring Report for October to December 1998, Jervis B. Webb Company Property, 5030 Firestone Boulevard, South Gate, California, 13 January 1999*) summarizing an October 1998 ground water investigation not contained in HRS documentation record references; however, the results of that sampling confirm the presence of ground water contamination at the Site and do not contradict the HRS documentation record assessment. (Results from that investigation as discussed by the commenter are addressed in section 3.7, Attribution, and its subsections of this support document).

Documents included in the comment submittal and those listed in the comment submittal that have previously been provided to the EPA are part of the docket for the Site at promulgation.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.4 Aquifer Interconnection

Comment: Dragun asserted that "[a]ccording to the WRDOSC [Water Replenishment District of Southern California], the Gaspur Aquifer is not hydraulically connected to the deeper drinking water aquifers." In its description of regional hydrology, Dragun cites to a 2000 Regional Groundwater Monitoring Report generated by the WRDOSC.

Response: For HRS scoring purposes, site-specific aquifer interconnection within 2 miles of the Site source was demonstrated in the HRS documentation record at proposal. Specifically, the Gaspur Aquifer has been shown to be hydraulically connected to the deeper Exposition and Gage aquifers present within the target distance limit (TDL) for the site.

To document aquifer interconnection, the HRS outlines that first the ground water target distance limit (TDL) be established and then aquifer boundaries and interconnections be evaluated. HRS Section 3.0.1.1, *Ground water target distance limit*, states:

> The target distance limit defines the maximum distance from sources at the site over which targets are evaluated. Use a target distance limit of 4 miles for the ground water migration pathway, except when aquifer discontinuities apply. Furthermore, consider any well with an observed release from a source at the site to lie within the target distance limit of the site, regardless of the well's distance from the sources at the site.

HRS Section 3.0.1.2, *Aquifer boundaries*, directs how to identify aquifer boundaries within the TDL. It states:

> Combine multiple aquifers into a single hydrologic unit for scoring purposes if aquifer interconnections can be established for these aquifers. In contrast, restrict aquifer boundaries if aquifer discontinuities can be established.

HRS Section 3.0.1.2.1, *Aquifer interconnections*, identifies the requirement used to consider the aquifers within the TDL at this site as interconnected:

> Evaluate whether aquifer interconnections occur within 2 miles of the sources at the site. If they occur within this 2-mile distance, combine the aquifers having interconnections in scoring the site. In addition, if observed ground water contamination attributable to the sources at the site extends beyond 2 miles from the sources, use any locations within the limits of this observed ground water contamination in evaluating aquifer interconnections. If data are not adequate to establish aquifer interconnections, evaluate the aquifers as separate aquifers.

Examples of information useful in identifying aquifer interconnections are presented in the preamble to the HRS (page 51553, Reference 1 of the HRS documentation record at proposal):

> This information includes literature of well logs indicating that no relative hydraulic conductivity layer or confining layer separates the aquifer being assessed (e.g., presence of a layer with hydraulic conductivity lower by two or more orders of magnitude); literature or well logs indicating that a lower relative hydraulic conductivity layer or confining layer separating the aquifers is not continuous through the two mile radius (i.e., hydrogeologic interconnections between the aquifers are identified); evidence that withdrawals of water from one aquifer (e.g., pumping tests, aquifer tests, well tests) affect water levels in another aquifer: and observed migration of any constituents from one aquifer to another within two miles. For this last type of

information, the mechanism of vertical migration does not have to be defined, and the constituents do not have to be attributable to the site being evaluated. Other mechanisms that can cause interconnection (e.g., boreholes, mining activities, faults, etc.) will also be considered while the descriptive text has been removed from the rule. The approaches mentioned in the proposed rule [see page 52028 of the 1988 Proposed HRS Revisions, 40 CFR Part 300 December 23, 1988] will be used in making aquifer interconnection determinations.

Figure A-4 of the HRS documentation record at proposal presents the areal extent of the TDL for the Site.

Pages 24 and 25 of the HRS documentation record at proposal (also see figures on pages 2-5 of Reference 28 of the HRS documentation record at proposal) outline the aquifers beneath the Site and list the strata in descending order:

- Stratum 1: Bellflower Aquiclude and Semi-Perched Aquifer
The Bellflower Aquiclude extends from the surface to a depth of approximately 55 to 70 feet bgs and consists of sandy silts, clayey silts, and lesser amounts of silty clay. The semi-perched aquifer is present within the Bellflower Aquiclude. Water levels are generally found in a laterally continuous 5-foot-thick silty/sandy unit at approximately 35 to 40 feet bgs, which is underlain by finer materials of the Bellflower Aquiclude (Ref. 16, p. 8; Ref. 23, pp. 34, 35). The Bellflower Aquiclude does not restrict ground water movement between the strata composing the aquifer (Ref. 11, pp. 29 – 38; Ref. 22, pp. 72, 73, 77, 168, 184, 185).

- Stratum 2: Gaspur Aquifer
The shallow aquifer is represented by the Gaspur Aquifer which underlies the Bellflower Aquiclude and extends to a depth of approximately 110 to 120 feet bgs. The Gaspur Aquifer is of fluvial origin and occurs within an ancestral Los Angeles River channel. The Gaspur Aquifer consists of sandy units varying from very fine to medium and coarse and to a lesser extent finer units comprising silty sand and sandy silt. Water level in the Gaspur Aquifer is generally at a depth that corresponds to the Lower Bellflower Aquiclude, suggesting the Gaspur Aquifer is a semi-confined aquifer (Ref. 16, p. 8; Ref. 23, p. 34). The horizontal flow direction in the Gaspur Aquifer is toward the south (Ref. 16, p. 9).

- Stratum 3: Exposition Aquifer
The Exposition Aquifer, which underlies the Gaspur Aquifer, begins at a depth of approximately 110 to 120 feet bgs (Ref. 16, p. 8). The maximum thickness of the Exposition Aquifer is 100 feet and is reportedly related to the ancestral Los Angeles River drainage system. Materials range in size from coarse gravels to clay, with the fine deposits separating the lenticular sandy and gravelly beds. The upper coarse members of the Exposition appear to have been either eroded and backfilled by the overlying Gaspur Aquifer deposits, or some of the upper members were deposited contemporaneously with the formation of the younger Gaspur Aquifer (Ref. 23, p. 34).

- Stratum 4: Unnamed Aquiclude
Based on DWR Geologic Section B-B', a lower permeability layer underlies the Exposition Aquifer beneath the Jervis B. Webb Co. facility. It extends from approximately 160 feet bgs to 200 feet bgs [Ref. 22, Plates 3A, 6A (Geologic Section B-B'); Figures A-1 and A-2 of the HRS September 2011 25 documentation record].

- Stratum 5: Gage Aquifer
The Gage Aquifer generally consists of fine-grained sand and silty sand in the Central Basin Pressure Area (Ref. 22, pp. 183, 184). This aquifer underlies the unnamed aquiclude and extends

> from 200 feet bgs to 275 feet bgs beneath the Jervis B. Webb Co. facility [Ref. 22, Plates 3A, 6A (Geologic Section B-B')].

The HRS documentation record at proposal discusses the aquifers and aquicludes at the Site and explains the rationale for considering the aquifers hydraulically interconnected. Page 25 of the HRS documentation record at proposal documents the interconnection of the Gaspur Aquifer to the Exposition and Gage aquifers by stating:

> Interconnection between the Semi-Perched, Gaspur, Exposition, and Gage aquifers is established within 2 miles of Source 1 at the site as follows (Ref. 1, Section 3.0.1.2.1):
>
> - Contamination has been documented in monitoring well MW-1, located on the Jervis B. Webb Co. property (Ref. 11, pp. 15-16, 72, 74, 77, 82). Examination of DWR Geologic Section B-B', indicates that the edge of the Gaspur Aquifer occurs at approximately 50 feet bgs in the vicinity of 2S/12W-31L1 (Ref. 22, Plate 6A). Monitoring well MW-1 is screened within the Gaspur Aquifer (Ref.11 pp. 6, 21, 23, 29-33; Ref.16, p. 8; Ref. 22, Plates 3A and 6A; Ref.23, p. 34). This supports that the Bellflower Aquiclude and Semi-perched Aquifer are interconnected to the underlying formations (i.e., Lakewood Formation) since contaminants have passed through to the lower aquifers.
> - An examination of DWR Geologic Sections B-B' and L-L' indicates that the Gaspur Aquifer is in direct contact with the Exposition Aquifer in the site vicinity (Ref. 22, Plates 3A, 6A, and 6E; Figures A-1 and A-2 of the documentation record).
> - An examination of DWR Geologic Section B-B' indicates that the unnamed aquiclude between the Exposition and Gage aquifers is not continuous within 2 miles of the source at the Jervis B. Webb Co. site. This aquiclude is shown as pinching out approximately 1,500 feet to the west of the property, resulting in a merging of the two aquifers [Ref. 1, Section 3.0.1.2.1; Ref. 22, Plates 3A and 6A (Geologic Section B-B'); Figures A-1 and A-2 of the HRS documentation record].

The information that Dragun presented in its comment is likely based on information presented on pages 3-6 and 3-7 of the 2000 Regional Groundwater Monitoring Report (an excerpt of which is included as Attachment 12 of this support document). The 2000 Regional Groundwater Monitoring Report as cited by Dragun does not provide data to support the assertion that the Gaspur Aquifer is hydraulically separate from the underlying aquifers. Further, the 2000 Regional Groundwater Monitoring Report does not imply that the Gaspur Aquifer is hydraulically separated from underlying aquifers. In fact, this report states that the Gaspur and Exposition Aquifers have similar hydraulic heads[4] and similar annual ground water elevation fluctuations that are consistent with hydraulically connected strata (see page 3-6 of that report).

The 2000 Regional Groundwater Monitoring Report cited by Dragun in its comments does imply that the Gage aquifer may not be hydraulically connected to the shallower Gaspur and Exposition aquifers in the study area for that report (see pages 3-6 and 3-7 of the 2000 Regional Groundwater Monitoring Report, excerpted in Attachment 12 of this support document). However, the data used in that report discussion is generated from wells that are approximately 3 miles or more from the Site and the report does not contain site-specific data within 2 miles of the contaminated soil source at the Site. (Pages 3-6 and 3-7 of the 2000 Regional Groundwater Monitoring Report discuss Central Basin Pressure Area aquifers using data from the Downey #1, Carson #1, Rio Hondo #1, and Huntington Park #1 wells; compare the approximate site location shown on Figure A-4 of the HRS documentation record at proposal to well locations on Figure 1.3 of the 2000 Regional Groundwater Monitoring Report.) Site-

[4] Hydraulic head is the level to which water will rise in a well. Hydraulic head refers to a measurement of water pressure and elevation at a specific location that is used to determine the total energy of the water; ground water will flow from high pressure to low pressure.

specific data, as presented in the HRS documentation record at proposal and cited above, properly establishes hydraulic interconnection of the Gaspur, Exposition, and Gage aquifers.

The following information outlines the hydraulic connections of the aquifers underlying the Site. Specifically, the hydraulic connections of the Bellflower Aquiclude to the Gaspur Aquifer, the Gasper Aquifer to the Exposition Aquifer, and the Exposition Aquifer to the Gage Aquifer are outlined below.

Bellflower Aquiclude to Gaspur Aquifer Connectivity

The HRS documentation record at proposal states that the Bellflower Aquiclude and Gaspur Aquifer are in direct contact and correctly demonstrates that they are hydraulically connected. In addition, according to page 24 of the HRS documentation record at proposal, "the Bellflower Aquiclude extends from the surface to a depth of approximately 55 to 70 feet bgs and consists of sandy silts, clayey silts, and lesser amounts of silty clay." Table 3-6 of the HRS provides hydraulic conductivities for geological materials and gives a hydraulic conductivity value for the geological materials present in the Bellflower Aquiclude of 10^{-6} centimeters per second (cm/sec). The Gaspur Aquifer, according to the HRS documentation record at proposal, consists of "sandy units varying from very fine to medium and coarse and to a lesser extent finer units comprising silty sand and sandy silt." Additionally, well borehole data taken from monitoring well MW-1, which is screened in the Gaspur Aquifer, shows that that the bottom of the borehole contains silty sand and sand as the predominant geological materials. Table 3-6 of the HRS assigns a hydraulic conductivity value of 10^{-4} cm/sec for the material present in the Gaspur Aquifer. As stated in the preamble to the December 14, 1990 HRS (see citation above), geological layers with hydraulic conductivities that are within two orders of magnitude are considered interconnected. Therefore, since the Bellflower Aquiclude is assigned a hydraulic conductivity of 10^{-6} cm/sec and the Gaspur Aquifer is assigned a hydraulic conductivity of 10^{-4} cm/sec, the two strata are considered interconnected and one hydraulic unit, and there is no continuous, significantly lower hydraulic conductivity layer that separates the two aquifers.

Gaspur to Exposition Aquifer Connectivity

The HRS documentation record at proposal states that the Gaspur Aquifer and Exposition Aquifer are in direct contact and correctly demonstrates that they are hydraulically connected. In addition, according to page 24 of the HRS documentation record at proposal the Gaspur Aquifer consists of "sandy units varying from very fine to medium and coarse and to a lesser extent finer units comprising silty sand and sandy silt". As established above, the hydraulic conductivity value assigned for the sediments present in the Gaspur Aquifer is 10^{-4} cm/sec. Page 24 the HRS documentation record at proposal states that the Exposition Aquifer consists of "materials [which] range in size from coarse gravels to clay, with the fine deposits separating the lenticular sandy and gravelly beds". According to Table 3-6 of the HRS, the "sandy and gravelly" geological materials present in the Exposition Aquifer are assigned a hydraulic conductivity value of 10^{-2} cm/sec. As stated in the preamble to the December 14, 1990, HRS (see citation above), geological layers with hydraulic conductivities that are within two orders of magnitude are considered interconnected. Therefore, since the Gaspur Aquifer is assigned hydraulic conductivity of 10^{-4} cm/sec and Exposition Aquifer is assigned a hydraulic conductivity value of 10^{-2} cm/sec, the two strata are considered interconnected and one hydraulic unit, and there is no continuous, significantly lower hydraulic conductivity layer that separates the two aquifers.

Exposition to Gage Aquifer Connectivity

The HRS documentation record at proposal states that the Exposition Aquifer and Gage Aquifer are in direct contact within 2 miles of the Site because, as quoted above, the unnamed aquiclude is "pinched out" within 1500 feet of the Site, and correctly demonstrates that the aquifers are hydraulically connected. In addition, as established above, the hydraulic conductivity value assigned for the sediments present in the Exposition Aquifer is 10^{-2} cm/sec. Page 25 of the HRS documentation record at proposal describes the Gage Aquifer as consisting of "fine-grained sand and silty sand." According to Table 3-6 of the HRS, the geological materials present in the Gage Aquifer are assigned a hydraulic conductivity value of 10^{-4} cm/sec. As stated in the preamble to the December 14, 1990 HRS (see citation above), geological layers with hydraulic conductivities that are within two orders of magnitude are considered interconnected. Therefore, since the Exposition Aquifer is assigned a hydraulic conductivity value of 10^{-2} cm/sec, and the Gage Aquifer is assigned a hydraulic conductivity value of 10^{-4} cm/sec, the two strata are considered interconnected and one hydraulic unit, and there is no continuous, significantly lower hydraulic conductivity layer that separates the two aquifers.

In summary, site-specific aquifer interconnection was correctly demonstrated within 2 miles of the Site source in the HRS documentation record at proposal. In addition, the 2000 Regional Groundwater Monitoring Report as cited by Dragun supports hydraulic connection of the Gaspur Aquifer to "deeper drinking water aquifers" by its statement that the Gaspur and Exposition Aquifers have similar hydraulic heads and similar annual ground water elevation fluctuations (page 3-6 of that report).

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.5 Previous Response Actions

Comment: Dragun commented that soils at the Site have been impacted by a release of volatile organic compounds (VOCs), possibly linked to historic activities at the Site, and that "Webb has implemented a series of remedial activities to address these impacted soils. [citing a November 30, 2000, report from EKI]"

Response: While the contaminated soils have been at least partially remediated, contaminated soils remain at the Site, and contamination appears to have migrated from the source toward and into the underlying aquifer; therefore it is appropriate to retain the contaminated soil in the HRS evaluation of the Site. Additionally, consideration of the response activities does not result in a change in the HRS Site score; the HRS factor value possibly impacted by the action, the HRS hazardous waste quantity factor value assigned to Source 1 (the contaminated soils), remains the same as at proposal because as explained below, the residual soil contamination remaining after the response activities would result in at least the same HRS waste quantity value for the Site and the same HRS Site score.

The EPA policy addressing consideration of removals has most recently been presented in April 1997, in OSWER Directive # 9345.1-25, "Revision to OSWER NPL Policy 'The Revised Hazard Ranking System: Evaluating Sites after Waste Removals'." This policy explains that removal actions taken prior to proposal of a site to the NPL will be considered in performing an HRS evaluation if it is clearly demonstrated "there is no remaining release or potential for a release that could cause adverse environmental or human health impacts." As detailed below, the actions taken regarding the contaminated soil at the Jervis Webb site do not reach this status. A State of California Department of Toxic Substance Control October 23, 2008, Consent Order (2008 Consent Order; see Attachment 1 of this support document) discusses the cleanup performed at the Site, the contamination remaining after that cleanup, and the current risk posed by the Site.

In section II, Findings of Fact, on pages 5-6, the 2008 Consent Order states that the clarifier from the 5030 Firestone property was removed in 1999 along with a 15 feet by 11 feet by 8 feet deep volume of soil in the area of the clarifier, backfilling with sand. Additionally, four soil vapor extraction (SVE) wells were installed in June

1999 and operated from March 16, 2000, until October 2001, removing approximately 177 pounds of VOCs. The 2008 Consent Order identifies that Webb of California subsequently performed sampling and generated a Soil Closure Report requesting no further action (NFA) for the 5030 Firestone Boulevard property; soil borings taken in this sampling showed residual VOC contamination remaining[5]. The Regional Water Quality Control Board agreed to the NFA decision for soil with the provision of requiring further ground water monitoring. The 2008 Consent Order states that this ground water monitoring was halted after 2004, but ground water TCE and PCE concentrations were still in exceedance of drinking water maximum contaminant levels (MCLs). Page 7 of the 2008 Consent Order identifies that ground water sampling in 2004 showed "high concentrations of TCE, PCE, DCA and DCE at various locations, with the highest concentrations of TCE at 17,864 µg/L (monitoring well MW-1), PCE at 98.5 µg/L, cis-1,2-DCE at 740.2 µg/L, and trans-1,2-DCE at 104.2 µg/L."

In section IV, Determination, on page 10, the 2008 Consent Order states that after the removal action "response action is necessary at the Site because there has been a release and/or there is a threatened release of a hazardous substance," and that "there may be an imminent and/or substantial endangerment to the public health or welfare or to the environment because of the release and/or the threatened release of hazardous substances at the Site."

Thus, as discussed in the 2008 Consent Order, the contamination in ground water below the Site and thought to be due to migration from the contaminated soil continues to pose a significant health threat, and contaminated soil remains on the property after the 2000–2001 response actions. Additionally, the HRS documentation record at proposal on page 30 documents that as late as 2005 the TCE level in monitoring well MW-1 ground water was 24,979 µg/L. Clearly, the cleanup performed did not remove this aquifer contamination.

Regarding the source waste quantity (the HRS factor value used in determining the HRS site score that reflects the amount of contamination at the site), as explained below, consideration of the amount of contamination removed by the SVE system operation at the Site would not result in a change in the waste quantity value for Source 1 at proposal of greater than zero even if the quantity of contaminated soil addressed by the actions were considered in the HRS evaluation..

HRS Section 2.4.2, *Hazardous waste quantity*, and its subsections contain the directions used to determine waste quantity for Source 1:

> Evaluate the hazardous waste quantity factor by first assigning each source (or area of observed contamination) a source hazardous waste quantity value as specified below. Sum these values to obtain the hazardous waste quantity factor value for the pathway being evaluated.

HRS Section 2.4.2.1, *Source hazardous waste quantity*, states:

> For each of the three migration pathways, assign a source hazardous waste quantity value to each source (including the unallocated source) having a containment factor value greater than 0 for the pathway being evaluated . . .
>
> For all pathways, evaluate source hazardous waste quantity using the following four measures in the following hierarchy:
>
> - Hazardous constituent quantity.
> - Hazardous wastestream quantity.

[5] Pages 1-2 of Attachment 8, Excerpt of IT Group Report on Soil Removal Activities, of this support document, describes the removal of soil with elevated residual levels of TCE from confirmation borings CB-3 and CB-4 to satisfy California Regional Water Quality Control Board requirements for soil closure at the Site; a TCE level of 24 µg/kg remained in a soil sample at 36 ft bgs in one boring following this operation.

- Volume.
- Area.

HRS Section 2.4.2.1.4, *Area*, was used to estimate the source waste quantity. This section gives direction on determining the area value for a source:

> Evaluate the area measure using the area of the source (or area of the area of the observed contamination). Based on this area, designated as A, assign a value to the area measure as follows:
>
> - For the migration pathways, assign the source a value for area using the appropriate Tier D equation of Table 2-5. . . .

Page 19 of the HRS documentation record at proposal assigned a waste quantity source value to Source 1 based on its area, stating that:

> The area of contaminated soil is unknown, but greater than 0. Analytical results of the 1997 and 1998 soil sampling efforts indicate the presence of contaminated soil on the Jervis B. Webb Co. property (Ref. 1, Section 2.4.2.1.4; Ref. 10, pp. 31, 32, 36; Ref. 11, pp. 22, 26; Figure A-3 of the HRS documentation record).
>
> Area Assigned Value: >0

Therefore, because the assigned area value for Source 1 in the HRS documentation record at proposal was "greater than zero," this value would not be reduced based on the contamination remaining at the Source 1 area following removal activities and the SVE operation. As identified in the 2008 Consent Order discussed above, and footnote 5, residual contamination remains post-removal in the soil at the Site. Thus the "greater than zero" source waste quantity still applies. In that the source waste quantity would not change, neither would the HRS Site score.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.6 Ground Water Flow Direction

Comment: Dragun stated that ground water at the Site flows from north to south, which means that Firestone Boulevard represents the upgradient property boundary, and the background well MW-2 is at this upgradient northern border of the property. Dragun based this direction on Figure 5 (a figure showing ground water elevation contours beneath the Site that indicate ground water flow toward the south, included on page 30 of the attachment to Dragun's comment document, docket ID EPA-HQ-SFUND-2011-0644-0008), in its comments generated from November 1998 direct push ground water sampling by EKI, which Dragun asserted was "the most aerially comprehensive groundwater sampling for the site." Dragun also stated that the November 1998 data was consistent with other monitoring events conducted between 1998 and 2000, pointing to other historical water table maps provided in Appendices B and C of the 2001 Dragun Report. Dragun asserted that "[t]he water table maps in Appendices B and C indicate that although the groundwater flow direction has varied to a limited extent, groundwater flow at the Site during the period of investigation has consistently been generally from north to south. The north to south groundwater flow direction is consistent with more regional investigations." Dragun identified that this flow would mean that ground water contaminants would move from north to south.

Response: The site-specific shallow ground water flow direction under the 5030 Firestone Boulevard property was correctly identified in the HRS documentation record at proposal as toward the south or southeast. As discussed below, based on the available data, flow specifically under the 5030 Firestone Boulevard property is

predominantly to the south-southeast. The data cited in Dragun's comments does not demonstrate that there is not a south-southeastern component to the ground water flow under the Site, although there might be regionally a more southerly flow gradient.

Ground water flow direction is used in an HRS evaluation to demonstrate that a downgradient well has been contaminated by hazardous substances that are attributable to the site based on the difference in contaminant concentrations in an upgradient or "background" well located upgradient of the site sources. Local ground water flow direction is used to ensure that the location of the background sample is upgradient from the source contaminants. In addition, the contaminant levels in the background sample can also be used as an estimate of the contribution of contamination in the ground water from any possible sites upgradient of the background well location.

The HRS documentation record at proposal states on page 23 that the general ground water flow direction in the underlying aquifers in the vicinity of the Rayo Avenue and Firestone Boulevard properties is toward the south or southeast. It states:

> In the South Gate area, shallow ground water occurs at a depth of approximately 45 feet bgs, with a ground water flow direction to the south or southeast. Shallow ground water beneath the Jervis B. Webb Co. property is expected to be similar to the nearby Cooper Drum Company property, where it occurs within or is controlled by the near surface Bellflower Aquiclude, which incorporates the Semi-perched Aquifer (Ref. 16, p. 8; Ref. 23, pp. 18-19). In the vicinity of the facility, the Lakewood Formation, which immediately underlies the Recent Alluvium, consists of the Gaspur Aquifer, Exposition Aquifer, an unnamed aquiclude, and the Gage Aquifer. Ground water flow within the Gaspur Aquifer is generally to the south beneath the Jervis B. Webb Co. facility (Ref. 16, pp. 70 - 72). Although data are not adequate to document ground water flow within the Exposition and Gage aquifers, it is assumed that the flow direction would be generally towards the south, in the direction of the Pacific Ocean (Ref. 11, p. 6-7; Ref. 21, p. 2).

Although ground water flow toward the south may be generally consistent with regional investigations, it is not consistent with available data for the local ground water flow at this site (i.e., directly below the 5030 Firestone property). Site-specific ground water data show that the direction of ground water flow over time is predominantly to the south-southeast. Although Figure 5 in the 2001 Dragun Report shows ground water flow due south, the other historical ground water contour maps, that span a greater time period than the information in Figure 5 represents, are attached in appendix B and C of the 2001 Dragun Report show the ground water flow direction as predominantly south-southeast (see pages 76-123 of the 2001 Dragun Report, showing ground water contour maps for data collected from February 1998 to December 2000). In fact, 23 out of 28 of the ground water elevation figures (including ground water elevation data spanning from May, 20, 1998, to December 5, 2000) provided in Appendix B and C of Dragun's comments on pages 76-123 of the 2001 Dragun Report show the ground water flow direction at the Site toward the south-southeast.

In addition to the 2001 Dragun Report appendix figures, Figure 3 in Reference 11 of the HRS documentation record at proposal and Figure 3 in Reference 30 of the HRS documentation record at proposal contain historical ground water contour maps at the facility that show the ground water flow direction toward the southeast under the facility (ground water data collected in May 1998 and July 2004, respectively).

Other information also further demonstrates that local ground water flow direction data is not always consistent with that in regional investigations. Pages 70 and 71 of Reference 16 of the HRS documentation record at proposal contain figures of ground water elevation contours at the neighboring Cooper Drum Company site that show ground water flow at the facility toward the east-southeast. These figures illustrate the variation in site-specific ground water flow direction and the importance of using local wells to determine ground water flow at the facility. Two additional ground water elevation figures, as cited above, in References 11 and 30 of the HRS

documentation record at proposal document ground water flow toward the southeast (ground water data collected in May 1998 and July 2004, respectively). Thus, the majority of the ground water flow direction data suggests flow toward the south-southeast.

Furthermore, Dragun's assertion is based on the Dragun statement that the October-December 1998 ground water sampling by EKI was "the most aerially comprehensive ground water sampling" event and was used to generate Figure 5 on page 30 of the 2001 Dragun Report. This is not clearly the situation. The ground water level data used to generate Figure 5 in the 2001 Dragun Report is based on the same five monitoring wells that are used to generate all of the ground water flow data in the majority of the other figures available for the Site[6] (see page 11 of Attachment 2, Excerpt of January 1999 Additional Groundwater Investigation Report, of this support document).

These five monitoring wells are the same wells used in the historical ground water contour maps attached in Appendices B and C of the 2001 Dragun Report as well as the same wells included in Figure 3 of References 11 and 30 of the HRS documentation record at proposal that predominantly show ground water flow to the south-southeast. Moreover, the January 1999 EKI report (containing October-December 1998 ground water sampling data, and included as Attachment 2, Excerpt of January 1999 Additional Groundwater Investigation Report, of this support document), from which Figure 5 of the 2001 Dragun Report was generated, contains two other ground water level data figures that show the ground water flow toward the south-southeast (pages 30 and 32 of Attachment 2). Figure 3 on page 30 uses ground water data collected on October 8, 1998 and Figure 5 on page 32 uses data collected on December 21, 1998; both were collected approximately one month apart from the data collected to produce Figure 5 (collected on November 5, 1998) in the 2001 Dragun Report.

In summary, the majority of the ground water flow data at the facility suggests that the local ground water flow direction is to the south-southeast. In addition this flow direction to the south-southeast also demonstrates that the background well sample location is upgradient of the source contaminated soil samples and upgradient of the well sample location used to establish a release to ground water from the Site. As discussed in the section 3.7 of this support document, this south-southeast ground water flow direction also enables the background sample to demonstrate that at least part of the TCE contamination under this Site is due to a release from the Site.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.7 Observed Release and Attribution

Comment: Dragun submitted comments that challenge the attribution of the contamination in the aquifer under the Site to releases from the Site. Dragun commented that the available evidence indicates that the chlorinated solvent contamination in the ground water and deep soil at the Site has been caused by contaminated ground water migration from an offsite upgradient source, not downward migration from Source 1 surficial soil contamination at the Site.

Dragun acknowledged that "some soils at the Site contained concentrations of chlorinated volatile organic compounds (VOCs) above the detection limits that could be linked to historic Site activities."

Dragun asserted that ground water at the Site flows from north to south, which means that Firestone Boulevard represents the upgradient property boundary for the Site, and the background well MW-2 is at this upgradient

[6] Figure 5 on page 30 of the 2001 Dragun Report states that it is based on November 1998 data. The January 1999 Additional Groundwater Investigation Report containing that data (as well as other data from October-December 1998 ground water sampling events) shows that only monitoring wells 1-5 were sampled in November 1998. The CPT ground water samples [direct push samples] were collected on October 1, 1998, and are not included on any of the ground water elevation figures included in the report.

northern border of the property. Dragun pointed out that this flow direction would mean that ground water contaminants would move from north to south.

Dragun asserted that VOCs such as TCE have been detected at a high level in the well used to establish background contaminant levels, MW-2; . Dragun also identified that soil gas and soil chemistry data show no TCE in the soil at MW-2. Dragun also argued that ground water at direct-push sample locations CPT-6 and CPT-7 also had high levels of TCE, but that "the soil (B-5, B-10, and B-15 near CPT-6 and B-9 near CPT-7) and the soil gas data show no indication of substantial TCE in soil at these locations" based on a 1998 CPT (cone penetrometer testing[7]) sampling event not discussed in the HRS documentation record at proposal. Dragun stated that "[a]lthough these locations are not on the upgradient property boundary, they are located hydraulically upgradient from the highest soil gas concentrations (Figures 7 and 8) and from the highest concentrations of TCE in the soil (Figure 9)." (See 2001 Dragun Report Figures 1 and 2 showing these sample locations.)

Because the soil gas and soil chemistry results do not show TCE or PCE in the soil along the northern upgradient border of the property and at MW-2, Dragun asserted the contamination in the ground water must have originated from an upgradient and offsite source. Using the same rationale, Dragun claimed that the levels of TCE in CPT-6 cannot be accounted for by "TCE in soil near CPT-6 or by other on-site locations in view of the observed groundwater flow direction" which Dragun claimed was north to south.

Dragun's challenge to attribution of ground water contaminants to the Site was based on several claims:

- A continuous clayey unit encountered at about 25 fbgl [feet below ground level] would inhibit the vertical migration of contaminants to the water table.
- There is TCE contamination in upgradient ground water at the Site, but there is insufficient soil TCE contamination at these locations to explain the contamination, indicating that the Site has been impacted by an upgradient offsite source.
- The high TCE levels in ground water at the Site mean that a dense non-aqueous phase liquid (DNAPL) has impacted the ground water. However, TCE concentrations in site soil are too low to imply DNAPL was present in the soil. Also, a clay layer at the Site should have inhibited the downward migration of DNAPL, but there is no evidence of DNAPL accumulated above the clay layer.
- The distribution of contaminants at the Site (including TCE/PCE breakdown products 1,1-DCE, 1,1-DCA and cis-1,2-DCE) in groundwater cannot be explained by the chemicals in soil.
- TCE/PCE ratios in soil, soil gas, and ground water indicate that contaminants in the surficial soil at the Site did not cause the ground water contamination; rather, these ratios support an offsite upgradient origin of contaminated ground water.
- Dragun claimed that the combined evidence of contaminant distribution, TCE/PCE ratios, and the continuous clay layer, imply that the deep soils below the clay layer were contaminated by ground water, not by contamination in surficial soil.

[7] The CPT sampling was conducted by pushing an instrument cone-tipped probe into the ground while simultaneously recording resistance to penetration; ground water samples were subsequently collected at each CPT location using a push-in plastic piezometer and a bailer.

Dragun concluded that:

> Surficial soil contamination on the Jervis B. Webb Company of California property is not the cause of the high VOC concentrations in groundwater beneath the property. Rather, an offsite, upgradient source has impacted groundwater beneath the Jervis B. Webb Company of California property. Accordingly, there appears to be insufficient information to list the 5030 Firestone Boulevard and 9301 Rayo Avenue properties on the NPL [the general location of the Site], and [the] EPA should focus its attention on the upgradient properties to discover the source of the groundwater contamination, which is migrating onto the Firestone and Rayo properties.

Response: The significant increase in ground water contaminants identified at the Site was correctly attributed at least in part to the Site in the HRS documentation record at proposal, consistent with the HRS, as explained in the following subsections:

- HRS Requirements for Attributing a Release to the Site
- HRS Documentation Record Establishment of Significant Increase and Attribution.

Furthermore, while there is likely at least one offsite upgradient source contributing chlorinated solvent contamination to ground water at the Site, some portion of the significant increase in the contaminants in ground water observed release samples at the Site is attributable to the Site, consistent with the HRS. Specifically, the significant increase in contamination levels in the onsite well MW-1 and direct push CPT (cone penetrometer test) ground water samples is more likely to be coming from the Site than from upgradient sources for several reasons discussed in these subsequent subsections:

- Flow Gradient
- Background Levels Screening
- Little Evidence of Ground Water Contamination Movement
- Magnitude of Significant Increase in Ground Water Contaminant Levels
- Stability of Significant Increase in Contaminant Levels
- Scale and Pattern of Soil Contamination Consistent with Downward Migration to Water Table.

HRS Requirements for Attributing a Release to the Site

The requirement of attribution of contamination in the aquifer below a site to a release from a site is part of assigning the Likelihood of release category value for the site. HRS Section 3.1, *Likelihood of release*, and its subsections provide the specific requirements for assigning a likelihood of release factor category value based on an observed release for the ground water migration pathway:

> For an aquifer, evaluate the likelihood of release factor category in terms of an observed release factor or a potential to release factor.

An observed release may be established by direct observation and/or by chemical analysis. At this site only an observed release by chemical analysis was established at proposal. HRS Section 3.1.1, *Observed release*, states in relevant part:

> Establish an observed release to an aquifer by demonstrating that the site has released a hazardous substance to the aquifer. Base this demonstration on either:
>
> - Direct observation . . . .

- Chemical analysis—an analysis of ground water samples from the aquifer indicates that the concentration of hazardous substance(s) has increased significantly above the background concentration for the site (see section 2.3). Some portion of the significant increase must be attributable to the site to establish the observed release, except: when the source itself consists of a ground water plume with no identified source, no separate attribution is required.

On the subject of attribution, HRS Section 2.3, *Likelihood of release*, presents the basic requirements for identifying an observed release by chemical analysis:

> The minimum standard to establish an observed release by chemical analysis is analytical evidence of a hazardous substance in the media significantly above the background level. **Further, some portion of the release must be attributable to the site. [emphasis added]**

HRS Table 2-3 identifies the significant increase criteria for establishing an observed release by chemical analysis above background when there is a possible upgradient source. This table requires:

> If the background concentration is not detected (or is less than the detection limit), an observed release is established when the sample measurement equals or exceeds the sample quantitation limit.
>
> . . .
>
> If the background concentration equals or exceeds the detection limit, an observed release is established when the sample measurement is 3 times or more above the background concentration.

HRS Documentation Record Establishment of Significant Increase and Attribution

The significant increase over the background level established at proposal was not questioned by Dragun. Pages 28-30 of the HRS documentation record at proposal listed results from sampling events on March 4, 1998; May 20, 1998; and June 10, 2005 to establish an observed release. The MW-2 background well concentrations were 2,700, 3,000 and 1865.7 µg/L TCE, respectively; the MW-1 observed release well concentrations were 24,000, 24,000 and 24,979 µg/L TCE, respectively. (See Figure 1 of this support document, which shows well locations.)

Pages 30-33 of the HRS documentation record at proposal document attribution at least in part, of the significant increase in contamination levels in ground water at the Site, including the following information:

> Starting in the 1950s, the Jervis B. Webb Co. operated a custom conveyor and crane manufacturing facility on the 9301 Rayo Avenue property. The manufacturing process consisted of cutting, drilling, assembling, welding, and painting the steel pieces that comprised the final product. Hazardous substances utilized in the manufacturing process included oil-based paints with chlorinated solvents, lacquer paint thinner and 1,1,1-trichloroethane (1,1,1-TCA) (Ref. 9, p. 47; Ref. 20). The 5030 Firestone Boulevard property was occupied by the Blake Rivet Company from the 1950s until approximately 1980 (Ref. 10, p. 6). Operations conducted by the Blake Rivet Company included manufacturing aircraft rivets. The manufacturing process included an above ground anodizing operation that generated wastewater. Wastewater was discharged to a three-stage clarifier and then to a sanitary sewer. Raw materials stored on the property during the Blake Rivet Company's occupation included metal stock and anodizing solutions (Ref. 10, p. 6).

In the South Gate area, shallow ground water occurs at a depth of approximately 45 feet bgs [below ground surface], with a ground water flow direction to the south or southeast. Shallow ground water beneath the Jervis B. Webb Co. property is expected to be similar to the nearby Cooper Drum Company property, where it occurs within or is controlled by the near surface Bellflower Aquiclude, which also incorporates the semi-perched aquifer (Ref. 16, p. 8; Ref. 23, pp. 18-19). In the vicinity of the Jervis B. Webb Co. facility, the Lakewood Formation, which immediately underlies the Recent Alluvium, consists of the Gaspur Aquifer, Exposition Aquifer, an unnamed aquiclude, and the Gage Aquifer. Ground water flow within the Gaspur Aquifer is generally to the south beneath the Jervis B. Webb Co. facility (Ref. 16, p. 70 - 72). Although data are not adequate to document ground water flow within the Exposition and Gage aquifers, it is assumed that the flow direction would be generally towards the south, in the direction of the Pacific Ocean [Ref. 11, pp. 6-7; Ref. 21, p. 2; Ref. 22, pp. 182, 183, 184, Plate 6A (Geologic Section B-B'); Ref. 28; Figures A-1 and A-2 of the HRS documentation record].

The Cooper Drum Company Superfund Site (EPA ID: CAD055753370) is located at 9316 Atlantic Avenue in South Gate, California (Ref. 12, p. 1). The 3.8 acre facility is located approximately 450 feet southwest, and hydraulically downgradient, of the Jervis B. Webb Co. property (Ref. 4; Ref. 16, pp. 7-8). . . .

The Seam Master Industries site (EPA ID: CAN000905902) [currently referred to as the Southern Avenue Industrial Area site]is located at 5211 Southern Avenue in South Gate, California (Ref. 29, p. 1). The facility is located approximately 750 feet south, and hydraulically downgradient, of the Jervis Webb property (Ref. 4; Ref. 11, p. 7; Figure A-3 of the HRS documentation record). . . .

The 1998 Phase II soil investigation report established an onsite source at the Jervis B. Webb Co. facility. Analytical results indicated that elevated concentrations of TCE and PCE exist in onsite soils. TCE and PCE were detected at maximum concentrations of 270 mg/kg and 140 mg/kg, respectively, in one sample collected at approximately 20 feet bgs in the vicinity of the former clarifier (Ref. 10, p. 20).

Hazardous waste manifests from the 1980s indicate that solvents existed on the Jervis B. Webb Co. property. In 1986, approximately 1,500 pounds of soil contaminated with oil and solvents was transported offsite; in 1988, 385 gallons of waste 1,1,1-TCA was transported offsite; and in 1989, 385 gallons of oil based paints containing chlorinated solvents was transported offsite (Ref. 18; Ref. 19; Ref. 20).

A site reconnaissance conducted in February 2011 showed that although the Jervis B. Webb Co. property is mostly paved, the pavement is in poor condition and contains multiple cracks (Ref. 15, pp. 1, 2). In addition, during the 1997 and 1998 sampling events, there was no evidence that a liner or engineered cover were present at or beneath the ground surface (Ref. 10 pp. 56-91; Ref. 11, pp. 29-43). Precipitation could infiltrate the contaminated soil beneath the pavement (Ref. 15, pp. 1, 2).

In 1998, ground water sampling was conducted as part of the Phase II investigation on the 5030 Firestone Boulevard portion of the Jervis B. Webb Co. property. Ground water samples collected from monitoring well MW-1, located on the Jervis B. Webb Co. property, indicated that TCE was present in ground water at a maximum concentration of 24,000 ug/l and PCE was present in ground water at a maximum concentration of 140 ug/l (Ref. 11, pp. 5, 15, 16, 72, 74). The maximum contaminant level (MCL) for TCE and PCE is 5 ug/l (Ref. 2, p. 11; Ref. 13, p. 1).

> In 2005, ground water samples from the property were collected as part of an annual ground water monitoring program. Ground water samples collected beneath the property, from monitoring well MW-1, indicated that TCE was present in ground water at a maximum of 24,979 ug/l (Ref. 30, pp. 1, 8, 17, 24). 1,1-DCE and trans-1,2-DCE were also detected in ground water samples at concentrations of 239.8 ug/l and 66.8 ug/l, respectively (Ref. 30, pp. 17, 23).
>
> Monitoring well MW-1 is screened between 40 and 70 feet bgs (Ref. 11, pp. 21, 29-33). Examination of DWR Plate 3A and Figure A-1 indicated that monitoring well MW-1 is located nearest to transect line B-B', approximately 0.25 miles from Well L1 and approximately 0.25 miles from Atlantic Avenue (Ref. 11, p. 26; Ref. 22, Plate 3A; Ref. 28, p. 2; Figures A-1 and A-2 of the HRS documentation record). Examination of DWR geological section B-B', indicates that the edge of the Gaspur Aquifer occurs at approximately 50 feet bgs in the vicinity of 2S/12W-31L1 (Ref. 22, Plate 6A). Monitoring well MW-1 is screened in the Gaspur Aquifer.
>
> . . .
>
> An observed release to the aquifer has been documented in monitoring well MW-1 at the Jervis B. Webb Co. site. Hazardous substances that meet the criteria for an observed release by chemical analysis were detected in Source 1 (see Section 2.2.2 of this documentation record). Background well MW-2 used to evaluate an observed release by chemical analysis is located upgradient of the source at the Jervis B. Webb Co. site. An observed release of 1,1-DCE, trans- 1,2-DCE, PCE and TCE is documented in MW-1 at the Jervis B. Webb Co. site based on chemical analysis (see above tables in Section 3.1.1 of the HRS documentation record).
>
> The evidence provided in this section of the HRS documentation record for the Jervis B. Webb Co. site documents that an observed release has occurred by chemical analysis of ground water samples to the Semi-Perched/Gaspur/Exposition/Gage interconnected aquifer of the hazardous substances listed below [1,1-DCE, Trans-1,2-DCE, PCE and TCE].

Thus, the HRS documentation record at proposal provided sufficient evidence to demonstrate a significant increase in contaminant concentrations in the aquifer below the Site and to attribute some portion of the significant increase to the Site based on the increase in contamination levels between the upgradient background well MW-2 and the downgradient release well MW-1. This increase in contamination is attributed to a release from the Site based on the finding of the same contaminants in an onsite source located between the background and release wells. The following subsections detail additional evidence supporting attribution of the significant increase to the Site.

Background Levels Screening

One additional reason the release is attributed to the Site is that while the background well MW-2 sample contains contamination indicating upgradient offsite sources, the concentrations in the release well are significantly greater than the levels in the background well, and thus are not likely coming from upgradient sources. In essence, any effects of a possible upgradient offsite source are screened out by background well MW-2. As established in section 3.6, Ground Water Flow Direction, of this support document, based on the available data, flow specifically under the 5030 Firestone Boulevard property is predominantly to the south-southeast. This means that background well MW-2 is almost exactly upgradient of observed release well MW-1 (see Figure 1 of this support document for well locations).

Because background well MW-2 is directly upgradient from observed release well MW-1, it effectively accounts for any offsite upgradient contamination influence on the concentrations found in MW-1. That is, as shown in section 3.7 above, Observed Release and Attribution, of this support document, the HRS documentation record

established that contaminant concentrations in well MW-1 are clearly greater than three times those detected in background well MW-2, and an observed release was established consistent with the HRS.

Evidence of Minimal Ground Water Contamination Movement

The assertion that the ground water contamination below the Site migrated from an origin north of Firestone Boulevard is also considered improbable because there is little evidence of large-scale movement of the ground water contamination at the Site, evidenced by the consistency of ground water contaminant levels. That is, over the approximately seven years of sampling the five monitoring wells at the Site, contamination levels have remained relatively stable. Reference 30 of the HRS documentation record at proposal, page 17, Table 2, contains data from 1998 through 2005 which illustrate this, showing the following approximate TCE ranges:

- MW-1: 14,253.3 to 33,000 µg/L
- MW-2: 1,051.7 to 3,200 µg/L
- MW-3: 902.1 to 3,100 µg/L
- MW-4: Not detected to 150 µg/L
- MW-5: 1,700 to 6,000 µg/L

If indeed the commenter's asserted scenario of contamination migrating onsite from an upgradient source were correct (originating from property somewhere north of Firestone Avenue), and if there were significant contamination due to migration from upgradient sources, the plume should have migrated at least to some extent from its original location since the release first occurred, and one would expect to see contamination in downgradient wells (MW-3, MW-4, and MW-5) increasing over time; however, there is no evidence of this. And, the above data show that the significant increase measured in observed release well MW-1 is not a pulse of contamination that is migrating from an upgradient offsite source.

Magnitude of Significant Increase in Ground Water Contaminant Levels

The large increase in TCE concentrations in the observed release well at the Site (relative to background levels) indicates an upgradient offsite source did not cause the increase.

The significant increase over the background level established at proposal was not questioned by Dragun. Further, TCE levels in the observed release well MW-1 are approximately 10 times those observed in background well MW-2, well above the minimum three-fold significant increase criteria required in HRS Sections 3.1.1, 2.3 and Table 2-3 quoted above and documented on pages 27-30 of the HRS documentation record at proposal. Pages 28-30 of the HRS documentation record at proposal list results from sampling events on March 4, 1998; May 20, 1998; and June 10, 2005, to establish an observed release. The MW-2 background well concentrations were 2,700, 3,000 and 1865.7 µg/L TCE, respectively; the MW-1 observed release well concentrations were 24,000, 24,000 and 24,979 µg/L TCE, respectively.

Thus, the scale of the observed release indicates that the Site is contributing at least some portion of the significant increase in chlorinated solvents to ground water.

Scale and Pattern of Soil Contamination Consistent with Downward Migration to Water Table

The extent and pattern of soil contamination at the Site is consistent with a situation in which a spill at the Site surface has spread laterally and migrated downward through soils to the water table.

As is further explained in section 3.7.2, Magnitude of TCE/PCE Soil Contamination and Evidence of DNAPL, of this support document, sufficient contamination has been found in the contaminated soil and throughout the

vadose zone at the Site to demonstrate that the ground water contamination could have resulted from downward migration from the contaminated soil to the ground water.

And, as further detailed in section 3.7.1, Continuity of Clay Layer, of this support document, Source 1 contaminated soil samples listed in the Source Samples table on pages 15-16 and 18 of the HRS documentation record at proposal are found at many depths from 6 to 46 ft bgs, (shallow ground water begins at about 45 ft bgs, and observed release well MW-1 is screened from 40 to 70 ft bgs); and, at two of the soil boring locations, B18 and B19, where samples were taken from several depths in shallow and deep soil, above and below the clay layer. In soil boring locations B18 and B19, TCE and PCE were detected at almost every depth sampled (see Figures 7 and 8 on pages 40-41 of Reference 10 of the HRS documentation record at proposal). This evidence suggests a vertical range of contamination from surficial soil through deeper soil to the water table.

The pattern of soil contamination indicates that there is a clear relationship between contamination in soils and the contamination in the ground water below. As explained in section 3.7.1, Continuity of Clay Layer, of this support document, Figures 11 and 12 on pages 44-45 of Reference 10 of the HRS documentation record at proposal show higher shallow soil contamination at about 20 ft bgs approximated by a shaded oval centered near the former facility wastewater clarifier, and higher levels of deep soil contamination at 40 ft bgs spread over a larger approximated oval area—but are still nearly centered under the 20 ft bgs oval. This suggests that the shallow and deep soil contamination is continuous, and is consistent with a scenario in which a spill at the soil surface has spread laterally as it migrated downward to deeper soil (and eventually to the water table).

The locations of the greatest ground water contamination are in the vicinity of the Source 1 contaminated soils, indicating a link between the two and an influence of soil contamination on ground water. The Source 1 contaminated soils are located north and south of observed release well MW-1, with the majority located to the north and northwest (upgradient) of MW-1. Further, locations of MW-1, CPT-6, and CPT-7 coincide with the significant VOC concentrations from the soil gas survey (as shown in Dragun Report Figure 7 soil gas concentration contour lines). These locations are within the highest TCE soil gas concentration contours and are within the immediate vicinity of the source area. Therefore the elevated ground water concentrations would be expected below these locations.

Furthermore, the presence of contamination in ground water at CPT-6 and CPT-7, does not necessarily demonstrate that the significant increase in contamination levels under the Site could not have come from a release from the Site. The ground water contamination at CPT-6 and CPT-7 could have been caused by contamination from the Site as well as by migration from upgradient sources. As previously mentioned, TCE and/or PCE were found in soil and soil gas near and north of these locations: specifically at borings B9, B10, B15, SG5, SG11, SG13, SG15 and SG16. Figures 7 and 8 on pages 40-41 of Reference 10 of the HRS documentation record at proposal list TCE and PCE levels in soil samples at boring locations B9, B10, and B15 (these figures are also included in the Dragun Report on Dragun comment document pages 72 and 73). Figures 4 and 5 of Reference 10 of the HRS documentation record at proposal list TCE and PCE levels in soil gas locations SG5, SG11, SG13, SG15, and SG16. Also, considering that the operations that may be the origin of the release at the Site were occurring decades before the soil and ground water samples discussed here were collected, it is likely that the levels of contamination found in the 1997/1998 soil samples are the remnants of much higher levels of soil contamination that had migrated down to ground water since the original release took place. And, as explained above, it appears from evidence at the Site that a concentrated release occurred in the vicinity of the former clarifier and spread in all directions laterally as it moved down through soil; thus, the soil contaminants may have spread from this origin to upgradient areas before encountering ground water and being influenced by its flow direction. This lateral spreading may have been enhanced as downward migration was slowed by the clay layer at the Site.

These facts suggest extensive soil TCE and PCE contamination at the Site at substantial concentrations that over time reached ground water and led to the significant increase in chlorinated solvent contamination in the observed release well.

Conclusion

The HRS documentation record at proposal demonstrated that a significant increase in contaminant concentrations occurred in the aquifer below the Site and correctly attributed some portion of the significant increase to the Site. Additionally, there is ample evidence as shown above that contamination originating in surficial soils at the Site could have migrated down through deeper soils to the ground water, and caused a portion of the significant increase of chlorinated solvents over background levels in the observed release established at the Site. The speculation that the contamination is present due to migration from an offsite source is only hypothesized by Dragun; Dragun has not presented any actual data showing that the migration necessarily occurred.

Further, even if Dragun's general speculation that the cause of ground water contamination at the Site was due to an upgradient offsite source was demonstrated to be true, the Site would still score above 28.50 and be eligible for NPL listing based on scoring the HRS potential to release factor category value, and scoring the contaminant distribution in the vadose zone at the site and the quantity of solvents removed by the SVE system. In response to Dragun's comments, the Agency has included an alternative scoring for the site, presented in Attachment 3, Site Rescoring based on Potential to Release, of this support document..

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

In arguing that ground water contamination and deep soil contamination did not originate at the Site and was more likely from an upgradient offsite source, Dragun relied on several claims. Its specific challenges to the establishment of attribution of the significant increase in contaminant concentrations to the Site are addressed in the following subsections:

- 3.7.1 Continuity of Clay Layer
- 3.7.2 Magnitude of Soil Contamination and Evidence of DNAPL
- 3.7.3 Distribution of TCE/PCE Degradation Products
- 3.7.4 TCE/PCE Ratio
- 3.7.5 Vertical Contaminant Migration

3.7.1 Continuity of Clay Layer

Comment: Dragun argued that a clay layer at the Site approximately 25 ft. below ground surface (bgs) would "inhibit" surface contaminant migration from the onsite contaminated soil to the ground water.

Dragun stated that:

> The soil boring and CPT data [EKI October-December 1997 soil boring sample and October 1998 CPT sample] indicate that a continuous, two-to-five foot thick clayey unit extends across the Site at approximately 25 fbgl. The clayey unit is described in the borehole logs as highly plastic, soft to firm, and moist . . . Above the clayey unit is almost 15 feet of moist to wet sandy silt to silty clay.

Dragun stated that a "continuous clayey unit encountered at about 25 fbgl [feet below ground level] would inhibit the vertical migration of DNAPL to the water table." In its description of the clay layer, Dragun cited to soil

boring data and cone penetrometer test (CPT) data discussed in 1998, 1999 and 2000 EKI investigation and site reports, emphasizing that the two-to-five foot thick clay layer is "continuous and competent."[8]

Dragun claimed that "the hydrostratigraphic conditions at the Site . . . [citing to Figure 4 of the 2001 Dragun Report, a hydrostratigraphic cross-section figure for the site] are not conducive to the vertical migration of a DNAPL to the water table." Dragun stated that:

> [t]he clayey unit is described in the borehole logs as highly plastic, soft to firm, and moist (EKI, 1998b, and 1999a). Above the clayey unit is almost 15 feet of moist to wet sandy silt to silty clay. These soils would slow any potential downward movement of chemicals to the water table due to their low hydraulic conductivity. Even if there had been DNAPLs at the site, they would have had to accumulate above the clayey unit until a sufficient head of DNAPL developed before they could penetrate the clayey unit (Cohen and Mercer, 1993). None of the 78 soil samples indicate that this happened.

Response: While a clay layer may have acted to possibly slow downward migration, the clay layer at the Site is not competent or continuous and did not act as a complete barrier to downward migration of TCE and PCE. Therefore, there is no reason to doubt the attribution of a significant increase in contaminant concentrations to the Site simply because of the presence of an incompetent clay layer at the Site. This situation is explained in the following subsections:

- Incompetence of Clay Layer
- Extent and Pattern of Soil Contamination

Incompetence of Clay Layer

While there are perhaps several areas of clay between the soil surface and the ground water, and there appears to be a clay layer at 25 feet bgs in many locations at the Site, none of the clay layers are continuous or competent at the Site, as documented by borings showing the absence of a clay layer in the vicinity of the soil contamination source. Therefore the clay layer does not prevent contaminant migration from the Site contaminated soil source into ground water.

The presence of a continuous clay layer at 25 feet beneath the site is inferred by Dragun based on 4 soil borings from the December 1997 sampling event (B15, B17, B18 and B19). The 2001 Dragun Report Figure 4 referred to by the commenter is derived from 1998 EKI soil boring information detailed in Reference 10 of the HRS documentation record at proposal. However, for one of these borings, B19, the soil boring log **does not show any clay layer**. Additionally, boring B18 shows the clay layer thinning to approximately 1.5 ft thick in the same area as B19 (see pages 84-91 of Reference 10 of the HRS documentation record at proposal).

Additionally, a more definitive sampling and logging approach to determine the presence/absence of a clay layer is logging on a *near-continuous interval* of the soil types as drilling takes place. Data from this technique is available in Attachment 2, Excerpt of January 1999 Additional Groundwater Investigation Report, of this support document (see soil behavior type data for locations CPT-1 through CPT-9 on pages 40-83 of that report). Lithologic data from a CPT[9] sampling event described in that report generally show the presence of interbedded sandy silts, clay, clayey silts, and lesser amounts of silty clay from ground surface to approximately 50 feet bgs. For example, the CPT log reports for locations CPT-6 and CPT-7 exhibit these interbedded layers and do not

[8] "Competent" in this sense indicates that the clay layer is intact.
[9] Cone penetrometer testing (CPT) consisted of pushing an instrument cone-tipped probe into the ground while simultaneously recording resistance to penetration at 50 millimeter (about 2 inch) intervals; this data was then interpreted to produce soil type information.

show any identified pure clay layers (see pages 66-69 and 71-73, respectively of Attachment 2, Excerpt of January 1999 Additional Groundwater Investigation report, of this support document).

Therefore the presence of a continuous pure clay layer beneath the site is not supported by the CPT data. (Note that measurements of "silty clay" or "clay to silty clay" are shown in these CPT logs, however, silty clay has a greater hydraulic conductivity than clay[10] and would not impede the contaminant transport as a "clay" layer would.)

Similar lithological units have also been observed in approximately 60 CPT locations drilled in the immediate downgradient area of the Jervis Webb site during the Cooper Drum Co site investigation (see, for example, pages 88-89 of Reference 16 of the HRS documentation record at proposal). Additionally, monitoring wells completed downgradient of the Jervis B. Webb Co. site also demonstrate the presence of similar soil groups mentioned previously and the absence of a continuous clay layer. For example, the log for monitoring well MW-15B (pages 68, and 95-96 of Reference 16 of the HRS documentation record at proposal) shows the presence of sandy silt with clay between 16 – 37 feet; the log for MW-23B (see pages 68, and 99-100 of Reference 16 of the HRS documentation record at proposal) shows clayey silt with sand occurring between 17 – 42 feet and silty sand with clay between 42 – 95 feet, but no layer composed only of clay. (See well construction logs on pages 95-121 of Reference 16 of the HRS documentation record at proposal, showing no continuous clay unit at that site. See also the site hydrogeology discussions on pages 8-9 of Reference 16 which again mention the presence of sandy silts, clayey silts, and lesser amounts of silty clay from the surface to about 55-60 ft bgs.).

Extent and Pattern of Soil Contamination

The continuity of the vertical extent and pattern of soil contamination in Source 1 soil samples and boring samples above and below the depth where Dragun claims a continuous clay layer to be present also indicate there is no continuous and competent clay layer acting as an absolute barrier to downward contaminant migration.

Source 1 contaminated soil samples listed in the Source Samples table on pages 15-16 and 18 of the HRS documentation record at proposal are found at many depths from 6-46 ft bgs, including 6, 10.5, 11, 16, 20.5, 21, 26, 26.5, 27.5, 31, 35.5, 36.5, 40, 41, 44.5 and 46 ft bgs (shallow ground water begins at about 45 ft bgs, and observed release well MW-1 is screened from 40 to 70 ft bgs)—evidence suggesting a vertical range of contamination from surficial soil through deeper soil to the water table. Also, at two of the soil boring locations, B18 and B19, where samples were taken from several depths in shallow and deep soil, above and below the Dragun-identified clay layer, TCE and PCE were detected at almost every depth sampled. (See Figures 7 and 8 on pages 40-41 of Reference 10 of the HRS documentation record at proposal, which show all the 1997 soil boring locations and TCE and PCE concentrations detected at the depths sampled.)

And, as can be seen in Figures 11 and 12 on pages 44-45 of Reference 10 of the HRS documentation record at proposal (see also Figures 3 and 4 of this support document below), the higher TCE concentrations (those concentrations greater than 1 mg/kg) of shallow soil contamination at about 20 ft bgs approximated by a shaded oval in Figure 11 are centered near the former facility wastewater clarifier (this clarifier was described as a possible source not scored on page 22 of the HRS documentation record at proposal). Higher levels of deep soil contamination at 40 ft bgs shown on Figure 12 are spread over a larger approximated oval area but are still nearly centered under the 20 ft bgs oval in Figure 11. This pattern of contamination suggests that the shallow and deep soil contamination is continuous with depth and shows no break associated with a clay layer. The pattern is consistent with a scenario in which a spill at the soil surface has spread laterally as it migrated downward to

[10] See table HRS Table 3-6, *Hydraulic Conductivity of Geologic Materials*, which shows the hydraulic conductivities of various materials for the purpose of evaluating the HRS potential to release factor value. Clay is listed with a hydraulic conductivity of 10^{-8}, vs. silty clay which is in a material category with a greater hydraulic conductivity of 10^{-6}.

deeper soil—further proof that the discontinuous clay layer at the Site does not halt vertical contaminant movement.

Based on the evidence presented above demonstrating the lack of a clay layer in well logs from some parts of the Site, and the lack of any obvious break in contaminant concentrations with depth that would be associated with a competent clay layer, the clay layer at the Site is not competent and continuous; it would not have prevented chlorinated solvent contamination released at the surface from migrating downward to the water table. The presence of the clay layer does not negate the attribution of the significant increase in contaminant levels in part to the Site.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

Figure 3 – Excerpt from HRS Documentation Record Reference 10 Figure 11

Figure 4 – Excerpt from HRS Documentation Record Reference 10 Figure 11

3.7.2 Magnitude of TCE/PCE Soil Contamination and Evidence of DNAPL

Comment: Dragun contended that Source 1 soil contaminant levels are too low to account for the ground water contamination at the Site, and that the clay layer should have exhibited higher contaminant concentrations above it if indeed the source of ground water contamination was a surface soil TCE/PCE release moving downward toward the water table.

Dragun stated that TCE has been found in ground water at levels above 25,000 µg/L in monitoring well MW-1 and direct-push locations CPT-6 and CPT-7. Dragun stated that "a concentration in groundwater of a dense non-aqueous phase liquid (DNAPL) such as TCE greater than one percent of its aqueous solubility infers that the groundwater has been impacted by DNAPL somewhere along its flow path. For TCE, this would be a concentration in groundwater greater than 11,000 µg/L." Dragun concluded that the high concentrations in ground water at the Site indicate that DNAPL has impacted ground water along its flow path.

Dragun identified that characteristics of DNAPL migration depend on site-specific geological conditions, and stated that only soil concentrations higher than 10,000 mg/kg would imply the presence of DNAPL in the tight soils at the Site.

Dragun stated that there are only low levels of TCE and PCE in Site soils, noting that the greatest concentration of TCE detected in Site soils was 270 mg/kg, and asserting that "the concentrations of TCE observed in soil are magnitudes lower than would be necessary to infer the presence of DNAPL in soil." Dragun made similar claims that the soils near other potential sources (such as the sumps and furnace pit area) and the soils at monitoring well locations (MW-1, MW-2, MW-3, and MW-5) only contained low levels of TCE and PCE, indicating these soils are not likely the source of ground water contamination. Dragun further identified that no soil results show DNAPL accumulated above the clayey unit.

Dragun claimed that "the hydrostratigraphic conditions at the Site . . . [citing a hydrostratigraphic cross-section figure for the Site] are not conducive to the vertical migration of a DNAPL to the water table." Dragun stated that:

> [t]he clayey unit is described in the borehole logs as highly plastic, soft to firm, and moist (EKI, 1998b, and 1999a). Above the clayey unit is almost 15 feet of moist to wet sandy silt to silty clay. These soils would slow any potential downward movement of chemicals to the water table due to their low hydraulic conductivity. Even if there had been DNAPLs at the site, they would have had to accumulate above the clayey unit until a sufficient head of DNAPL developed before they could penetrate the clayey unit (Cohen and Mercer, 1993). None of the 78 soil samples indicate that this happened.

Thus, Dragun argued that soil TCE concentrations cannot explain ground water TCE levels, and that the DNAPL affecting ground water must have entered the ground water upgradient of the Site.

Response: The release of contamination to the soil has not been demonstrated to be insufficient to have caused the significant increase in contaminant levels in the ground water at the Site. The contaminant levels and the distribution of the contaminants in the soil on the Site is not sufficiently well known to state whether or not there is or was sufficient quantity of contaminants to cause the contaminant levels in the ground water at the Site. And, there is no HRS requirement stating that concentrations of hazardous substances identified in a source be above a certain level relative to concentrations identified in an observed release at the time of the sampling event. Furthermore, as explained in this response:

- The levels of chlorinated solvent soil contamination in Source 1 are significant, and can reasonably be judged sufficient to account for the ground water contamination at the Site.
- It is possible that the levels of contamination found in the soil are the remnants of much higher levels of soil contamination that have migrated down to ground water since the original release took place.
- Given the few samples ever collected at the Site near the top of the clay layer, there is insufficient evidence to draw any conclusions regarding the presence or absence of pooled DNAPL at the clay layer.

On attribution, HRS Section 3.1.1, *Observed release*, directs (note that only an observed release by chemical analysis was established at this site):

> Establish an observed release to an aquifer by demonstrating that the site has released a hazardous substance to the aquifer. Base this demonstration on either:
>
> - Direct observation . . . .

- Chemical analysis—an analysis of ground water samples from the aquifer indicates that the concentration of hazardous substance(s) has increased significantly above the background concentration for the site (see section 2.3). **Some portion of the significant increase must be attributable to the site to establish the observed release . . .[emphasis added]**

As discussed in section 3.7, Observed Release and Attribution, of this support document, attribution at this site was established by demonstrating that the observed release hazardous substance is associated with the Site, and at least some portion of the significant increase identified in the observed release is from the Site. The hazardous substances in the observed release are associated with the Site. That is, TCE and PCE are present in Source 1; and 1,1-DCE and trans-1,2-DCE are degradation products of TCE. Dragun did not disagree with this finding.

And, as discussed in section 3.7 of this support document, the HRS documentation record at proposal has clearly identified some portion of the significant increase in the contaminants in ground water observed release samples at the Site is from the site release. While there was evidence of possible sources upgradient of the Site, the background sample location is downgradient of these sources and upgradient of the release sample location, and the levels of contamination possibly from upgradient sources is indicated by the level of contamination in the background sample. However, the significant increase in contaminant levels over background levels—an approximate 10-fold increase—is more than enough to meet the HRS requirement to show a significant increase in contaminant levels has occurred and that the release sample concentrations did not come only from these upgradient sources. Thus, for HRS purposes, attribution is established consistent with the HRS.

Levels of Chlorinated Solvent Soil Contamination

Sufficient contamination has been found in the contaminated soil and throughout the vadose zone at the Site to demonstrate that the ground water contamination could have resulted from downward migration from the contaminated soil to the ground water. Dragun's assertion to the contrary is not sufficiently supported to show the increase in contamination did not come from the Site release. Specifically regarding the magnitude of contamination found in Source 1 soil at the Site and its implications on attribution of some portion of the significant increase to the Site, although sampling events at the Site may not have happened to collect soil precisely from an area containing DNAPL, the levels found in the soil are significant. TCE and/or PCE contamination was detected in a multitude of Source 1 soil samples, as is shown in the 35 contaminated soil sample points listed in the Source Samples table on pages 15-16 and 18 of the HRS documentation record at proposal; and soil contamination has been found at high concentrations.

- Several of those soil samples contained levels of greater than 1 mg/kg of TCE or PCE (samples B4-16, B4-20.5, B15-40, B15-44.5, B16-51, B4-16, B4-20.5, B15-40, B15-44.5, and B16-51).

- Sample B4-20.5 contained 140 mg/kg PCE and 270 mg/kg TCE (the equivalent of 0.014% and 0.027%, respectively).

- During 2000-2001 SVE system operation, system startup concentrations in shallow SVE wells were measured as high as 10,000 parts per million by volume (ppmv) TCE in extraction well SVE-1 on March 16, 2000, and again on March 22, 2000; and TCE was measured as high as to 1,000 ppmv in deeper extraction well SVE-D1 on March 16, 2000 (see tables 4b and 4f of Appendix E of Attachment 4, Excerpt of October 2001 Soil Closure Report, of this support document).

- Over the course of the SVE system operation from March 2000 to October 2001, an estimated 177 pounds of VOC contamination (primarily TCE) was removed from soil at the Site (see page 5 of Attachment 1, 2008 State of California Department of Toxic Substance Control Consent Order, of this support document). Just

that mass of VOCs captured by the SVE system, if it were all TCE, would be enough to contaminate over 4 billion gallons of water at the EPA MCL of 5µg/L.

These facts indicate significant levels of contamination in Source 1 soils and show that there is sufficient contamination in the soil to have resulted in the contaminant levels found in the ground water at the Site.

Possibility of Higher Contaminant Levels in the Past

It is not necessarily the case that the recent soil contamination measurements at the site are indicative of prior contaminant levels—they are more likely remnants of higher past contaminant levels. The historical facility operations that may be the origin of the release at the Site were occurring decades before the soil and ground water samples discussed here were collected (the Blake Rivet Company alone operated at the 5030 Firestone Boulevard property from the 1950s until 1980). And, as explained in section 3.7.1, Continuity of Clay Layer, of this support document, the clay layer at the Site is not competent and continuous; it would not have prevented chlorinated solvent contamination released at the surface from migrating downward to the water table. It is therefore possible that the levels of contamination found in the soil are the remnants of much higher levels of soil contamination that have migrated down to ground water since the original release took place. Thus, there may once have been DNAPL levels of TCE pooled on the clay layer, and it is entirely possible that those high concentrations migrated downward to ground water before the 1998 soil samples were collected. In fact, it is likely that DNAPL existed in Site soils at some point in the past, given that 177 pounds of VOCs were removed from the Site soils during the soil vapor extraction response action.

Insufficient Sampling to Conclude DNAPL is Absent

Also, of all the soil samples collected at the Site during the October-December 1997 sampling event, the February 1998 sampling event, and the October 1998 sampling event[11] , there are actually very few samples close to the top of the clay layer; only approximately 3 samples—MW-2-20.5, B15-26.5, and B18-27—were collected at a borehole exhibiting a clay layer and within 1 foot of the top of the clay layer. There is therefore insufficient evidence to draw any conclusions regarding the presence or absence of pooled DNAPL at the clay layer. For example, DNAPL pools might be the size of golf balls or even smaller; to find such pools it would be necessary to sample every several inches of the Site. Dragun provided no such sampling data.

Conclusion

Thus, the levels of contamination found in soil samples during the 1998 sampling event do not contradict the presence of DNAPL levels of TCE and PCE in ground water, or the possible past or present existence of DNAPL in Site soils.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.7.3 Distribution of TCE/PCE Degradation Products

Comment: As further evidence of its assertion that the distribution of chemicals in ground water cannot be explained by the chemicals in soil, Dragun also pointed specifically to the distribution of TCE/PCE breakdown products, 1,1-DCE, 1,1-DCA and cis-1,2-DCE, at the Site.

[11] See boring logs on pages 56-91 of Reference 10 of the HRS documentation record at proposal; listed soil sample depths for samples analyzed for VOCs on page 22 of Reference 11 of the HRS documentation record at proposal and well boring logs on pages 29-43 of the same reference; and listed soil sample depths for samples analyzed for VOCs on page 22 of Attachment 2, Excerpt of January 1999 Additional Groundwater Investigation Report, of this support document, and well boring logs on pages 98-107 of the same attachment.

Dragun identified that 1,1-DCE was found in several ground water samples, including those from MW-1, MW-2, MW-5 and CPT-7. Dragun stated that "[t]he 1,1-DCE plume is wide, extending from at least MW-2 in the northwest to at least MW-5 in the southeast." Dragun continued that "there were no detections of 1,1-DCE in any of the 78 soil samples collected from the Site."

Dragun asserted that 1,1-DCA detected in ground water came from an offsite source for the following reasons:

- 1,1-DCA was found in MW-2 ground water, but no 1,1-DCA (or 1,1-DCA parent compound) was found in the soil at MW-2.
- High 1,1-DCA levels were found in CPT-6 and CPT-7 ground water; 1,1-DCA was detected in CPT-4, CPT-8, and MW-3; and "elevated detection levels" were found in MW-1, MW-5, and CPT-5 ground water. But, 1,1-DCA was not detected in any site soil samples.

Regarding cis-1,2-DCE in ground water, Dragun stated that:

> [t]he general distribution of cis 1,2-DCE appears to be different from those of TCE, PCE, 1,1-DCE and 1,1-DCA. The highest observed concentration of cis 1,2-DCE was at MW-5, which is located along the eastern property boundary. There was no cis 1,2-DCE detected in soil at MW-5. The only VOC detected in soil at MW-5 was TCE at 550 µg/kg at 41 fbgl [feet below ground level] near the water table. TCE was not detected in either of the soil samples collected from 21 fbgl or 31 fbgl at MW-5.

Dragun concluded that "the distribution of chemicals in groundwater cannot be accounted for by the observed distribution of chemicals in soil and the observed groundwater flow direction," and that this evidence instead indicates an upgradient offsite source.

Response: As with the distribution of TCE and PCE (discussed in section 3.7, Observed Release and Attribution, of this support document and its subsections), the distribution of 1,1-DCE, 1,1-DCA and cis-1,2-DCE does not conflict with the attribution of some portion of the significant increase in ground water contamination to the Site as explained below. In fact, the distribution of chlorinated solvents in the soils is consistent with the ground water contamination.

1,1-DCE Distribution

Regarding the presence of 1,1-DCE in the ground water and absence of 1,1-DCE in Site soil samples, this does not contradict the HRS documentation record scenario in which ground water was contaminated by a solvent release at the surface soil. As Dragun acknowledges, 1,1-DCE can be a degradation product of PCE and TCE. The TCE and PCE found in ground water samples may have degraded over time and produced some quantity of 1,1-DCE—this would be expected. A lack of 1,1-DCE in soils above the ground water does not call into question the attribution of some portion of the significant increase in ground water contaminants to the Site, because the biological mechanisms by which chlorinated solvent degradation take place are complex and depend on several parameters (aerobic/anaerobic conditions, available electron acceptors, available electron donors, pH, etc.) (see pages 38-42 of Attachment 5, Excerpt of EPA Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water, of this support document, which describe the effects of various parameters on biodegradation processes); thus, it may simply be that conditions for degradation of TCE specifically to 1,1-DCE in soil at the Site are more ideal in water than soil[12].

[12] Also, 1,1-DCE was not found in ground water at CPT-7, as the commenter asserted (Table 5 on page 49 of the Dragun Report shows that 1,1-DCE was not detected at CPT-7).

1,1-DCA Distribution

Regarding 1,1-DCA, while it is possible that some 1,1-DCA found in ground water samples originated at an offsite source, this does not negate the attribution of some portion of the significant increase in ground water contaminants (PCE, TCE, 1,1-DCE and trans-1,2-DCE) to the Site. Furthermore, although there was no 1,1-DCA detected in Site soils, 1,1,1-TCA was detected in the majority of 1998 soil gas samples at the Site (see page 26 of Reference 10 of the HRS documentation record at proposal). As Dragun acknowledges, 1,1,1-TCA is a parent compound of 1,1-DCA; the 1,1,1-TCE detected in soil gas may account for some portion of the 1,1-DCA found in ground water samples.

Cis-1,2-DCE Distribution

Regarding cis-1,2-DCE, nothing in the distribution of cis-1,2-DCE calls into question the attribution of some portion of the significant increase in contaminants in MW-1 ground water (PCE, TCE, 1,1-DCE, and trans-1,2-DCE) to the Site. As cis-1,2-DCE is a degradation product of PCE and TCE (acknowledged by Dragun), it is possible that the cis-1,2-DCE observed in ground water at the Site (including that found in MW-5) is a product of the PCE and TCE at the Site. Also, the highest cis-1,2-DCE concentration found at the MW-5 location—downgradient of the highest TCE concentrations near MW-1 and CPT-6—could be explained if conditions in ground water at the Site are more ideal for biodegradation than those in soils. In that situation, one would expect to see downgradient areas with higher levels of degradation products (such as cis-1,2-DCE) because contamination in the downgradient areas would have spent more time in ground water since its initial transition from deep soil to the water table near Source 1.

Conclusion

Thus, the distribution of these other chlorinated solvent compounds can be explained as the effects of contamination in the soil and natural biodegradation at the Site, and it does not conflict with the attribution of a portion of the significant increase identified in the observed release to the Site, consistent with the HRS.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.7.4 TCE/PCE Ratio

Comment: Dragun asserted that the TCE/PCE ratios in soil, soil gas, and ground water contradict the HRS documentation record scenario in which ground water has been contaminated by Source 1 contaminated soils.

Dragun stated that the TCE/PCE ratios in "soil gas and soil are similar to each other; however, they are strikingly different from the TCE to PCE ratio in the groundwater." "This indicates that the TCE and PCE in soil have not caused the TCE and PCE impact in the groundwater." Dragun asserted that this "supports that an off-site, rather than an on-site source has impacted the groundwater."

In explaining this argument, Dragun commented that TCE/PCE ratios range from 0.1 to 2.5 for 34 of the 37 soil gas sampling locations, and that the remaining three locations ranged from 2-8.5. Dragun concluded that "soil gas data indicate that the shallow impacted soil can be characterized by a TCE to PCE ratio of less than about 2.5:1." Dragun stated that the TCE/PCE ratios for soil "above the clayey unit at about 25 fbgl [feet below ground level] is generally about 1:1," noting the highest TCE and PCE concentrations were in the 20.5 ft bgs B4 soil boring sample with a ratio of about 2:1. Dragun asserted that the ground water TCE/PCE ratio in the central area of the plume is about 150-300, noting ratios of 318 at CPT-6 and 165 at MW-1 during the October/November 1998 sampling event, and that similar ratios were measured in other sampling events. Dragun further commented that

the TCE/PCE ratio increases below the clay layer, and that "ratios in the soils near the water table approach the ratios of the groundwater [citing to results in Table 3 of the 2001 Dragun Report]."

Response: The TCE/PCE concentration ratios are consistent with what could be predicted given the chemical properties of the substances and probable effects of biodegradation at the Site, and are consistent with ground water at the Site being contaminated by Source 1 contaminated soils. Therefore the TCE/PCE ratios does not demonstrate conclusively that the contamination in the ground water did not come from the site release.

In fact, the shift from a low TCE/PCE ratio in surficial to a higher ratio in deeper soils and ground water can be explained by several parameters:

- Volatility: TCE is more volatile than PCE (the boiling point of TCE = 86.7 °C, and its vapor pressure = 74 millimeters of mercury (mm Hg) at 25 °C; the boiling point for PCE = 121 °C, and its vapor pressure = 18.47 mm Hg at 25 °C[13]). Therefore, TCE would be more volatile than PCE and more likely to evaporate from soils near the surface, lowering the TCE/PCE ratio in surface soils.

- Solubility in water: TCE is more soluble in water than PCE (the solubility of TCE is 1.366 grams per liter (g/L) at 25 °C, whereas that of PCE is 0.15 g/L at 25 °C[13]). Therefore, as rainwater filters down through the soil, it is more likely to carry TCE with it from shallow soils to deeper soils, lowering the TCE/PCE ratio in shallow soils and raising the ratio in deeper soils.

- Biodegradation: Biodegradation via reductive dechlorination converts PCE to TCE in the environment, increasing the TCE/PCE ratio. TCE is subsequently converted to less chlorinated daughter products, but at a slower rate than PCE is converted to TCE[14]. This process occurs under anaerobic conditions; therefore, reductive dechlorination biodegradation may be more prevalent in deeper soils further from the surface and available oxygen, leading to increased TCE/PCE ratios in deeper soils and ground water. Additionally, this process could act at an even greater rate once substances migrate below the water table. Indeed, the presence of TCE breakdown products in ground water at the Site discussed by Dragun (and addressed in section 3.7.3, Distribution of 1,1-DCE, 1,1-DCA and cis-1,2-DCE, of this support document) could indicate favorable conditions for reductive dechlorination in ground water at the Site.

  And, similar gradients of TCE/PCE ratios have also been found at the nearby Cooper Drum Superfund site. For example, see Figures 6 and 7 of Attachment 9: Excerpt of July 2006 Cooper Drum Remedial Design Technical Memorandum, to this support document, which show results in several soil gas sampling locations at various depths. Of the 39 sample locations on those figures for which results are available for multiple depths, 29 exhibit[15] a general increase in the TCE/PCE ratio with an increase in depth. See also TCE and PCE concentrations in ground water for onsite wells MW-2, MW-21, EW-1 and EW-2 in Table 15, also in Attachment 9 of this support document; these exhibit relatively high TCE/PCE ratios in ground water at the Cooper Drum site. Thus, the TCE/PCE ratio tends to increase with depth through soil and becomes relatively high at Cooper Drum, similar to the TCE/PC E ratio behavior at the

[13] Chemical properties are from page 184 of *Toxicological Profile for Trichloroethylene* and page 171 of *Toxicological Profile for Tetrachloroethylene*, both published by the U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, September 1997 (excerpts available in Attachments 6 and 7 of this support document, respectively).

[14] See pages 23 and 25 of the September 1998 *EPA Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water* (excerpted in Attachment 5 of this support document).

[15] The sample locations exhibiting an increase in TCE/PCE ratio with depth at the Cooper Drum site include: SG-1, SG-3, SG-7, SG-8, SG-10, SG-12, SG-13, SG-14, SG-15, SG-16, SG-17, SG-20, SG-21, SG-22, SG-23, SG-24, SG-26, SG-27, SG-28, SG-29, SG-30, SG-31, SG-32, SG-33, SG-34, SG-35, SG-37, SG-38 and SG-39.

Jervis B. Webb site. This suggests that this pattern is indeed a function of reductive conditions in local ground water conducive to biodegradation.

Thus, the TCE/PCE ratio differences between soils and ground water at the Site are consistent with the scenario presented in the HRS documentation record in which chlorinated solvent contamination in Site soils has affected ground water and causes a portion of the significant increase identified in observed release samples at the Site.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.7.5 Vertical Contaminant Migration

Comment: Dragun asserted that the deeper soil below the clayey layer has been contaminated by chlorinated solvents in the ground water, not from a surface release of chemicals at the Site. Dragun established this conclusion on its previous assertions that:

- Contaminant levels in soils are not significant enough, and are not in locations that would explain ground water contamination.
- The TCE/PCE ratios of the deep soil samples below the clayey layer more closely match ratios in ground water samples than ratios in the soil above the clayey layer (based on Dragun's comments that: surficial soil ratios are approximately 1 based on soil chemistry measurements and less than 2.5 from soil gas measurements; and the central portion of the ground water plume exhibits ratios from 150-300; and Dragun's assertion that the ratio increases below the clay layer, and that "ratios in the soils near the water table approach the ratios of the groundwater [citing to results in Table 3 of the 2001 Dragun Report].")
- "The clayey unit at 25 fbgl [ft bgs] would restrict the downward migration of chemicals from above 25 fbgl."

Dragun stated that soil TCE and PCE levels are low above the clayey unit. Dragun also stated that contaminant concentrations increase with depth in soils below the clayey unit, "although not nearly high enough to produce the observed groundwater concentrations." Dragun claimed that results such as those for soil borings B15 and B17 are examples of this trend, and that the data "suggest that TCE in soil just above the water table is due to the impacted groundwater (off-gassing or smear zone) and not the overlying soil." Therefore, Dragun concluded that the origin of the ground water TCE and PCE must be an offsite upgradient source.

Response: The available evidence supports that soil below the clay layer at the Site has been contaminated by chlorinated solvents migrating downward from shallow soils. As detailed in section 3.7.4, TCE/PCE Ratio, of this support document, there are several parameters related to the chemical properties and biodegradation of TCE and PCE that can explain the increase of the TCE/PCE ratio with depth at the Site; and, the observed change in TCE/PCE ratios with depth is consistent with the scenario presented in the HRS documentation record at proposal in which chlorinated solvent contamination in Site soils has affected ground water and causes a portion of the significant increase identified in observed release samples at the Site.

Additionally, as stated in section 3.7.1, Continuity of Clay Layer, of this support document, the clay layer is not competent and continuous—there is therefore no reason to believe that deeper soils below the clay layer are isolated from contamination migrating downward from shallow soils. And, as discussed in section 3.7, Observed Release and Attribution, of this support document, there is ample evidence that contamination originating in surficial soils at the Site has migrated down through deeper soils to the ground water.

Further, when comparing the TCE and PCE distribution in Site soils against depth, there is no clear indication that the contamination below the clay layer is from a different source than that above the clay layer. If the difference

between the log of the TCE concentration and the log of the PCE concentration[16] is plotted versus soil depth for available soil samples in which both TCE and PCE were detected (see Figure 1 below), the result is a gradual pattern of TCE concentrations increasing relative to PCE concentrations with increasing depth—there is no clear shift in data just around the clay layer at approximately 25-30 ft bgs, as would be expected if indeed the surficial soil and deep soil contamination were associated with separate plumes as asserted by the commenter.

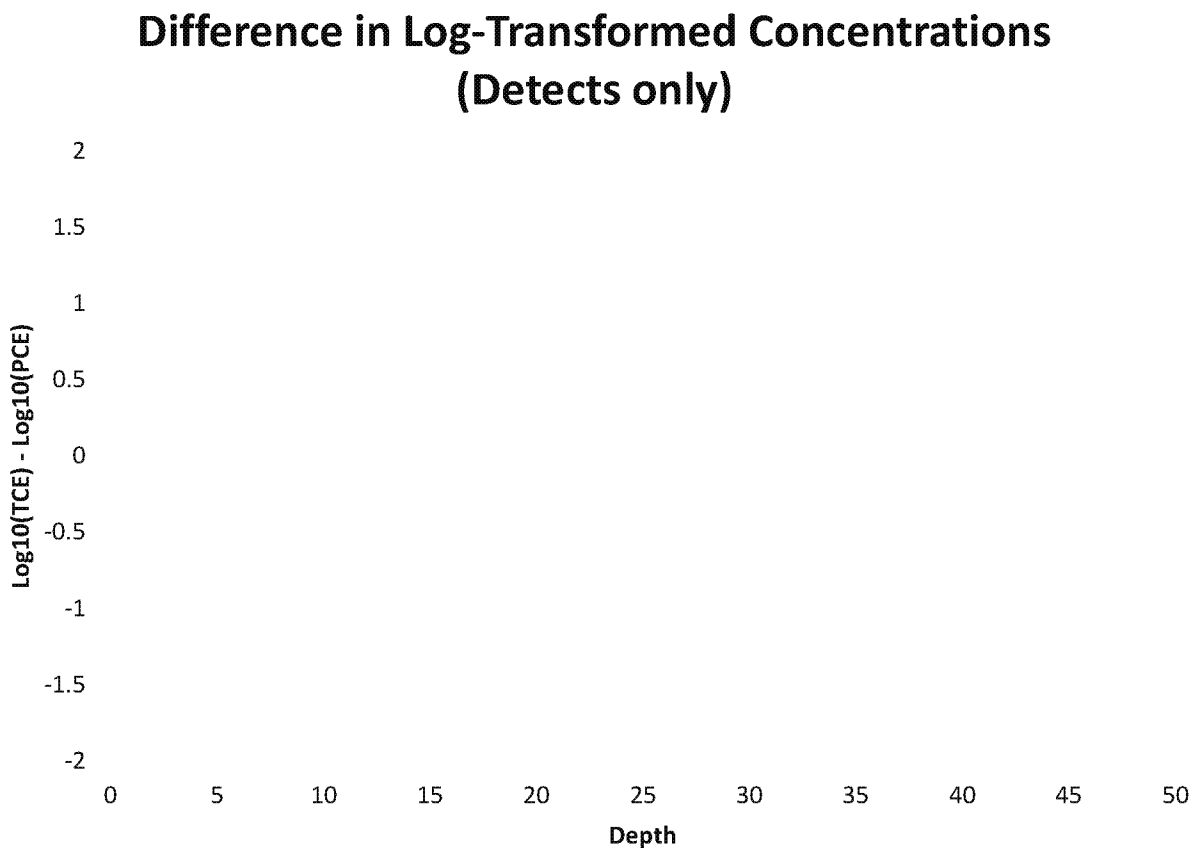

Figure 5 – Soil TCE/PCE Ratio vs. Sample Depth. Figure 5 plots the difference in log-transformed concentration (i.e., $\log_{10}$(TCE concentration) – $\log_{10}$(PCE concentration) vs. depth for each soil sample result listed in Table 3 of the 2001 Dragun Report (which includes soil sample results from the EKI October and December 1997 sampling events, and EKI February 1998 sampling event).

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

[16] On Figure 5, the difference in log-transformed concentrations is plotted instead of a simple ratio because 1) the concentrations appear to be lognormal, and 2) when looking at ratios in a traditional way, differences and patterns get obscured as they are not symmetric in the usual scale (e.g., simply plotting the TCE/PCE ratio vs. depth would overemphasize a situation in which TCE = 10 x PCE, compared to PCE = 10 x TCE, while the log approach treats them equally). Additionally, only samples with both a detected TCE and detected PCE concentration are used in Figure 5. Table 3 of the 2001 Dragun Report contained generated ratios comparing TCE to PCE even when one or both analytes are not-detected, substituting the method detection limit (MDL) for the analyte result not detected. However, this method may introduce errors, as detection limits listed for not-detected results generally act as a maximum value; additionally, MDLs listed for these data do not appear to be sample-specific (adjusted for sample dilution factors, sample percent moisture, etc.), and thus introduce additional error if used in this comparison.

3.8 Consideration of Revisions in TCE Toxicological Parameters

Commenters did not challenge the toxicity value for TCE used in the HRS documentation record. However, based on the EPA's September 2011 revision to the TCE toxicological parameters posted in the Integrated Risk Information System (IRIS) database, the toxicity value for TCE has been updated. The updated toxicity value for TCE has been revised to 1,000. The EPA's revision to the IRIS database does not result in a change to the mobility factor value for TCE. This update to the TCE toxicological parameter affects the Site score as explained in this section, but does not change the decision to place the Site on the NPL.

HRS Section 3.2.1.3, *Calculation of toxicity/mobility factor value*, states to:

> [a]ssign each hazardous substance a toxicity/mobility factor value from table 3–9, based on the values assigned to the hazardous substance for the toxicity and mobility factors. Use the hazardous substance with the highest toxicity/mobility factor value for the aquifer being evaluated to assign the value to the toxicity/mobility factor for that aquifer.

Table 3-9 Toxicity/Mobility Factor Values[a]

Mobility factor value	Toxicity factor value					
	10,000	1,000	100	10	1	0
1.0	10,000	1,000	100	10	1	0
0.2	2,000	200	20	2	0.2	0
0.01	100	10	1	0.1	0.01	0
0.002	20	2	0.2	0.02	0.002	0
0.0001	1	0.1	0.01	0.001	$1x10^{-4}$	0
$2x10^{-5}$	0.2	0.02	0.002	$2x10^{-4}$	$2x10^{-5}$	0
$2x10^{-7}$	0.02	$2x10^{-4}$	$2x10^{-5}$	$2x10^{-6}$	$2x10^{-7}$	0
$2x10^{-9}$	$2x10^{-5}$	$2x10^{-6}$	$2x10^{-7}$	$2x10^{-8}$	$2x10^{-9}$	0

a Do not round to nearest integer.

As shown on page 35 of the HRS documentation record at proposal, the mobility factor value for TCE is 1, because "Hazardous substances meeting the criteria for an observed release by chemical analysis receive a mobility factor value of 1 [citing HRS Section 3.2.1.2]." The commenter did not challenge this. Therefore, the assigned toxicity/mobility factor value changed from 10,000 at proposal to 1,000 in the HRS documentation record at promulgation.

HRS Section 3.2.1.3, *Calculation of toxicity/mobility factor value*, of the HRS states: "[u]se the hazardous substance with the highest toxicity/mobility factor value for the aquifer being evaluated to assign the value to the toxicity/mobility factor for that aquifer." Because the TCE toxicity/mobility factor value of 1,000 is still the greatest of the hazardous substances evaluated, it is still the toxicity/mobility factor value assigned for the aquifer at promulgation.

HRS Section 3.2.3, *Calculation of waste characteristics factor category value*, states to "[m]ultiply the toxicity/mobility and hazardous waste quantity factor values, subject to a maximum product of 1×10^{8} . Based on this product, assign a value from table 2–7 (section 2.4.3.1) to the waste characteristics factor category."

HRS Table 2-7 details the waste characteristics factor category value assigned based on this product:

Table 2-7 Waste Characteristics Factor Category Values

Waste characteristics product	Assigned value
0	0
Greater than 0 to less than 10	1
10 to less than $1x10^2$	2
$1x10^2$ to less than $1x10^3$	3
$1x10^3$ to less than $1x10^4$	6
$1x10^4$ to less than $1x10^5$	10
$1x10^5$ to less than $1x10^6$	18
$1x10^6$ to less than $1x10^7$	32
$1x10^7$ to less than $1x10^8$	56
$1x10^8$ to less than $1x10^9$	100
$1x10^9$ to less than $1x10^{10}$	180
$1x10^{10}$ to less than $1x10^{11}$	320
$1x10^{11}$ to less than $1x10^{12}$	560
$1x10^{12}$	1,000

The hazardous waste quantity factor value assigned on page 36 of the HRS documentation record at proposal was 10, based on a hazardous waste quantity of >0 for Source 1. This was not challenged by the commenter. Therefore, the product of the new toxicity/mobility value of 1,000 and the hazardous waste quantity factor value of 10 is 10,000. Consequently, the resulting waste characteristics factor category value has been revised to 10 in the HRS documentation record at promulgation, per HRS Table 2-7 above.

HRS Section 3.4, *Ground water migration score for an aquifer*, states:

> For the aquifer being evaluated, multiply the factor category values for likelihood of release, waste characteristics, and targets, and round the product to the nearest integer. Then divide by 82,500. Assign the resulting value, subject to a maximum value of 100, as the ground water migration pathway score for the aquifer.

As show in the scoresheet on page 3 of the HRS documentation record at proposal, the likelihood of release factor category value is 550 and the targets factor category value is 1,373. Thus, the ground water migration score for the aquifer in the HRS documentation record at promulgation is 550 x 10 x 1,373 ÷ 82,500, or 91.53.

HRS Section 3.5, *Calculation of ground water migration pathway score*, states:

> Calculate a ground water migration score for each aquifer underlying the sources at the site, as appropriate. Assign the highest ground water migration score for an aquifer as the ground water migration pathway score (S_{gw}) for the site.

As there is one aquifer evaluated at the Site, 91.53 is assigned as the ground water migration pathway score in the HRS documentation record at promulgation.

HRS Section 2.1.1, *Calculation of HRS site score*, states that:

> [s]cores are first calculated for the individual pathways as specified in sections 2 through 7 and then are combined for the site using the following root-mean-square equation to determine the overall HRS site score, which ranges from 0 to 100:

The Site score at promulgation is then the square root of ($91.53^2 \div 4$), or 45.76. The Site score is above 28.50 and sufficient to qualify the Site for the NPL.

4. Conclusion

The original HRS score for this site was 50.00. Based on the above responses to public comments and EPA's change to the TCE toxicity value used, the final scores for the Jervis B. Webb Co. site are:

Ground Water:	91.53
Surface Water:	NS
Soil Exposure:	NS
Air Pathway:	NS
HRS Score:	45.76

Attachment 1

2008 State of California Department of Toxic Substance Control
Consent Order

Linda S. Adams
Secretary for
Environmental Protection

Department of Toxic Substances Control

Maureen F. Gorsen, Director
9211 Oakdale Avenue
Chatsworth, California 91311

Arnold Schwarzenegger
Governor

October 23, 2008

Mr. Michael Farley **CERTIFIED MAIL #7005 3110 0002 8425 5142**
Jervis Webb of California
34375 West Twelve Mile Road
Farmington Hills, Michigan 48331

Mr. Jose Ramirez **CERTIFIED MAIL #7005 3110 0002 8425 5159**
P.O. Box 2907
Huntington Park, California 90255-8907

CONSENT ORDER FOR JERVIS B. WEBB OF CALIFORNIA SITE, 5030 FIRESTONE BOULEVARD AND 9301 RAYO AVENUE, SOUTH GATE, CALIFORNIA

Dear Sirs:

The Department of Toxic Substances Control (DTSC) sent you letters, dated May 21, 2007, with an enclosed consent order. The letter requested that you enter into the consent order to agree to participate in the investigation and possible remediation of contamination at the Jervis Web site (Site). DTSC also indicated in the letter that it would issue a unilateral order if the consent order wasn't executed within 45 days. DTSC received no responses from the parties named in the consent order within that time period.

Again, DTSC requests that you enter into the attached consent order for the Site. DTSC must receive the executed consent order within fifteen days (15) days from the date of this letter. DTSC will issue a unilateral order if it does not receive the executed consent order in the allotted time.

Printed on Recycled Paper

If you have any questions regarding this letter, please contact me, at (818)717-6547 or Mr. Robert Elliott, senior staff counsel, at (916) 327-6105.

Sincerely,

Michel Iskarous
Project Manager
Brownfields and Environmental Restoration Program – Chatsworth Office

Return Receipt Requested

Enclosure

cc: Robert L. Elliott
Senior Staff Counsel
Office of Legal Counsel
Department of Toxic Substances Control
1001 "I" Street
P.O. Box 806
Sacramento, CA 95812-0806

Mr. Eric Yunker
U.S. EPA (SFD-7-3)
75 Hawthrone Street
San Francisco, CA 94105

Mr Jim Collins
U.S. EPA (ORC-3)
75 Hawthorne Street
San Francisco, CA 94105

Mr. Jeffrey Palmer
Reliable Steel Building Products, Inc
9301 Rayo Avenue
South Gate, CA 90280

STATE OF CALIFORNIA
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
DEPARTMENT OF TOXIC SUBSTANCES CONTROL

In the Matter of:	)	Docket No. _____
	)	
Jervis B. Webb of California 5030 Firestone Boulevard South Gate, California 90280	)))	IMMINENT AND SUBSTANTIAL ENDANGERMENT DETERMINATION AND CONSENT ORDER
Respondents:		
	)	
Jervis B. Webb Company 34375 West Twelve Mile Road Farmington Hills, Michigan 48331	)))	Health and Safety Code Sections 25355.5(a)(1)(B) and (C), 25358.3(a), 58009 and 58010
Jose Ramirez PO Box 2907 Huntington Park, California 90255-8907)	))	
Jeffrey Palmer 9301 Rayo Ave South Gate, California 90280	))	

I. INTRODUCTION

1.1 Parties. The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) and Jervis B. Webb Company, a Michigan company registered in California (Webb of California); Mr. Jose Ramirez, an individual; and Mr. Jeffrey Palmer, an individual (Respondents) hereby enter into this Consent Order (Order) and agree to its terms and conditions. DTSC and Respondents are referred to collectively herein as the Parties.

1.2 Property/Site. This Order applies to the properties located at 5030 Firestone Boulevard (Webb-Firestone) and 9301 Rayo Avenue (Webb-Rayo), South Gate, California. The Webb-Firestone property and the Webb-Rayo property (collectively hereinafter called "the Property") are located adjacent to one another. The Webb-Firestone property consists of approximately 1.4 acres and comprises the northwestern portion of the Property. The Webb-Rayo property, which was sold to Reliable Steel in 1997, occupies about 2.8 acres and comprises the southeastern portion of the Property. The Property is bordered to the north by Firestone Boulevard, Rayo Avenue to the south-southeast, a 50-foot wide Union Pacific Railroad (UPR)

easement to the west, and the Piazza Trucking operation to the east. A 35-foot wide Los Angeles County Flood Control easement, containing a large underground storm drain, extends along the entire western portion of the Property. A five-foot wide rail spur enters the Property from the northwest and extends across the west side. North of Firestone Boulevard are mainly industrial, commercial and manufacturing facilities. South of Rayo Avenue are the UPR tracks; the Purex Rubbish Disposal Company, a solid waste landfill site, located at 9400 South Rayo Avenue; the California Alabama Pipe Company; and the Los Angeles River. East of the Piazza Trucking facility lies the Los Angeles River and the Interstate 710 Freeway. West of the UPR tracks is McLeod Metals at 8980 Kendall Avenue and 9309 Rayo Avenue, and the Cooper Drum Company Superfund Site at 9316 Atlantic Avenue. A location map and diagram of the Property are attached hereto as Exhibit A and Exhibit B, respectively. The Property is also identified by Assessor's Parcel Numbers 6222-005-015 & 6222-005-024. This Order applies to the Property and the areal extent of contamination that resulted from activities on the Property ("Site").

1.3 Jurisdiction. This Order is entered into by the parties pursuant to Health and Safety Code sections 25358.3(a), 25355.5(a)(1)(B) and (C), 58009 and 58010.

Health and Safety Code section 25358.3(a) authorizes DTSC to take various actions, including issuance of an Imminent or Substantial Endangerment Determination and Order, when DTSC determines that there may be an imminent or substantial endangerment to the public health or welfare or to the environment, because of a release or a threatened release of a hazardous substance.

Health and Safety Code section 25355.5(a)(1)(B) authorizes DTSC to issue an order establishing a schedule for removing or remedying a release of a hazardous substance at a site, or for correcting the conditions that threaten the release of a hazardous substance. The order may include, but is not limited to requiring specific dates by which the nature and extent of a release shall be determined and the site adequately characterized, a remedial action plan prepared and submitted to DTSC for approval, and a removal or remedial action completed.

Health and Safety Code section 25355.5(a)(1)(C) authorizes DTSC to enter into an enforceable agreement with a responsible party for the site which requires the party to take necessary corrective action to remove the threat of the release, or to determine the nature and extent of the release and adequately characterize the site, prepare a remedial action plan, and complete the necessary removal or remedial actions, as required in the approved remedial action plan.

Health and Safety Code section 58009 authorizes DTSC to commence and maintain all proper and necessary actions and proceedings to enforce its rules and regulations; to enjoin and abate nuisances related to matters within its jurisdiction which are dangerous to health; to compel the performance of any act specifically enjoined upon any person, officer, or board, by any law of this state relating to matters within its jurisdiction; and/or on matters within its jurisdiction, to protect and preserve the public health.

Health and Safety Code section 58010 authorizes DTSC to abate public nuisances related to matters within its jurisdiction.

II. FINDINGS OF FACT

DTSC hereby finds:

2.1 Liability of Respondent. Respondents are responsible parties or liable persons as defined in Health and Safety Code section 25323.5.

2.1.1 Webb of California manufactured industrial conveyor systems at the Webb-Rayo property from the middle 1950's to early 1996. The adjacent Webb-Firestone property was purchased by Webb of California in 1975 from Spear Industries.

2.1.2 In March 1997 Mr. Jeffrey Palmer acquired the Webb-Rayo property (9301 Rayo Ave) from the Jervis Webb Company of California.

2.1.3 In January 2002, the Webb-Firestone property (5030 Firestone Blvd.) was sold to Mr. Jose Ramirez.

2.2 Physical Description of Site. The Property is a little over 4 acres in size, roughly rectangular in shape, and is oriented approximately northwest to southeast. The Property is comprised of two adjacent parcels of land: the Webb-Firestone property and the Webb-Rayo property. The Webb-Firestone property is approximately 1.4 acres in size and is improved with a 20,000 square-foot steel-framed building with corrugated steel siding. The building is surrounded by asphalt and concrete paving except for a planter on the north side of the building. The Webb-Rayo property is approximately 2.8 acres in size and is improved with a 37,000 square-foot corrugated steel building. A five-foot side rail spur enters the Webb-Rayo property from the northwest and extends across the west side to a 10,000 square-foot, steel-framed open bay located to the south. The Property is situated in an area of relatively low relief and is fairly flat, with elevations ranging from about 107 feet above mean sea level at the northwest property corner to about 104 feet above mean sea level at the southeast property corner. The land surface slopes to the south with a gradient of approximately 12 feet per mile. The Property is located approximately ¼-mile west of the concrete-lined Los Angeles River, which flows due south. The Rio Hondo River flows into the Los Angeles River approximately 1.2 miles south of the Property.

2.3 Site History. Prior to the 1950's, the Property was vacant. By 1953, the Webb-Firestone property was developed with two small buildings, which consisted of the current building configuration. The Webb-Rayo property was developed in 1954 with a large manufacturing building. By 1957, the two small buildings on the Webb-Firestone property were joined by a large addition, consisting of the main manufacturing portion of the current structure. Additional expansion of buildings on both properties had occurred by 1960, with the railroad

spur present by 1966. Few changes to the configuration of the Site have occurred from 1960 to 1992. The Blake Rivet Company (Blake), an aircraft rivet manufacturer, which had been leasing the Webb-Firestone property prior to Webb of California's ownership, continued to lease the property from Webb of California until approximately 1981, when Blake went out of business. Blake used an above-ground anodizer as part of its rivet manufacturing operation. Wastewater from the anodizer was collected in floor trenches and directed to a three-stage concrete-made clarifier. The clarifier was located outside just to the south of the southern wall of the Webb-Firestone property building until it was removed in November 1996. The clarifier reportedly discharged to the local sewer system. After Blake vacated the Webb-Firestone property, Webb of California used the property primarily for storage of metal stock for use in manufacturing at the neighboring Webb-Rayo property.

2.3.1 Webb-Firestone Property. Blake used the Webb-Firestone property for the production of aluminum and stainless steel aircraft rivets from the 1950s until approximately 1980. Wastewater Discharge Permit No. 5181 from the City of South Gate indicates that wastewater producing operations were sulfuric acid anodizing, tumbling, and deburring. The raw materials used included sulfuric acid, alkaline caustic, and chromic acid. Approximately 4,000 gallons of wastewater was discharged to the sanitary sewer via a below-ground concrete clarifier from Blake every day. The below-ground clarifier was located outside the southeast corner of the building. The clarifier consisted of three compartments and a sampling box at the point of discharge to the sanitary sewer. The anodizing operation included tanks containing sulfuric acid anodize, dichromate seal, DX-34, CH-90, ETCH, and rinse waters. On May 18, 1979, a Notice of Violation (NOV) was issued to Blake by the Sanitation District of Los Angeles County for heavy metals discharge [total chromium was detected in the discharge wastewater at a concentration of 34 milligrams per liter (mg/L)]. In 1981, Permit No. 5181 was voided because Blake was no longer in business. In 1992, a City of South Gate inspector visited the Site and reported that all equipment and floor drains were removed and the clarifier had been filled with sand and concrete.

In 1998, Erler & Kalinowski, Inc. (EKI) performed a Phase II Soil Investigation of the Webb-Firestone property for Webb of California and noted indications of several below-ground concrete structures at several locations inside the building. These included a concrete-lined sump and a shallow, L-shaped concrete-lined drainage trench along the northeasterly and southeasterly walls bounding the anodizing area. The trench drain was observed by EKI to be partially filled in with sand and gravel. The trench drain slopes towards a drain located at the southwest end of the trench and eventually leads underground to the three-stage clarifier located outside the building. EKI also noted that "rinse tanks" were reportedly located in the southeast corner of the building. Numerous patches on the concrete floor were observed by EKI in this area. West of the rinse tank area was a "concrete pit for furnace and quench tank" (according to the 'Plumbing Plan' for the property obtained by EKI). No pit was observed by EKI in the location indicated on the Plumbing Plan, however a large rectangular concrete patch was observed on the floor in this area. EKI also noted that the concrete floor inside the rest of the building was in poor condition (pitted, etched, broken, and cracked), with some oil stains noted

in former machining areas, and had numerous patches where former structures or improvements may have been located.

In October 1997, Jervis Webb completed 14 soil borings which were sampled to a maximum depth of ten feet below ground surface (bgs) inside and outside the building and to a maximum depth of 20 feet bgs in the vicinity of the clarifier. Volatile organic compounds (VOCs), such as trichloroethylene (TCE) and tetrachloroethylene (PCE), were detected at maximum concentrations of 270 milligrams per kilogram (mg/kg) and 140 mg/kg, respectively, in the general area of the clarifier. Hexavalent chromium was also detected in one boring at a concentration of 0.88 mg/kg. In December 1997, a soil vapor survey was conducted to identify potential areas of VOC contamination. TCE and PCE were detected in soil vapor at maximum concentrations of 25 micrograms per liter (µg/L) and 28 µg/L, respectively. In addition, five deep soil borings, drilled to depths ranging between 46.5 and 62.5 feet bgs, were completed at the property to determine the vertical impact of VOCs in soil beneath the clarifier and anodizing areas. Elevated concentrations of TCE and PCE were detected in these soil samples.

In 1998, five groundwater monitoring wells (designated MW-1 to MW-5) were installed on the Property and screened from 40 feet to 70 feet bgs. Groundwater was encountered at approximately 57 feet bgs, with flow direction to the southeast. The highest VOC concentrations in groundwater occurs at monitoring well MW-1, with TCE concentrations ranging from 14,253 µg/L up to 33,000 µg/L, followed by other VOCs [PCE, cis and trans 1,2-dichloroethene (DCE), 1,1-dichloroethane (DCA), 1,2-DCA, 1,1-DCE, acetone, benzene, xylenes, toluene, and methyl-ethyl-ketone (MEK)] detected at lower concentrations. PCE concentrations at monitoring well MW-1 ranged from 48.5 µg/L to approximately 200 µg/L. Well MW-1 is located just downgradient of the former clarifier area located on the Webb-Firestone property, suggesting that contaminants may have been released from the clarifier area to impact groundwater beneath the Site.

In 1999, EKI removed the clarifier from the Webb-Firestone property and excavated an area measuring approximately 15 feet by 11 feet by 8 feet (depth) surrounding the clarifier. The excavated area was backfilled with approximately 47 cubic yards of sand. In June 1999, four soil vapor extraction (SVE) wells and four vapor monitoring probes were installed to extract and treat VOCs in soil vapor beneath the Webb-Firestone property in the vicinity of the former clarifier. The SVE system started operation on March 16, 2000 and ran nearly continuously until October 2001, removing an estimated total of 177 pounds of VOCs (primarily TCE): the estimated total mass of VOCs in soil. In September 2001, Webb of California drilled five soil confirmation borings and analyzed for VOCs and metals. TCE was detected in two of the soil borings at concentrations of 290 micrograms per kilogram (µg/kg) and 630 µg/kg. These borings were reamed out using 12-inch diameter hollow-stem-augers in an effort to remove impacted soil. Confirmation samples collected at the bases of these borings indicated the presence of some residual VOCs and metals, including hexavalent chromium and lead. In October 2001, Webb of California submitted a Soil Closure Report requesting no further action (NFA) for the Webb-Firestone property to the Regional Water Quality Control Board (RWQCB)

in an effort to sell the property. In January 2002, the RWQCB concurred with NFA for soil at the property, but with the stipulation that Webb of California continue with groundwater monitoring. Quarterly groundwater monitoring was conducted at the property from March 1998 until June 2001, then reduced to semi-annually until June 2004, when groundwater monitoring activities were terminated. However, groundwater VOC concentrations (as last tested in 2004) were still in exceedance of drinking water MCLs, most notably for TCE and PCE. In 2006, the Webb-Firestone property was sold to Mr. Jose Ramirez.

2.3.2 Webb-Rayo Property. Webb of California manufacturing operations were primarily located on the Webb-Rayo property and included metal fabrication (shearing, bending, sawing, machining, welding), and painting operations associated with the manufacture of conveyor systems. Hazardous substances used in the manufacturing process included solvents/thinners ('J209' and 'Solvent Blend'; or mixtures of alcohols, esters, ketones, toluene, xylene, glycol ethers, and petroleum distillates in varying concentrations), and paints. Prior to the mid 1980's, 1,1,1-trichloroethane (1,1,1-TCA) was used by Jervis Webb as a solvent to clean fabricated metal pieces. The 1,1,1-TCA was replaced in the mid 1980's by naphtha petroleum. The waste generated from the cleaning activities was containerized in 55-gallon drums and sent to an off-site treatment facility for disposal. Bechtel Inc. completed a Preliminary Assessment/Site Inspection of the Site in 1994 in which it noted "A former 8,000-gallon paint and water sump used during the wet-painting process." The sump was converted to hold paint filters for a dry-painting booth in the mid-1980s. In November 1996, EKI removed a 6,500 gallon concrete containment structure and a 250 gallon open-bottom sump from the property. No petroleum hydrocarbons, VOCs, or elevated metals were detected in soil samples collected from directly beneath the 6,500 gallon tank. A layer of paint, approximately one to two inches thick, was observed on the gravelly fill soil at the base of the sump. Soil samples collected directly beneath the sump indicated elevated levels of total lead (1,600 mg/kg), with low levels of total chromium (7.4 to 16 mg/kg) and arsenic (1.6 to 3.1 mg/kg). In response, soil was excavated from beneath the sump to a depth of 10 feet bgs for a total of 35 cubic yards removed. Subsequent confirmation soil sampling indicated no detectable levels of lead present. In addition, one cubic yard of oil-stained soil was removed from a 15-foot-long section of an unlined utility trench located near the vicinity of the sump. Elevated concentrations of 1,1-DCA, 1,1,1-TCA, benzene, and toluene were detected in the excavated soil. Confirmation soil samples contained no VOCs but petroleum hydrocarbons of middle to heavy distillates were detected in one sample up to 16,000 mg/kg. In 1996, the Los Angeles County Department of Public Works (LACDPW) issued an NFA letter for the Webb-Rayo property. In 1997, the Webb-Rayo property was sold to the current owner, Reliable Steel, also a metal fabricator.

2.4 Hazardous Substances Found at the Site. Pursuant to section 102 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. section 9602, and Health and Safety Code section 25316, a substance is a "hazardous substance" if it is listed in 40 Code of Federal Regulations (C.F.R.) part 302.4. Various reports and documents indicate that TCE, PCE, DCA and DCE were detected in soil, soil vapor, and ground water at the Site. TCE was detected in groundwater beneath the Site up to a maximum

concentration of 33,000 μg/L. PCE was also detected in groundwater at concentrations around 100 μg/L. Other VOCs frequently detected in groundwater include cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, and 1,1-DCE. Benzene and toluene were detected but at fewer frequencies than the others. Groundwater sampling results from the most recent Annual Groundwater Sampling Report dated July 22, 2004 from Brown and Caldwell, Inc., show high concentrations of TCE, PCE, DCA and DCE at various locations, with the highest concentration of TCE at 17,864 μg/L (monitoring well MW-1), PCE at 98.5 μg/L, cis-1,2-DCE at 740.2 μg/L, and trans-1,2-DCE at 104.2 μg/L. Heavy metals, including hazardous metals (such as cadmium, lead, mercury, and hexavalent chromium - which were identified as being present in soils sampled at the Site), were never analyzed in groundwater during the six years of continuous monitoring of the Site wells, therefore it is unknown if these hazardous metals exist there in groundwater.

2.5 Health Effects. There are hazardous substances identified at the site that are carcinogenic and/or toxic at certain dosage and exposure. Potential health effects, if any, will be determined during the health risk assessment after completion of the Remedial Investigation.

2.5.1 PCE. PCE is listed as a chemical known to the State to cause cancer pursuant to the Safe Drinking Water and Toxic Enforcement Act of 1986. Short-term exposure to PCE through ingestion and inhalation may cause nausea, vomiting, headache, dizziness, drowsiness, and tremors. Skin contact with PCE causes irritation and blistering. Liver and kidney toxicity are long-term effects.

2.5.2 TCE. TCE is listed as a chemical known to the State to cause cancer pursuant to the Safe Drinking Water and Toxic Enforcement Act of 1986. Acute exposure to TCE causes headaches, dizziness, vertigo, tremors, irregular heartbeat, fatigue, nausea, vomiting, and blurred vision. TCE vapors may cause irritation of the eyes, nose and throat. Long-term effects may include liver and kidney damage.

2.5.3 Cis-1,2-DCE. 1,2-DCE has anesthetic properties at high concentrations. Humans inhaling high concentrations of the compound may display symptoms of nausea, vomiting, weakness, tremor and cramps, followed by unconsciousness.

2.5.4 1,2-DCA. EPA has found 1,2-DCA to potentially cause the following health effects when people are exposed to it at levels above the MCL for relatively short periods of time: central nervous system disorders, and adverse lung, kidney, liver circulatory and gastrointestinal effects. 1,2-DCA has the potential to cause cancer from a lifetime exposure at levels above the MCL.

2.5.5 Barium. Overexposure to barium compounds (e.g. as barium chloride, barium nitrate, or barium sulfate) can irritate the eyes, skin, and upper respiratory system. Skin burns may also occur, as well as slow pulse, hypokalemia, and extrasystoles. The Merck Index (12TH Ed., 1996, pg 165, No. 991) states that "All water or acid soluble barium compounds are poisonous!" Target organs include the eyes, skin, heart, the respiratory system, and the central nervous

system.

2.5.6 Cadmium. Potential health affects from an overexposure to cadmium dusts or fumes include headache, chest pains, fever, nausea, and weakness. Cadmium targets the respiratory system, kidneys, and blood, and can cause prostate and lung cancer. Chronic inhalation can cause pulmonary emphysema and chronic bronchitis. Potential toxic effects due to chronic overexposure by inhalation or ingestion are anemia, kidney damage, osteomalacia, and osteoporosis. *Itai-itai* disease is a skeletal disease characterized by progressive bone demineralization with painful joints and bones associated with a cadmium-induced renal disorder. It has been attributed to high oral intake of cadmium in food and water.

2.5.7 Lead. Lead is a known human carcinogen. Lead is also a bioaccumulative substance and can lead to reproductive and developmental disorders. Lead poisoning is one of the most commonly reported occupational diseases among adults due to inhalation of dust and fumes. Some lead compounds are carcinogenic to lungs and kidneys. Possible exposure pathways include ingestion and inhalation. Symptoms develop more quickly through inhalation exposure than ingestion since absorption takes place through the respiratory tract rather quickly. Acute lead poisoning is most common in children with history of pica; symptoms include anorexia, vomiting, malaise, and convulsions due to increased intracranial pressure, which may lead to permanent brain damage. Chronic poisoning effects in children include weight loss, weakness and anemia.

2.5.8 Mercury. Mercury is a known human poison and is readily absorbed via the respiratory tract, intact skin, and gastrointestinal tract. Acute effects include severe nausea, vomiting, abdominal pain, bloody diarrhea, and kidney damage. Death usually occurs within 10 days. Chronic effects include inflammation of the mouth and gums, kidney damage, brain damage, and muscle tremors.

2.5.9 Arsenic. Arsenic is a confirmed human carcinogen producing liver tumors. It is poisonous by subcutaneous, intramuscular, and intraperitoneal routes. Human systemic skin and gastrointestinal effects are observed by ingestion. It has some other reproductive effects. Mutation data is reported.

2.5.10 Chromium. Chromium and certain chromium compounds are listed as known human carcinogens. Overexposure to chromium metal by inhalation can cause histologic fibrosis of the lungs. Chromic acid and chromate salts can be irritating to exposed tissues, with toxic effects including dermatitis, skin ulcers, nasal inflammation, perforation of the nasal septum, and lung, nasal, and paranasal sinus cancer. Target organs include the blood, the respiratory system, liver, kidneys, eyes, and skin. The most significant groundwater and soil problem typically associated with the use of chromium is chromium VI, or hexavalent chromium. Chromium VI is acutely toxic, mutagenic, and carcinogenic in the environment. It is also very soluble, mobile, and moves at essentially the same rate as groundwater.

2.6 Routes of Exposure.

2.6.1 People working on the site could be exposed to contaminants via dermal contact or via inhalation of volatile or dust-borne contaminants. Excavation of soil in areas where contamination exists could expose workers to contamination via dermal contact or via inhalation of contaminants, either from soil or groundwater.

2.6.2 If contaminated groundwater migrates, it could potentially result in exposure to workers on adjacent parcels to contaminants via inhalation of volatile contaminants or exposure to contaminants thereof.

2.7 Public Health and/or Environmental Risk. The public at risk includes those people who may work in the two buildings located on the Property, those who excavate into contaminated soil or groundwater, and/or persons who otherwise come into contact with, inhale or ingest contaminated air, soil or groundwater. For example, workers and site occupants may be exposed to these chemicals during trenching activities. The hazardous substances found at the Site include VOCs, which could migrate into indoor air and expose Site occupants to levels of these chemicals above those deemed safe, and metals (in particular hexavalent chromium and lead), which may have impacted groundwater beneath the Site and may be exposed to workers performing subterranean work such as trenching or dewatering. Continued migration of chemicals in soil vapor and groundwater could result in exposure of occupants of property down gradient of the Site to these chemicals. The extent of contamination in groundwater has not been delineated and these chemicals may impact groundwater designated by the RWQCB as a potential drinking water source.

III. CONCLUSIONS OF LAW

3.1 Respondents are responsible parties as defined by Health and Safety Code section 25323.5.

3.2 Each of the substances listed in Section 2.4 is a "hazardous substance" as defined in Health and Safety Code section 25316.

3.3 There has been a "release" and/or there is a "threatened release" of hazardous substances listed in Section 2.4 at the Site, as defined in Health and Safety Code section 25320.

3.4 The actual and threatened release of hazardous substances at the Site may present an imminent and substantial endangerment to the public health or welfare or to the environment.

3.5 Response action is necessary to abate a public nuisance and/or to protect and preserve the public health.

IV. DETERMINATION

4.1 Based on the foregoing findings of fact and conclusions of law, DTSC hereby determines that response action is necessary at the Site because there has been a release and/or there is a threatened release of a hazardous substance.

4.2 Based on the foregoing findings of fact and conclusions of law, DTSC hereby determines that there may be an imminent and/or substantial endangerment to the public health or welfare or to the environment because of the release and/or the threatened release of hazardous substances at the Site.

V. CONSENT ORDER

Based on the foregoing, IT IS HEREBY AGREED AND ORDERED THAT Respondents conduct the following response actions in the manner specified herein, and in accordance with a schedule specified by DTSC as follows:

5.1 All response actions taken pursuant to this Order shall be consistent with the requirements of Chapter 6.8 (commencing with section 25300), division 20 of the Health and Safety Code and any other applicable state or federal statutes and regulations.

5.1.1 Site Remediation Strategy. The purpose of this Order is to require for the Site: implementation of any appropriate removal actions, completion of a Remedial Investigation/Feasibility Study (RI/FS), preparation of a Remedial Action Plan (RAP) or Removal Action Workplan (RAW), preparation of California Environmental Quality Act (CEQA) documents, and Design and Implementation of the remedial actions approved in the RAP. An overall Site investigation and remediation strategy shall be developed by Respondents in conjunction with DTSC that reflects program goals, objectives, and requirements. Current knowledge of the Site contamination sources, exposure pathways, and receptors shall be used in developing this strategy.

An objective of the Site investigations shall be to identify immediate or potential risks to public health and the environment and prioritize and implement response actions using removal actions and operable units, if appropriate, based on the relative risks at the Site. Respondents and DTSC shall develop and possibly modify Site priorities throughout the course of the investigations. If necessary for the protection of public health and the environment, DTSC will require additional response actions not specified in this Order to be performed as removal actions or separate operable units. Removal actions shall be implemented in accordance with a workplan and implementation schedule submitted by Respondents and approved by DTSC.

For operable unit remedial actions, DTSC will specify the separate and focused remedial phase activities to be conducted as RI/FS, RAP or RAW, Design, and Implementation. The focused activities shall be conducted in accordance with the corresponding remedial phase

requirements specified in this Order, but shall only address the area or problem of the operable unit.

5.1.2 Remedial Action Objectives. Based on available information, DTSC has preliminarily determined that the remedial action objectives for the Site shall include:

(a) Existing and potential beneficial uses of groundwater shall be protected. The RWQCB Basin Plan identifies public water supply as a beneficial use of this aquifer. Therefore, drinking water standards or more conservative values determined by a Risk Assessment shall be remedial action objectives for this Site.

(b) The past and the reasonably foreseeable future land use of the Site is industrial. Therefore, if contamination is left in place that would not allow for unrestricted use after site remediation activities have been completed then a land use covenant imposing appropriate limitations on land use shall be executed and recorded.

5.1.3 Removal Actions. Respondents shall undertake removal actions if, during the course of the RI or FS, DTSC determines that they are necessary to mitigate the release of hazardous substances at or emanating from the Site. DTSC may require Respondents to submit a RAW that includes a schedule for implementing the workplan for DTSC's approval. Either DTSC or Respondents may identify the need for removal actions. Respondents shall implement the following removal actions.

5.1.4 Groundwater Monitoring. Respondents shall immediately recommence interim groundwater monitoring in accordance with DTSC's letter, attached as Exhibit C. Groundwater level measurements shall be conducted monthly, commencing the first Monday of May 2007. Groundwater sampling shall be conducted on a quarterly basis commencing May 2007. Subsequent monitoring shall be conducted until DTSC determines it is appropriate to terminate monitoring.

5.1.5 Site Remediation Strategy Meeting. Respondents, including the Project Coordinator (Section 6.1) and Project Engineer/Geologist (Section 6.2), shall meet with DTSC within [20] days from the effective date (and concurrent with the development of the RI/FS workplan) of this Order to discuss the Site remediation strategy. These discussions will include Site risks and priorities; project planning, phasing and scheduling, remedial action objectives, remedial technologies, data quality objectives, and the RI/FS workplan. Results of the discussions will be included in the Scoping Document, Section 5.2.2(b) of this Order.

5.2 Remedial Investigation/Feasibility Study (RI/FS). A RI/FS shall be conducted for the Site. The RI/FS may be performed as a series of focused RI/FSs, if appropriate, based on Site priorities. The RI/FS shall be prepared consistent with the U.S. Environmental Protection Agency's "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA," October 1988. The purpose of the RI/FS is to assess Site conditions and to evaluate

alternatives to the extent necessary to select a remedy appropriate for the Site. RI and FS activities shall be conducted concurrently and iteratively so that the investigations can be completed expeditiously. Because of the unknown nature of the Site and iterative nature of the RI/FS, additional data requirements and analyses may be identified throughout the process. Respondents shall fulfill additional data and analysis needs identified by DTSC; these additional data and analysis requests will be consistent with the general scope and objectives of this Order.

The following elements of the RI/FS process and those defined by DTSC in Section 5.1.4 of this Order shall be preliminarily defined in the initial Site scoping and refined and modified as additional information is gathered throughout the RI/FS process.

(a) Conceptual Site Model identifying contamination sources, exposure pathways, and receptors;

(b) Federal, State and local remedial action objectives including applicable legal requirements or relevant and appropriate standards;

(c) Project phasing including the identification of removal actions and operable units;

(d) General response actions and associated remedial technology types; and

(e) The need for treatability studies.

5.2.1 RI/FS Objectives. The objectives of the RI/FS are to:

(a) Determine the nature and full extent of hazardous substance contamination of air, soil, surface water and groundwater at the Site;

(b) Identify all actual and potential exposure pathways and routes through environmental media;

(c) Determine the magnitude and probability of actual or potential harm to public health, safety or welfare or to the environment posed by the threatened or actual release of hazardous substances at or from the Site;

(d) Identify and evaluate appropriate response actions to prevent or minimize future releases and mitigate any releases which have already occurred; and

(e) Collect and evaluate the information necessary to prepare a RAP.

5.2.2 RI/FS Workplan. Within [30] days from the effective date of this Order, Respondents shall prepare and submit to DTSC for review and approval a detailed RI/FS Workplan and implementation schedule which covers all the activities necessary to conduct a complete RI/FS

of the Site.

The RI/FS Workplan shall include a detailed description of the tasks to be performed, information or data needed for each task, and the deliverables which will be submitted to DTSC. Either Respondents or DTSC may identify the need for additional work.

These RI/FS Workplan deliverables are discussed in the remainder of this Section, with a schedule for implementation, and monthly reports. The RI/FS Workplan shall include all the sections and address each component listed below.

(a) Project Management Plan. The Project Management Plan shall define relationships and responsibilities for major tasks and project management items by Respondents, its contractors, subcontractors, and consultants. The plan shall include an organization chart with the names and titles of key personnel and a description of their individual responsibilities.

(b) Scoping Document. The Scoping Document shall incorporate program goals, program management principles, and expectations contained in the National Contingency Plan (NCP) (40 C.F.R. § 300), as amended. It shall include:

(1) An analysis and summary of the Site background and the physical setting. At a minimum, the following information is required:

(A) A map of the Site, and if they exist, aerial photographs and blueprints showing buildings and structures;

(B) A description of past disposal practices;

(C) A list of all hazardous substances which were disposed, discharged, spilled, treated, stored, transferred, transported, handled or used at the Site, and a description of their estimated volumes, concentrations, and characteristics;

(D) A description of the characteristics of the hazardous substances at the Site; and

(E) If applicable, a description of all current and past manufacturing processes which are or were related to each hazardous substance.

(2) An analysis and summary of previous response actions including a summary of all existing data including air, soil, surface water, and groundwater data and the Quality Assurance/Quality Control (QA/QC) procedures which were followed;

(3) Presentation of the Conceptual Site Model;
(4) The scope and objectives of RI/FS activities;

(5) Preliminary identification of possible response actions and the data needed for the evaluation of alternatives. Removal actions shall be proposed, if needed, based on the initial evaluation of threats to public health and the environment. If remedial actions involving treatment can be identified, treatability studies shall be conducted during the characterization phase, unless Respondents and DTSC agree that such studies are unnecessary as set forth in Section 5.4; and

(6) If applicable, initial presentation of the Site Remediation Strategy.

(c) Field Sampling Plan. The Field Sampling Plan shall include:

(1) Sampling objectives, including a brief description of data gaps and how the field sampling plan will address these gaps;

(2) Sample locations, including a map showing these locations, and proposed frequency;

(3) Sample designation or numbering system;

(4) Detailed specification of sampling equipment and procedures;

(5) Sample handling and analysis including preservation methods, shipping requirements and holding times; and

(6) Management plan for wastes generated.

(d) Quality Assurance Project Plan. The plan shall include:

(1) Project organization and responsibilities with respect to sampling and analysis;

(2) Quality assurance objectives for measurement including accuracy, precision, and method detection limits. In selecting analytical methods, Respondents shall consider obtaining detection limits at or below potentially applicable legal requirements or relevant and appropriate standards, such as Maximum Contaminant Levels (MCLs) or Maximum Contaminant Level Goals (MCLGs);

(3) Sampling procedures;

(4) Sample custody procedures and documentation;

(5) Field and laboratory calibration procedures;

(6) Analytical procedures;

(7) Laboratory to be used certified pursuant to Health and Safety Code section 25198;

(8) Specific routine procedures used to assess data (precision, accuracy and completeness) and response actions;

(9) Reporting procedure for measurement of system performance and data quality;

(10) Data management, data reduction, validation and reporting. Information shall be accessible to downloading into DTSC's system; and

(11) Internal quality control.

(e) Health and Safety Plan. A site-specific Health and Safety Plan shall be prepared in accordance with federal (29 CFR 1910.120) and state (Title 8 CCR Section 5192) regulations. This plan should include, at a minimum, the following elements:

(1) Site Background/History/Workplan;
(2) Key Personnel and Responsibilities
(3) Job Hazard Analysis/Summary;
(4) Employee Training;
(5) Personal Protection;-
(6) Medical Surveillance;
(7) Air Surveillance;
(8) Site Control;
(9) Decontamination;
(10) Contingency Planning;
(11) Confined Space Operations;
(12) Spill Containment;
(13) Sanitation;
(14) Illumination; and
(15) Other applicable requirements based on the work to be performed.

DTSC's Interim Draft Site Specific Health and Safety Plan Guidance Document for Site Assessment/Investigation, Site Mitigation Projects, Hazardous Waste Site Work Closure, Post Closure, and Operation and Maintenance Activities (DTSC, December 2000) can be used as a reference tool.

All contractors and all subcontractors shall be given a copy of the Health and Safety Plan prior to entering the Site. Any supplemental health and safety plans prepared by any subcontractor shall also be prepared in accordance with the regulations and guidance identified above. The prime contractor will be responsible for ensuring that all subcontractor supplemental health and safety plans will follow these regulations and guidelines.

(f) Other Activities. A description of any other significant activities which are appropriate to complete the RI/FS shall be included.

(g) Schedule. A schedule which provides specific time frames and dates for completion of each activity and report conducted or submitted under the RI/FS Workplan including the schedules for removal actions and operable unit activities.

5.2.3 RI/FS Workplan Implementation. Respondents shall implement the approved RI/FS Workplan.

5.2.4 RI/FS Workplan Revisions. If Respondents propose to modify any methods or initiates new activities for which no Field Sampling Plan, Health and Safety Plan, Quality Assurance Project Plan or other necessary procedures/plans have been established, Respondents shall prepare an addendum to the approved plan(s) for DTSC review and approval prior to modifying the method or initiating new activities.

5.3 Interim Screening and Evaluation of Remedial Technologies. At the request of DTSC, Respondents shall submit an interim document which identifies and evaluates potentially suitable remedial technologies and recommendations for treatability studies.

5.4 Treatability Studies. Treatability testing will be performed by Respondents to develop data for the detailed remedial alternatives. Treatability testing is required to demonstrate the implementability and effectiveness of technologies, unless Respondents can show DTSC that similar data or documentation or information exists. The required deliverables are: a workplan, a sampling and analysis plan, and a treatability evaluation report. To the extent practicable, treatability studies will be proposed and implemented during the latter part of Site characterization.

5.5 Remedial Investigation (RI) Report. The RI Report shall be prepared and submitted by Respondents to DTSC for review and approval in accordance with the approved RI/FS workplan schedule. The purpose of the RI is to collect data necessary to adequately characterize the Site for the purposes of defining risks to public health and the environment and developing and evaluating effective remedial alternatives. Site characterization may be conducted in one or more phases to focus sampling efforts and increase the efficiency of the investigation. Respondents shall identify the sources of contamination and define the nature, extent, and volume of the contamination. Using this information, the contaminant fate and transport shall be evaluated. The RI Report shall contain:

(a) Site Physical Characteristics. Data on the physical characteristics of the Site and surrounding area shall be collected to the extent necessary to define potential transport pathways and receptor populations and to provide sufficient engineering data for development and screening of remedial action alternatives.

(b) Sources of Contamination. Contamination sources (including heavily contaminated media) shall be defined. The data shall include the source locations, type of contaminant, waste characteristics, and Site features related to contaminant migration and human exposure.

(c) Nature and Extent of Contamination. Contaminants shall be identified and the horizontal and vertical extent of contamination shall be defined in soil, groundwater, surface water, sediment, air, and biota. Spatial and temporal trends and the fate and transport of contamination shall be evaluated.

5.6 Baseline Health and Ecological Risk Assessment. Respondents shall perform health and ecological risk assessments for the Site that meet the requirements of Health and Safety Code section 25356.1.5(b). Respondents shall submit a Baseline Health and Ecological Risk Assessment Report within [60] days from the submittal of the RI Report. The report shall be prepared consistent with U.S. EPA and DTSC guidance and regulations, including as a minimum: Risk Assessment Guidance for Superfund, Volume 1; Human Health Evaluation Manual, December 1989; Superfund Exposure Assessment Manual, April 1988; Risk Assessment Guidance for Superfund, Volume 2, Environmental Evaluation Manual, March 1989; Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities (DTSC, September 1993); and all other related or relevant policies, practices and guidelines of the California Environmental Protection Agency and policies, practices and guidelines developed by U.S.EPA pursuant to 40 C.F.R. part 300.400 et seq. The Baseline Health and Ecological Risk Assessment Report shall include the following components:

(a) Contaminant Identification. Characterization data shall identify contaminants of concern for the risk assessment process.

(b) Environmental Evaluation. An ecological assessment consisting of:

(1) Identification of sensitive environments and rare, threatened, or endangered species and their habitats; and

(2) As appropriate, ecological investigations to assess the actual or potential effects on the environment and/or develop remediation criteria.

(c) Exposure Assessment. The objectives of an exposure assessment are to identify actual or potential exposure pathways, to characterize the potentially exposed populations, and to determine the extent of the exposure. Exposed populations may include industrial workers, residents, and subgroups that comprise a meaningful portion of the general population, including, but not limited to, infants, children, pregnant women, the elderly, individuals with a history of serious illness, or other subpopulations, that are identifiable as being at greater risk of adverse health effects due to exposure to

hazardous substances than the general population.

(d) Toxicity Assessment. Respondents shall evaluate the types of adverse health or environmental effects associated with individual and multiple chemical exposures; the relationship between magnitude of exposures and adverse effects; and related uncertainties such as the weight of evidence for a chemical's potential carcinogenicity in humans.

(e) Risk Characterization. Risk characterization shall include the potential risks of adverse health or environmental effects for each of the exposure scenarios derived in the exposure assessment.

5.7 Feasibility Study (FS) Report. The FS Report shall be prepared and submitted by Respondents to DTSC for review and approval, no later than [60] days from submittal of the RI Report. The FS Report shall summarize the results of the FS including the following:

(a) Documentation of all treatability studies conducted.

(b) Development of medium specific or operable unit specific remedial action objectives, including legal requirements and other promulgated standards that are relevant.

(c) Identification and screening of general response actions, remedial technologies, and process options on a medium and/or operable unit specific basis.

(d) Evaluation of alternatives based on the criteria contained in the NCP including:

Threshold Criteria:

(1) Overall protection of human health and the environment.

(2) Compliance with legal requirements and other promulgated standards that are relevant.

Primary Balancing Criteria:

(1) Long-term effectiveness and permanence.

(2) Reduction of toxicity, mobility, or volume through treatment.

(3) Short-term effectiveness.

(4) Implementability based on technical and administrative feasibility.

(5) Cost.

Modifying Criteria:

(1) State and local agency acceptance.

(2) Community acceptance.

(e) Proposed remedial actions.

5.8 Public Participation Plan (Community Relations). Respondents shall work cooperatively with DTSC in providing an opportunity for meaningful public participation in response actions. Any such public participation activities shall be conducted in accordance with Health and Safety Code sections 25356.1 and 25358.7 and DTSC's most current Public Participation Policy and Guidance Manual, and shall be subject to DTSC's review and approval.

Respondents, in coordination with DTSC, shall conduct a baseline community survey and develop a Public Participation Plan (PPP) which describes how, under this Order, the public and adjoining community will be kept informed of activities conducted at the Site and how Respondents will be responding to inquiries from concerned citizens. Major steps in developing a PPP are as follows:

(a) Develop proposed list of interviewees;
(b) Schedule and conduct community interviews; and
(c) Analyze interview notes, and develop objectives.

Respondents shall conduct the baseline community survey and submit the PPP for DTSC's review within [40] days of the effective date of this Order.

Respondents shall implement any of the public participation support activities identified in the PPP, at the request of DTSC. DTSC retains the right to implement any of these activities independently. These activities include, but are not limited to, development and distribution of fact sheets; public meeting preparations; and development and placement of public notices.

5.9 California Environmental Quality Act (CEQA). DTSC must comply with CEQA insofar as activities required by this Order are projects requiring CEQA compliance. Upon DTSC request, Respondents shall submit any information deemed necessary by DTSC to facilitate compliance with CEQA. The costs incurred by DTSC in complying with CEQA are response costs and Respondents shall reimburse DTSC for such costs pursuant to Section 6.19.

5.10 Removal Action Workplan

If DTSC determines a removal action is appropriate, Respondents will prepare a Removal Action Workplan (RAW) in accordance with Health and Safety Code sections 25323.1 and

25356.1. The Removal Action Workplan will include:

(a) a description of the onsite contamination;

(b) the goals to be achieved by the removal action;

(c) an analysis of the alternative options considered and rejected and the basis for that rejection. This should include a discussion for each alternative which covers its effectiveness, implementability and cost;

(d) administrative record list;

(e) a description of the techniques and methods to be used in the removal action, including any excavating, storing, handling, transporting, treating, and disposing of material on or off the site;

(f) Sampling and Analysis Plan with corresponding Quality Assurance Plan to confirm the effectiveness of the RAW, if applicable;

(g) a brief overall description of methods that will be employed during the removal action to ensure the health and safety of workers and the public during the removal action. A detailed community air monitoring plan shall be included if requested by DTSC.

In conjunction with DTSC, Respondents shall implement the public review process specified in DTSC's Public Participation Policy and Guidance Manual. DTSC will prepare a response to the public comments received. If required, the Respondents shall submit within two (2) weeks of the request the information necessary for DTSC to prepare this document.

Following DTSC's finalization of the Responsiveness Summary, DTSC will specify any changes to be made in the RAW. Respondents shall modify the document in accordance with DTSC's specifications and submit a final RAW within [15] days of receipt of DTSC's comments.

If the proposed removal action does not meet the requirements of Health and Safety Code section 25356.1(h), the Respondents will prepare a Remedial Action Plan (RAP) in accordance with Health and Safety Code section 25356.1(c) for DTSC review and approval.

5.11 Remedial Action Plan (RAP). No later than [30] days after DTSC approval of the FS Report, Respondents shall prepare and submit to DTSC a draft RAP. The draft RAP shall be consistent with the NCP and Health and Safety Code section 25356.1. The draft RAP public review process may be combined with that of any other documents required by CEQA. The draft RAP shall be based on and summarize the approved RI/FS Reports, and shall clearly set forth:

(a) Health and safety risks posed by the conditions at the Site.

(b) The effect of contamination or pollution levels upon present, future, and probable beneficial uses of contaminated, polluted, or threatened resources.

(c) The effect of alternative remedial action measures on the reasonable availability of groundwater resources for present, future, and probable beneficial uses.

(d) Site specific characteristics, including the potential for offsite migration of hazardous substances, the surface or subsurface soil, and the hydro geologic conditions, as well as preexisting background contamination levels.

(e) Cost-effectiveness of alternative remedial action measures. Land disposal shall not be deemed the most cost-effective measure merely on the basis of lower short-term cost.

(f) The potential environmental impacts of alternative remedial action measures, including, but not limited to, land disposal of the untreated hazardous substances as opposed to treatment of the hazardous substances to remove or reduce their volume, toxicity, or mobility prior to disposal.

(g) A statement of reasons setting forth the basis for the removal and remedial actions selected. The statement shall include an evaluation of each proposed alternative submitted and evaluate the consistency of the removal and remedial actions proposed by the plan with the NCP.

(h) A schedule for implementation of all proposed removal and remedial actions.

In conjunction with DTSC, Respondents shall implement the public review process specified in DTSC's Public Participation Policy and Guidance Manual. DTSC will prepare a response to the public comments received. If required, the Respondents shall submit within two (2) weeks of the request the information necessary for DTSC to prepare this document.

Following DTSC's finalization of the Responsiveness Summary, DTSC will specify any changes to be made in the RAP. Respondents shall modify the document in accordance with DTSC's specifications and submit a final RAP within [15] days of receipt of DTSC's comments.

5.12 Remedial Design (RD). Within [60] days after DTSC approval of the final RAP, Respondents shall submit to DTSC for review and approval a RD describing in detail the technical and operational plans for implementation of the final RAP which includes the following elements, as applicable:

(a) Design criteria, process unit and pipe sizing calculations, process diagrams, and final

plans and specifications for facilities to be constructed.

(b) Description of equipment used to excavate, handle, and transport contaminated material.

(c) A field sampling and laboratory analysis plan addressing sampling during implementation and to confirm achievement of the performance objectives of the RAP.

(d) A transportation plan identifying routes of travel and final destination of wastes generated and disposed.

(e) For groundwater extraction systems: aquifer test results, capture zone calculations, specifications for extraction and performance monitoring wells, and a plan to demonstrate that capture is achieved.

(f) An updated health and safety plan addressing the implementation activities.

(g) Identification of any necessary permits and agreements.

(h) An operation and maintenance plan including any required monitoring.

(i) A detailed schedule for implementation of the remedial action consistent with the schedule contained in the approved RAP including procurement, mobilization, construction phasing, sampling, facility startup, and testing.

(j) A community air monitoring plan.

5.13 Land Use Covenant. If the approved remedy in the final RAP or final RAW includes land use restrictions, pursuant to California Code of Regulations, title 22, section 67391.1, the current owner(s) of the Site or a portion of the Site subject to such restrictions shall sign and record a Covenant to Restrict Use of Property approved by DTSC within [90] days of DTSC's approval of the final RAP or final RAW or as otherwise requested by DTSC.

5.14 Implementation of Final RAP or Final RAW. Upon DTSC approval of the RD or RAW, Respondents shall implement the final RAP or final RAW in accordance with the approved schedule in the RD or final RAW. Within [30] days of completion of field activities, Respondents shall submit an Implementation Report documenting the implementation of the final RAP and RD or final RAW.

5.15 Operation and Maintenance (O&M). Respondents shall comply with all O&M requirements in accordance with the final RAP and approved RD or final RAW. Within [30] days of the date of DTSC's request, Respondents shall prepare and submit to DTSC for approval an O&M workplan that includes an implementation schedule. Respondents shall implement the

workplan in accordance with the approved schedule. Respondents shall enter into an O&M Agreement, including financial assurance pursuant to California Health and Safety Code section 25355.2, with DTSC within [30] days of the date of DTSC's request.

5.16 Five-Year Review. Respondents shall review and reevaluate the remedial action after a period of [5] years from the completion of construction and startup, and every [5] years thereafter or after completion of a RAW, if applicable. The review and reevaluation shall be conducted to determine if human health and the environment are being protected by the remedial action. Within thirty (30) calendar days before the end of the time period approved by DTSC to review and reevaluate the remedial action, Respondents shall submit a remedial action review workplan to DTSC for review and approval. Within sixty (60) days of DTSC's approval of the workplan, Respondents shall implement the workplan and shall submit a comprehensive report of the results of the remedial action review. The report shall describe the results of all sample analyses, tests and other data generated or received by Respondents and evaluate the adequacy of the implemented remedy in protecting public health, safety and the environment. As a result of any review performed under this Section, Respondents may be required to perform additional work or to modify work previously performed.

5.17 Changes During Implementation of the Final RAP or Final RAW. During the implementation of the final RAP and RD or final RAW, DTSC may specify such additions, modifications, and revisions to the RD or final as DTSC deems necessary to protect public health and safety or the environment or to implement the final RAP or final RAW.

5.18 Stop Work Order. In the event that DTSC determines that any activity (whether or not pursued in compliance with this Order) may pose an imminent or substantial endangerment to the health or safety of people on the Site or in the surrounding area or to the environment, DTSC may order Respondents to stop further implementation of this Order for such period of time needed to abate the endangerment. In the event that DTSC determines that any site activities (whether or not pursued in compliance with this Order) are proceeding without DTSC authorization, DTSC may order Respondents to stop further implementation of this Order or activity for such period of time needed to obtain DTSC authorization, if such authorization is appropriate. Any deadline in this Order directly affected by a Stop Work Order, under this Section, shall be extended for the term of the Stop Work Order.

5.19 Emergency Response Action/Notification. In the event of any action or occurrence (such as a fire, earthquake, explosion, or human exposure to hazardous substances caused by the release or threatened release of a hazardous substance) during the course of this Order, Respondents shall immediately take all appropriate action to prevent, abate, or minimize such emergency, release, or immediate threat of release and shall immediately notify the Project Manager. Respondents shall take such action in consultation with the Project Manager and in accordance with all applicable provisions of this Order. Within [7] days of the onset of such an event, Respondents shall furnish a report to DTSC, signed by Respondents' Project Coordinator, setting forth the events which occurred and the measures taken in the response thereto. In the

event that Respondents fail to take appropriate response and DTSC takes the action instead, Respondents shall be liable to DTSC for all costs of the response action. Nothing in this Section shall be deemed to limit any other notification requirement to which Respondents may be subject.

5.20 Discontinuation of Remedial Technology. Any remedial technology employed in implementation of the final RAP or final RAW shall be left in place and operated by Respondents until and except to the extent that DTSC authorizes Respondents in writing to discontinue, move or modify some or all of the remedial technology because Respondents have met the criteria specified in the final RAP or final RAW for its discontinuance, or because the modifications would better achieve the goals of the final RAP or final RAW.

5.21 Financial Assurance. Respondents shall demonstrate to DTSC and maintain financial assurance for O&M and monitoring. Respondents shall demonstrate financial assurance prior to the time that O&M activities are initiated and shall maintain it throughout the period of time necessary to complete all required O&M activities. The financial assurance mechanisms shall meet the requirements of Health and Safety Code section 25355.2. All financial assurance mechanisms are subject to the review and approval of DTSC.

VI. GENERAL PROVISIONS

6.1 Project Coordinator. Within [10] days from the date this Order is signed by DTSC, Respondents shall submit to DTSC in writing the name, address, and telephone number of a Project Coordinator whose responsibilities will be to receive all notices, comments, approvals, and other communications from DTSC. Respondents shall promptly notify DTSC of any change in the identity of the Project Coordinator. Respondents shall obtain approval from DTSC before the new Project Coordinator performs any work under this Order.

6.2 Project Engineer/Geologist. The work performed pursuant to this Order shall be under the direction and supervision of a qualified professional engineer or a professional geologist in the State of California, with expertise in hazardous substance site cleanups. Within [15] calendar days from the date this Order is signed by DTSC, Respondents must submit: a) the name and address of the project engineer or geologist chosen by Respondents; and b) in order to demonstrate expertise in hazardous substance cleanup, the resumé of the engineer or geologist, and the statement of qualifications of the consulting firm responsible for the work. Respondents shall promptly notify DTSC of any change in the identity of the Project Engineer/Geologist. Respondents shall obtain approval from DTSC before the new Project Engineer/Geologist performs any work under this Order.

6.3 Monthly Summary Reports. Within [30] days from the date this Order is signed by DTSC, and on a monthly basis thereafter, Respondents shall submit a Monthly Summary Report of its activities under the provisions of this Order. The report shall be received by DTSC by the [15th] day of each month and shall describe:

(a) Specific actions taken by or on behalf of Respondents during the previous calendar month;

(b) Actions expected to be undertaken during the current calendar month;

(c) All planned activities for the next month;

(d) Any requirements under this Order that were not completed;

(e) Any problems or anticipated problems in complying with this Order; and

(f) All results of sample analyses, tests, and other data generated under this Order during the previous calendar month, and any significant findings from these data.

6.4 Quality Assurance/Quality Control (QA/QC). All sampling and analysis conducted by Respondents under this Order shall be performed in accordance with QA/QC procedures submitted by Respondents and approved by DTSC pursuant to this Order.

6.5 Submittals. All submittals and notifications from Respondents required by this Order shall be sent simultaneously to:

Sayareh Amirebrahimi, Branch Chief
Southern California-Cleanup Operations Division
Attention: Michel Iskarous [two copies]
Site Mitigation & Brownfield Reuse Program
Department of Toxic Substances Control
1011 N. Grandview Avenue
Glendale, California 91201

U.S. EPA, Region IX
Attn: Superfund Program Manager
75 Hawthorne Street
San Francisco, California 94105

6.6 Communications. All approvals and decisions of DTSC made regarding submittals and notifications will be communicated to Respondents in writing by the Site Mitigation Branch Chief, DTSC, or his/her designee. No informal advice, guidance, suggestions or comments by DTSC regarding reports, plans, specifications, schedules or any other writings by Respondents shall be construed to relieve Respondents of the obligation to obtain such formal approvals as may be required.

6.7 DTSC Review and Approval. (a) All response actions taken pursuant to this Order shall be subject to the approval of DTSC. Respondents shall submit all deliverables required by

this Order to DTSC. Once the deliverables are approved by DTSC, they shall be deemed incorporated into, and where applicable, enforceable under this Order.

(1) If DTSC determines that any report, plan, schedule or other document submitted for approval pursuant to this Order fails to comply with this Order or fails to protect public health or safety or the environment, DTSC may:

(a) Modify the document as deemed necessary and approve the document as modified; or

(b) Return comments to Respondents with recommended changes and a date by which Respondents must submit to DTSC a revised document incorporating the recommended changes.

(c) Any modifications, comments or other directives issued pursuant to (a) or (b) above, are incorporated into this Order. Any noncompliance with these modifications or directives shall be deemed a failure or refusal to comply with this Order.

6.8 Compliance with Applicable Laws. Nothing in this Order shall relieve Respondents from complying with all other applicable laws and regulations, including but not limited to compliance with all applicable waste discharge requirements issued by the State Water Resources Control Board or a California Regional Water Quality Control Board. Respondents shall conform all actions required by this Order with all applicable federal, state and local laws and regulations.

6.9 Respondents Liabilities. Nothing in this Order shall constitute or be construed as a satisfaction or release from liability for any conditions or claims arising as a result of past, current or future operations of Respondents. Nothing in this Order is intended or shall be construed to limit the rights of any of the parties with respect to claims arising out of or relating to the deposit or disposal at any other location of substances removed from the Site. Nothing in this Order is intended or shall be construed to limit or preclude DTSC from taking any action authorized by law to protect public health or safety or the environment and recovering the cost thereof. Notwithstanding compliance with the terms of this Order, Respondents may be required to take further actions as are necessary to protect public health and the environment.

6.10 Site Access. Access to the Site and laboratories used for analyses of samples under this Order shall be provided at all reasonable times to employees, contractors, and consultants of DTSC. Nothing in this Section is intended or shall be construed to limit in any way the right of entry or inspection that DTSC or any other agency may otherwise have by operation of any law. DTSC and its authorized representatives shall have the authority to enter and move freely about all property at the Site at all reasonable times for purposes including, but not limited to: inspecting records, operating logs, sampling and analytic data, and contracts relating to this Site; reviewing the progress of Respondents in carrying out the terms of this Order; conducting such tests as DTSC may deem necessary; and verifying the data submitted to DTSC by Respondents.

To the extent the Site or any other property to which access is required for the implementation of this Order is owned or controlled by persons other than Respondents, Respondents shall use best efforts to secure from such persons access for Respondents, as well as DTSC, its representatives, and contractors, as necessary to effectuate this Order. To the extent that any portion of the Site is controlled by tenants of Respondents, Respondents shall use best efforts to secure from such tenants, access for Respondents, as well as for DTSC, its representatives, and contractors, as necessary to effectuate this Order. For purposes of this Section, "best efforts" includes the payment of reasonable sums of money in consideration of access. If any access required to complete the Work is not obtained within forty-five (45) days of the effective date of this Order, or within forty-five (45) days of the date DTSC notifies Respondents in writing that additional access beyond that previously secured is necessary, Respondents shall promptly notify DTSC, and shall include in that notification a summary of the steps Respondents have taken to attempt to obtain access. DTSC may, as it deems appropriate, assist Respondents in obtaining access. Respondents shall reimburse DTSC in obtaining access, including, but not limited to, attorneys fees and the amount of just compensation.

6.11 Site Access for Respondents. The Site owner Respondents shall grant access to other Respondents who are in compliance with this Order for the purpose of conducting activities pursuant to this Order or for activities deemed necessary by DTSC to meet the objectives of this Order.

6.12 Sampling, Data and Document Availability. Respondents shall permit DTSC and its authorized representatives to inspect and copy all sampling, testing, monitoring or other data generated by Respondents or on Respondents' behalf in any way pertaining to work undertaken pursuant to this Order. Respondents shall submit all such data upon the request of DTSC. Copies shall be provided within [7] days of receipt of DTSC's written request. Respondents shall inform DTSC at least [7] days in advance of all field sampling under this Order, and shall allow DTSC and its authorized representatives to take duplicates of any samples collected by Respondents pursuant to this Order. Respondents shall maintain a central depository of the data, reports, and other documents prepared pursuant to this Order.

6.13 Record Retention. All such data, reports and other documents shall be preserved by Respondents for a minimum of ten years after the conclusion of all activities under this Order. If DTSC requests that some or all of these documents be preserved for a longer period of time, Respondents shall either comply with that request or deliver the documents to DTSC, or provide DTSC copies of the documents prior to destruction. Respondents shall notify DTSC in writing, at least six months prior to destroying any documents prepared pursuant to this Order.

6.14 Government Liabilities. The State of California shall not be liable for any injuries or damages to persons or property resulting from acts or omissions by Respondents, or related parties specified in Section 6.26, Parties Bound, in carrying out activities pursuant to this Order, nor shall the State of California be held as party to any contract entered into by Respondents or

its agents in carrying out activities pursuant to this Order.

6.15 Additional Actions. By issuance of this Order, DTSC does not waive the right to take any further actions authorized by law.

6.16 Extension Requests. If Respondents are unable to perform any activity or submit any document within the time required under this Order, Respondents may, prior to expiration of the time, request an extension of the time in writing. The extension request shall include a justification for the delay. All such requests shall be in advance of the date on which the activity or document is due.

6.17 Extension Approvals. If DTSC determines that good cause exists for an extension, it will grant the request and specify a new schedule in writing. Respondents shall comply with the new schedule incorporated in this Order.

6.18 Liability for Costs. Respondents are liable for all of DTSC's costs that have been incurred in taking response actions at the Site (including costs of overseeing response actions performed by Respondents) and costs to be incurred in the future.

6.19 Payment of Costs. DTSC may bill Respondents for costs incurred in taking response actions at the Site prior to the effective date of this Order. DTSC will bill Respondents quarterly for its response costs incurred after the effective date of this Order. Respondents shall pay DTSC within sixty [60] days of receipt of any DTSC billing. Any billing not paid within sixty [60] days is subject to interest calculated from the date of the billing pursuant to Health and Safety Code section 25360.1. All payments made by Respondents pursuant to this Order shall be by cashier's or certified check made payable to "DTSC," and shall bear on the face the project code of the Site (301286) and the Docket number of this Order. Payments shall be sent to:

Department of Toxic Substances Control
Accounting/Cashier
1001 I Street, 21st Floor
P.O. Box 806
Sacramento, California 95812-0806

A photocopy of all payment checks shall also be sent to the person designated by DTSC to receive submittals under this Order.

6.20 Severability. The requirements of this Order are severable, and Respondents shall comply with each and every provision hereof, notwithstanding the effectiveness of any other provision.

6.21 Incorporation of Plans, Schedules and Reports. All plans, schedules, reports, specifications and other documents that are submitted by Respondents pursuant to this Order are incorporated in this Order upon DTSC's approval or as modified pursuant to Section 6.7, DTSC

Review and Approval, and shall be implemented by Respondents. Any noncompliance with the documents incorporated in this Order shall be deemed a failure or refusal to comply with this Order.

6.22 Modifications. DTSC reserves the right to unilaterally modify this Order. Any modification to this Order shall be effective upon the date the modification is signed by DTSC and shall be deemed incorporated in this Order.

6.23 Time Periods. Unless otherwise specified, time periods begin from the effective date of this Order and "days" means calendar days.

6.24 Termination and Satisfaction. Except for Respondents obligations under Sections 5.15 Operation and Maintenance (O&M), 5.16 Five-Year Review, 5.21 Financial Assurance, 6.13 Record Retention, 6.18 Liability for Costs, and 6.19 Payment of Costs, Respondents' obligations under this Order shall terminate and be deemed satisfied upon Respondents receipt of written notice from DTSC that Respondents have complied with all the terms of this Order.

6.25 Calendar of Tasks and Schedules. This Section is merely for the convenience of listing in one location the submittals required by this Order. If there is a conflict between the date for a scheduled submittal within this Section and the date within the Section describing the specific requirement, the latter shall govern.

Calendar of Tasks and Schedules

TASK	SCHEDULE
1. Identify Project Coordinator; Section 6.1;	Within [10] days from the date this Order is signed by DTSC.
2. Identify Project Engineer/Geologist; Section 6.2;	Within [15] days from the date this Order is signed by DTSC.
3. Submit Monthly Summary Reports; Section 6.3;	Within [30] days from the date this Order is signed by DTSC.by DTSC.
4. Attend Site Remediation Strategy Meeting; Section 5.1.7;	Within [20] days from the date this Order is signed by DTSC.
5. Submit groundwater level measurements;	First Monday of specified month.

Groundwater sampling results; Section 5.1.5;	Quarterly basis.
6. Submit RI/FS Workplan; Section 5.2.2.	Within [30] days of the effective date of this Order.
7. Submit interim screening and evaluation document; Section 5.3;	As requested by DTSC.
8. Submit Treatability Studies; Section 5.4;	As required during Site characterization or as requested by DTSC.
9. Submit RI Report; Section 5.5;	Per approved RI/FS Workplan Schedule.
10. Submit Baseline Risk Assessment; Section 5.6;	Within [60 days] or as required from submittal of RI Report.
11. Submit FS Report; Section 5.7;	Within [60] days from submittal of RI Report.
12. Submit Public Participation Plan; Section 5.8;	Within [40] days from the date this Order is signed by DTSC.
Submit and distribute Fact Sheets;	For projected or completed key milestones, as specified in Public Participation Plan or when requested by DTSC.
13. Submit Initial Study and Checklist; Section 5.9;	Within [30] days after approval of FS Report.
14. Submit Draft RAW or Draft RAP: Section 5.10 or 5.11;	Within [30] days after approval of FS Report.
Submit information needed to prepare the Responsiveness Summary;	Within [10] days of DTSC request.
Submit Final RAP or Final RAW;	Within [15] days of receipt of DTSC's comments.
15. Submit Remedial Design; Section 5.12;	Within [60] days after DTSC's approval of the Final RAP.

16. Land Use Covenant; Section 5.13;	Within [90] days of approval of Final RAP or Final RAW.
17. Submit Implementation Report; Section 5.14;	Within [30] days of completion of field activities.
18. Operation and Maintenance Section 5.15;	
Submit O&M plan	Within [30] days of DTSC's request.
Sign O&M Agreement	Within [30] days of DTSC's request
19. Submit Remedial Action Review Workplan; Section 5.16;	Within [30] days before end of five-year period.
20. Submit Emergency Response Action Report; Section 5.19;	Within [7] days of an emergency response action.
21. Provide copies of sampling, data, and documentation; Section 6.12;	Within [7] days of receipt of DTSC's request.
Provide prior notice before conducting field sampling;	Inform DTSC [7] days in advance of sampling.
22. Maintain central depository of data, reports, documentation; and	Maintain central depository for a minimum of ten years after conclusion of all activities conducted pursuant to this Order.
23. Provide prior written notice to DTSC before destroying any documentation prepared pursuant to this Order; Section 6.13.	At least six months prior to destroying any any documents.

6.26 Parties Bound. This Order applies to and is binding upon Respondents, and its officers, directors, agents, employees, contractors, consultants, receivers, trustees, successors and assignees, including but not limited to, individuals, partners, and subsidiary and parent corporations. Respondents shall provide a copy of this Order to all contractors, subcontractors, laboratories, and consultants which are retained to conduct any work performed under this Order, within [15] days after the effective date of this Order or the date of retaining their services, whichever is later. Respondents shall condition any such contracts upon

satisfactory compliance with this Order. Notwithstanding the terms of any contract, Respondents are responsible for compliance with this Order and for ensuring that its subsidiaries, employees, contractors, consultants, subcontractors, agents and attorneys comply with this Order.

6.27 Change in Ownership. No change in ownership or corporate or partnership status relating to the Site shall in any way alter Respondents' responsibility under this Order. No conveyance of title, easement, or other interest in the Site, or a portion of the Site, shall affect Respondents' obligations under this Order. Unless DTSC agrees that such obligations may be transferred to a third party, Respondents shall be responsible for and liable for any failure to carry out all activities required of Respondents by the terms and conditions of this Order, regardless of Respondents' use of employees, agents, contractors, or consultants to perform any such tasks. Respondents shall provide a copy of this Order to any subsequent owners or successors before ownership rights or stock or assets in an corporate acquisition are transferred.

6.28. Dispute Resolution. The parties agree to use their best efforts to resolve all disputes informally. The parties agree that the procedures contained in this Section are the required administrative procedures for resolving disputes arising under this Order. If Respondents fail to follow the procedures contained in this Section, it shall have waived its right to further contest the disputed issue. Respondents reserve their legal rights to contest or defend against any final decision rendered by DTSC under this Section. Disputes regarding DTSC billings shall follow the procedures set forth in Section 6.28.3

6.28.1. Respondents shall first seek resolution with DTSC's assigned project manager and unit chief. If the issue is not resolved after review by the unit chief, Respondents shall seek resolution with the DTSC branch chief by presenting in a letter the issues in dispute, the legal or other basis for Respondents' position, and the remedy sought. The branch chief shall issue a written decision with an explanation for the decision within thirty (30) business days after receipt of the letter from Respondents.

6.28.2. If Respondents disagree with the branch chief's decision, Respondents may appeal to the Statewide Cleanup Operations Division Chief. To appeal to the division chief, Respondents must prepare a letter stating the reasons why the branch chief's decision is not acceptable. Attached to the letter shall be (a) Respondents' original statement of dispute, (2) supporting documents, and (3) copies of any responses prepared by the project manager, unit chief, and branch chief. This letter and attachments shall be sent to the division chief within ten [10] business days from the date of Respondents' receipt of the branch chief's response. The division chief or designee shall review Respondents' letter and supporting documents, consider the issues raised and render a written decision to Respondents within thirty [30] business days of receipt of Respondents' letter. The decision of the division chief, or designee, shall constitute DTSC's administrative decision on the issues in dispute.

6.28.3. If Respondents dispute a DTSC billing, or any part thereof, Respondents shall notify

DTSC's assigned project manager and attempt to informally resolve the dispute with DTSC's project manager and branch chief. If Respondents desire to formally request dispute resolution with regard to the billing, Respondents shall file a request for dispute resolution in writing within [45] days of the date of the billing in dispute. The written request shall describe all issues in dispute and shall set forth the reasons for the dispute, both factual and legal. If the dispute pertains only to a portion of the costs included in the invoice, Respondents shall pay all costs which are undisputed in accordance with Section 6.19. The filing of a notice of dispute pursuant to this Section shall not stay the accrual of interest on any unpaid costs pending resolution of the dispute. The written request shall be sent to:

Special Assistant for Cost Recovery and Reimbursement Policy
Department of Toxic Substances Control
P.O. Box 806
Sacramento, California 95812-0806

A copy of the written request for dispute resolution shall also be sent to the person designated by DTSC to receive submittals under this Order. A decision on the billing dispute will be rendered by the Special Assistant for Cost Recovery and Reimbursement Policy or other DTSC designee.

6.28.4. The existence of a dispute shall not excuse, stay, or suspend any other compliance obligation or deadline required pursuant to this Order.

VII. EFFECTIVE DATE

7. The effective date of this Order shall be the date on which this Order is signed by the Parties.

VIII. PENALTIES FOR NONCOMPLIANCE

8. Each Respondent may be liable for penalties of up to $25,000 for each day out of compliance with any term or condition set forth in this Order and for punitive damages up to three times the amount of any costs incurred by DTSC as a result of Respondent's(s') failure to comply, pursuant to Health and Safety Code sections 25359, 25359.2, 25359.4, and 25367(c). Health and Safety Code section 25359.4.5 provides that a responsible party who complies with this Order, or with another order or agreement concerning the same response actions required by this Order, may seek treble damages from Respondents who fail or refuse to comply with this Order without sufficient cause.

IX. SIGNATORIES

9. Each undersigned representative of the parties to this Order certifies that he or she is fully authorized to enter into the terms and conditions of this Order and to execute and legally bind the Parties to this Order.

9.1 This Order may be executed and delivered in any number of counterparts, each of which when executed and delivered shall be deemed to be an original, but such counterparts shall together constitute one and the same document.

IT IS HEREBY AGREED AND ORDERED.

DATE:_____ _____
[Respondent]

DATE:_____ _____
Sayareh Amirebrahimi, Branch Chief
Southern California Cleanup Operations Division
Glendale Branch

cc: Site Mitigation Program
Headquarters, Planning & Policy
Office of Legal Counsel

Attachment 2

Excerpt of January 1999 Additional Groundwater Investigation Report

Additional Groundwater Investigation and Quarterly Monitoring Report for October to December 1998

Jervis B. Webb Company Property
5030 Firestone Boulevard
South Gate, California

13 January 1999

**Erler &
Kalinowski, Inc.**

Consulting Engineers and Scientists
2951 28th Street, Suite 1020
Santa Monica, California 90405
(310) 314-8855
Fax: (310) 314-8860

Additional Groundwater Investigation and Quarterly Monitoring Report for October to December 1998

Jervis B. Webb Company Property
5030 Firestone Boulevard, South Gate, California

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Additional Groundwater Investigation and Quarterly Monitoring Report for October to December 1998

Jervis B. Webb Company Property
5030 Firestone Boulevard, South Gate, California

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Additional Groundwater Investigation and Quarterly Monitoring Report for October to December 1998

Jervis B. Webb Company Property
5030 Firestone Boulevard, South Gate, California

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volume of purged groundwater were recorded on field purge forms (see Appendix E). Purging at each well was continued until water quality parameters stabilized to within approximately 10%. Groundwater quality parameters were generally stable after purging three casing volumes of water from each well, and final turbidity was generally low, between 1 and 5 NTU.

2.5. Groundwater Sampling Procedures

Groundwater samples were collected from the new groundwater monitoring wells MW-4 and MW-5 and previously existing wells MW-1, MW-2, and MW-3 on 5 November 1998. The depths to groundwater measured in the monitoring wells are provided in Table 3 and the analytical results for samples of groundwater collected from the wells are provided in Tables 5 and 6. Laboratory reports and Chain-of-Custody forms for groundwater samples are attached in Appendix F.

Prior to sampling of groundwater, each well was purged of a minimum of three well-casing volumes of groundwater using a submersible, electric pump. Groundwater purging was performed by West Hazmat and groundwater samples were collected by EKI. All down-hole equipment was thoroughly steam cleaned before use at each well.

During purging of groundwater on 5 November 1998, groundwater quality parameters were recorded by EKI (temperature, pH, conductivity, and turbidity). Water quality monitoring equipment was calibrated prior to commencement of groundwater purging. For each purge sample, the time, water quality parameters, and volume of purged groundwater were recorded on field purge forms (see Appendix E). Purging at each well was continued until parameters stabilized to within approximately 10%. Groundwater quality parameters were generally stable after purging three casing volumes of water from each well. Final turbidity was generally low, between 0.25 and 2.5 NTU (see Appendix E).

Groundwater samples were collected by EKI using a bottom-emptying Teflon® bailer. Prior to sampling at each well, the bailer was disassembled and each piece of equipment was thoroughly washed in a non-phosphate detergent solution in water, followed by rinsing with potable and distilled water. An equipment rinsate blank was collected from the sampling bailer immediately following sample collection at well MW-2. Monitoring well MW-1 was the last well sampled on 5 November 1998.

A sample label that included a unique sample identification number, the time, and the date when the sample was collected was attached to each container. Groundwater samples were sealed in zip-lock plastic bags and placed in a cooler with ice for temporary storage and transport to the laboratory. A travel blank, which accompanied the sample bottles from the laboratory to the Site, was returned to the laboratory unopened. Chain-of-Custody forms were initiated in the field and included with the samples. Chain-of-Custody forms are included in Appendix F.

TABLE 2

Analytical Results for Samples of Soil

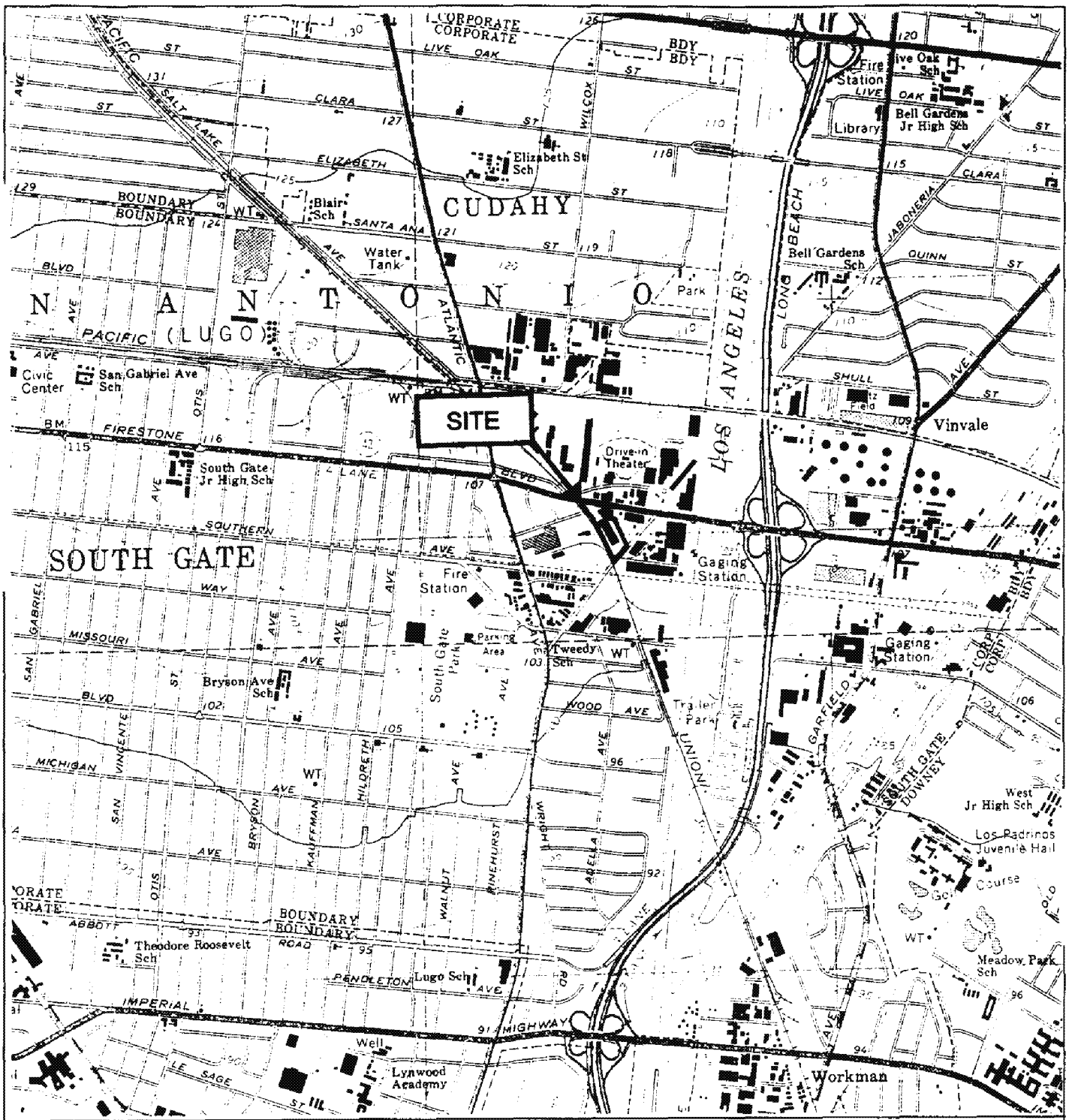
Additional Groundwater Investigation and
Quarterly Monitoring Report for October to December 1998
Jervis B. Webb Company, 5030 Firestone Boulevard, South Gate, California

Boring Number	Sample Number	Depth (ft. bgs)	Concentration PCE (ug/kg)	TCE (ug/kg)
MW-5	MW-5-21	21	<2.5	**22**
MW-5	MW-5-31	31	<2.5	**11**
MW-5	MW-5-41	41	<50	**550**

NOTES: Abbreviations:

PCE = tetrachloroethene
TCE = trichloroethene
ft bgs = feet beneath ground surface
ug/kg = micrograms per kilogram

1. Chemical analyses were performed by Orange Coast Analytical, Inc. using EPA Method 8010.
2. Samples from boring MW-5 collected on 28 November 1998.
3. Sample depth is indicated in the sample name. Depth is indicated by the last number separate a hyphen in each sample description. (i.e. sample MW-5-21 collected at 21 ft bgs.



N

0 2,000 4,000

(Approximate Scale in Feet)

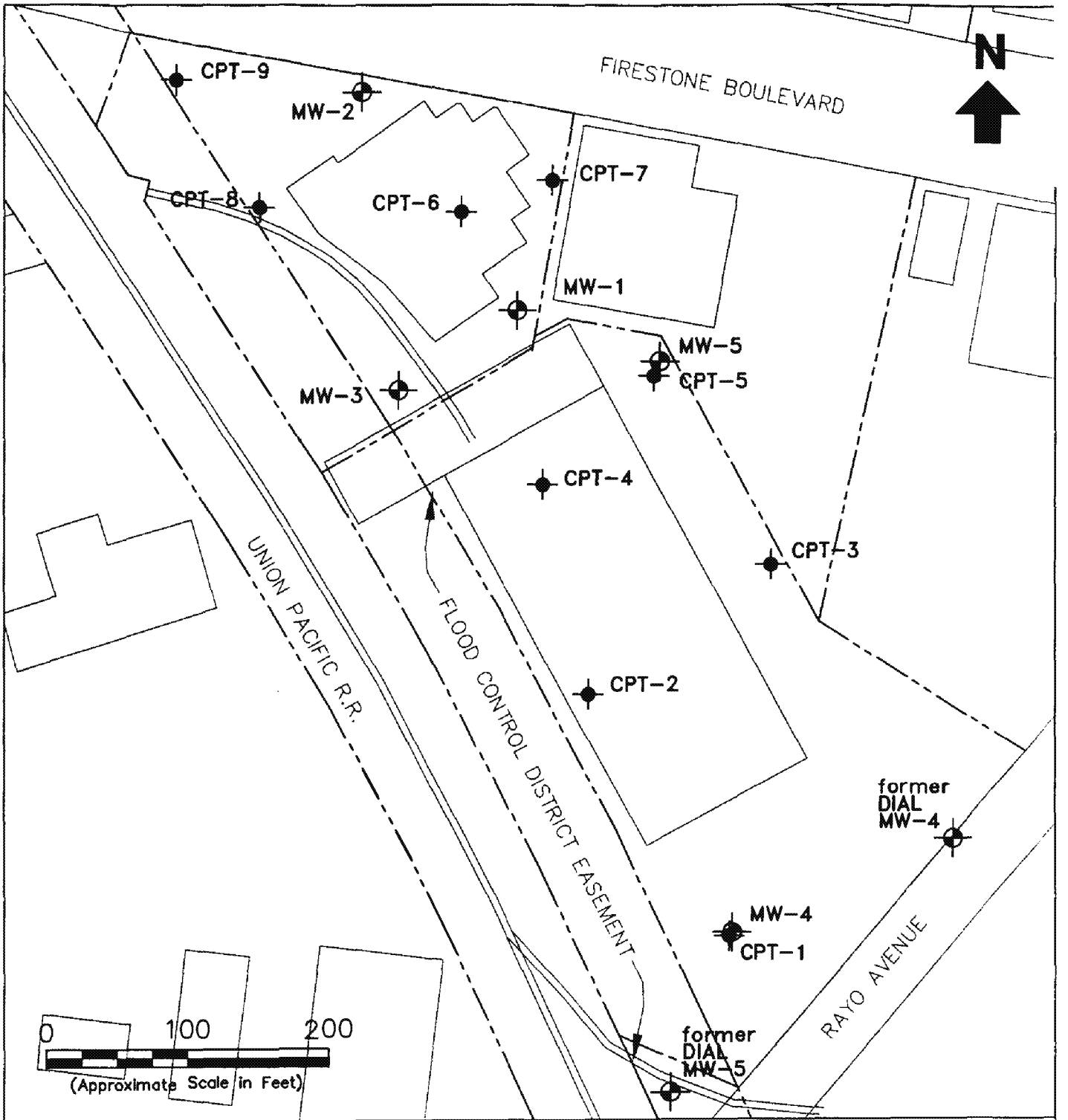
Erler & Kalinowski, Inc.

Site Location Map

Source: U.S.G.S 7.5 Minute Series "South Gate" Quadrangle, 1964, photorevised 1981.

Jervis B. Webb Company
South Gate, California
January 1999
EKI 961025.02

Figure 1



LEGEND

- PIPP Groundwater Sample Location
- Groundwater Monitoring Well
- Property Line/Boundary

Erler & Kalinowski, Inc.

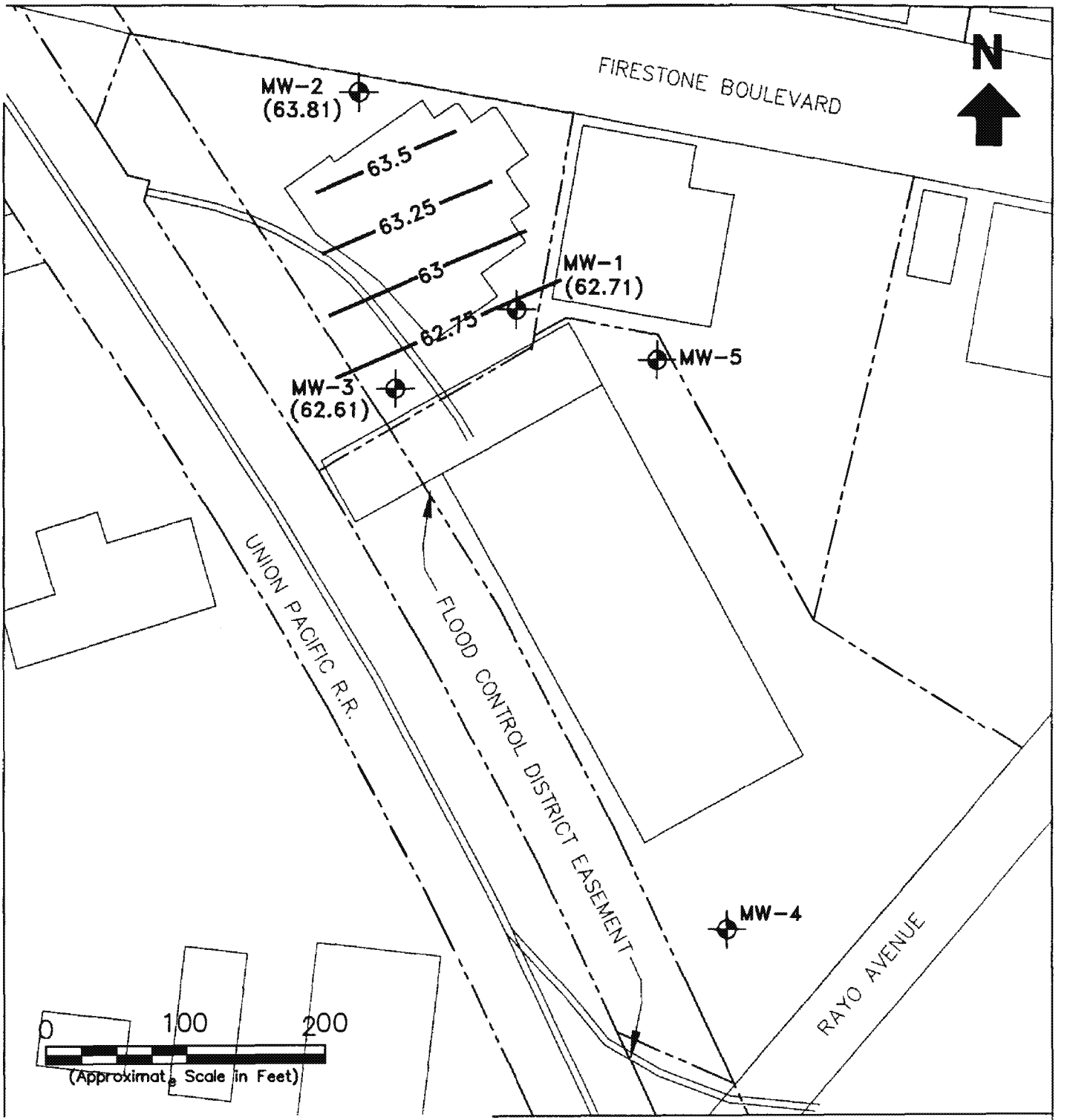
CPT Groundwater Sampling and Monitoring Well Locations

Jervis B. Webb Company
South Gate, California
January 1999
EKI 961025.02

Figure 2

Notes:

1. All locations are approximate.



LEGEND

Contour Representing the Elevation of the Groundwater Table in Feet Above Mean Sea Level (msl)

MW-3 (62.61) Groundwater Monitoring Well with Groundwater Elevation (msl)

Property Line/Boundary

Notes:

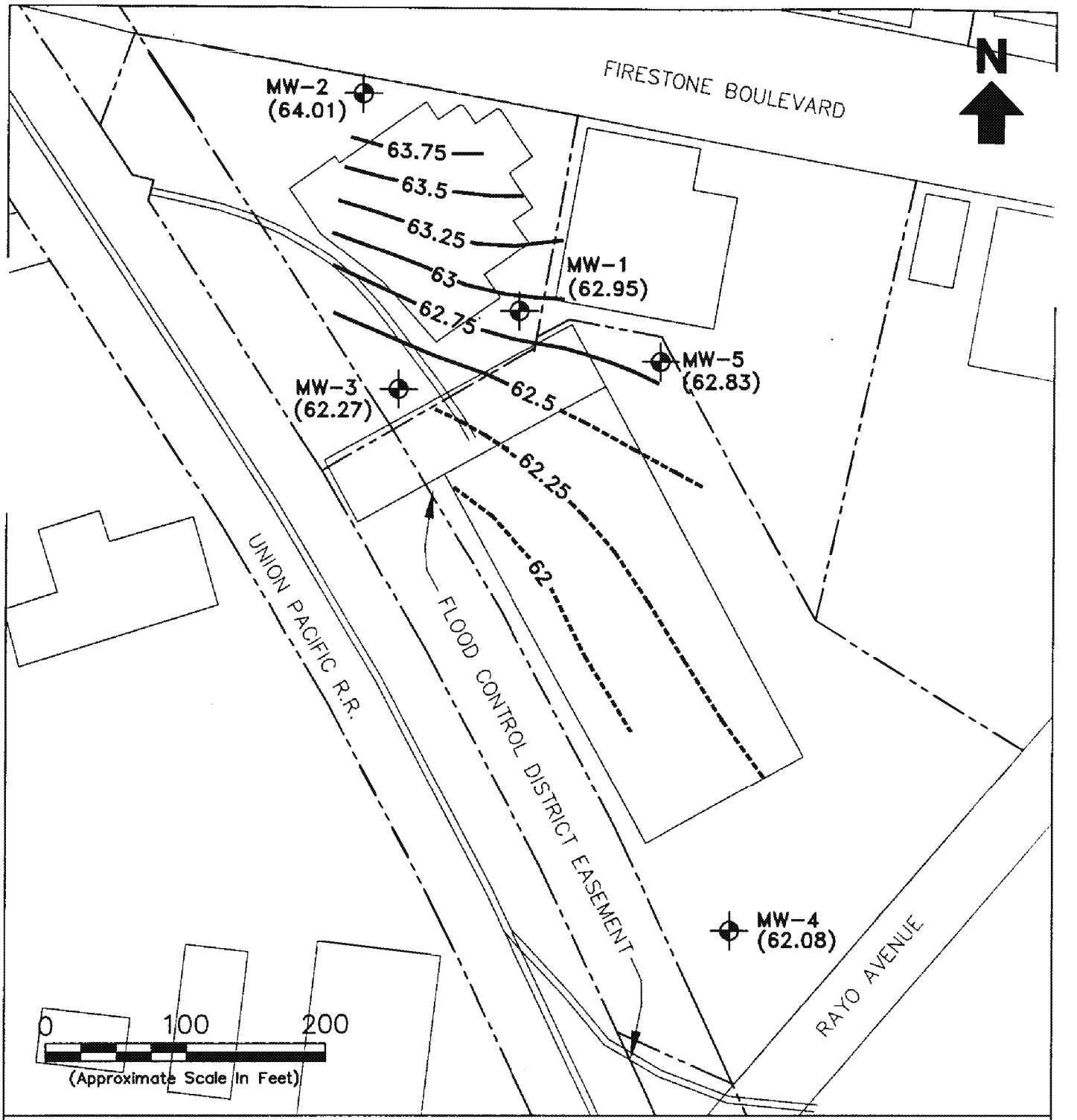
1. All locations are approximate.
2. Wells MW-4 and MW-5 had not yet been installed on 8 October 1998.

Erler & Kalinowski, Inc.

Elevation of the Groundwater Table on 8 October 1998

Jervis B. Webb Company
South Gate, California
January 1999
EKI 961025.02

Figure 3



LEGEND

Contour Representing the Elevation of the Groundwater Table in Feet Above Mean Sea Level (msl)

MW-3 (62.61) Groundwater Monitoring Well with Groundwater Elevation (msl)

Property Line/Boundary

Notes:

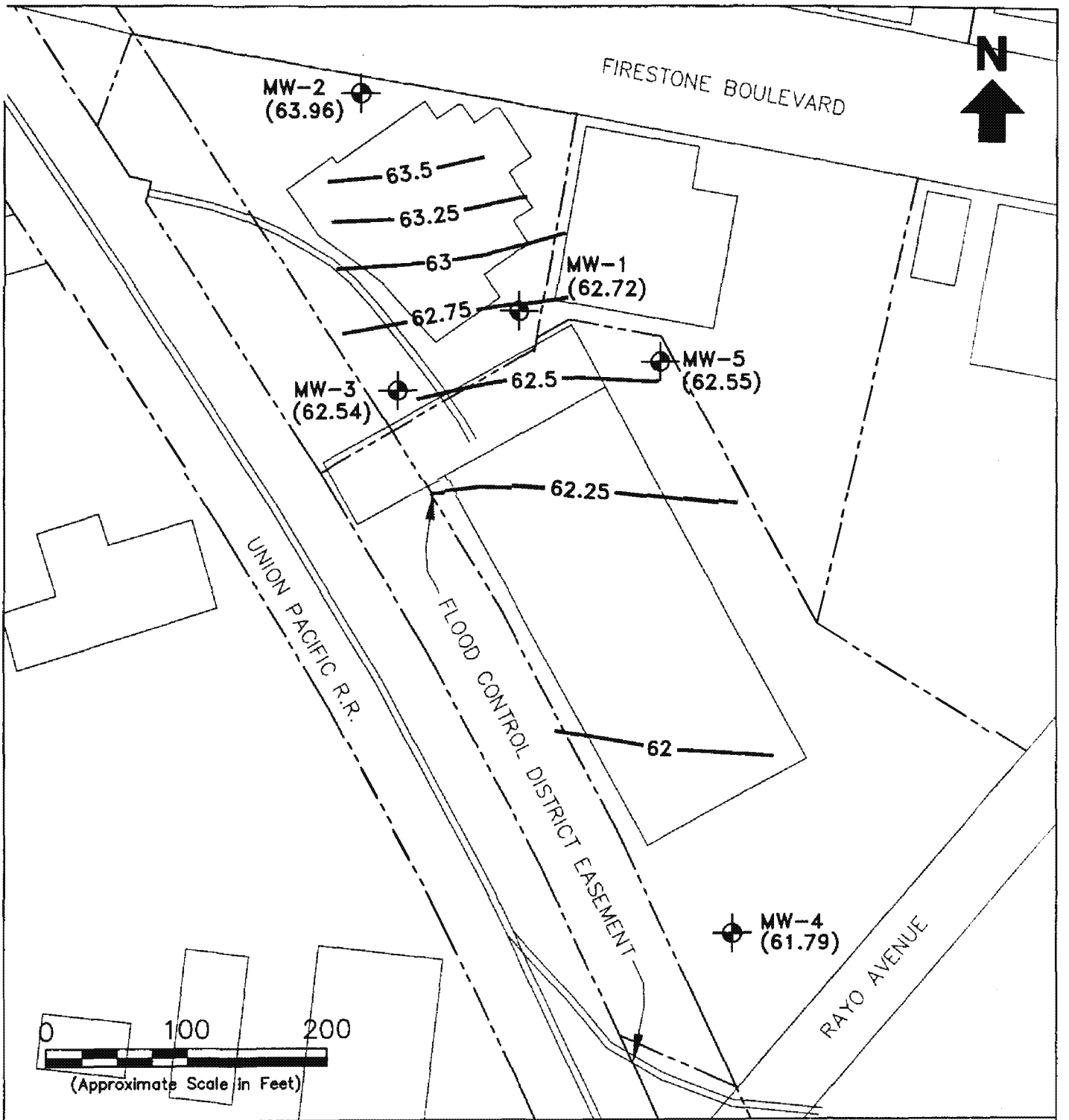
1. All locations are approximate.

Erler & Kalinowski, Inc.

Elevation of the Groundwater Table on 5 November 1998

Jervis B. Webb Company
South Gate, California
January 1999
EKI 961025.02

Figure 4



LEGEND

Contour Representing the Elevation of the Groundwater Table in Feet Above Mean Sea Level (msl)

MW-3 (62.61) Groundwater Monitoring Well with Groundwater Elevation (msl)

Property Line/Boundary

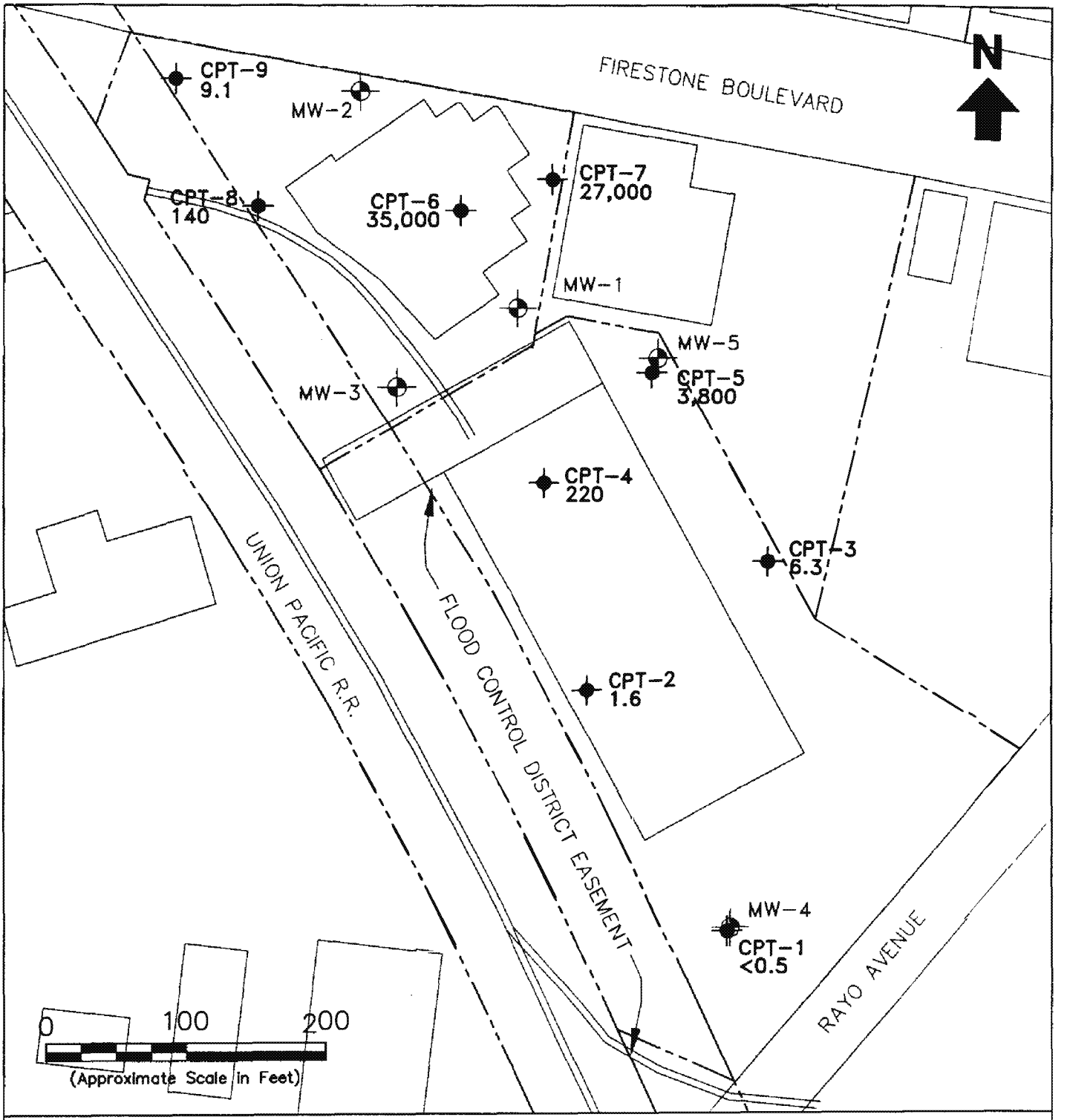
Erler & Kalinowski, Inc.

Elevation of the Groundwater Table on 21 December 1998

Jervis B. Webb Company
South Gate, California
January 1999
EKI 961025.02
Figure 5

Notes:

1. All locations are approximate.



LEGEND

- PIPP Groundwater Sample Location
- Groundwater Monitoring Well
- Property Line/Boundary

Erler & Kalinowski, Inc.

Concentrations of Trichloroethene Detected in PIPP Groundwater Samples

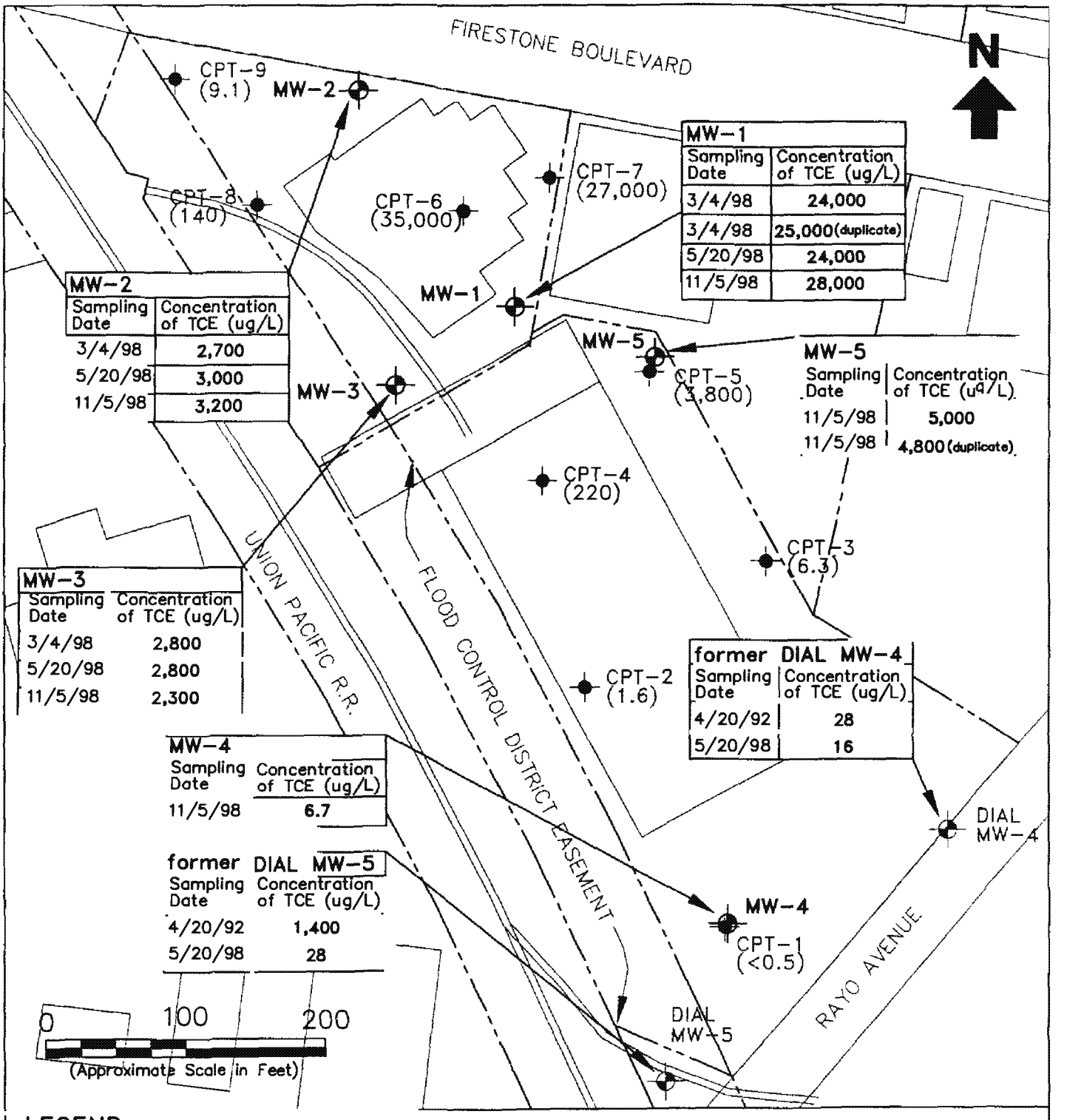
Jervis B. Webb Company
South Gate, California

January 1999
EKI 961025.02

Figure 6

Notes:

1. All locations are approximate.
2. Concentrations shown in units of micrograms per liter.



MW-1 Sampling Date	Concentration of TCE (ug/L)
3/4/98	24,000
3/4/98	25,000 (duplicate)
5/20/98	24,000
11/5/98	28,000

MW-2 Sampling Date	Concentration of TCE (ug/L)
3/4/98	2,700
5/20/98	3,000
11/5/98	3,200

MW-5 Sampling Date	Concentration of TCE (ug/L)
11/5/98	5,000
11/5/98	4,800 (duplicate)

MW-3 Sampling Date	Concentration of TCE (ug/L)
3/4/98	2,800
5/20/98	2,800
11/5/98	2,300

former DIAL MW-4 Sampling Date	Concentration of TCE (ug/L)
4/20/92	28
5/20/98	16

MW-4 Sampling Date	Concentration of TCE (ug/L)
11/5/98	6.7

former DIAL MW-5 Sampling Date	Concentration of TCE (ug/L)
4/20/92	1,400
5/20/98	28

LEGEND

Groundwater Monitoring Well

CPT-4 (220) PIPP Groundwater Sample Location with TCE Concentration from PIPP Sample

Property Line/Boundary

Notes:

1. All locations are approximate.
2. Groundwater sampling at former Dial Corporation wells MW-4 and MW-5 performed by Emcon on 20 April 1992 and Erler & Kalinowski on 20 May 1998.
3. PIPP samples of groundwater collected on 1 and 2 October 1998.
   TCE = trichloroethene ug/L = micrograms per liter

Erler & Kalinowski, Inc.

Concentrations of Trichloroethene Detected in Monitoring Well Groundwater Samples

Jervis B. Webb Company
South Gate, California

January 1999
EKI 961025.02

Figure 7

APPENDIX A

Holguin, Fahan & Associates CPT Test Data and Interpretations

HOLGUIN, FAHAN & ASSOCIATES, INC.
CONE PENETROMETER TESTING AND DIRECT-PUSH SAMPLING GROUP
16570 Aston Street • Irvine, California 92606 • (949) 442-6665 • FAX (949) 724-0446

October 16, 1998

RECEIVED
OCT 19 1998
ERLER & KALINOWSKI, INC.
SANTA MONICA OFFICE

Mr. Rob Hesse
Erler & Kalinowski, Inc.
2951 28th Street
Suite 1020
Santa Monica, CA 90405

PROJECT NAME: CPT and GW Sampling at the Webb Site
PROJECT NO.: 961025.02

Dear Mr. Hesse:

Enclosed please find copies of the cone penetrometer testing (CPT) data for the above referenced project along with a copy of the corresponding invoice.

The cone penetrometer testing conducted for this project consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve.

The cone penetrometer testing described in this report was conducted in general accordance with the current ASTM specifications (ASTM D5778-95 and D3441-94) using an electronic cone penetrometer.

The CPT equipment operated by Holguin, Fahan & Associates, Inc. (HFA) consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to continuously push the cone and rods into the soil at a rate of 20-mm per second (approximately four feet per minute) while the cone tip resistance and sleeve friction resistance are recorded every 50-mm (approximately two inches) and stored in digital form. A specially designed all wheel drive 23-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the test equipment.

The cone penetrometer assembly used for this project consists of a conical tip and a cylindrical friction sleeve. The conical tip has a 60° apex angle and a diameter of 35.6-mm (1.40-inch) resulting in a projected cross-sectional area of 10 cm^2 (1.5 square inches). The cylindrical friction sleeve is 133-mm (5.25-inch) in length and has an outside diameter of 35.8-mm (1.41-inch), resulting in a surface area of 150 cm^2 (23 square inches).

The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals from the strain gauges are transmitted by a shielded cable in the sounding rods to the PC-based data acquisition hardware in the CPT truck. The sounding log is also displayed on a monitor.

The CPT data processing is performed using the truck mounted computer based data acquisition and presentation system. The computer generated graphical logs include cone resistance, friction resistance, friction ratio, and pore pressure ratio versus depth at a user selectable scale.

Soil behavior type interpretations are based on the following reference: Robertson, P.K. and Campanella, R.C., 1989, "Guidelines for Geotechnical Design using the Cone Penetrometer Test and CPT with Pore Pressure Measurement." Soil Mechanics series No. 120, Civil Engineering Department, University of British Columbia, Vancouver, B.C., V6T 1Z4, September 1989.

Interpretations and plotting has been done using HFA's proprietary data interpretation and presentation software. It is important to note that the data is not averaged. All interpretations are point interpretations at the corresponding depth listed.

It is also important to note that the soil behavior type correlations are based on a combination of theory, field research, research performed under laboratory conditions, and literature review. The information presented in the tabulated and/or graphical logs should, therefore, be viewed as a guideline rather than as precise measurements.

Some care is recommended when using the soil behavior type interpretations. If a tabulation depth happens to fall on a soil layer interface, or a seam of soil differing from the rest of the layer, the tabulated data can be misleading. The solution to this problem is the proper use of the graphical CPT logs. The tip and sleeve penetration resistance logs are the primary source of profile description; the soil behavior type logs are supplemental. The graphical logs of tip and sleeve resistance should be examined and layer boundaries delineated in accordance with the project requirements. The soil behavior type interpretations are only representative of the response of the soil to the large shear deformations imposed during cone penetration. This is not necessarily a prediction of grain size distribution. However, it has been found that the interpreted soil behavior types generally agree well with the soil types defined in accordance with the grain size distribution methods such as used in the Unified Soil Classification System.

Limitations

Holguin, Fahan & Associates, Inc. (HFA) presents the attached data in accordance with ASTM Standards D5778-95 and D3441-94 and generally accepted cone penetrometer testing practices and standards. The attached data further relates only to the specific project and location discussed in the data. Judgement may be required to verify the CPT soil behavior interpretations.

The "Client" may distribute this data or excerpts therefrom provided the following statement is prominently displayed and included with the distribution:

"Neither CLIENT nor HFA make any guarantee or warranty, express or implied, regarding this data. THE USE OF THIS INFORMATION SHALL BE AT THE USER'S SOLE RISK REGARDLESS OF ANY FAULT OR NEGLIGENCE OF THE CLIENT OR HFA."

Please feel free to call if you have any questions.

Respectfully submitted,

Girish Agrawal

Girish Agrawal, Ph.D, P.E.
Operations Manager & Geotechnical Services Manager
Holguin, Fahan & Associates, Inc.

\Enclosures

CPT INTERPRETATIONS

SOUNDING : CPT-1
PROJECT : EKI/WEBB
DATE/TIME: 10-01-98 06:49

PROJECT No.: 98-E623
CONE/RIG : 473/R#3 KC/MR

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	.00	.00		0	0			.0
.300	.98	.00	.00		0	0			.0
.450	1.48	56.21	2.99	SANDY SILT to CLAYEY SILT	22	36		3.7	
.600	1.97	46.72	2.03	SANDY SILT to CLAYEY SILT	19	30		3.1	
.750	2.46	33.93	3.27	CLAYEY SILT to SILTY CLAY	17	27		2.3	
.900	2.95	18.21	3.79	CLAY to SILTY CLAY	12	19		1.2	
1.050	3.44	32.87	2.56	SANDY SILT to CLAYEY SILT	13	21		2.2	
1.200	3.94	37.33	3.16	CLAYEY SILT to SILTY CLAY	19	30		2.5	
1.350	4.43	31.31	2.97	CLAYEY SILT to SILTY CLAY	16	25		2.1	
1.500	4.92	27.72	2.67	CLAYEY SILT to SILTY CLAY	14	22		1.8	
1.650	5.41	28.72	2.54	CLAYEY SILT to SILTY CLAY	14	23		1.9	
1.800	5.91	33.21	2.83	CLAYEY SILT to SILTY CLAY	17	27		2.2	
1.950	6.40	39.64	2.52	SANDY SILT to CLAYEY SILT	16	25		2.6	
2.100	6.89	59.55	2.22	SANDY SILT to CLAYEY SILT	24	38		3.9	
2.250	7.38	80.73	2.06	SILTY SAND to SANDY SILT	27	41	70		43.5
2.400	7.87	98.02	1.80	SILTY SAND to SANDY SILT	33	49	76		44.0
2.550	8.37	66.81	2.16	SILTY SAND to SANDY SILT	22	32	65		42.0
2.700	8.86	40.26	2.68	SANDY SILT to CLAYEY SILT	16	23		2.7	
2.850	9.35	50.82	2.54	SANDY SILT to CLAYEY SILT	20	28		3.4	
3.000	9.84	16.19	2.04	CLAYEY SILT to SILTY CLAY	8	11		1.2	
3.150	10.33	17.04	1.94	CLAYEY SILT to SILTY CLAY	9	11		1.3	
3.300	10.83	35.37	2.52	SANDY SILT to CLAYEY SILT	14	18		2.3	
3.450	11.32	59.00	3.15	SANDY SILT to CLAYEY SILT	24	29		3.4	
3.600	11.81	29.68	3.54	CLAYEY SILT to SILTY CLAY	15	18		1.9	
3.750	12.30	101.53	2.35	SILTY SAND to SANDY SILT	34	40	72		42.0
3.900	12.80	102.82	2.77	SANDY SILT to CLAYEY SILT	41	48		6.0	
4.050	13.29	24.28	4.41	CLAY to SILTY CLAY	16	19		1.6	
4.200	13.78	9.54	2.31	CLAY to SILTY CLAY	6	7		.7	
4.350	14.27	24.92	2.77	CLAYEY SILT to SILTY CLAY	12	14		1.6	
4.500	14.76	31.38	3.57	CLAYEY SILT to SILTY CLAY	16	17		2.0	
4.650	15.26	42.53	2.87	SANDY SILT to CLAYEY SILT	17	18		2.8	
4.800	15.75	38.86	3.73	CLAYEY SILT to SILTY CLAY	19	20		2.2	
4.950	16.24	53.39	2.72	SANDY SILT to CLAYEY SILT	21	22		3.5	
5.100	16.73	61.76	3.19	SANDY SILT to CLAYEY SILT	25	25		3.6	
5.250	17.22	28.02	4.68	CLAY	28	28		1.6	
5.400	17.72	83.34	3.02	SANDY SILT to CLAYEY SILT	33	33		4.8	
5.550	18.21	46.16	3.53	CLAYEY SILT to SILTY CLAY	23	23		2.7	
5.700	18.70	16.87	2.55	CLAYEY SILT to SILTY CLAY	8	8		1.1	
5.850	19.19	12.02	4.24	CLAY	12	11		.7	
6.000	19.69	16.72	3.35	CLAY to SILTY CLAY	11	10		1.0	
6.150	20.18	16.17	3.03	CLAYEY SILT to SILTY CLAY	8	8		1.0	

TOP 1.0 ft IS DISTURBED SOIL
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-1

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	11.85	3.04	CLAY to SILTY CLAY	8	7		.7	
6.450	21.16	10.71	2.61	CLAY to SILTY CLAY	7	6		.8	
6.600	21.65	28.40	3.49	CLAYEY SILT to SILTY CLAY	14	13		1.8	
6.750	22.15	21.65	4.80	CLAY	22	19		1.4	
6.900	22.64	13.45	3.20	CLAY to SILTY CLAY	9	8		.8	
7.050	23.13	45.72	3.06	CLAYEY SILT to SILTY CLAY	23	20		3.0	
7.200	23.62	61.57	3.96	CLAYEY SILT to SILTY CLAY	31	26		3.5	
7.350	24.11	102.61	3.00	SANDY SILT to CLAYEY SILT	41	35		6.0	
7.500	24.61	123.07	3.10	SANDY SILT to CLAYEY SILT	49	41		7.2	
7.650	25.10	67.56	3.49	CLAYEY SILT to SILTY CLAY	34	28		3.9	
7.800	25.59	12.26	4.32	CLAY	12	10		.7	
7.950	26.08	12.60	6.03	CLAY	13	10		.7	
8.100	26.57	30.74	4.55	CLAY to SILTY CLAY	20	17		1.7	
8.250	27.07	15.25	2.36	CLAYEY SILT to SILTY CLAY	8	6		1.1	
8.400	27.56	11.88	3.79	CLAY	12	9		.7	
8.550	28.05	13.38	3.36	CLAY to SILTY CLAY	9	7		.8	
8.700	28.54	10.96	3.47	CLAY	11	9		.6	
8.850	29.04	13.28	3.46	CLAY to SILTY CLAY	9	7		.8	
9.000	29.53	15.57	3.08	CLAY to SILTY CLAY	10	8		.9	
9.150	30.02	19.33	3.26	CLAYEY SILT to SILTY CLAY	10	7		1.2	
9.300	30.51	28.09	3.77	CLAY to SILTY CLAY	19	14		1.8	
9.450	31.00	36.24	3.50	CLAYEY SILT to SILTY CLAY	18	14		2.3	
9.600	31.50	78.05	2.59	SANDY SILT to CLAYEY SILT	31	23		5.1	
9.750	31.99	108.45	2.75	SANDY SILT to CLAYEY SILT	43	32		6.3	
9.900	32.48	141.75	2.66	SILTY SAND to SANDY SILT	47	35	68		38.5
10.050	32.97	165.14	2.74	SILTY SAND to SANDY SILT	55	40	72		39.5
10.200	33.46	173.70	2.98	SILTY SAND to SANDY SILT	58	42	73		39.5
10.350	33.96	187.83	2.80	SILTY SAND to SANDY SILT	63	45	75		39.5
10.500	34.45	211.11	2.74	SILTY SAND to SANDY SILT	70	50	79		40.5
10.650	34.94	197.90	2.68	SILTY SAND to SANDY SILT	66	47	77		40.0
10.800	35.43	206.07	2.80	SILTY SAND to SANDY SILT	69	48	77		40.0
10.950	35.93	238.58	3.01	SILTY SAND to SANDY SILT	80	55	81		41.0
11.100	36.42	232.40	3.04	SILTY SAND to SANDY SILT	77	54	81		40.5
11.250	36.91	205.52	2.85	SILTY SAND to SANDY SILT	69	47	77		39.5
11.400	37.40	184.60	2.67	SILTY SAND to SANDY SILT	62	42	74		39.0
11.550	37.89	74.36	4.21	CLAYEY SILT to SILTY CLAY	37	25		4.2	
11.700	38.39	20.37	2.21	CLAYEY SILT to SILTY CLAY	10	7		1.5	
11.850	38.88	40.98	3.54	CLAYEY SILT to SILTY CLAY	20	14		2.6	
12.000	39.37	54.77	3.72	CLAYEY SILT to SILTY CLAY	27	18		3.1	
12.150	39.86	88.65	3.44	SANDY SILT to CLAYEY SILT	35	23		5.1	
12.300	40.35	64.58	3.62	CLAYEY SILT to SILTY CLAY	32	21		3.7	
12.450	40.85	82.41	3.28	SANDY SILT to CLAYEY SILT	33	22		4.7	
12.600	41.34	97.85	2.51	SILTY SAND to SANDY SILT	33	21	54		36.5
12.750	41.83	90.06	3.52	SANDY SILT to CLAYEY SILT	36	23		5.2	
12.900	42.32	30.59	4.32	CLAY to SILTY CLAY	20	13		1.7	
13.050	42.81	37.54	4.21	CLAY to SILTY CLAY	25	16		2.1	
13.200	43.31	62.82	2.80	SANDY SILT to CLAYEY SILT	25	16		4.0	
13.350	43.80	51.20	3.69	CLAYEY SILT to SILTY CLAY	26	16		2.9	
13.500	44.29	99.70	3.04	SANDY SILT to CLAYEY SILT	40	25		5.7	
13.650	44.78	52.05	3.94	CLAYEY SILT to SILTY CLAY	26	16		2.9	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-1

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	119.69	2.97	SANDY SILT to CLAYEY SILT	48	30		6.9	
13.950	45.77	115.49	3.07	SANDY SILT to CLAYEY SILT	46	29		6.6	
14.100	46.26	41.36	5.32	CLAY	41	26		2.3	
14.250	46.75	20.29	3.84	CLAY to SILTY CLAY	14	8		1.2	
14.400	47.24	26.94	4.05	CLAY to SILTY CLAY	18	11		1.6	
14.550	47.74	38.94	4.06	CLAYEY SILT to SILTY CLAY	19	12		2.1	
14.700	48.23	21.18	4.01	CLAY to SILTY CLAY	14	9		1.2	
14.850	48.72	79.73	3.36	SANDY SILT to CLAYEY SILT	32	20		4.5	
15.000	49.21	120.44	3.19	SANDY SILT to CLAYEY SILT	48	30		6.9	
15.150	49.70	68.62	4.72	CLAY to SILTY CLAY	46	28		3.9	
15.300	50.20	27.32	5.42	CLAY	27	17		1.4	
15.450	50.69	66.64	4.49	CLAYEY SILT to SILTY CLAY	33	20		3.7	
15.600	51.18	52.79	3.94	CLAYEY SILT to SILTY CLAY	26	16		2.9	
15.750	51.67	41.47	3.06	CLAYEY SILT to SILTY CLAY	21	13		2.6	
15.900	52.17	58.89	3.33	CLAYEY SILT to SILTY CLAY	29	18		3.3	
16.050	52.66	56.68	3.95	CLAYEY SILT to SILTY CLAY	28	17		3.2	
16.200	53.15	26.36	3.07	CLAYEY SILT to SILTY CLAY	13	8		1.6	
16.350	53.64	28.21	3.44	CLAYEY SILT to SILTY CLAY	14	9		1.7	
16.500	54.13	27.49	3.56	CLAYEY SILT to SILTY CLAY	14	8		1.6	
16.650	54.63	92.12	3.19	SANDY SILT to CLAYEY SILT	37	22		5.2	
16.800	55.12	70.60	3.24	SANDY SILT to CLAYEY SILT	28	17		4.0	
16.950	55.61	29.47	4.78	CLAY	29	18		1.5	
17.100	56.10	72.72	3.81	CLAYEY SILT to SILTY CLAY	36	22		4.1	
17.250	56.59	61.33	3.88	CLAYEY SILT to SILTY CLAY	31	18		3.4	
17.400	57.09	59.08	4.15	CLAYEY SILT to SILTY CLAY	30	18		3.3	
17.550	57.58	82.41	4.00	CLAYEY SILT to SILTY CLAY	41	24		4.7	
17.700	58.07	99.49	3.58	SANDY SILT to CLAYEY SILT	40	23		5.7	
17.850	58.56	44.55	4.04	CLAYEY SILT to SILTY CLAY	22	13		2.4	
18.000	59.06	51.09	2.90	SANDY SILT to CLAYEY SILT	20	12		3.2	
18.150	59.55	39.28	5.02	CLAY	39	23		2.1	
18.300	60.04	99.57	3.32	SANDY SILT to CLAYEY SILT	40	23		5.7	
18.450	60.53	92.95	4.01	CLAYEY SILT to SILTY CLAY	46	27		5.3	
18.600	61.02	72.66	3.99	CLAYEY SILT to SILTY CLAY	36	21		4.1	
18.750	61.52	57.47	3.78	CLAYEY SILT to SILTY CLAY	29	17		3.2	
18.900	62.01	45.17	4.12	CLAYEY SILT to SILTY CLAY	23	13		2.4	
19.050	62.50	128.08	2.98	SANDY SILT to CLAYEY SILT	51	30		7.3	
19.200	62.99	154.02	2.96	SANDY SILT to CLAYEY SILT	62	36		8.8	
19.350	63.48	110.90	4.30	*VERY STIFF FINE GRAINED	100	64			
19.500	63.98	174.06	3.23	SANDY SILT to CLAYEY SILT	70	40		10.0	
19.650	64.47	206.24	2.97	SILTY SAND to SANDY SILT	69	39	72		38.5
19.800	64.96	213.89	2.49	SILTY SAND to SANDY SILT	71	41	73		38.5
19.950	65.45	197.81	2.65	SILTY SAND to SANDY SILT	66	38	70		38.0
20.100	65.94	178.61	3.08	SANDY SILT to CLAYEY SILT	71	41		10.3	
20.250	66.44	220.44	2.38	SILTY SAND to SANDY SILT	73	42	73		38.5
20.400	66.93	247.91	2.43	SILTY SAND to SANDY SILT	83	47	77		39.0
20.550	67.42	187.12	2.28	SILTY SAND to SANDY SILT	62	35	69		38.0
20.700	67.91	146.38	2.02	SILTY SAND to SANDY SILT	49	28	62		37.0
20.850	68.41	172.70	1.94	SILTY SAND to SANDY SILT	58	32	66		38.0
21.000	68.90	258.61	1.72	SAND to SILTY SAND	65	36	78		39.0
21.150	69.39	172.10	1.63	SAND to SILTY SAND	43	24	66		38.0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

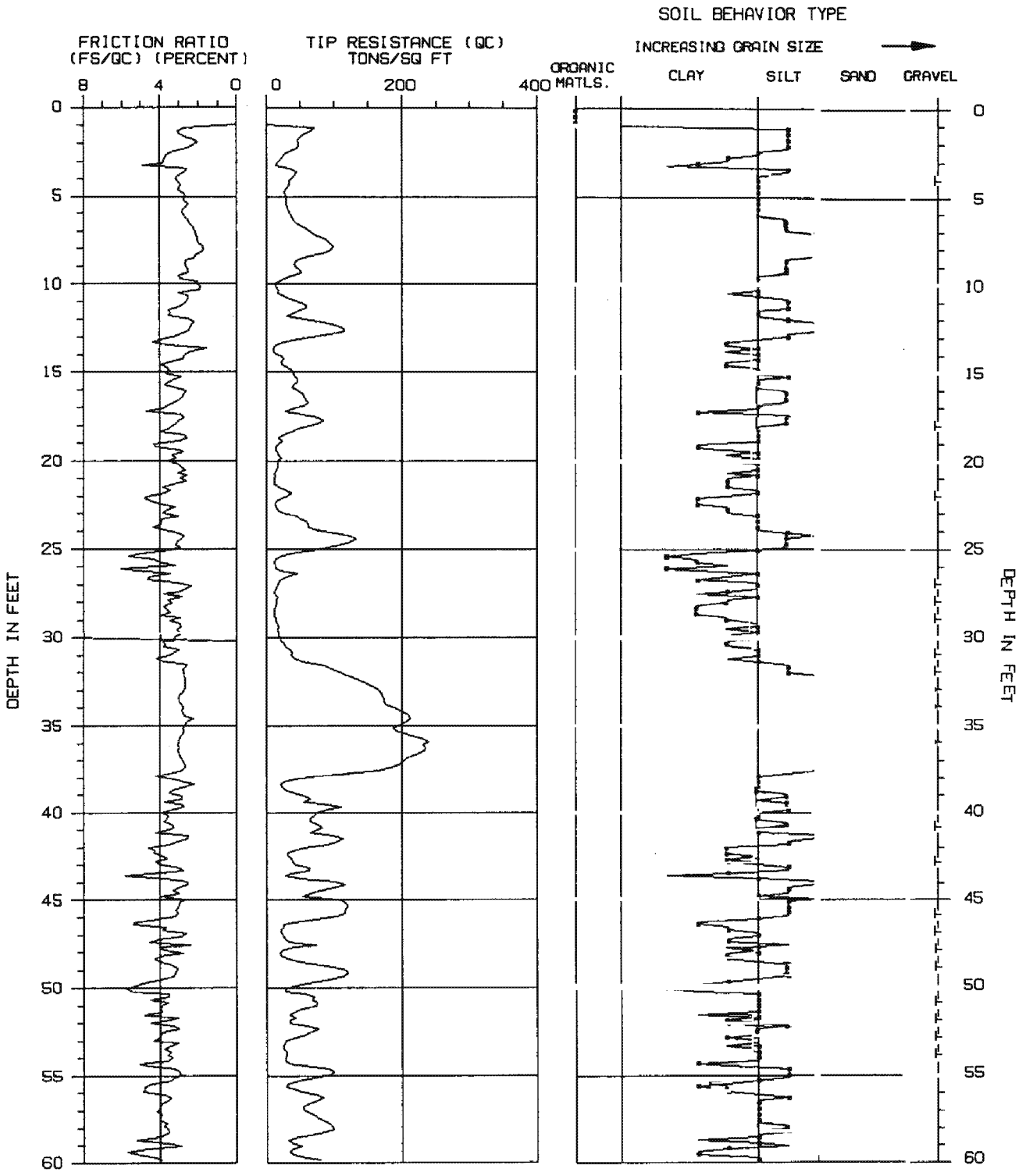
SOUNDING : CPT-1

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
21.300	69.88	45.6	3.97	-.13	CLAYEY SILT to SILTY CLAY	23
21.450	70.37	33.0	3.79	-.14	CLAYEY SILT to SILTY CLAY	17
21.600	70.87	47.5	5.26	-.13	CLAY	48
21.750	71.36	135.0	3.19	-.14	SANDY SILT to CLAYEY SILT	54
21.900	71.85	76.0	4.34	-.15	CLAYEY SILT to SILTY CLAY	38
22.050	72.34	106.8	3.53	-.15	SANDY SILT to CLAYEY SILT	43
22.200	72.83	164.8	3.35	-.14	SANDY SILT to CLAYEY SILT	66
22.350	73.33	155.0	3.86	-.15	*SAND to CLAYEY SAND	78
22.500	73.82	166.9	3.73	-.15	*SAND to CLAYEY SAND	83
22.650	74.31	157.9	3.54	-.14	SANDY SILT to CLAYEY SILT	63
22.800	74.80	144.8	3.72	-.14	SANDY SILT to CLAYEY SILT	58
22.950	75.30	50.2	5.73	-.14	CLAY	50
23.100	75.79	28.5	3.26	-.15	CLAYEY SILT to SILTY CLAY	14
23.250	76.28	32.9	3.49	-.15	CLAYEY SILT to SILTY CLAY	16
23.400	76.77	35.5	3.66	-.15	CLAYEY SILT to SILTY CLAY	18
23.550	77.26	36.0	3.52	-.15	CLAYEY SILT to SILTY CLAY	18
23.700	77.76	57.6	3.80	-.15	CLAYEY SILT to SILTY CLAY	29
23.850	78.25	82.3	3.96	-.15	CLAYEY SILT to SILTY CLAY	41
24.000	78.74	99.0	4.07	-.15	CLAYEY SILT to SILTY CLAY	49
24.150	79.23	111.9	1.77	-.15	SILTY SAND to SANDY SILT	37
24.300	79.72	37.0	4.60	-.15	CLAY to SILTY CLAY	25
24.450	80.22	48.0	4.64	-.15	CLAY to SILTY CLAY	32
24.600	80.71	230.4	2.80	-.15	SILTY SAND to SANDY SILT	77
24.750	81.20	101.6	4.90	-.15	*VERY STIFF FINE GRAINED	100
24.900	81.69	32.4	6.91	-.14	CLAY	32
25.050	82.19	164.6	3.47	-.14	SANDY SILT to CLAYEY SILT	66
25.200	82.68	61.7	6.28	-.14	CLAY	62
25.350	83.17	29.3	4.23	-.15	CLAY to SILTY CLAY	20
25.500	83.66	31.0	3.38	-.15	CLAYEY SILT to SILTY CLAY	16
25.650	84.15	27.4	4.16	-.14	CLAY to SILTY CLAY	18
25.800	84.65	24.6	3.73	-.13	CLAY to SILTY CLAY	16
25.950	85.14	26.9	5.06	-.13	CLAY	27
26.100	85.63	107.4	3.79	-.13	CLAYEY SILT to SILTY CLAY	54
26.250	86.12	169.6	3.96	-.13	*SAND to CLAYEY SAND	85
26.400	86.61	188.1	4.02	-.12	*SAND to CLAYEY SAND	94
26.550	87.11	186.5	3.92	-.12	*SAND to CLAYEY SAND	93
26.700	87.60	128.2	4.34	-.12	*VERY STIFF FINE GRAINED	100
26.850	88.09	158.8	3.53	-.12	SANDY SILT to CLAYEY SILT	64
27.000	88.58	133.0	4.15	-.12	*VERY STIFF FINE GRAINED	100
27.150	89.07	70.4	4.53	-.12	CLAY to SILTY CLAY	47
27.300	89.57	184.1	3.51	-.12	*SAND to CLAYEY SAND	92
27.450	90.06	185.8	3.91	-.12	*SAND to CLAYEY SAND	93

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 115 PCF

ASSUMED DEPTH OF WATER TABLE = 43.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-1 (1 OF 2

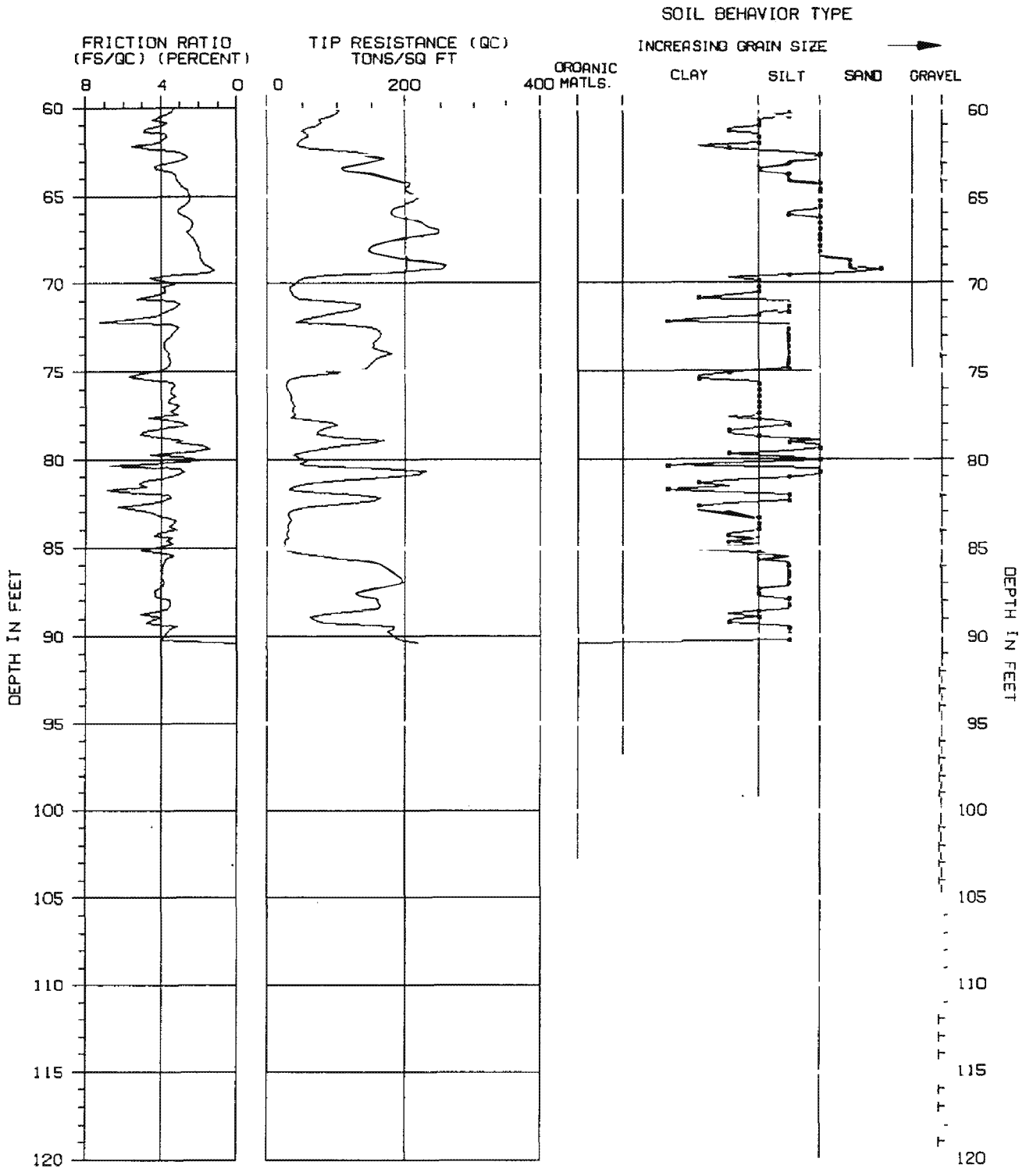
PROJECT NAME : EKI/WEBB

PROJECT NUMBER : 98-E623

CONE/RIG : 473/R#3 KC/MR

DATE/TIME: 10-01-98 06:49

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 115 PCF

ASSUMED DEPTH OF WATER TABLE = 43.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-1 (2 OF 2

PROJECT NAME : EKI/WEBB

PROJECT NUMBER : 98-E623

CONE/RIG : 473/R#3 KC/MR

DATE/TIME: 10-01-98 06:49

HFA

CONE PENETRATION TEST

SOUNDING : CPT-2
PROJECT : EKI/WEBB
DATE/TIME: 10-01-98 14:18

PROJECT No.: 98-E623
CONE/RIG : 473/R#3 KC/MR

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
.150	.49	.0	.00	.00		0
.300	.98	.0	.00	.00		0
.450	1.48	96.5	1.85	6.44	SILTY SAND to SANDY SILT	32
.600	1.97	40.1	2.22	.05	SANDY SILT to CLAYEY SILT	16
.750	2.46	115.7	1.04	.52	SAND to SILTY SAND	29
.900	2.95	93.3	.98	.53	SAND to SILTY SAND	23
1.050	3.44	112.8	.74	.58	SAND to SILTY SAND	28
1.200	3.94	86.0	.62	.55	SAND to SILTY SAND	22
1.350	4.43	25.8	1.63	.24	SANDY SILT to CLAYEY SILT	10
1.500	4.92	23.9	1.55	.13	SANDY SILT to CLAYEY SILT	10
1.650	5.41	28.0	1.28	.01	SANDY SILT to CLAYEY SILT	11
1.800	5.91	26.9	1.45	.00	SANDY SILT to CLAYEY SILT	11
1.950	6.40	25.9	1.70	-.01	SANDY SILT to CLAYEY SILT	10
2.100	6.89	29.9	1.74	.06	SANDY SILT to CLAYEY SILT	12
2.250	7.38	27.6	2.72	.12	CLAYEY SILT to SILTY CLAY	14
2.400	7.87	30.3	1.88	.21	SANDY SILT to CLAYEY SILT	12
2.550	8.37	50.3	1.21	.25	SILTY SAND to SANDY SILT	17
2.700	8.86	48.7	1.42	.21	SILTY SAND to SANDY SILT	16
2.850	9.35	47.6	1.77	.12	SILTY SAND to SANDY SILT	16
3.000	9.84	59.0	1.10	.22	SILTY SAND to SANDY SILT	20
3.150	10.33	61.8	1.23	.32	SILTY SAND to SANDY SILT	21
3.300	10.83	27.9	1.72	.29	SANDY SILT to CLAYEY SILT	11
3.450	11.32	13.9	1.87	.29	CLAYEY SILT to SILTY CLAY	7
3.600	11.81	37.5	1.68	.41	SANDY SILT to CLAYEY SILT	15
3.750	12.30	63.8	.97	.56	SILTY SAND to SANDY SILT	21
3.900	12.80	60.5	1.32	.61	SILTY SAND to SANDY SILT	20
4.050	13.29	51.7	1.55	.60	SILTY SAND to SANDY SILT	17
4.200	13.78	92.2	1.41	.79	SILTY SAND to SANDY SILT	31
4.350	14.27	115.3	.75	1.11	SAND to SILTY SAND	29
4.500	14.76	30.0	2.53	.60	SANDY SILT to CLAYEY SILT	12
4.650	15.26	7.5	2.00	1.28	CLAY to SILTY CLAY	5
4.800	15.75	14.2	2.39	1.76	CLAYEY SILT to SILTY CLAY	7
4.950	16.24	16.1	1.62	3.95	SANDY SILT to CLAYEY SILT	6
5.100	16.73	18.4	1.52	4.34	SANDY SILT to CLAYEY SILT	7
5.250	17.22	14.3	1.82	4.92	CLAYEY SILT to SILTY CLAY	7
5.400	17.72	14.6	1.71	5.22	CLAYEY SILT to SILTY CLAY	7
5.550	18.21	30.9	1.43	7.94	SANDY SILT to CLAYEY SILT	12
5.700	18.70	17.1	2.52	2.35	CLAYEY SILT to SILTY CLAY	9
5.850	19.19	26.8	2.20	2.93	SANDY SILT to CLAYEY SILT	11
6.000	19.69	24.9	2.17	3.49	SANDY SILT to CLAYEY SILT	10
6.150	20.18	31.8	2.29	4.39	SANDY SILT to CLAYEY SILT	13

TOP 1.0 ft IS DISTURBED SOIL
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

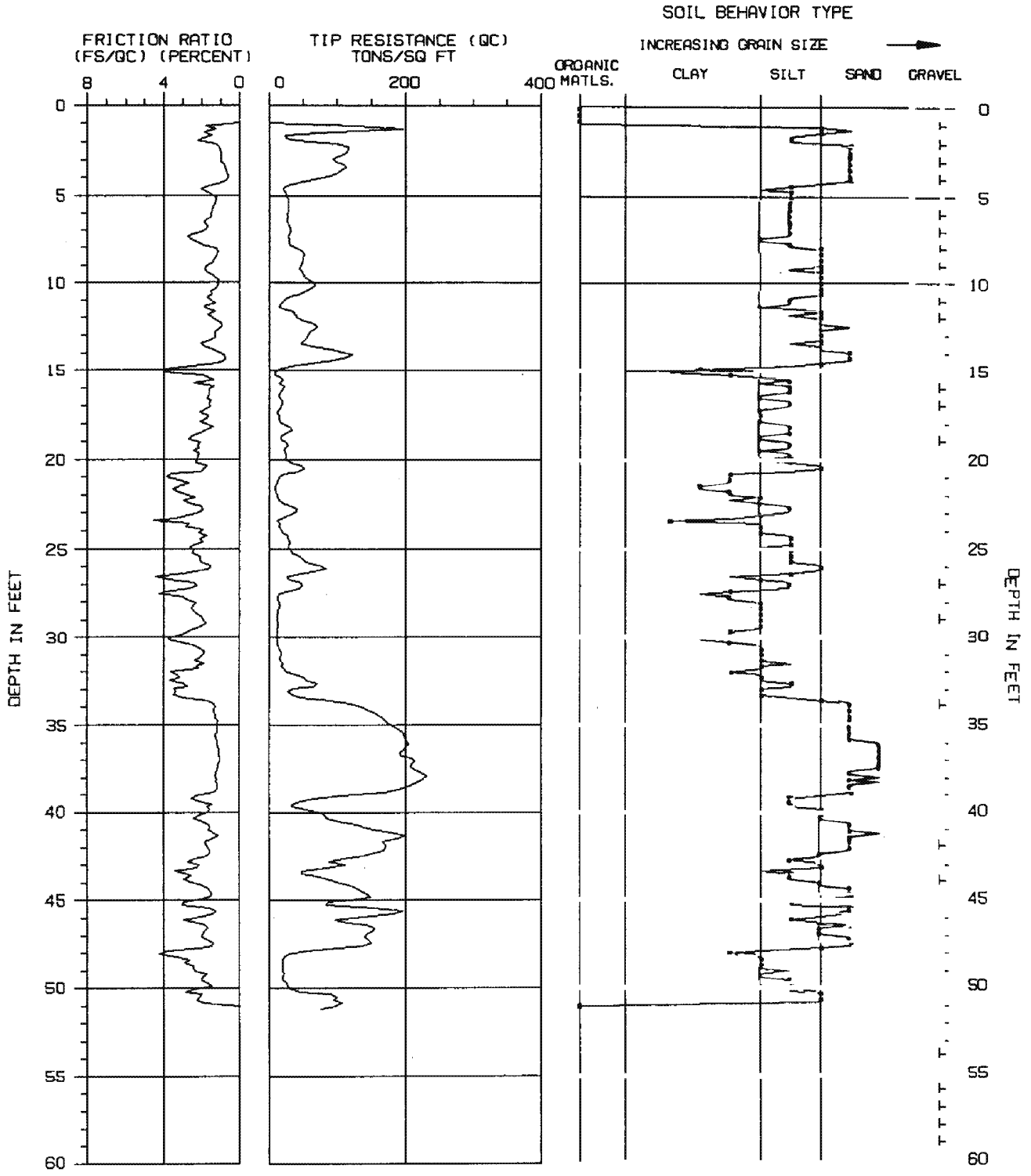
SOUNDING : CPT-2

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
6.300	20.67	42.3	2.04	3.12	SANDY SILT to CLAYEY SILT	17
6.450	21.16	12.1	3.23	2.24	CLAY to SILTY CLAY	8
6.600	21.65	8.8	3.51	2.39	CLAY	9
6.750	22.15	12.2	2.37	3.05	CLAYEY SILT to SILTY CLAY	6
6.900	22.64	32.0	2.03	4.56	SANDY SILT to CLAYEY SILT	13
7.050	23.13	27.2	2.72	4.29	CLAYEY SILT to SILTY CLAY	14
7.200	23.62	15.3	2.68	3.75	CLAYEY SILT to SILTY CLAY	8
7.350	24.11	19.4	2.17	5.21	CLAYEY SILT to SILTY CLAY	10
7.500	24.61	29.9	1.94	6.09	SANDY SILT to CLAYEY SILT	12
7.650	25.10	31.6	2.43	4.35	SANDY SILT to CLAYEY SILT	13
7.800	25.59	49.3	2.09	4.43	SANDY SILT to CLAYEY SILT	20
7.950	26.08	82.9	1.56	5.79	SILTY SAND to SANDY SILT	28
8.100	26.57	26.2	4.46	2.18	CLAY to SILTY CLAY	17
8.250	27.07	48.7	2.24	3.69	SANDY SILT to CLAYEY SILT	19
8.400	27.56	14.6	4.24	1.88	CLAY	15
8.550	28.05	14.3	2.30	1.77	CLAYEY SILT to SILTY CLAY	7
8.700	28.54	12.0	2.34	1.92	CLAYEY SILT to SILTY CLAY	6
8.850	29.04	10.7	1.96	2.41	CLAYEY SILT to SILTY CLAY	5
9.000	29.53	11.5	2.43	3.09	CLAYEY SILT to SILTY CLAY	6
9.150	30.02	11.0	3.72	3.78	CLAY	11
9.300	30.51	12.6	2.38	4.73	CLAYEY SILT to SILTY CLAY	6
9.450	31.00	16.9	1.96	7.16	CLAYEY SILT to SILTY CLAY	8
9.600	31.50	19.6	1.89	8.16	SANDY SILT to CLAYEY SILT	8
9.750	31.99	24.7	3.65	6.31	CLAY to SILTY CLAY	16
9.900	32.48	53.5	3.68	12.44	CLAYEY SILT to SILTY CLAY	27
10.050	32.97	36.7	3.46	7.05	CLAYEY SILT to SILTY CLAY	18
10.200	33.46	45.9	2.98	12.85	SANDY SILT to CLAYEY SILT	18
10.350	33.96	133.2	1.28	8.15	SAND to SILTY SAND	33
10.500	34.45	158.8	1.30	3.77	SAND to SILTY SAND	40
10.650	34.94	174.6	1.19	2.80	SAND to SILTY SAND	44
10.800	35.43	196.6	1.21	1.51	SAND to SILTY SAND	49
10.950	35.93	202.3	1.21	1.73	SAND to SILTY SAND	51
11.100	36.42	197.0	1.08	1.79	SAND	39
11.250	36.91	208.5	1.05	1.27	SAND	42
11.400	37.40	207.5	1.16	1.25	SAND	41
11.550	37.89	231.6	1.30	1.23	SAND to SILTY SAND	58
11.700	38.39	210.7	1.20	.79	SAND	42
11.850	38.88	168.8	1.38	.70	SAND to SILTY SAND	42
12.000	39.37	44.5	2.09	.25	SANDY SILT to CLAYEY SILT	18
12.150	39.86	54.3	1.55	.21	SILTY SAND to SANDY SILT	18
12.300	40.35	84.6	2.42	.91	SILTY SAND to SANDY SILT	28
12.450	40.85	139.6	1.58	3.65	SAND to SILTY SAND	35
12.600	41.34	199.9	1.14	8.86	SAND	40
12.750	41.83	170.2	1.80	4.37	SAND to SILTY SAND	43
12.900	42.32	154.3	1.59	4.74	SAND to SILTY SAND	39
13.050	42.81	87.4	2.76	2.73	SANDY SILT to CLAYEY SILT	35
13.200	43.31	48.0	3.42	3.31	CLAYEY SILT to SILTY CLAY	24
13.350	43.80	84.9	2.97	6.33	SANDY SILT to CLAYEY SILT	34
13.500	44.29	127.9	1.67	13.61	SILTY SAND to SANDY SILT	43
13.650	44.78	149.1	1.54	17.76	SAND to SILTY SAND	37

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 115 PCF

ASSUMED DEPTH OF WATER TABLE = 43.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-2

PROJECT NAME : EKI/WEBB

PROJECT NUMBER : 98-E623

CONE/RIG : 473/R#3 KC/MR

DATE/TIME: 10-01-98 14:18

HFA

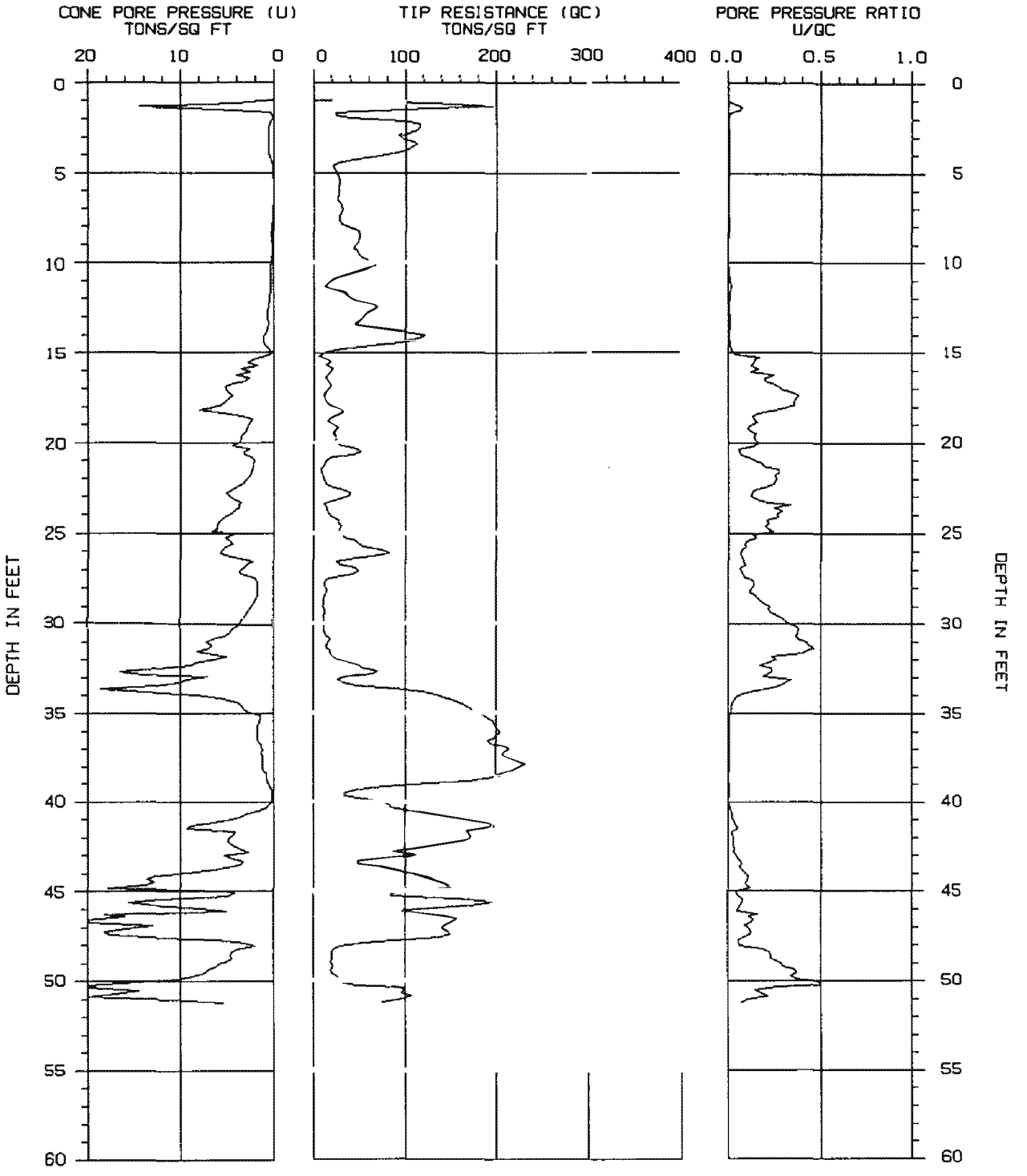
SOUNDING : CPT-2

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
13.800	45.28	84.2	3.07	4.91	SANDY SILT to CLAYEY SILT	34
13.950	45.77	182.6	1.39	13.01	SAND to SILTY SAND	46
14.100	46.26	116.2	2.21	18.13	SILTY SAND to SANDY SILT	39
14.250	46.75	152.5	1.81	19.81	SILTY SAND to SANDY SILT	51
14.400	47.24	146.2	1.69	18.16	SAND to SILTY SAND	37
14.550	47.74	103.0	2.10	6.14	SILTY SAND to SANDY SILT	34
14.700	48.23	21.1	3.36	3.95	CLAYEY SILT to SILTY CLAY	11
14.850	48.72	19.9	2.41	4.54	CLAYEY SILT to SILTY CLAY	10
15.000	49.21	21.1	1.71	6.22	SANDY SILT to CLAYEY SILT	8
15.150	49.70	25.5	1.68	8.63	SANDY SILT to CLAYEY SILT	10
15.300	50.20	45.4	2.86	22.63	SANDY SILT to CLAYEY SILT	18
15.450	50.69	95.6	2.24	16.93	SILTY SAND to SANDY SILT	32

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-2

PROJECT NAME : EKI/WEBB

PROJECT NUMBER : 98-E623

CONE/RIG : 473/R#3 KC/MR

DATE/TIME: 10-01-98 14:18

HFA

SOUNDING : CPT-3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
6.300	20.67	71.6	2.46	.35	SANDY SILT to CLAYEY SILT	29
6.450	21.16	51.3	3.59	.35	CLAYEY SILT to SILTY CLAY	26
6.600	21.65	44.3	3.41	.31	CLAYEY SILT to SILTY CLAY	22
6.750	22.15	63.1	2.58	.33	SANDY SILT to CLAYEY SILT	25
6.900	22.64	82.1	2.56	.36	SANDY SILT to CLAYEY SILT	33
7.050	23.13	140.8	2.07	.41	SILTY SAND to SANDY SILT	47
7.200	23.62	181.5	1.76	.47	SAND to SILTY SAND	45
7.350	24.11	127.7	2.04	.47	SILTY SAND to SANDY SILT	43
7.500	24.61	52.6	2.91	.41	SANDY SILT to CLAYEY SILT	21
7.650	25.10	20.0	4.05	.30	CLAY to SILTY CLAY	13
7.800	25.59	25.5	3.13	.28	CLAYEY SILT to SILTY CLAY	13
7.950	26.08	16.2	2.28	.27	CLAYEY SILT to SILTY CLAY	8
8.100	26.57	15.7	4.26	.25	CLAY	16
8.250	27.07	20.2	3.87	.26	CLAY to SILTY CLAY	13
8.400	27.56	13.7	4.10	.26	CLAY	14
8.550	28.05	27.1	2.91	.34	CLAYEY SILT to SILTY CLAY	14
8.700	28.54	40.3	2.18	.43	SANDY SILT to CLAYEY SILT	16
8.850	29.04	45.5	2.38	.54	SANDY SILT to CLAYEY SILT	18
9.000	29.53	81.3	2.07	.69	SILTY SAND to SANDY SILT	27
9.150	30.02	84.3	2.49	.81	SANDY SILT to CLAYEY SILT	34
9.300	30.51	60.2	2.92	.85	SANDY SILT to CLAYEY SILT	24
9.450	31.00	38.3	4.31	.80	CLAY to SILTY CLAY	26
9.600	31.50	142.1	1.64	.98	SAND to SILTY SAND	36
9.750	31.99	161.5	1.62	.98	SAND to SILTY SAND	40
9.900	32.48	174.2	1.57	.96	SAND to SILTY SAND	44
10.050	32.97	171.2	1.85	.93	SAND to SILTY SAND	43
10.200	33.46	218.4	1.56	.92	SAND to SILTY SAND	55
10.350	33.96	217.7	1.46	.90	SAND to SILTY SAND	54
10.500	34.45	178.7	1.67	.81	SAND to SILTY SAND	45
10.650	34.94	208.6	1.27	.81	SAND to SILTY SAND	52
10.800	35.43	147.6	1.51	.81	SAND to SILTY SAND	37
10.950	35.93	33.0	2.82	.78	CLAYEY SILT to SILTY CLAY	16
11.100	36.42	51.1	2.48	.77	SANDY SILT to CLAYEY SILT	20
11.250	36.91	76.7	2.24	.77	SILTY SAND to SANDY SILT	26
11.400	37.40	96.8	2.06	.98	SILTY SAND to SANDY SILT	32
11.550	37.89	184.7	1.38	1.18	SAND to SILTY SAND	46
11.700	38.39	117.8	1.94	1.17	SILTY SAND to SANDY SILT	39
11.850	38.88	104.4	2.03	1.23	SILTY SAND to SANDY SILT	35
12.000	39.37	80.5	2.45	1.27	SANDY SILT to CLAYEY SILT	32
12.150	39.86	104.7	1.55	1.43	SILTY SAND to SANDY SILT	35
12.300	40.35	60.6	2.67	1.43	SANDY SILT to CLAYEY SILT	24
12.450	40.85	38.6	4.04	1.76	CLAYEY SILT to SILTY CLAY	19
12.600	41.34	50.8	3.31	2.12	CLAYEY SILT to SILTY CLAY	25
12.750	41.83	29.4	5.38	2.25	CLAY	29
12.900	42.32	146.5	1.64	2.99	SAND to SILTY SAND	37
13.050	42.81	141.1	1.28	3.25	SAND to SILTY SAND	35
13.200	43.31	107.9	2.17	3.58	SILTY SAND to SANDY SILT	36
13.350	43.80	139.4	1.54	3.94	SAND to SILTY SAND	35
13.500	44.29	144.0	1.52	3.67	SAND to SILTY SAND	36
13.650	44.78	25.0	4.88	3.11	CLAY	25

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

CONE PENETRATION TEST

SOUNDING : CPT-3
PROJECT : EKI/WEBB
DATE/TIME: 10-01-98 10:56

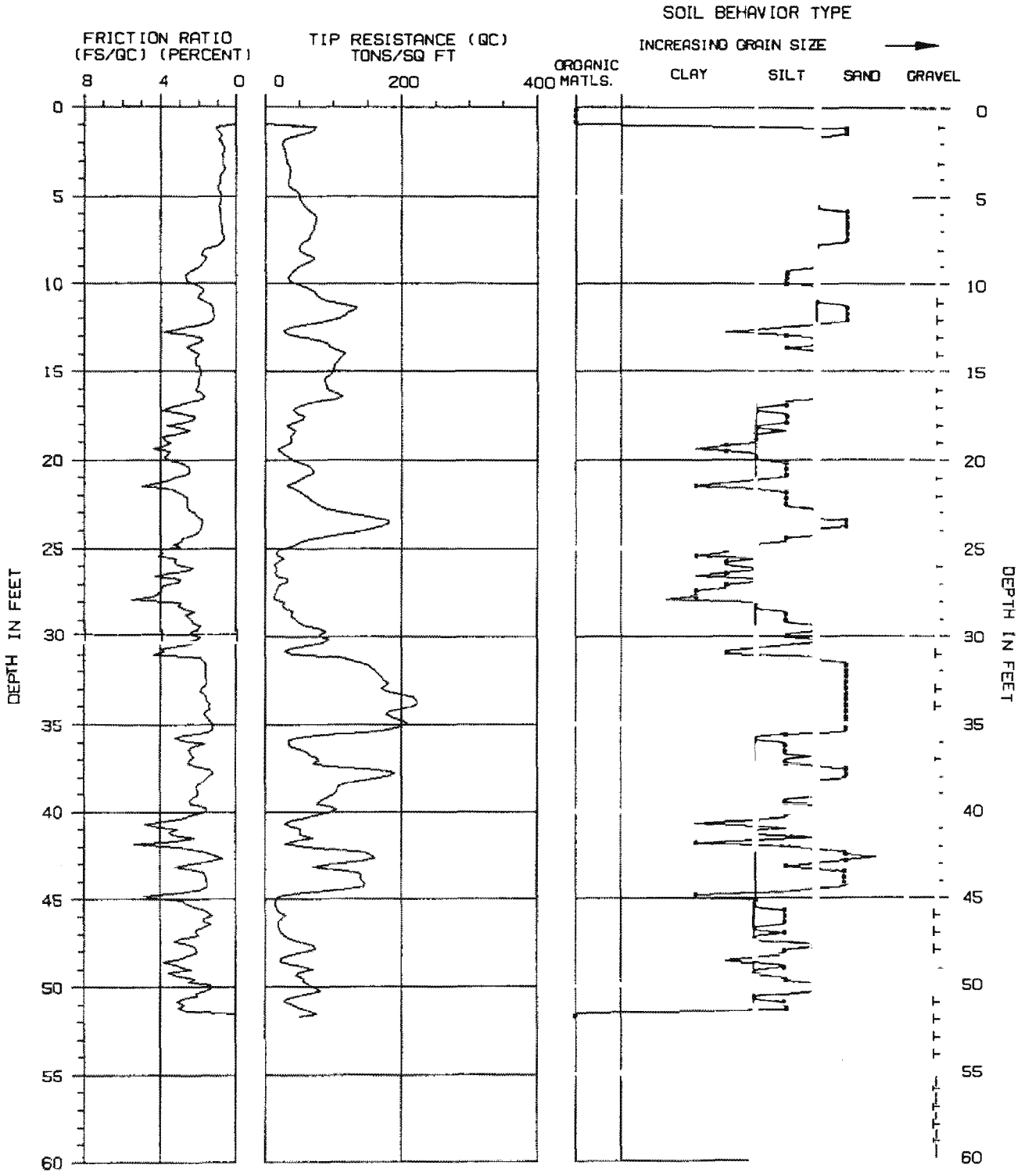
PROJECT No.: 98-E623
CONE/RIG : 473/R#3 KC/MR

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
.150	.49	.0	.00	.00		0
.300	.98	.0	.00	.00		0
.450	1.48	61.3	.82	.20	SAND to SILTY SAND	15
.600	1.97	25.8	.77	.13	SILTY SAND to SANDY SILT	9
.750	2.46	28.0	.68	.13	SILTY SAND to SANDY SILT	9
.900	2.95	30.1	.70	.12	SILTY SAND to SANDY SILT	10
1.050	3.44	34.8	.63	.12	SILTY SAND to SANDY SILT	12
1.200	3.94	34.1	.85	.11	SILTY SAND to SANDY SILT	11
1.350	4.43	33.9	.97	.11	SILTY SAND to SANDY SILT	11
1.500	4.92	49.1	.84	.11	SILTY SAND to SANDY SILT	16
1.650	5.41	53.6	.86	.07	SILTY SAND to SANDY SILT	18
1.800	5.91	66.9	.87	.07	SAND to SILTY SAND	17
1.950	6.40	74.9	.80	.08	SAND to SILTY SAND	19
2.100	6.89	71.4	.77	.08	SAND to SILTY SAND	18
2.250	7.38	65.4	.64	.08	SAND to SILTY SAND	16
2.400	7.87	50.6	.99	.07	SILTY SAND to SANDY SILT	17
2.550	8.37	62.1	1.80	.14	SILTY SAND to SANDY SILT	21
2.700	8.86	59.7	1.79	.23	SILTY SAND to SANDY SILT	20
2.850	9.35	39.1	2.48	.23	SANDY SILT to CLAYEY SILT	16
3.000	9.84	35.0	2.63	.25	SANDY SILT to CLAYEY SILT	14
3.150	10.33	65.5	1.80	.31	SILTY SAND to SANDY SILT	22
3.300	10.83	81.2	2.03	.35	SILTY SAND to SANDY SILT	27
3.450	11.32	134.1	1.22	.42	SAND to SILTY SAND	34
3.600	11.81	116.9	1.20	.40	SAND to SILTY SAND	29
3.750	12.30	62.5	1.70	.39	SILTY SAND to SANDY SILT	21
3.900	12.80	25.3	3.87	.33	CLAY to SILTY CLAY	17
4.050	13.29	82.8	1.75	.34	SILTY SAND to SANDY SILT	28
4.200	13.78	105.6	2.35	.34	SILTY SAND to SANDY SILT	35
4.350	14.27	110.0	2.13	.34	SILTY SAND to SANDY SILT	37
4.500	14.76	101.1	1.94	.36	SILTY SAND to SANDY SILT	34
4.650	15.26	93.8	1.89	.38	SILTY SAND to SANDY SILT	31
4.800	15.75	89.1	2.01	.39	SILTY SAND to SANDY SILT	30
4.950	16.24	103.5	1.83	.40	SILTY SAND to SANDY SILT	34
5.100	16.73	74.8	2.37	.39	SANDY SILT to CLAYEY SILT	30
5.250	17.22	40.8	3.90	.36	CLAYEY SILT to SILTY CLAY	20
5.400	17.72	55.3	2.26	.35	SANDY SILT to CLAYEY SILT	22
5.550	18.21	33.9	3.07	.33	CLAYEY SILT to SILTY CLAY	17
5.700	18.70	35.6	3.93	.27	CLAYEY SILT to SILTY CLAY	18
5.850	19.19	28.4	3.87	.27	CLAY to SILTY CLAY	19
6.000	19.69	26.6	3.58	.26	CLAYEY SILT to SILTY CLAY	13
6.150	20.18	50.3	2.90	.28	SANDY SILT to CLAYEY SILT	20

TOP 1.0 ft IS DISTURBED SOIL
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 115 PCF

ASSUMED DEPTH OF WATER TABLE = 43.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-3

PROJECT NAME : EKI/WEBB

CONE/RIG : 473/R#3 KC/MR

PROJECT NUMBER : 98-E623

DATE/TIME: 10-01-98 10:56

HFA

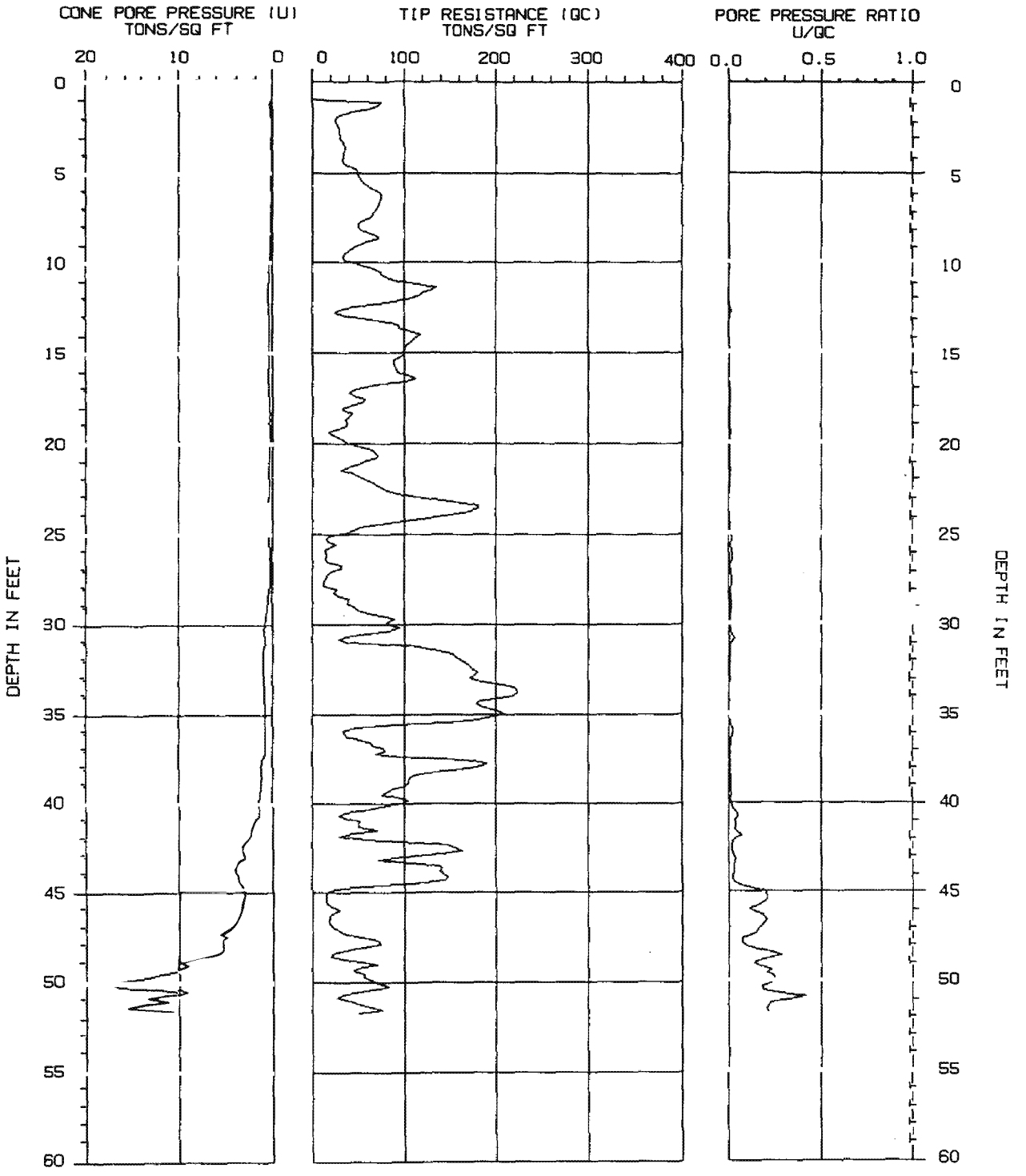
SOUNDING : CPT-3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
13.800	45.28	14.8	2.64	3.04	CLAYEY SILT to SILTY CLAY	7
13.950	45.77	19.9	1.46	3.18	SANDY SILT to CLAYEY SILT	8
14.100	46.26	19.0	1.74	3.47	SANDY SILT to CLAYEY SILT	8
14.250	46.75	19.4	2.11	3.85	CLAYEY SILT to SILTY CLAY	10
14.400	47.24	32.8	2.93	4.89	CLAYEY SILT to SILTY CLAY	16
14.550	47.74	72.2	2.18	5.31	SILTY SAND to SANDY SILT	24
14.700	48.23	34.3	2.53	5.22	SANDY SILT to CLAYEY SILT	14
14.850	48.72	35.9	3.21	7.91	CLAYEY SILT to SILTY CLAY	18
15.000	49.21	49.9	3.61	8.96	CLAYEY SILT to SILTY CLAY	25
15.150	49.70	55.7	2.51	13.45	SANDY SILT to CLAYEY SILT	22
15.300	50.20	82.3	1.55	16.44	SILTY SAND to SANDY SILT	27
15.450	50.69	32.1	2.83	9.09	CLAYEY SILT to SILTY CLAY	16
15.600	51.18	48.8	3.05	11.12	SANDY SILT to CLAYEY SILT	20

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST	SOUNDING NUMBER: CPT-3
PROJECT NAME : EKI/WEBB	CONE/RIG : 473/R#3 KC/MR
PROJECT NUMBER : 98-E623	DATE/TIME: 10-01-98 10:56

CONE PENETRATION TEST

SOUNDING : CPT-4
PROJECT : EKI/WEBB
DATE/TIME: 10-01-98 16:57

PROJECT No.: 98-E623
CONE/RIG : 473/R#3 KC/MR

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
.150	.49	.0	.00	.00		0
.300	.98	.0	.00	.00		0
.450	1.48	81.4	1.35	.02	SILTY SAND to SANDY SILT	27
.600	1.97	117.3	1.45	.03	SAND to SILTY SAND	29
.750	2.46	100.5	1.72	.03	SILTY SAND to SANDY SILT	34
.900	2.95	109.8	1.09	.03	SAND to SILTY SAND	27
1.050	3.44	84.0	.79	.03	SAND to SILTY SAND	21
1.200	3.94	27.9	1.83	.02	SANDY SILT to CLAYEY SILT	11
1.350	4.43	22.8	1.71	.01	SANDY SILT to CLAYEY SILT	9
1.500	4.92	24.7	1.58	.01	SANDY SILT to CLAYEY SILT	10
1.650	5.41	26.7	1.50	-.00	SANDY SILT to CLAYEY SILT	11
1.800	5.91	33.3	1.74	-.03	SANDY SILT to CLAYEY SILT	13
1.950	6.40	33.7	2.08	-.02	SANDY SILT to CLAYEY SILT	13
2.100	6.89	37.3	1.63	-.01	SANDY SILT to CLAYEY SILT	15
2.250	7.38	44.2	1.16	-.01	SILTY SAND to SANDY SILT	15
2.400	7.87	38.1	1.23	-.01	SILTY SAND to SANDY SILT	13
2.550	8.37	44.2	1.00	-.01	SILTY SAND to SANDY SILT	15
2.700	8.86	40.0	1.60	-.02	SILTY SAND to SANDY SILT	13
2.850	9.35	21.4	2.24	-.03	CLAYEY SILT to SILTY CLAY	11
3.000	9.84	24.8	1.98	-.03	SANDY SILT to CLAYEY SILT	10
3.150	10.33	8.5	1.29	-.03	CLAYEY SILT to SILTY CLAY	4
3.300	10.83	20.5	1.47	-.01	SANDY SILT to CLAYEY SILT	8
3.450	11.32	36.9	1.76	.02	SANDY SILT to CLAYEY SILT	15
3.600	11.81	66.3	1.09	.04	SILTY SAND to SANDY SILT	22
3.750	12.30	62.8	1.56	.05	SILTY SAND to SANDY SILT	21
3.900	12.80	45.3	1.70	.05	SILTY SAND to SANDY SILT	15
4.050	13.29	37.4	2.00	.06	SANDY SILT to CLAYEY SILT	15
4.200	13.78	103.7	.48	.09	SAND to SILTY SAND	26
4.350	14.27	72.1	1.14	.09	SILTY SAND to SANDY SILT	24
4.500	14.76	8.6	4.07	.07	CLAY	9
4.650	15.26	19.7	1.17	.08	SANDY SILT to CLAYEY SILT	8
4.800	15.75	20.0	1.15	.09	SANDY SILT to CLAYEY SILT	8
4.950	16.24	18.7	1.92	.11	CLAYEY SILT to SILTY CLAY	9
5.100	16.73	14.4	1.73	.12	CLAYEY SILT to SILTY CLAY	7
5.250	17.22	22.1	1.13	.14	SANDY SILT to CLAYEY SILT	9
5.400	17.72	13.9	1.43	.14	CLAYEY SILT to SILTY CLAY	7
5.550	18.21	9.2	2.61	.15	CLAY to SILTY CLAY	6
5.700	18.70	17.6	1.82	.19	CLAYEY SILT to SILTY CLAY	9
5.850	19.19	17.3	2.42	.20	CLAYEY SILT to SILTY CLAY	9
6.000	19.69	13.3	1.36	.21	CLAYEY SILT to SILTY CLAY	7
6.150	20.18	10.9	2.11	.22	CLAYEY SILT to SILTY CLAY	5

TOP 1.0 ft IS DISTURBED SOIL
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

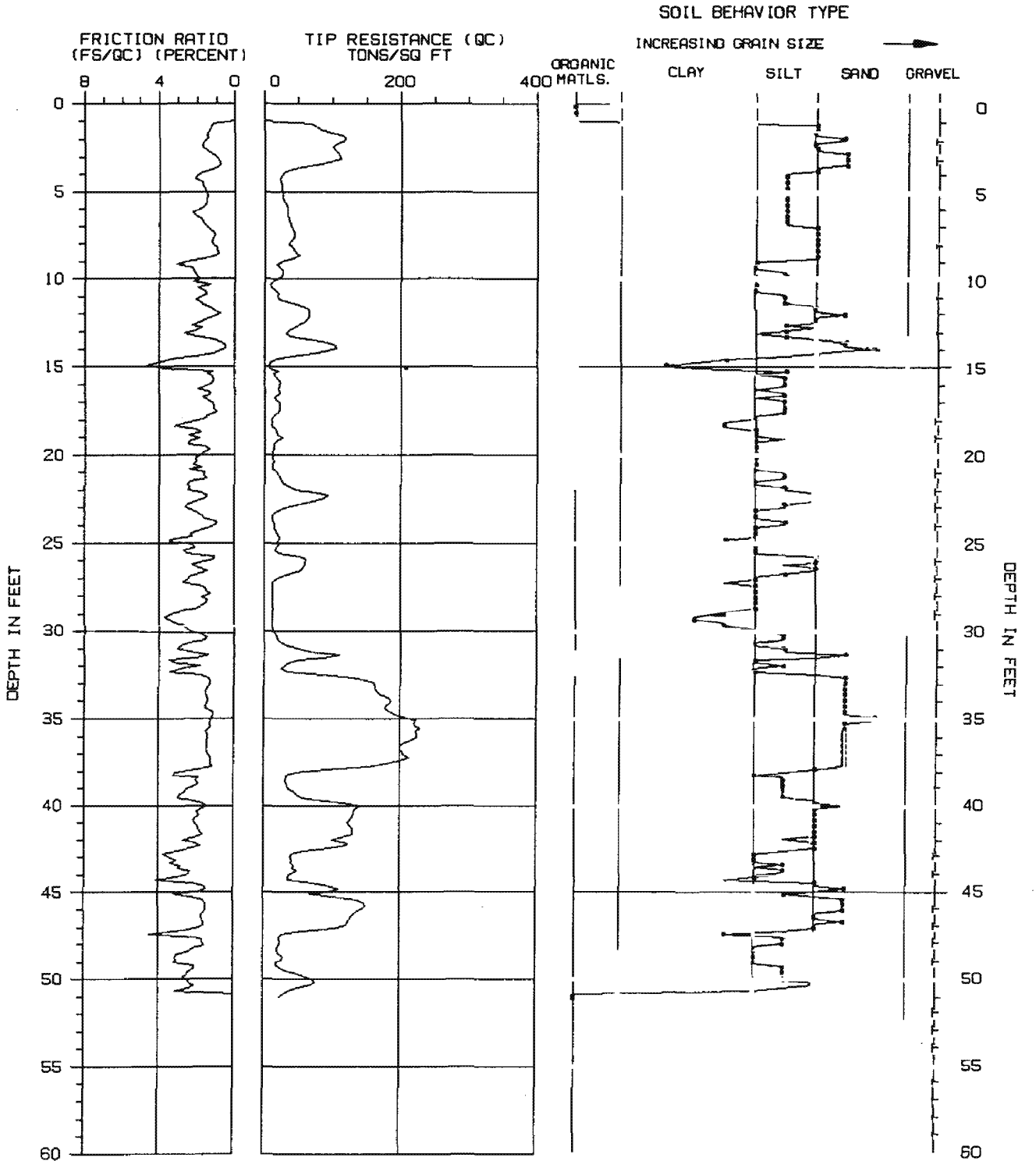
SOUNDING : CPT-4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
6.300	20.67	11.2	1.78	.23	CLAYEY SILT to SILTY CLAY	6
6.450	21.16	20.0	1.65	.24	SANDY SILT to CLAYEY SILT	8
6.600	21.65	28.2	2.52	.26	CLAYEY SILT to SILTY CLAY	14
6.750	22.15	73.7	1.75	.31	SILTY SAND to SANDY SILT	25
6.900	22.64	73.7	2.06	.33	SILTY SAND to SANDY SILT	25
7.050	23.13	21.7	2.22	.32	CLAYEY SILT to SILTY CLAY	11
7.200	23.62	10.6	1.61	.32	CLAYEY SILT to SILTY CLAY	5
7.350	24.11	14.0	1.36	.33	CLAYEY SILT to SILTY CLAY	7
7.500	24.61	22.0	2.27	.34	CLAYEY SILT to SILTY CLAY	11
7.650	25.10	22.2	2.26	.36	CLAYEY SILT to SILTY CLAY	11
7.800	25.59	21.7	2.53	.37	CLAYEY SILT to SILTY CLAY	11
7.950	26.08	60.1	1.86	.39	SILTY SAND to SANDY SILT	20
8.100	26.57	54.3	1.44	.40	SILTY SAND to SANDY SILT	18
8.250	27.07	17.3	2.48	.39	CLAYEY SILT to SILTY CLAY	9
8.400	27.56	11.0	1.55	.40	CLAYEY SILT to SILTY CLAY	5
8.550	28.05	10.6	1.70	.41	CLAYEY SILT to SILTY CLAY	5
8.700	28.54	11.2	1.79	.46	CLAYEY SILT to SILTY CLAY	6
8.850	29.04	11.2	3.38	.48	CLAY to SILTY CLAY	7
9.000	29.53	10.6	3.11	.48	CLAY to SILTY CLAY	7
9.150	30.02	14.3	1.75	.50	CLAYEY SILT to SILTY CLAY	7
9.300	30.51	20.2	1.59	.52	SANDY SILT to CLAYEY SILT	8
9.450	31.00	49.0	3.02	.57	SANDY SILT to CLAYEY SILT	20
9.600	31.50	87.3	2.02	.63	SILTY SAND to SANDY SILT	29
9.750	31.99	29.9	1.84	.62	SANDY SILT to CLAYEY SILT	12
9.900	32.48	85.2	1.84	.67	SILTY SAND to SANDY SILT	28
10.050	32.97	160.4	1.31	.74	SAND to SILTY SAND	40
10.200	33.46	165.6	1.49	.76	SAND to SILTY SAND	41
10.350	33.96	186.3	1.40	.79	SAND to SILTY SAND	47
10.500	34.45	178.5	1.53	.80	SAND to SILTY SAND	45
10.650	34.94	209.5	1.18	.79	SAND	42
10.800	35.43	224.5	1.27	.80	SAND to SILTY SAND	56
10.950	35.93	225.0	1.40	.83	SAND to SILTY SAND	56
11.100	36.42	204.6	1.48	.84	SAND to SILTY SAND	51
11.250	36.91	205.0	1.47	.84	SAND to SILTY SAND	51
11.400	37.40	200.7	1.25	.84	SAND to SILTY SAND	50
11.550	37.89	92.2	2.01	.81	SILTY SAND to SANDY SILT	31
11.700	38.39	33.6	1.90	.82	SANDY SILT to CLAYEY SILT	13
11.850	38.88	35.0	2.08	1.00	SANDY SILT to CLAYEY SILT	14
12.000	39.37	49.6	2.88	1.20	SANDY SILT to CLAYEY SILT	20
12.150	39.86	115.7	1.66	1.44	SILTY SAND to SANDY SILT	39
12.300	40.35	131.8	1.98	1.51	SILTY SAND to SANDY SILT	44
12.450	40.85	126.2	2.16	1.55	SILTY SAND to SANDY SILT	42
12.600	41.34	131.0	1.89	1.59	SILTY SAND to SANDY SILT	44
12.750	41.83	116.6	2.08	1.53	SILTY SAND to SANDY SILT	39
12.900	42.32	122.5	1.80	1.59	SILTY SAND to SANDY SILT	41
13.050	42.81	41.8	3.75	1.53	CLAYEY SILT to SILTY CLAY	21
13.200	43.31	41.2	3.40	1.60	CLAYEY SILT to SILTY CLAY	21
13.350	43.80	49.0	2.29	1.68	SANDY SILT to CLAYEY SILT	20
13.500	44.29	36.3	4.10	1.77	CLAY to SILTY CLAY	24
13.650	44.78	111.3	1.45	1.95	SAND to SILTY SAND	28

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 115 PCF

ASSUMED DEPTH OF WATER TABLE = 43.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-4

PROJECT NAME : EKI/WEBB

CONE/RIG : 473/R#3 KC/MR

PROJECT NUMBER : 98-E623

DATE/TIME: 10-01-98 16:57

HFA

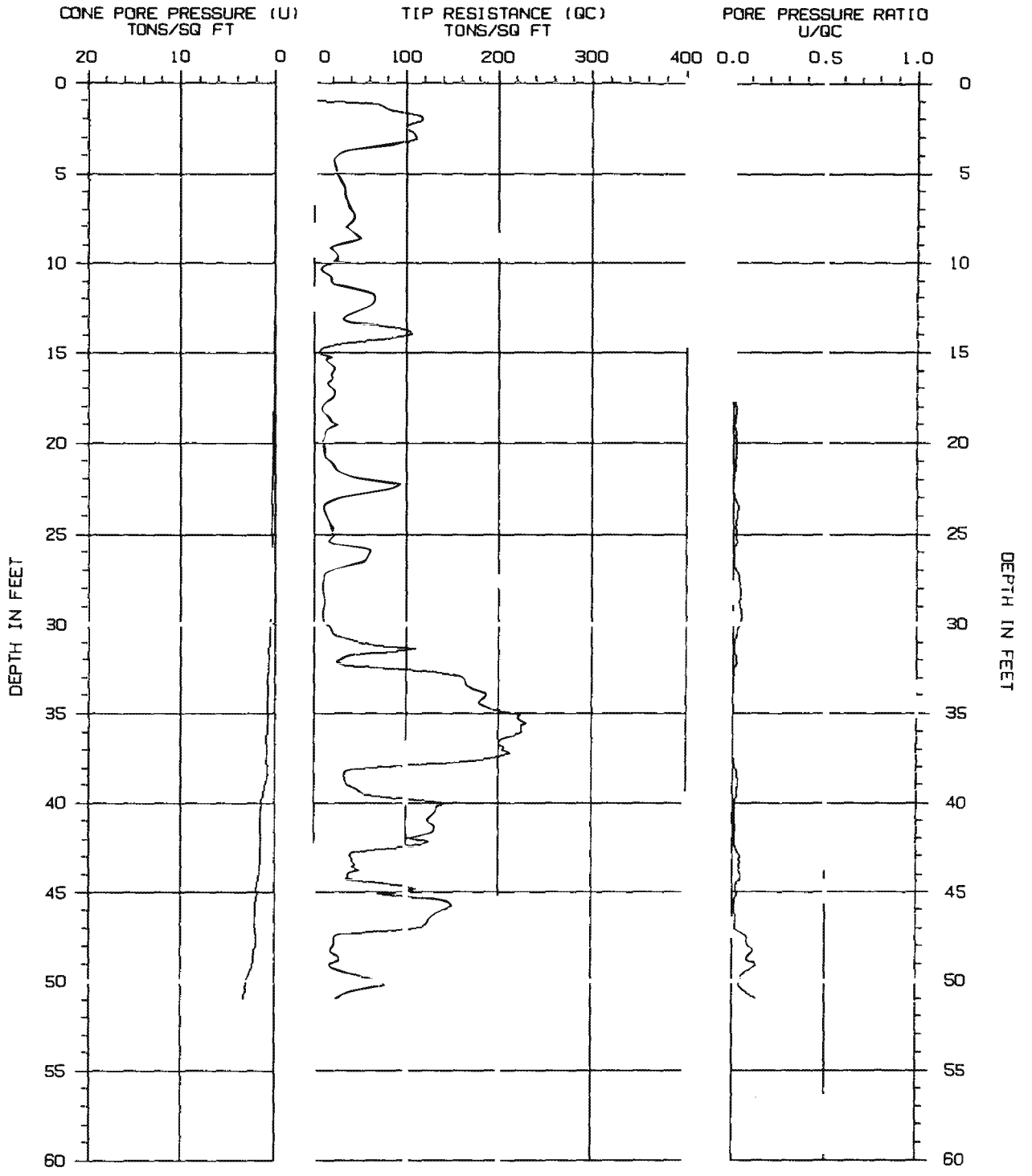
SOUNDING : CPT-4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
13.800	45.28	101.6	2.23	1.99	SILTY SAND to SANDY SILT	34
13.950	45.77	149.6	1.49	2.10	SAND to SILTY SAND	37
14.100	46.26	132.8	1.70	2.13	SILTY SAND to SANDY SILT	44
14.250	46.75	123.1	1.60	2.15	SAND to SILTY SAND	31
14.400	47.24	58.5	3.13	2.09	SANDY SILT to CLAYEY SILT	23
14.550	47.74	23.1	1.65	1.99	SANDY SILT to CLAYEY SILT	9
14.700	48.23	19.4	2.16	2.23	CLAYEY SILT to SILTY CLAY	10
14.850	48.72	28.2	3.08	2.33	CLAYEY SILT to SILTY CLAY	14
15.000	49.21	18.0	2.11	2.47	CLAYEY SILT to SILTY CLAY	9
15.150	49.70	50.8	2.46	2.82	SANDY SILT to CLAYEY SILT	20
15.300	50.20	76.5	2.33	3.12	SILTY SAND to SANDY SILT	25
15.450	50.69	37.0	3.10	3.18	CLAYEY SILT to SILTY CLAY	19

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-4

PROJECT NAME : EKI/WEBB

PROJECT NUMBER : 98-E623

CONE/RIG : 473/R#3 KC/MR

DATE/TIME: 10-01-98 16:57

HFA

CONE PENETRATION TEST

SOUNDING : CPT-5
PROJECT : EKI/WEBB
DATE/TIME: 10-01-98 13:31

PROJECT No.: 98-E623
CONE/RIG : 473/R#3 KC/MR

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
.150	.49	.0	.00	.00		0
.300	.98	.0	.00	.00		0
.450	1.48	44.6	1.21	.05	SILTY SAND to SANDY SILT	15
.600	1.97	80.2	.71	.05	SAND to SILTY SAND	20
.750	2.46	78.1	.81	.04	SAND to SILTY SAND	20
.900	2.95	79.6	.67	.04	SAND to SILTY SAND	20
1.050	3.44	25.2	1.03	.02	SANDY SILT to CLAYEY SILT	10
1.200	3.94	14.6	1.51	.02	CLAYEY SILT to SILTY CLAY	7
1.350	4.43	17.0	1.24	.01	SANDY SILT to CLAYEY SILT	7
1.500	4.92	16.8	1.25	.01	SANDY SILT to CLAYEY SILT	7
1.650	5.41	23.3	1.07	-.02	SANDY SILT to CLAYEY SILT	9
1.800	5.91	38.6	.91	-.02	SILTY SAND to SANDY SILT	13
1.950	6.40	41.5	.97	-.01	SILTY SAND to SANDY SILT	14
2.100	6.89	47.3	.95	-.02	SILTY SAND to SANDY SILT	16
2.250	7.38	50.7	.99	-.02	SILTY SAND to SANDY SILT	17
2.400	7.87	71.8	.89	-.01	SAND to SILTY SAND	18
2.550	8.37	48.5	1.13	-.01	SILTY SAND to SANDY SILT	16
2.700	8.86	24.8	1.98	-.04	SANDY SILT to CLAYEY SILT	10
2.850	9.35	24.4	1.47	-.04	SANDY SILT to CLAYEY SILT	10
3.000	9.84	13.3	2.19	-.03	CLAYEY SILT to SILTY CLAY	7
3.150	10.33	16.3	2.34	-.01	CLAYEY SILT to SILTY CLAY	8
3.300	10.83	8.5	3.18	.01	CLAY	9
3.450	11.32	21.4	3.04	.07	CLAYEY SILT to SILTY CLAY	11
3.600	11.81	17.0	3.59	.12	CLAY to SILTY CLAY	11
3.750	12.30	26.4	2.39	.17	CLAYEY SILT to SILTY CLAY	13
3.900	12.80	66.5	.93	.24	SAND to SILTY SAND	17
4.050	13.29	71.2	.76	.25	SAND to SILTY SAND	18
4.200	13.78	25.4	2.20	.23	SANDY SILT to CLAYEY SILT	10
4.350	14.27	6.2	3.86	.20	CLAY	6
4.500	14.76	62.5	1.58	.27	SILTY SAND to SANDY SILT	21
4.650	15.26	47.4	1.83	.37	SILTY SAND to SANDY SILT	16
4.800	15.75	15.6	2.18	.37	CLAYEY SILT to SILTY CLAY	8
4.950	16.24	17.1	2.33	.42	CLAYEY SILT to SILTY CLAY	9
5.100	16.73	19.8	1.87	.45	SANDY SILT to CLAYEY SILT	8
5.250	17.22	19.7	1.83	.48	SANDY SILT to CLAYEY SILT	8
5.400	17.72	19.4	2.06	.50	CLAYEY SILT to SILTY CLAY	10
5.550	18.21	26.3	2.13	.53	SANDY SILT to CLAYEY SILT	11
5.700	18.70	37.4	1.23	.59	SILTY SAND to SANDY SILT	12
5.850	19.19	17.5	2.11	.58	CLAYEY SILT to SILTY CLAY	9
6.000	19.69	31.2	1.95	.60	SANDY SILT to CLAYEY SILT	12
6.150	20.18	16.0	2.07	.60	CLAYEY SILT to SILTY CLAY	8

TOP 1.0 ft IS DISTURBED SOIL
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

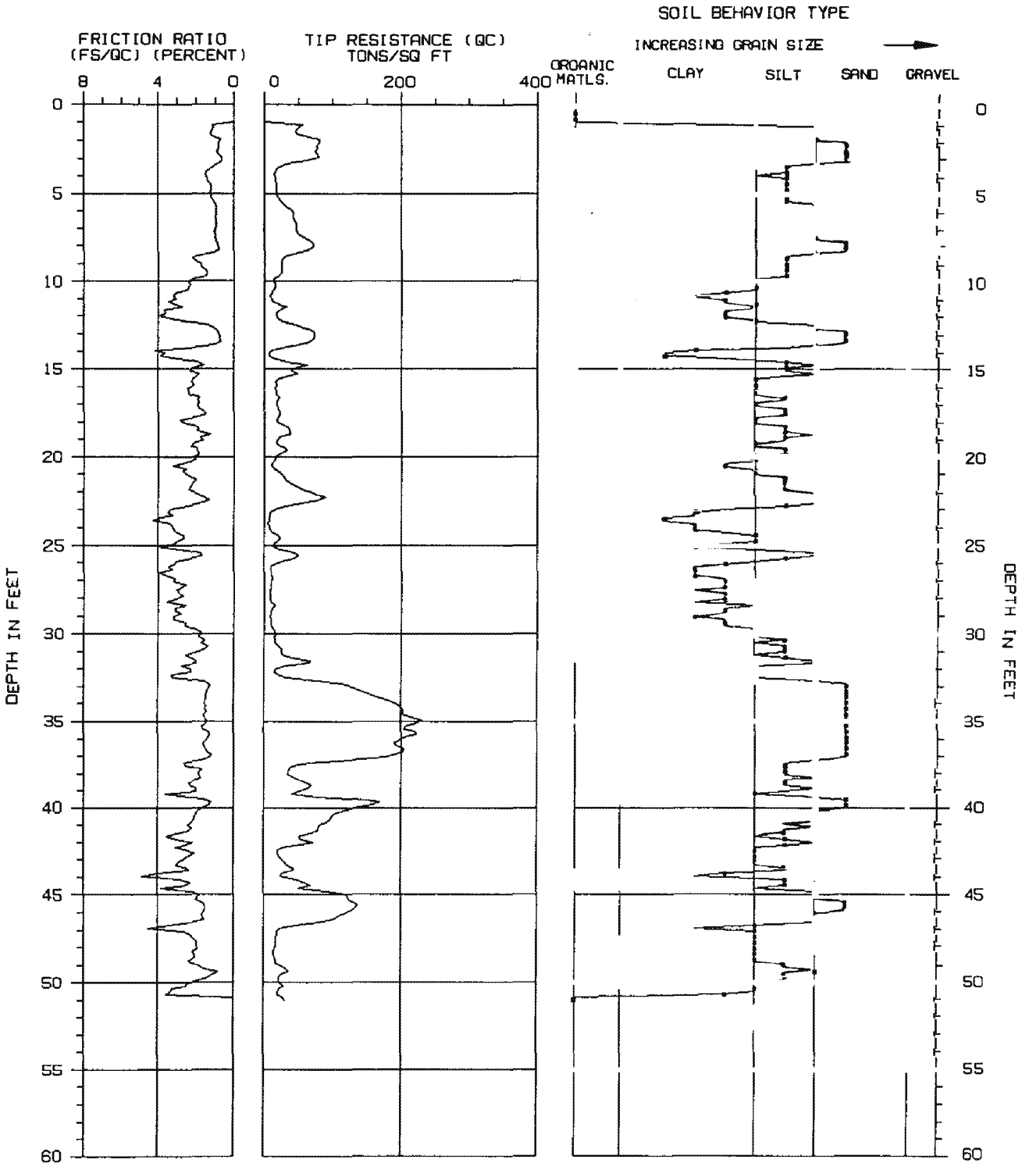
SOUNDING : CPT-5

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
6.300	20.67	14.4	2.51	.61	CLAYEY SILT to SILTY CLAY	7
6.450	21.16	28.1	2.24	.65	SANDY SILT to CLAYEY SILT	11
6.600	21.65	44.7	2.26	.72	SANDY SILT to CLAYEY SILT	18
6.750	22.15	72.8	1.94	.80	SILTY SAND to SANDY SILT	24
6.900	22.64	54.3	1.84	.84	SILTY SAND to SANDY SILT	18
7.050	23.13	8.6	3.50	.78	CLAY	9
7.200	23.62	6.1	4.25	.78	CLAY	6
7.350	24.11	8.5	3.18	.79	CLAY	8
7.500	24.61	23.5	2.60	.81	CLAYEY SILT to SILTY CLAY	12
7.650	25.10	11.9	4.03	.89	CLAY	12
7.800	25.59	49.8	1.69	.99	SILTY SAND to SANDY SILT	17
7.950	26.08	14.7	3.12	.95	CLAY to SILTY CLAY	10
8.100	26.57	9.0	3.89	.98	CLAY	9
8.250	27.07	9.5	3.16	1.02	CLAY to SILTY CLAY	6
8.400	27.56	8.0	3.00	1.07	CLAY	8
8.550	28.05	8.5	3.05	1.12	CLAY to SILTY CLAY	6
8.700	28.54	10.9	3.11	1.27	CLAY to SILTY CLAY	7
8.850	29.04	8.8	3.18	1.32	CLAY	9
9.000	29.53	9.8	2.56	1.38	CLAY to SILTY CLAY	7
9.150	30.02	16.7	1.79	1.48	CLAYEY SILT to SILTY CLAY	8
9.300	30.51	15.0	1.73	1.59	CLAYEY SILT to SILTY CLAY	8
9.450	31.00	23.8	1.89	1.77	SANDY SILT to CLAYEY SILT	10
9.600	31.50	67.1	2.01	2.15	SILTY SAND to SANDY SILT	22
9.750	31.99	17.3	2.26	2.06	CLAYEY SILT to SILTY CLAY	9
9.900	32.48	31.3	3.20	2.22	CLAYEY SILT to SILTY CLAY	16
10.050	32.97	125.4	1.27	2.65	SAND to SILTY SAND	31
10.200	33.46	155.9	1.47	2.66	SAND to SILTY SAND	39
10.350	33.96	192.3	1.50	2.79	SAND to SILTY SAND	48
10.500	34.45	202.9	1.39	2.77	SAND to SILTY SAND	51
10.650	34.94	231.1	1.39	2.46	SAND to SILTY SAND	58
10.800	35.43	205.4	1.58	2.42	SAND to SILTY SAND	51
10.950	35.93	204.0	1.36	2.44	SAND to SILTY SAND	51
11.100	36.42	194.4	1.56	2.40	SAND to SILTY SAND	49
11.250	36.91	193.3	1.20	2.40	SAND to SILTY SAND	48
11.400	37.40	66.1	2.65	2.10	SANDY SILT to CLAYEY SILT	26
11.550	37.89	34.3	1.84	1.85	SANDY SILT to CLAYEY SILT	14
11.700	38.39	50.1	1.98	2.81	SANDY SILT to CLAYEY SILT	20
11.850	38.88	63.7	1.98	3.85	SILTY SAND to SANDY SILT	21
12.000	39.37	77.3	2.33	5.15	SILTY SAND to SANDY SILT	26
12.150	39.86	158.1	1.27	6.78	SAND to SILTY SAND	40
12.300	40.35	103.3	2.01	6.43	SILTY SAND to SANDY SILT	34
12.450	40.85	91.1	2.26	6.98	SILTY SAND to SANDY SILT	30
12.600	41.34	78.6	2.38	7.53	SANDY SILT to CLAYEY SILT	31
12.750	41.83	53.4	2.98	4.88	SANDY SILT to CLAYEY SILT	21
12.900	42.32	28.5	3.05	4.87	CLAYEY SILT to SILTY CLAY	14
13.050	42.81	22.0	2.41	5.27	CLAYEY SILT to SILTY CLAY	11
13.200	43.31	33.4	2.99	6.33	CLAYEY SILT to SILTY CLAY	17
13.350	43.80	26.6	4.02	6.78	CLAY to SILTY CLAY	18
13.500	44.29	58.5	2.24	8.82	SANDY SILT to CLAYEY SILT	23
13.650	44.78	90.8	2.23	6.85	SILTY SAND to SANDY SILT	30

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 115 PCF

ASSUMED DEPTH OF WATER TABLE = 43.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-5

PROJECT NAME : EKI/WEBB

CONE/RIG : 473/R#3 KC/MR

PROJECT NUMBER : 98-E623

DATE/TIME: 10-01-98 13:31

HFA

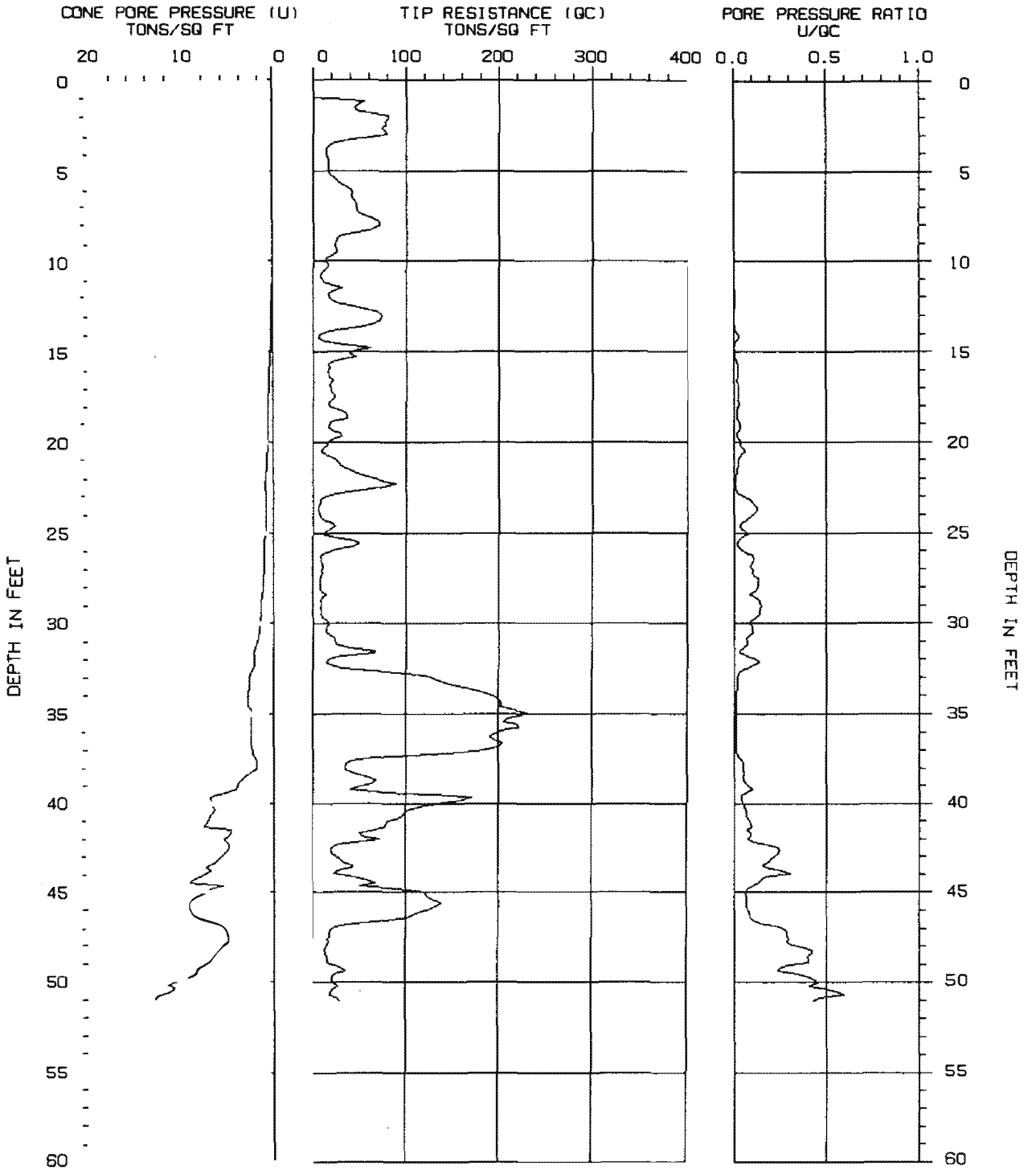
SOUNDING : CPT-5

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
13.800	45.28	123.1	1.98	8.34	SILTY SAND to SANDY SILT	41
13.950	45.77	132.6	1.49	9.24	SAND to SILTY SAND	33
14.100	46.26	105.9	1.62	8.74	SILTY SAND to SANDY SILT	35
14.250	46.75	46.3	3.35	6.73	CLAYEY SILT to SILTY CLAY	23
14.400	47.24	18.1	2.26	5.17	CLAYEY SILT to SILTY CLAY	9
14.550	47.74	17.6	1.93	4.99	CLAYEY SILT to SILTY CLAY	9
14.700	48.23	14.0	2.15	5.83	CLAYEY SILT to SILTY CLAY	7
14.850	48.72	16.7	2.34	6.70	CLAYEY SILT to SILTY CLAY	8
15.000	49.21	31.1	1.58	7.82	SANDY SILT to CLAYEY SILT	12
15.150	49.70	21.9	1.32	8.79	SANDY SILT to CLAYEY SILT	9
15.300	50.20	28.2	2.52	11.41	CLAYEY SILT to SILTY CLAY	14
15.450	50.69	19.8	3.54	11.76	CLAY to SILTY CLAY	13

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-5

PROJECT NAME : EKI/WEBB

PROJECT NUMBER : 98-E623

CONE/RIG : 473/R#3 KC/MR

DATE/TIME: 10-01-98 13:31

HFA

SOUNDING : CPT-6

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
6.300	20.67	17.4	2.47	.25	CLAYEY SILT to SILTY CLAY	9
6.450	21.16	19.3	2.48	.25	CLAYEY SILT to SILTY CLAY	10
6.600	21.65	18.7	1.55	.26	SANDY SILT to CLAYEY SILT	7
6.750	22.15	12.6	2.06	.27	CLAYEY SILT to SILTY CLAY	6
6.900	22.64	21.4	2.85	.28	CLAYEY SILT to SILTY CLAY	11
7.050	23.13	63.9	2.30	.30	SANDY SILT to CLAYEY SILT	26
7.200	23.62	13.5	2.15	.29	CLAYEY SILT to SILTY CLAY	7
7.350	24.11	15.6	1.60	.30	CLAYEY SILT to SILTY CLAY	8
7.500	24.61	19.5	2.05	.32	CLAYEY SILT to SILTY CLAY	10
7.650	25.10	77.8	1.82	.34	SILTY SAND to SANDY SILT	26
7.800	25.59	47.7	2.85	.34	SANDY SILT to CLAYEY SILT	19
7.950	26.08	76.5	2.25	.35	SILTY SAND to SANDY SILT	25
8.100	26.57	64.1	2.51	.35	SANDY SILT to CLAYEY SILT	26
8.250	27.07	18.0	3.16	.34	CLAYEY SILT to SILTY CLAY	9
8.400	27.56	13.4	3.59	.35	CLAY to SILTY CLAY	9
8.550	28.05	13.3	1.89	.35	CLAYEY SILT to SILTY CLAY	7
8.700	28.54	12.6	1.51	.38	CLAYEY SILT to SILTY CLAY	6
8.850	29.04	10.7	1.68	.39	CLAYEY SILT to SILTY CLAY	5
9.000	29.53	11.2	2.50	.39	CLAYEY SILT to SILTY CLAY	6
9.150	30.02	10.9	2.76	.40	CLAY to SILTY CLAY	7
9.300	30.51	12.5	2.08	.40	CLAYEY SILT to SILTY CLAY	6
9.450	31.00	14.6	1.24	.41	SANDY SILT to CLAYEY SILT	6
9.600	31.50	15.8	1.64	.42	CLAYEY SILT to SILTY CLAY	8
9.750	31.99	64.3	2.84	.47	SANDY SILT to CLAYEY SILT	26
9.900	32.48	25.4	2.13	.47	SANDY SILT to CLAYEY SILT	10
10.050	32.97	30.3	3.20	.49	CLAYEY SILT to SILTY CLAY	15
10.200	33.46	102.2	1.67	.52	SILTY SAND to SANDY SILT	34
10.350	33.96	116.0	1.84	.55	SILTY SAND to SANDY SILT	39
10.500	34.45	113.2	1.86	.57	SILTY SAND to SANDY SILT	38
10.650	34.94	140.8	1.86	.60	SILTY SAND to SANDY SILT	47
10.800	35.43	197.7	1.61	.70	SAND to SILTY SAND	49
10.950	35.93	210.8	1.84	.77	SAND to SILTY SAND	53
11.100	36.42	226.7	1.86	.83	SAND to SILTY SAND	57
11.250	36.91	236.3	1.60	.90	SAND to SILTY SAND	59
11.400	37.40	268.9	1.60	.93	SAND to SILTY SAND	67
11.550	37.89	245.1	1.20	.94	SAND	49
11.700	38.39	184.6	1.41	.90	SAND to SILTY SAND	46
11.850	38.88	69.2	2.40	.86	SANDY SILT to CLAYEY SILT	28
12.000	39.37	28.9	1.14	.86	SILTY SAND to SANDY SILT	10
12.150	39.86	31.2	1.67	1.08	SANDY SILT to CLAYEY SILT	12
12.300	40.35	68.8	2.56	1.34	SANDY SILT to CLAYEY SILT	28
12.450	40.85	114.8	1.96	1.48	SILTY SAND to SANDY SILT	38
12.600	41.34	173.7	1.43	1.59	SAND to SILTY SAND	43
12.750	41.83	137.6	1.90	1.61	SILTY SAND to SANDY SILT	46
12.900	42.32	99.9	2.08	1.59	SILTY SAND to SANDY SILT	33
13.050	42.81	79.6	2.45	1.59	SANDY SILT to CLAYEY SILT	32
13.200	43.31	38.7	3.43	1.61	CLAYEY SILT to SILTY CLAY	19
13.350	43.80	53.3	2.87	1.70	SANDY SILT to CLAYEY SILT	21
13.500	44.29	48.6	2.53	1.75	SANDY SILT to CLAYEY SILT	19
13.650	44.78	49.9	3.04	1.86	SANDY SILT to CLAYEY SILT	20

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

CONE PENETRATION TEST

SOUNDING : CPT-6
PROJECT : EKI/WEBB
DATE/TIME: 10-02-98 09:35

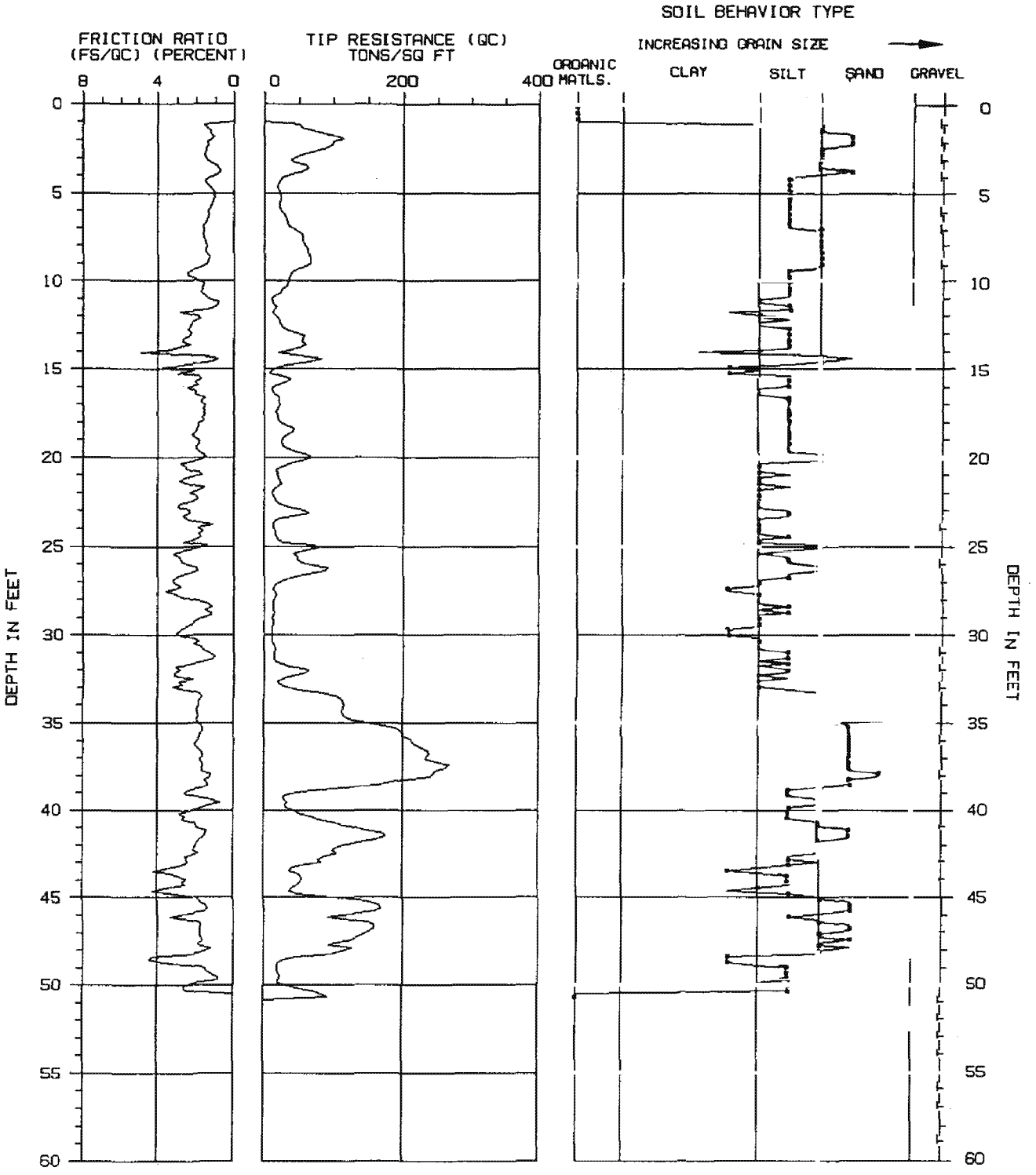
PROJECT No.: 98-E623
CONE/RIG : 473/R#3 KC/MR

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
.150	.49	.0	.00	.00		0
.300	.98	.0	.00	.00		0
.450	1.48	70.9	1.21	.04	SILTY SAND to SANDY SILT	24
.600	1.97	113.5	1.15	.06	SAND to SILTY SAND	28
.750	2.46	90.0	1.43	.06	SILTY SAND to SANDY SILT	30
.900	2.95	45.1	1.53	.05	SILTY SAND to SANDY SILT	15
1.050	3.44	59.7	.90	.05	SILTY SAND to SANDY SILT	20
1.200	3.94	39.8	.85	.05	SILTY SAND to SANDY SILT	13
1.350	4.43	20.4	1.47	.04	SANDY SILT to CLAYEY SILT	8
1.500	4.92	21.4	1.03	.03	SANDY SILT to CLAYEY SILT	9
1.650	5.41	23.0	1.09	.01	SANDY SILT to CLAYEY SILT	9
1.800	5.91	22.3	1.30	.01	SANDY SILT to CLAYEY SILT	9
1.950	6.40	30.9	1.33	.01	SANDY SILT to CLAYEY SILT	12
2.100	6.89	35.3	1.61	.01	SANDY SILT to CLAYEY SILT	14
2.250	7.38	53.3	1.61	.01	SILTY SAND to SANDY SILT	18
2.400	7.87	57.0	1.44	.01	SILTY SAND to SANDY SILT	19
2.550	8.37	63.6	1.45	.01	SILTY SAND to SANDY SILT	21
2.700	8.86	65.3	1.36	.00	SILTY SAND to SANDY SILT	22
2.850	9.35	45.6	2.13	.00	SANDY SILT to CLAYEY SILT	18
3.000	9.84	35.3	2.07	.01	SANDY SILT to CLAYEY SILT	14
3.150	10.33	30.9	1.65	.01	SANDY SILT to CLAYEY SILT	12
3.300	10.83	15.2	1.51	.01	SANDY SILT to CLAYEY SILT	6
3.450	11.32	12.5	.88	.02	SANDY SILT to CLAYEY SILT	5
3.600	11.81	10.9	2.84	.02	CLAY to SILTY CLAY	7
3.750	12.30	20.8	2.17	.03	CLAYEY SILT to SILTY CLAY	10
3.900	12.80	30.6	2.42	.03	SANDY SILT to CLAYEY SILT	12
4.050	13.29	55.8	2.60	.04	SANDY SILT to CLAYEY SILT	22
4.200	13.78	49.3	2.92	.05	SANDY SILT to CLAYEY SILT	20
4.350	14.27	50.5	1.66	.05	SILTY SAND to SANDY SILT	17
4.500	14.76	36.0	2.39	.05	SANDY SILT to CLAYEY SILT	14
4.650	15.26	8.8	2.97	.05	CLAY to SILTY CLAY	6
4.800	15.75	32.0	2.03	.19	SANDY SILT to CLAYEY SILT	13
4.950	16.24	11.6	1.98	.19	CLAYEY SILT to SILTY CLAY	6
5.100	16.73	20.1	1.64	.20	SANDY SILT to CLAYEY SILT	8
5.250	17.22	18.9	1.64	.21	SANDY SILT to CLAYEY SILT	8
5.400	17.72	18.4	1.68	.21	SANDY SILT to CLAYEY SILT	7
5.550	18.21	30.0	1.87	.22	SANDY SILT to CLAYEY SILT	12
5.700	18.70	33.7	2.19	.22	SANDY SILT to CLAYEY SILT	13
5.850	19.19	24.2	1.82	.23	SANDY SILT to CLAYEY SILT	10
6.000	19.69	45.1	1.84	.24	SANDY SILT to CLAYEY SILT	18
6.150	20.18	54.7	1.92	.25	SILTY SAND to SANDY SILT	18

TOP 1.0 ft IS DISTURBED SOIL
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 115 PCF

ASSUMED DEPTH OF WATER TABLE = 43.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-6

PROJECT NAME : EKI/WEBB

PROJECT NUMBER : 98-E623

CONE/RIG : 473/R#3 KC/MR

DATE/TIME: 10-02-98 09:35

HFA

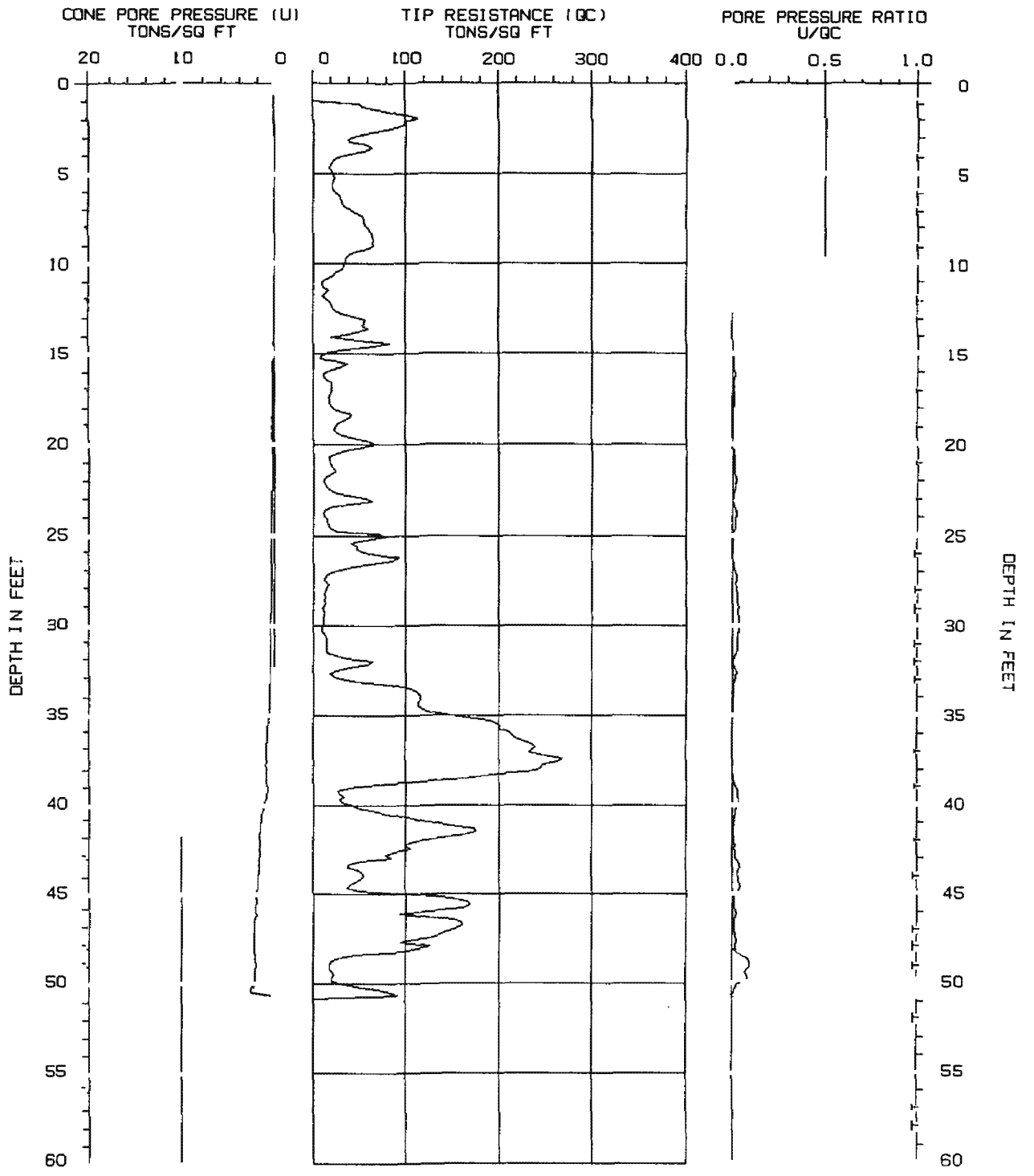
SOUNDING : CPT-6

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
13.800	45.28	153.6	1.71	2.02	SAND to SILTY SAND	38
13.950	45.77	160.2	1.50	2.07	SAND to SILTY SAND	40
14.100	46.26	128.1	2.24	2.16	SILTY SAND to SANDY SILT	43
14.250	46.75	159.5	1.77	2.23	SAND to SILTY SAND	40
14.400	47.24	135.4	1.73	2.25	SILTY SAND to SANDY SILT	45
14.550	47.74	94.4	1.82	2.22	SILTY SAND to SANDY SILT	31
14.700	48.23	97.8	2.12	2.19	SILTY SAND to SANDY SILT	33
14.850	48.72	20.0	3.69	2.05	CLAY to SILTY CLAY	13
15.000	49.21	18.3	1.42	2.05	SANDY SILT to CLAYEY SILT	7
15.150	49.70	20.3	.84	2.09	SANDY SILT to CLAYEY SILT	8
15.300	50.20	52.0	2.58	2.23	SANDY SILT to CLAYEY SILT	21
15.450	50.69	92.8	*****	2.45		0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-6

PROJECT NAME : EKI/WEBB

PROJECT NUMBER : 98-E623

CONE/RIG : 473/R#3 KC/MR

DATE/TIME: 10-02-98 09:35

HFA

CONE PENETRATION TEST

SOUNDING : CPT-7
PROJECT : EKI/WEBB
DATE/TIME: 10-02-98 07:08

PROJECT No.: 98-E623
CONE/RIG : 473/R#3 KC/MR

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
.150	.49	.0	.00	.00		0
.300	.98	.0	.00	.00		0
.450	1.48	126.5	1.19	.07	SAND to SILTY SAND	32
.600	1.97	114.9	1.14	.08	SAND to SILTY SAND	29
.750	2.46	71.9	1.17	.08	SILTY SAND to SANDY SILT	24
.900	2.95	70.8	.71	.07	SAND to SILTY SAND	18
1.050	3.44	30.7	.81	.07	SILTY SAND to SANDY SILT	10
1.200	3.94	19.7	1.17	.05	SANDY SILT to CLAYEY SILT	8
1.350	4.43	16.9	1.07	.04	SANDY SILT to CLAYEY SILT	7
1.500	4.92	23.9	.96	.03	SANDY SILT to CLAYEY SILT	10
1.650	5.41	25.9	1.77	-.01	SANDY SILT to CLAYEY SILT	10
1.800	5.91	37.0	1.41	-.01	SILTY SAND to SANDY SILT	12
1.950	6.40	40.8	1.52	-.01	SILTY SAND to SANDY SILT	14
2.100	6.89	41.3	1.53	-.01	SILTY SAND to SANDY SILT	14
2.250	7.38	50.5	1.59	-.01	SILTY SAND to SANDY SILT	17
2.400	7.87	51.2	1.23	-.00	SILTY SAND to SANDY SILT	17
2.550	8.37	25.1	1.35	-.01	SANDY SILT to CLAYEY SILT	10
2.700	8.86	17.5	1.82	-.03	CLAYEY SILT to SILTY CLAY	9
2.850	9.35	31.3	1.25	-.02	SILTY SAND to SANDY SILT	10
3.000	9.84	17.9	2.29	-.02	CLAYEY SILT to SILTY CLAY	9
3.150	10.33	11.1	2.08	-.02	CLAYEY SILT to SILTY CLAY	6
3.300	10.83	19.6	2.25	-.02	CLAYEY SILT to SILTY CLAY	10
3.450	11.32	14.1	2.48	-.02	CLAYEY SILT to SILTY CLAY	7
3.600	11.81	20.2	2.73	.00	CLAYEY SILT to SILTY CLAY	10
3.750	12.30	21.9	2.14	.00	CLAYEY SILT to SILTY CLAY	11
3.900	12.80	23.0	1.26	.01	SANDY SILT to CLAYEY SILT	9
4.050	13.29	23.6	1.74	.02	SANDY SILT to CLAYEY SILT	9
4.200	13.78	30.5	1.51	.04	SANDY SILT to CLAYEY SILT	12
4.350	14.27	8.9	1.12	.04	CLAYEY SILT to SILTY CLAY	4
4.500	14.76	13.0	1.23	.04	CLAYEY SILT to SILTY CLAY	6
4.650	15.26	47.5	1.47	.06	SILTY SAND to SANDY SILT	16
4.800	15.75	24.8	1.66	.07	SANDY SILT to CLAYEY SILT	10
4.950	16.24	28.3	1.66	.09	SANDY SILT to CLAYEY SILT	11
5.100	16.73	36.4	1.79	.10	SANDY SILT to CLAYEY SILT	15
5.250	17.22	31.0	1.61	.11	SANDY SILT to CLAYEY SILT	12
5.400	17.72	31.8	1.73	.12	SANDY SILT to CLAYEY SILT	13
5.550	18.21	40.0	1.50	.12	SILTY SAND to SANDY SILT	13
5.700	18.70	24.4	1.93	.13	SANDY SILT to CLAYEY SILT	10
5.850	19.19	36.7	1.75	.13	SANDY SILT to CLAYEY SILT	15
6.000	19.69	21.5	2.42	.14	CLAYEY SILT to SILTY CLAY	11
6.150	20.18	27.0	1.67	.14	SANDY SILT to CLAYEY SILT	11

TOP 1.0 ft IS DISTURBED SOIL
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-7

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
6.300	20.67	15.8	1.83	.14	CLAYEY SILT to SILTY CLAY	8
6.450	21.16	13.9	1.94	.15	CLAYEY SILT to SILTY CLAY	7
6.600	21.65	32.1	1.15	.15	SILTY SAND to SANDY SILT	11
6.750	22.15	38.3	2.77	-.35	SANDY SILT to CLAYEY SILT	15
6.900	22.64	67.1	1.46	-.35	SILTY SAND to SANDY SILT	22
7.050	23.13	19.2	2.60	-.35	CLAYEY SILT to SILTY CLAY	10
7.200	23.62	15.2	2.43	-.35	CLAYEY SILT to SILTY CLAY	8
7.350	24.11	29.7	2.42	-.34	SANDY SILT to CLAYEY SILT	12
7.500	24.61	16.3	2.89	-.34	CLAYEY SILT to SILTY CLAY	8
7.650	25.10	67.1	1.19	-.33	SILTY SAND to SANDY SILT	22
7.800	25.59	60.3	1.96	-.33	SILTY SAND to SANDY SILT	20
7.950	26.08	21.4	2.76	-.33	CLAYEY SILT to SILTY CLAY	11
8.100	26.57	11.2	2.05	-.33	CLAYEY SILT to SILTY CLAY	6
8.250	27.07	13.1	1.83	-.32	CLAYEY SILT to SILTY CLAY	7
8.400	27.56	13.1	1.07	-.32	SANDY SILT to CLAYEY SILT	5
8.550	28.05	21.2	1.09	-.31	SANDY SILT to CLAYEY SILT	8
8.700	28.54	14.6	.96	-.29	SANDY SILT to CLAYEY SILT	6
8.850	29.04	10.7	1.96	-.29	CLAYEY SILT to SILTY CLAY	5
9.000	29.53	11.8	2.71	-.28	CLAY to SILTY CLAY	8
9.150	30.02	16.3	1.35	-.28	SANDY SILT to CLAYEY SILT	7
9.300	30.51	24.4	.78	-.27	SILTY SAND to SANDY SILT	8
9.450	31.00	39.6	2.22	-.26	SANDY SILT to CLAYEY SILT	16
9.600	31.50	75.6	2.78	-.25	SANDY SILT to CLAYEY SILT	30
9.750	31.99	19.7	2.79	-.24	CLAYEY SILT to SILTY CLAY	10
9.900	32.48	71.2	2.06	-.23	SILTY SAND to SANDY SILT	24
10.050	32.97	130.8	1.41	-.22	SAND to SILTY SAND	33
10.200	33.46	147.1	1.48	-.21	SAND to SILTY SAND	37
10.350	33.96	145.9	1.62	-.21	SAND to SILTY SAND	36
10.500	34.45	168.5	1.32	-.21	SAND to SILTY SAND	42
10.650	34.94	189.5	1.56	-.20	SAND to SILTY SAND	47
10.800	35.43	224.6	1.54	-.20	SAND to SILTY SAND	56
10.950	35.93	242.8	1.60	-.19	SAND to SILTY SAND	61
11.100	36.42	238.2	1.72	-.19	SAND to SILTY SAND	60
11.250	36.91	240.6	1.66	-.18	SAND to SILTY SAND	60
11.400	37.40	209.6	1.72	-.18	SAND to SILTY SAND	52
11.550	37.89	204.2	1.19	-.18	SAND to SILTY SAND	51
11.700	38.39	51.5	2.06	-.20	SANDY SILT to CLAYEY SILT	21
11.850	38.88	35.5	2.14	-.21	SANDY SILT to CLAYEY SILT	14
12.000	39.37	71.6	3.14	-.21	SANDY SILT to CLAYEY SILT	29
12.150	39.86	151.1	1.59	-.20	SAND to SILTY SAND	38
12.300	40.35	174.2	1.50	-.20	SAND to SILTY SAND	44
12.450	40.85	165.2	1.37	-.19	SAND to SILTY SAND	41
12.600	41.34	121.0	2.06	-.19	SILTY SAND to SANDY SILT	40
12.750	41.83	85.2	2.23	-.19	SILTY SAND to SANDY SILT	28
12.900	42.32	43.4	2.98	-.19	SANDY SILT to CLAYEY SILT	17
13.050	42.81	47.6	2.98	-.19	SANDY SILT to CLAYEY SILT	19
13.200	43.31	69.9	1.79	-.18	SILTY SAND to SANDY SILT	23
13.350	43.80	57.0	3.28	-.18	CLAYEY SILT to SILTY CLAY	29
13.500	44.29	148.0	1.43	-.16	SAND to SILTY SAND	37
13.650	44.78	167.4	1.37	-.15	SAND to SILTY SAND	42

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

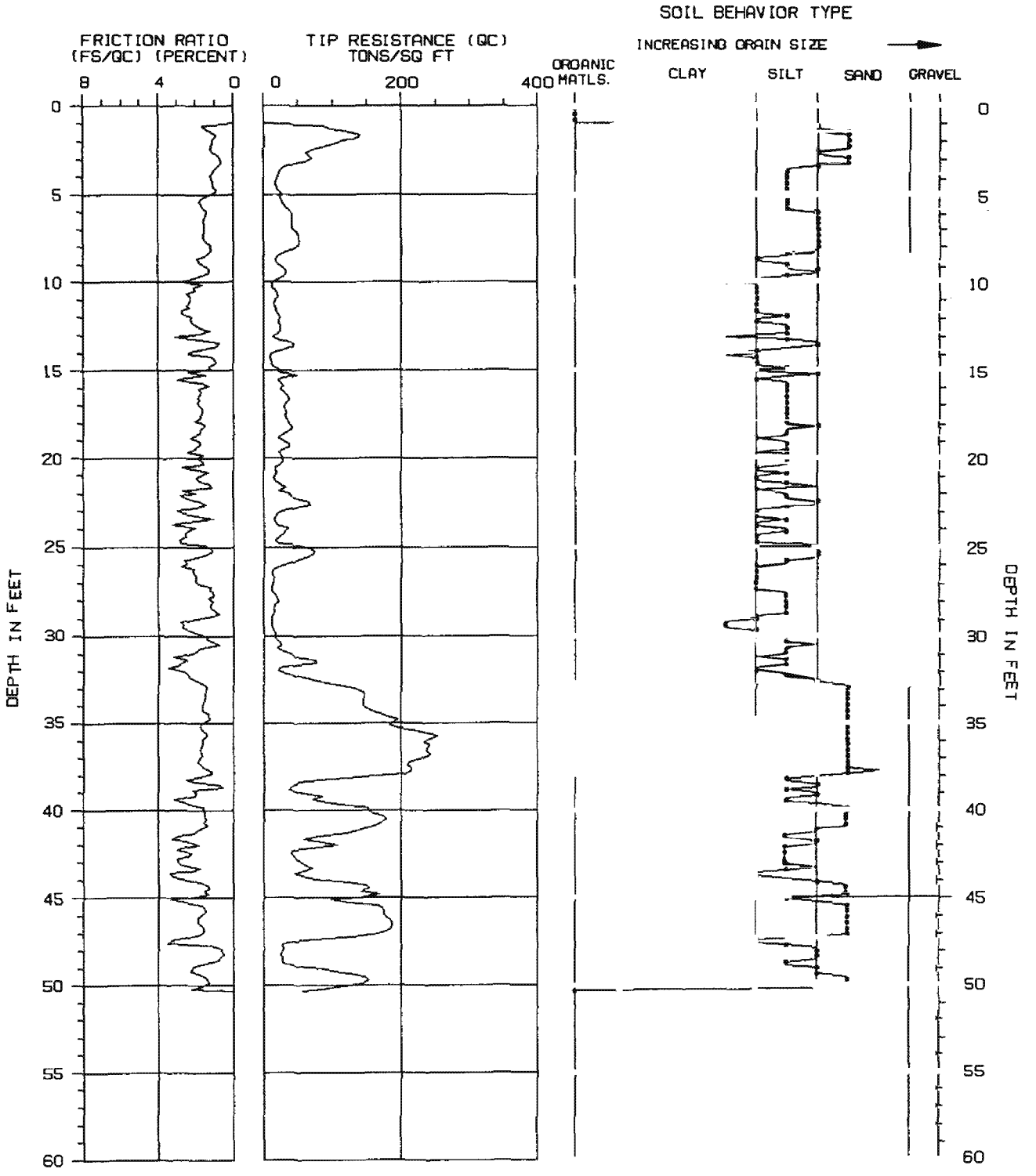
SOUNDING : CPT-7

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
13.800	45.28	124.6	2.50	-.14	SILTY SAND to SANDY SILT	42
13.950	45.77	174.8	1.48	-.13	SAND to SILTY SAND	44
14.100	46.26	185.0	1.90	-.13	SAND to SILTY SAND	46
14.250	46.75	185.1	1.58	-.12	SAND to SILTY SAND	46
14.400	47.24	113.7	2.39	-.12	SILTY SAND to SANDY SILT	38
14.550	47.74	25.4	1.18	-.12	SANDY SILT to CLAYEY SILT	10
14.700	48.23	25.1	.56	-.09	SILTY SAND to SANDY SILT	8
14.850	48.72	27.8	1.44	-.08	SANDY SILT to CLAYEY SILT	11
15.000	49.21	102.5	2.25	-.07	SILTY SAND to SANDY SILT	34
15.150	49.70	153.5	1.36	-.05	SAND to SILTY SAND	38
15.300	50.20	85.1	2.19	-.05	SILTY SAND to SANDY SILT	28

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 115 PCF

ASSUMED DEPTH OF WATER TABLE = 43.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-7

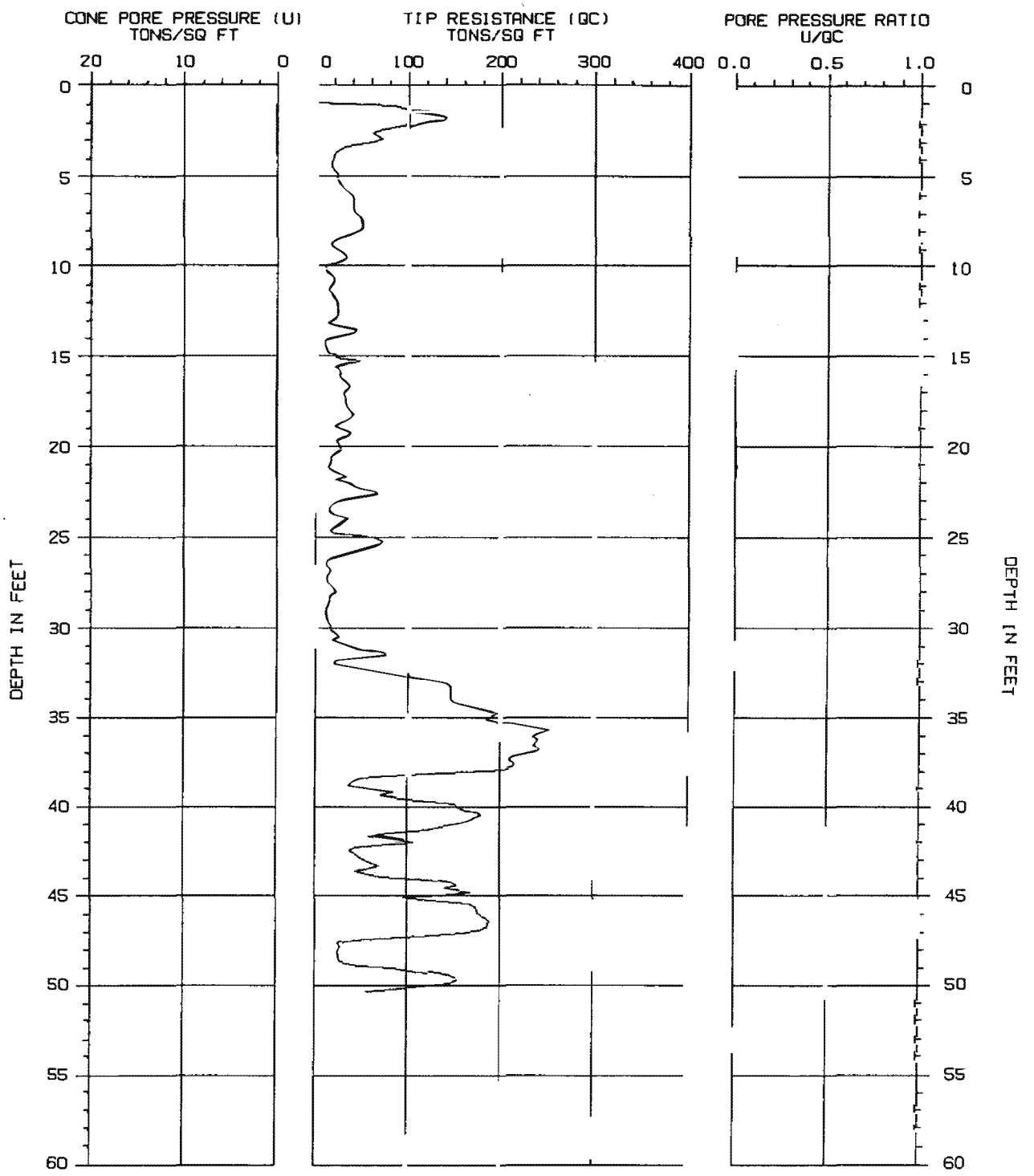
PROJECT NAME : EKI/WEBB

CONE/RIG : 473/R#3 KC/MR

PROJECT NUMBER : 98-E623

DATE/TIME: 10-02-98 07:08

HFA



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-7

PROJECT NAME : EKI/WEBB

PROJECT NUMBER : 98-E623

CONE/RIG : 473/R#3 KC/MR

DATE/TIME: 10-02-98 07:08

HFA

CONE PENETRATION TEST

SOUNDING : CPT-8
PROJECT : EKI/WEBB
DATE/TIME: 10-02-98 11:27

PROJECT No.: 98-E623
CONE/RIG : 473/R#3 KC/MR

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
.150	.49	.0	.00	.00		0
.300	.98	.0	.00	.00		0
.450	1.48	54.9	1.92	-.01	SILTY SAND to SANDY SILT	18
.600	1.97	45.0	1.52	-.02	SILTY SAND to SANDY SILT	15
.750	2.46	22.9	1.51	-.02	SANDY SILT to CLAYEY SILT	9
.900	2.95	18.2	1.21	-.02	SANDY SILT to CLAYEY SILT	7
1.050	3.44	18.6	1.07	-.03	SANDY SILT to CLAYEY SILT	7
1.200	3.94	16.8	1.08	-.03	SANDY SILT to CLAYEY SILT	7
1.350	4.43	16.7	1.06	-.03	SANDY SILT to CLAYEY SILT	7
1.500	4.92	17.5	.96	-.03	SANDY SILT to CLAYEY SILT	7
1.650	5.41	25.9	2.30	-.05	SANDY SILT to CLAYEY SILT	10
1.800	5.91	55.9	1.47	-.05	SILTY SAND to SANDY SILT	19
1.950	6.40	41.2	1.29	-.05	SILTY SAND to SANDY SILT	14
2.100	6.89	48.2	.94	-.06	SILTY SAND to SANDY SILT	16
2.250	7.38	58.3	.72	-.06	SAND to SILTY SAND	15
2.400	7.87	63.3	.80	-.06	SAND to SILTY SAND	16
2.550	8.37	56.7	1.96	-.06	SILTY SAND to SANDY SILT	19
2.700	8.86	39.2	2.32	-.06	SANDY SILT to CLAYEY SILT	16
2.850	9.35	30.4	1.51	-.05	SANDY SILT to CLAYEY SILT	12
3.000	9.84	23.3	1.36	-.05	SANDY SILT to CLAYEY SILT	9
3.150	10.33	26.3	1.42	-.06	SANDY SILT to CLAYEY SILT	11
3.300	10.83	72.0	1.35	-.05	SILTY SAND to SANDY SILT	24
3.450	11.32	47.8	2.03	-.04	SANDY SILT to CLAYEY SILT	19
3.600	11.81	55.2	1.87	-.05	SILTY SAND to SANDY SILT	18
3.750	12.30	67.6	1.57	-.05	SILTY SAND to SANDY SILT	23
3.900	12.80	24.1	3.53	-.05	CLAYEY SILT to SILTY CLAY	12
4.050	13.29	87.8	.82	-.04	SAND to SILTY SAND	22
4.200	13.78	66.1	1.15	-.04	SILTY SAND to SANDY SILT	22
4.350	14.27	10.0	4.04	-.04	CLAY	10
4.500	14.76	16.0	1.72	-.04	CLAYEY SILT to SILTY CLAY	8
4.650	15.26	30.4	2.57	-.02	CLAYEY SILT to SILTY CLAY	15
4.800	15.75	35.1	2.06	-.01	SANDY SILT to CLAYEY SILT	14
4.950	16.24	30.5	1.74	-.01	SANDY SILT to CLAYEY SILT	12
5.100	16.73	26.1	2.09	-.01	SANDY SILT to CLAYEY SILT	10
5.250	17.22	31.9	1.81	-.00	SANDY SILT to CLAYEY SILT	13
5.400	17.72	33.9	2.07	-.00	SANDY SILT to CLAYEY SILT	14
5.550	18.21	15.6	2.79	.00	CLAYEY SILT to SILTY CLAY	8
5.700	18.70	32.7	2.12	.01	SANDY SILT to CLAYEY SILT	13
5.850	19.19	19.0	3.03	.01	CLAYEY SILT to SILTY CLAY	9
6.000	19.69	16.3	2.29	.01	CLAYEY SILT to SILTY CLAY	8
6.150	20.18	15.2	2.56	.02	CLAYEY SILT to SILTY CLAY	8

TOP 1.0 ft IS DISTURBED SOIL
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-8

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
6.300	20.67	9.8	1.92	.02	CLAYEY SILT to SILTY CLAY	5
6.450	21.16	9.1	1.64	.02	CLAYEY SILT to SILTY CLAY	5
6.600	21.65	14.4	3.39	.02	CLAY to SILTY CLAY	10
6.750	22.15	17.4	2.38	.03	CLAYEY SILT to SILTY CLAY	9
6.900	22.64	25.4	3.01	.04	CLAYEY SILT to SILTY CLAY	13
7.050	23.13	35.4	4.14	.05	CLAY to SILTY CLAY	24
7.200	23.62	48.8	3.62	.05	CLAYEY SILT to SILTY CLAY	24
7.350	24.11	72.0	2.81	.07	SANDY SILT to CLAYEY SILT	29
7.500	24.61	74.4	2.05	.07	SILTY SAND to SANDY SILT	25
7.650	25.10	50.8	2.49	.09	SANDY SILT to CLAYEY SILT	20
7.800	25.59	49.0	2.42	.09	SANDY SILT to CLAYEY SILT	20
7.950	26.08	11.9	1.38	.09	CLAYEY SILT to SILTY CLAY	6
8.100	26.57	12.5	1.41	.09	CLAYEY SILT to SILTY CLAY	6
8.250	27.07	10.2	1.44	.09	CLAYEY SILT to SILTY CLAY	5
8.400	27.56	12.1	1.85	.09	CLAYEY SILT to SILTY CLAY	6
8.550	28.05	10.5	2.58	.09	CLAY to SILTY CLAY	7
8.700	28.54	10.2	2.24	.11	CLAYEY SILT to SILTY CLAY	5
8.850	29.04	22.5	3.73	.12	CLAY to SILTY CLAY	15
9.000	29.53	20.6	2.87	.12	CLAYEY SILT to SILTY CLAY	10
9.150	30.02	15.0	1.59	.13	CLAYEY SILT to SILTY CLAY	7
9.300	30.51	31.1	3.23	.13	CLAYEY SILT to SILTY CLAY	16
9.450	31.00	38.6	3.97	.14	CLAYEY SILT to SILTY CLAY	19
9.600	31.50	26.6	5.90	.15	CLAY	27
9.750	31.99	91.9	2.03	.18	SILTY SAND to SANDY SILT	31
9.900	32.48	125.8	2.10	.19	SILTY SAND to SANDY SILT	42
10.050	32.97	144.6	2.10	.20	SILTY SAND to SANDY SILT	48
10.200	33.46	164.7	2.13	.21	SILTY SAND to SANDY SILT	55
10.350	33.96	185.1	2.18	.22	SILTY SAND to SANDY SILT	62
10.500	34.45	203.0	1.86	.23	SAND to SILTY SAND	51
10.650	34.94	225.8	1.94	.25	SAND to SILTY SAND	56
10.800	35.43	194.4	2.09	.25	SILTY SAND to SANDY SILT	65
10.950	35.93	206.1	2.40	.25	SILTY SAND to SANDY SILT	69
11.100	36.42	212.0	2.47	.26	SILTY SAND to SANDY SILT	71
11.250	36.91	209.2	2.12	.27	SILTY SAND to SANDY SILT	70
11.400	37.40	173.2	1.70	.26	SAND to SILTY SAND	43
11.550	37.89	71.0	2.69	.26	SANDY SILT to CLAYEY SILT	28
11.700	38.39	41.4	1.22	.23	SILTY SAND to SANDY SILT	14
11.850	38.88	53.5	2.38	.23	SANDY SILT to CLAYEY SILT	21
12.000	39.37	88.3	2.63	.23	SANDY SILT to CLAYEY SILT	35
12.150	39.86	123.8	1.80	.24	SILTY SAND to SANDY SILT	41
12.300	40.35	160.2	1.81	.25	SAND to SILTY SAND	40
12.450	40.85	150.6	1.63	.25	SAND to SILTY SAND	38
12.600	41.34	121.2	1.73	.25	SILTY SAND to SANDY SILT	40
12.750	41.83	87.7	2.40	.24	SILTY SAND to SANDY SILT	29
12.900	42.32	29.1	2.59	.24	CLAYEY SILT to SILTY CLAY	15
13.050	42.81	37.5	3.04	.24	CLAYEY SILT to SILTY CLAY	19
13.200	43.31	55.0	1.54	.24	SILTY SAND to SANDY SILT	18
13.350	43.80	68.1	1.73	.24	SILTY SAND to SANDY SILT	23
13.500	44.29	90.0	.36	.25	SAND to SILTY SAND	22
13.650	44.78	51.8	2.97	.25	SANDY SILT to CLAYEY SILT	21

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

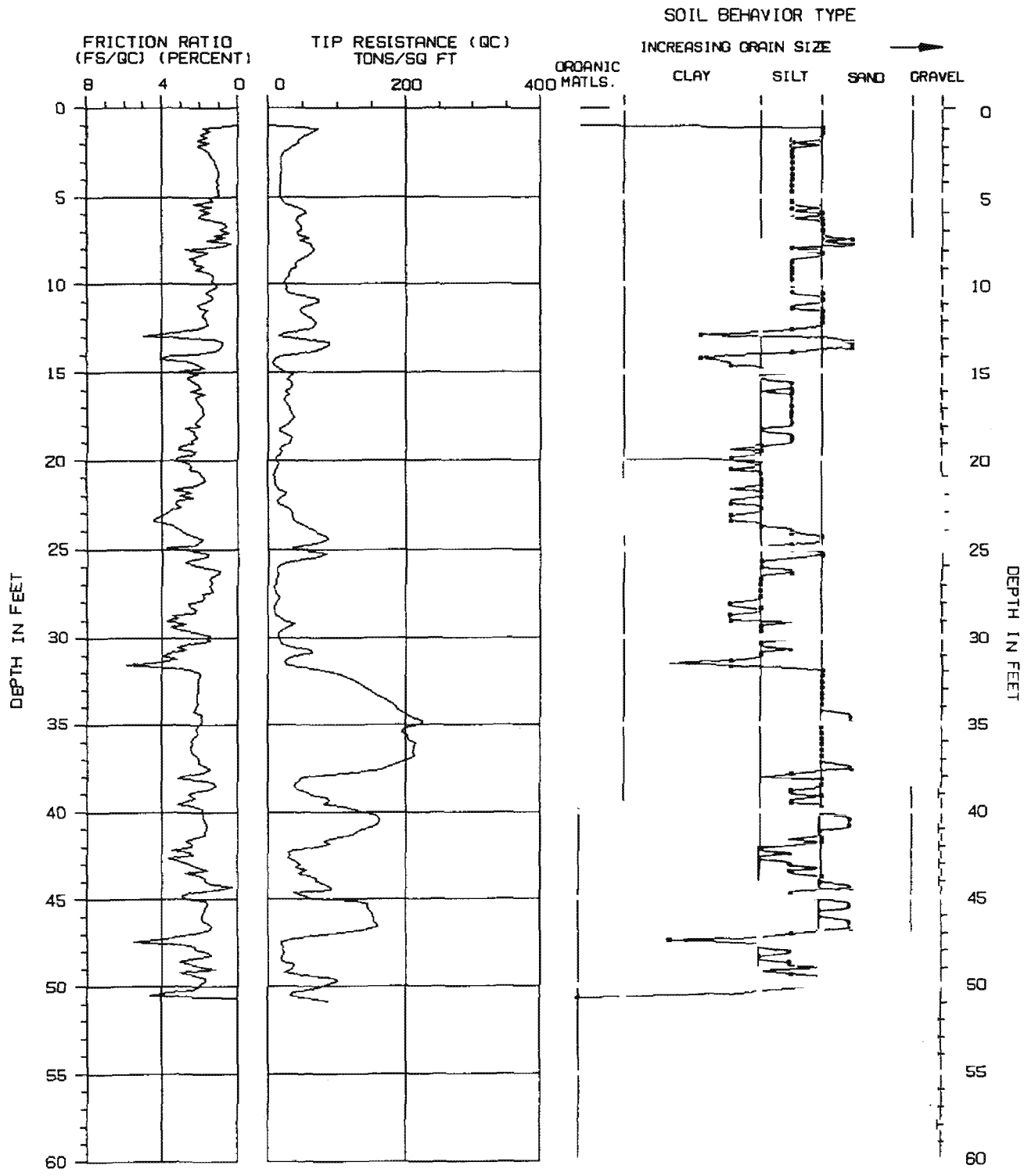
SOUNDING : CPT-8

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
13.800	45.28	143.8	1.58	.26	SAND to SILTY SAND	36
13.950	45.77	149.6	1.80	.26	SILTY SAND to SANDY SILT	50
14.100	46.26	153.6	1.77	.27	SAND to SILTY SAND	38
14.250	46.75	142.6	1.44	.28	SAND to SILTY SAND	36
14.400	47.24	37.1	3.81	.27	CLAYEY SILT to SILTY CLAY	19
14.550	47.74	22.0	2.26	.27	CLAYEY SILT to SILTY CLAY	11
14.700	48.23	20.0	1.43	.29	SANDY SILT to CLAYEY SILT	8
14.850	48.72	37.1	2.45	.29	SANDY SILT to CLAYEY SILT	15
15.000	49.21	23.6	3.03	.29	CLAYEY SILT to SILTY CLAY	12
15.150	49.70	100.3	1.70	.31	SILTY SAND to SANDY SILT	33
15.300	50.20	58.8	2.39	.31	SANDY SILT to CLAYEY SILT	24
15.450	50.69	56.4	*****	.32		0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 115 PCF

ASSUMED DEPTH OF WATER TABLE = 43.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-8

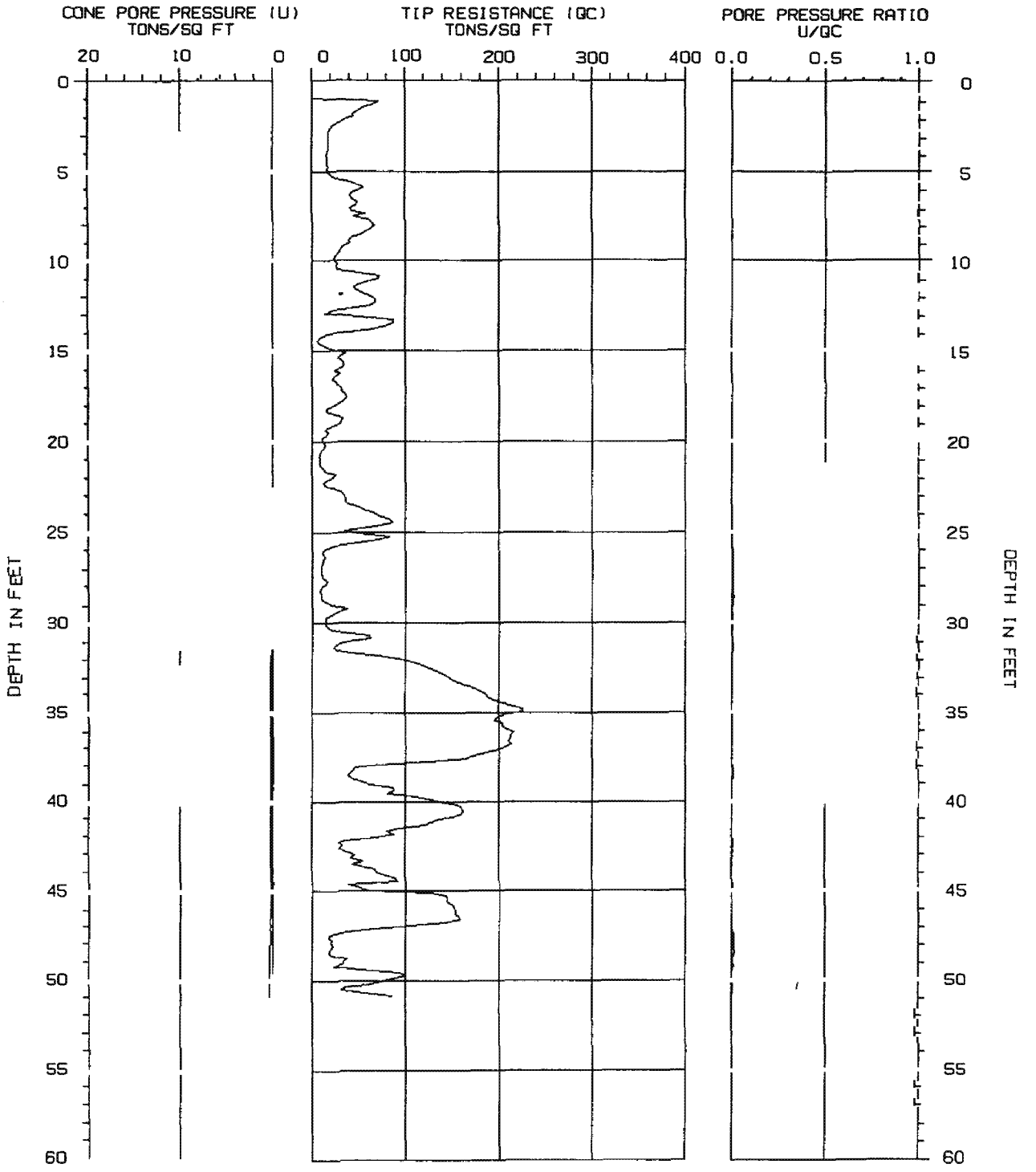
PROJECT NAME : EKI/WEBB

CONE/RIG : 473/R#3 KC/MR

PROJECT NUMBER : 98-E623

DATE/TIME: 10-02-98 11:27

HFA



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-8

PROJECT NAME : EKI/WEBB

PROJECT NUMBER : 98-E623

CONE/RIG : 473/R#3 KC/MR

DATE/TIME: 10-02-98 11:27

HFA

CONE PENETRATION TEST

SOUNDING : CPT-9
PROJECT : EKI/WEBB
DATE/TIME: 10-02-98 13:30

PROJECT No.: 98-E623
CONE/RIG : 473/R#3 KC/MR

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	o CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
.150	.49	.0	.00	.00		0
.300	.98	.0	.00	.00		0
.450	1.48	58.1	2.46	-.01	SANDY SILT to CLAYEY SILT	23
.600	1.97	88.0	1.46	.02	SILTY SAND to SANDY SILT	29
.750	2.46	46.5	1.68	.00	SILTY SAND to SANDY SILT	15
.900	2.95	38.9	1.19	.00	SILTY SAND to SANDY SILT	13
1.050	3.44	23.0	1.36	.00	SANDY SILT to CLAYEY SILT	9
1.200	3.94	20.3	1.48	-.01	SANDY SILT to CLAYEY SILT	8
1.350	4.43	22.2	1.40	-.01	SANDY SILT to CLAYEY SILT	9
1.500	4.92	22.7	1.40	-.01	SANDY SILT to CLAYEY SILT	9
1.650	5.41	26.5	1.31	-.02	SANDY SILT to CLAYEY SILT	11
1.800	5.91	25.1	1.48	-.04	SANDY SILT to CLAYEY SILT	10
1.950	6.40	25.8	1.64	-.04	SANDY SILT to CLAYEY SILT	10
2.100	6.89	26.5	1.39	-.04	SANDY SILT to CLAYEY SILT	11
2.250	7.38	21.4	1.84	-.05	SANDY SILT to CLAYEY SILT	9
2.400	7.87	18.0	1.98	-.04	CLAYEY SILT to SILTY CLAY	9
2.550	8.37	15.9	1.36	-.05	SANDY SILT to CLAYEY SILT	6
2.700	8.86	15.9	1.62	-.06	CLAYEY SILT to SILTY CLAY	8
2.850	9.35	18.1	1.61	-.06	SANDY SILT to CLAYEY SILT	7
3.000	9.84	23.4	1.42	-.06	SANDY SILT to CLAYEY SILT	9
3.150	10.33	21.1	1.41	-.06	SANDY SILT to CLAYEY SILT	8
3.300	10.83	21.9	1.49	-.06	SANDY SILT to CLAYEY SILT	9
3.450	11.32	23.4	2.18	-.06	SANDY SILT to CLAYEY SILT	9
3.600	11.81	33.9	1.69	-.06	SANDY SILT to CLAYEY SILT	14
3.750	12.30	32.3	2.36	-.05	SANDY SILT to CLAYEY SILT	13
3.900	12.80	15.1	3.37	-.05	CLAY to SILTY CLAY	10
4.050	13.29	45.8	1.88	-.04	SANDY SILT to CLAYEY SILT	18
4.200	13.78	36.3	3.43	-.03	CLAYEY SILT to SILTY CLAY	18
4.350	14.27	13.6	3.78	-.03	CLAY	14
4.500	14.76	16.9	1.76	-.03	CLAYEY SILT to SILTY CLAY	8
4.650	15.26	8.8	2.26	-.02	CLAY to SILTY CLAY	6
4.800	15.75	18.6	1.96	-.03	CLAYEY SILT to SILTY CLAY	9
4.950	16.24	11.5	3.54	-.03	CLAY	11
5.100	16.73	30.3	2.79	-.02	CLAYEY SILT to SILTY CLAY	15
5.250	17.22	30.9	2.56	-.01	SANDY SILT to CLAYEY SILT	12
5.400	17.72	32.8	2.15	-.01	SANDY SILT to CLAYEY SILT	13
5.550	18.21	67.9	1.62	.00	SILTY SAND to SANDY SILT	23
5.700	18.70	24.2	2.86	.00	CLAYEY SILT to SILTY CLAY	12
5.850	19.19	11.5	1.44	.00	CLAYEY SILT to SILTY CLAY	6
6.000	19.69	10.1	2.64	.00	CLAY to SILTY CLAY	7
6.150	20.18	17.7	1.41	.00	SANDY SILT to CLAYEY SILT	7

TOP 1.0 ft IS DISTURBED SOIL
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : CPT-9

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
6.300	20.67	13.4	1.52	.00	CLAYEY SILT to SILTY CLAY	7
6.450	21.16	13.8	1.91	.01	CLAYEY SILT to SILTY CLAY	7
6.600	21.65	7.3	2.17	.01	CLAY to SILTY CLAY	5
6.750	22.15	7.6	2.34	.01	CLAY to SILTY CLAY	5
6.900	22.64	7.9	3.35	.02	CLAY	8
7.050	23.13	42.8	3.86	.02	CLAYEY SILT to SILTY CLAY	21
7.200	23.62	55.3	3.94	.03	CLAYEY SILT to SILTY CLAY	28
7.350	24.11	84.4	2.48	.05	SANDY SILT to CLAYEY SILT	34
7.500	24.61	53.6	3.01	.05	SANDY SILT to CLAYEY SILT	21
7.650	25.10	18.6	5.17	.05	CLAY	19
7.800	25.59	59.5	2.08	.06	SILTY SAND to SANDY SILT	20
7.950	26.08	76.8	1.88	.06	SILTY SAND to SANDY SILT	26
8.100	26.57	51.9	2.67	.06	SANDY SILT to CLAYEY SILT	21
8.250	27.07	13.7	2.86	.06	CLAY to SILTY CLAY	9
8.400	27.56	10.3	2.97	.06	CLAY to SILTY CLAY	7
8.550	28.05	8.2	2.47	.06	CLAY to SILTY CLAY	5
8.700	28.54	11.1	2.15	.08	CLAYEY SILT to SILTY CLAY	6
8.850	29.04	8.0	3.15	.08	CLAY	8
9.000	29.53	8.9	2.90	.08	CLAY to SILTY CLAY	6
9.150	30.02	18.2	2.12	.09	CLAYEY SILT to SILTY CLAY	9
9.300	30.51	13.1	1.64	.09	CLAYEY SILT to SILTY CLAY	7
9.450	31.00	12.9	2.53	.10	CLAYEY SILT to SILTY CLAY	6
9.600	31.50	92.3	2.10	.12	SILTY SAND to SANDY SILT	31
9.750	31.99	61.7	2.37	.13	SANDY SILT to CLAYEY SILT	25
9.900	32.48	24.7	2.81	.13	CLAYEY SILT to SILTY CLAY	12
10.050	32.97	90.1	1.81	.14	SILTY SAND to SANDY SILT	30
10.200	33.46	133.3	1.59	.15	SAND to SILTY SAND	33
10.350	33.96	131.6	1.99	.15	SILTY SAND to SANDY SILT	44
10.500	34.45	156.6	2.17	.16	SILTY SAND to SANDY SILT	52
10.650	34.94	174.5	1.99	.18	SILTY SAND to SANDY SILT	58
10.800	35.43	218.5	1.90	.18	SAND to SILTY SAND	55
10.950	35.93	202.8	1.58	.18	SAND to SILTY SAND	51
11.100	36.42	192.0	1.87	.18	SAND to SILTY SAND	48
11.250	36.91	207.0	1.93	.18	SAND to SILTY SAND	52
11.400	37.40	214.1	2.03	.19	SILTY SAND to SANDY SILT	71
11.550	37.89	185.9	2.04	.19	SILTY SAND to SANDY SILT	62
11.700	38.39	117.6	1.69	.19	SILTY SAND to SANDY SILT	39
11.850	38.88	27.0	2.10	.15	SANDY SILT to CLAYEY SILT	11
12.000	39.37	33.0	2.68	.15	CLAYEY SILT to SILTY CLAY	17
12.150	39.86	68.5	2.25	.16	SILTY SAND to SANDY SILT	23
12.300	40.35	163.7	1.80	.18	SAND to SILTY SAND	41
12.450	40.85	199.5	1.88	.18	SAND to SILTY SAND	50
12.600	41.34	206.8	1.80	.19	SAND to SILTY SAND	52
12.750	41.83	163.3	1.51	.19	SAND to SILTY SAND	41
12.900	42.32	68.6	3.08	.18	SANDY SILT to CLAYEY SILT	27
13.050	42.81	30.5	3.02	.18	CLAYEY SILT to SILTY CLAY	15
13.200	43.31	34.5	3.38	.18	CLAYEY SILT to SILTY CLAY	17
13.350	43.80	58.5	3.51	.18	CLAYEY SILT to SILTY CLAY	29
13.500	44.29	101.2	2.29	.19	SILTY SAND to SANDY SILT	34
13.650	44.78	159.9	.94	.20	SAND	32

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

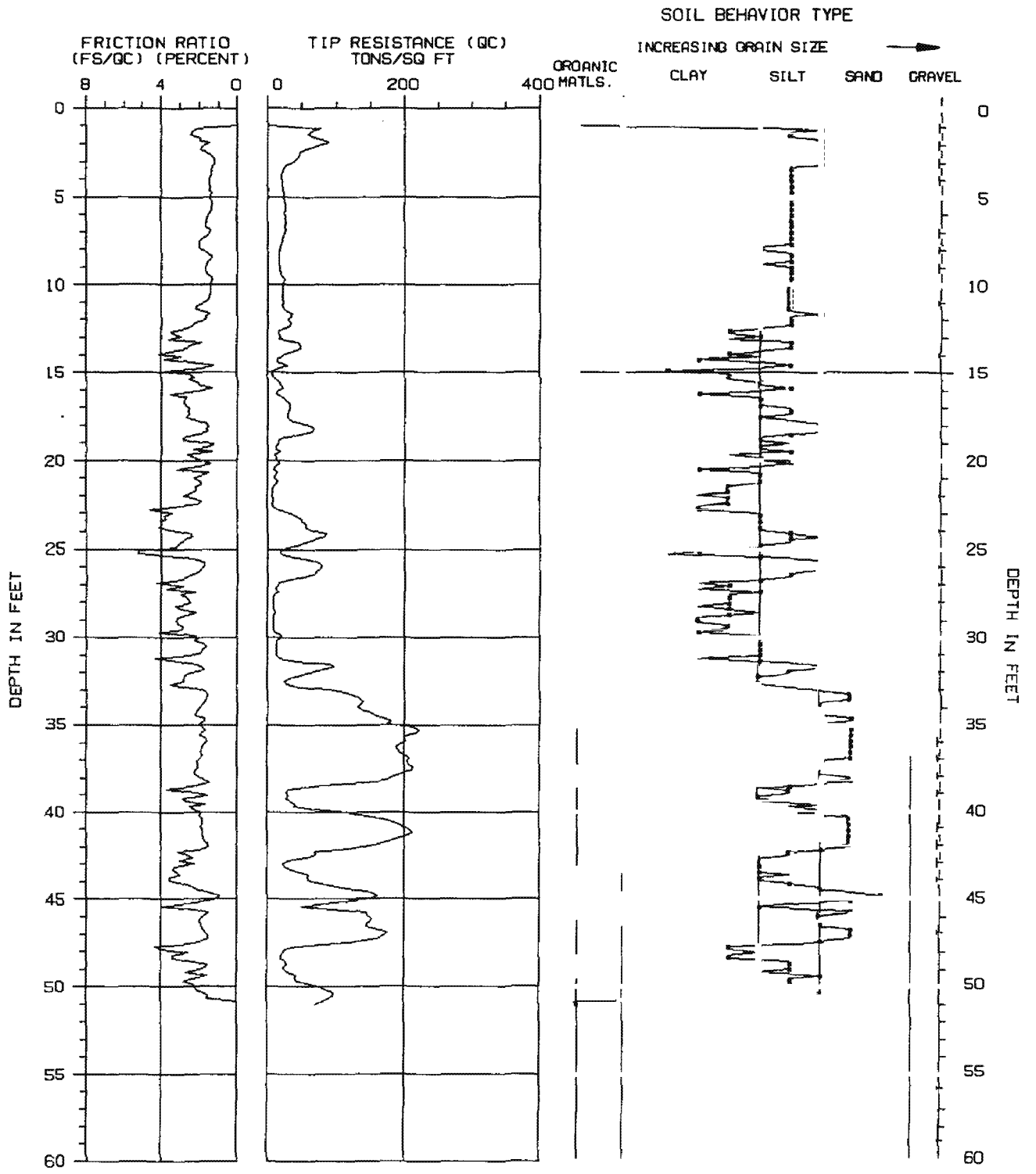
SOUNDING : CPT-9

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	CONE PORE PRESSURE (tsf)	SOIL BEHAVIOR TYPE	N(60)
13.800	45.28	83.8	2.61	.20	SANDY SILT to CLAYEY SILT	34
13.950	45.77	144.4	1.53	.21	SAND to SILTY SAND	36
14.100	46.26	150.1	1.98	.21	SILTY SAND to SANDY SILT	50
14.250	46.75	161.1	1.79	.22	SAND to SILTY SAND	40
14.400	47.24	159.7	1.53	.22	SAND to SILTY SAND	40
14.550	47.74	43.6	4.34	.22	CLAY to SILTY CLAY	29
14.700	48.23	20.3	3.40	.22	CLAY to SILTY CLAY	14
14.850	48.72	26.8	1.55	.24	SANDY SILT to CLAYEY SILT	11
15.000	49.21	29.6	2.69	.24	CLAYEY SILT to SILTY CLAY	15
15.150	49.70	43.3	2.79	.25	SANDY SILT to CLAYEY SILT	17
15.300	50.20	88.0	2.04	.26	SILTY SAND to SANDY SILT	29
15.450	50.69	90.4	1.57	.27	SILTY SAND to SANDY SILT	30

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 pcf
ASSUMED DEPTH OF WATER TABLE = 43.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 115 PCF

ASSUMED DEPTH OF WATER TABLE = 43.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-9

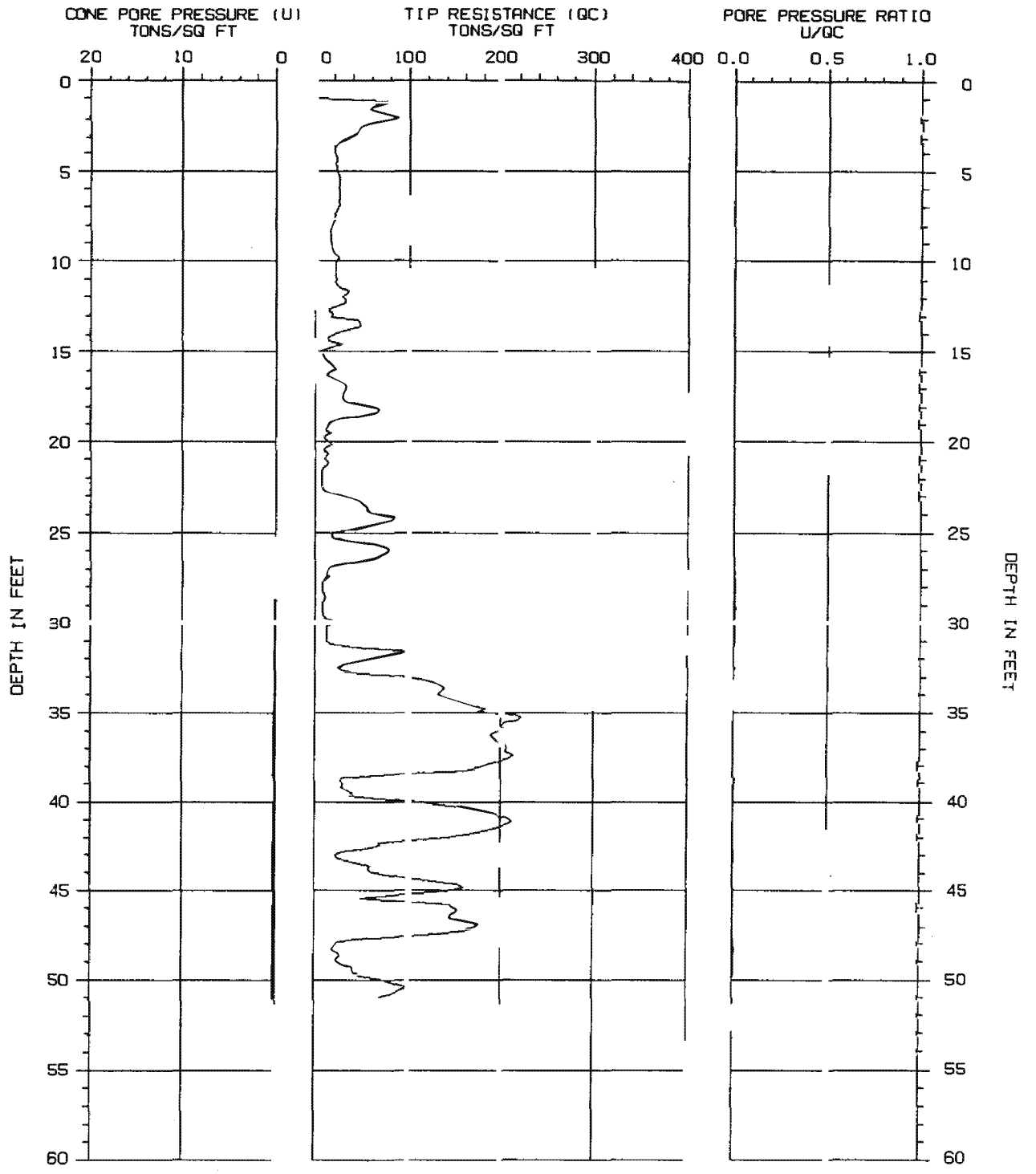
PROJECT NAME : EKI/WEBB

CONE/RIG : 473/R#3 KC/MR

PROJECT NUMBER : 98-E623

DATE/TIME: 10-02-98 13:30

HFA



TOP 1.0 FT IS DISTURBED SOIL

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-9

PROJECT NAME : EKI/WEBB

CONE/RIG : 473/R#3 KC/MR

PROJECT NUMBER : 98-E623

DATE/TIME: 10-02-98 13:30

HFA

APPENDIX C

Boring Logs

Boring & Well Construction Log

Erler & Kalinowski, Inc.

BOREHOLE LOCATION	Webb at Reliable Steel Property						BOREHOLE/ WELL NAME	MW-04	
DRILLING COMPANY	West Hazmat						PROJECT NAME	Webb- Monitoring Wells	
DRILLING METHOD	Hollow Stem Auger						PROJECT NUMBER	961025.02	
CONDUCTOR CASING			DIAMETER (inches)		FROM (feet)	TO	DATE STARTED	10/28/98	DATE COMPLETED 10/28/98
BLANK CASING	PVC		DIAMETER (inches)	4.00in	FROM (feet) 0.0'	TO 40.00'	BOREHOLE SIZE	10.00in	TOTAL DEPTH (feet) 70.00'
PERFORATED CASING	Slotted	0.010in	DIAMETER (inches)	4.00in	FROM (feet) 40.00'	TO 70.00'	DATUM	Mean Sea Level	
GROUT	Bentonite				FROM (feet) 0.00'	TO 33.00'	TOP OF CASING		GROUND SURFACE
SEAL	Bentonite Pellets				FROM (feet) 33.00'	TO 38.00'	LOGGED BY	Rob Hesse	
ANNULAR FILL	Sand Filter				FROM (feet) 38.00'	TO 70.00'	GEATHARD BY	Beth Lamb, CEG	

REMARKS: 1.5-inch O.D. Split Spoon Sampler
Well Completion: 12-inch surface housing

TIME COLLECTED	SAMPLE No.	SAMPLE	RECOVERY (ft)	BLOW COUNT	OVM (ppmV)	DEPTH (ft)	MATERIAL DESCRIPTION	Water Level	USCS Code	Graphic Log	WELL CONSTRUCTION	NOTES
									ML			Asphalt 4 to 6 inches.
						1-	SANDY SILT; grayish brown (10YR5/2); 15% clay, 35% sand; fine grained sand; micoceous; soft; moist.					Location is 2 feet north of CPT-1.
						2-						
						3-						
						4-						
			0.5	3		5-	Color change to dark greyish brown (10YR4/2)					
			0.5	2								
			0.5	3		6-						
						7-						
						8-						
						9-						
07:45	MW-4-10.5		0.5	3		10-	Increase clay to 25%, decrease sand to 20%.					
			0.5	4								
			0.5	5		11-						

BOREHOLE LOCATION MW-04 PROJECT NAME Webb- Monitoring Wells PROJECT NUMBER 961025.02

Erler & Kalinowski, Inc.

Boring & Well Construction Log

SAMPLING							MATERIAL DESCRIPTION	Water Level	USCS Code	Graphic Log	WELL CONSTRUCTION	NOTES
TIME COLLECTED	SAMPLE No.	SAMPLE	RECOVERY (ft)	BLOW COUNT	OVM (ppmV)	DEPTH (ft)						
						13						
						14						
			0.5	3		15	Decrease clay to 15%, increase sand to 35%.					
			0.5	4								
			0.5	5		16						
						17						
						18						
						19						
			0.5	5		20	CLAYEY SILT; dark grey (10YR4/1); 35% clay, 15% sand; fine grained sand; micaceous; soft; low plasticity; low toughness; low dry strength; moist.		ML			
			0.5	7								
08:00	MW-4-21.5		0.5	9		21						
						22						
						23						
						24	SANDY SILT; dark greyish brown (10YR4/2); 15% clay, 25% sand; fine grained sand; micaceous; soft; moist.		ML			
				4		25						
				5								
				6		26	CLAYEY SILT; greenish grey (10Y5/1); 40% clay, 10% sand; fine grained sand; micaceous; soft; medium plasticity; low toughness; low dry strength; moist.		ML			
						27						
						28						

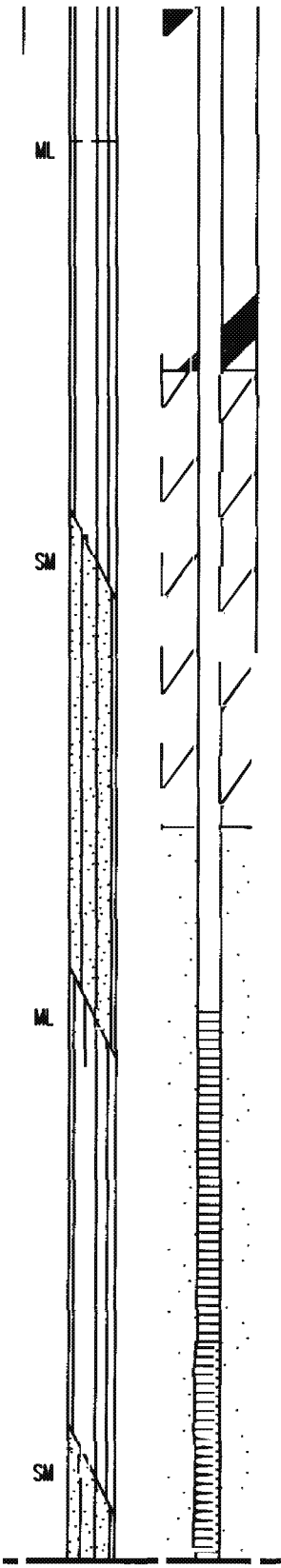
BOREHOLE LOCATION MW-04 | PROJECT NAME Webb- Monitoring Wells | PROJECT NUMBER 961025.02

Erler & Kalinowski, Inc.

Boring & Well Construction Log

TIME COLLECTED	SAMPLE No.	SAMPLE	RECOVERY (ft)	BLOW COUNT	OVM (ppmV)	DEPTH (ft)	MATERIAL DESCRIPTION	USCS Code
			0.5	5		30		
			0.5	8			SILTY SAND; greyish brown (2.5YR5/2); 15% clay, 40% silt; fine grained sand; micaceous; firm; moist.	ML
08:10	MW-4-31.5		0.5	10		31		
						32		
						33		
						34		
			0.5	14		35	SILTY SAND; light brownish grey (2.5YR6/2); 5% clay, 30% silt; fine grained sand; micaceous; quartzitic; loose; slightly moist.	SM
			0.5	20				
			0.5	32		36		
						37		
						38		
						39		
			0.5	15		40	SANDY SILT; dark greyish brown (10YR4/2); 15% clay, 35% sand; fine grained sand; micaceous; firm; moist.	ML
			0.5	16				
08:20	MW-4-41.5		0.5	20		41		
						42		
						43		
						44		
				11		45	SILTY SAND; dark grey (10YR4/1); 10% clay, 30% silt; fine grained sand; micaceous; quartzitic; hornblende; soft; moist to wet.	SM
				13				

Water Level | Graphic Log | WELL CONSTRUCTION | NOTES



BOREHOLE LOCATION MW-04 PROJECT NAME Webb– Monitoring Wells PROJECT NUMBER 961025.02

Erler & Kalinowski, Inc.

Boring & Well Construction Log

SAMPLES												
TIME COLLECTED	SAMPLE No.	SAMPLE	RECOVERY (ft)	BLOW COUNT	OVM (ppmV)	DEPTH (ft)	MATERIAL DESCRIPTION	Water Level	USCS Code	Graphic Log	WELL CONSTRUCTION	NOTES
				15								
						47						
						48						
						49						
			0.5	10		50	SANDY SILT; dark grey (2.5YR4/1); 15% clay, 40% sand; fine grained sand; micaceous; soft; wet.		ML			
			0.5	12								
			0.5	16		51						
						52						
						53						
						54						
				7		55						
				8								
				8		56						
						57						
						58						
						59						
			0.5	10		60	SANDY SILT, greenish grey (10Y5/1); 15% clay, 25% sand; fine grained sand; micaceous; soft; wet.					
			0.5	11								
			0.5	10		61						
						62						

BOREHOLE LOCATION MW-04 PROJECT NAME Webb- Monitoring Wells PROJECT NUMBER 961025.02

Boring & Well Construction Log

Erler & Kalinowski, Inc.

TIME COLLECTED	SAMPLE No.	SAMPLE	RECOVERY (ft)	BLOW COUNT	OVM (ppmV)	DEPTH (ft)	MATERIAL DESCRIPTION	Water Level	USCS Code	Graphic Log	WELL CONSTRUCTION	NOTES
						64-						
			0.5	11		65-	SAND; greenish grey (10Y5/1); with black (N1); 15% silt; fine to medium grained; quartzitic; orkosic; hornblende; subangular grains; well graded; dense; saturated.		SW			
			0.5	50/6								
			0.5			66-						
						67-						
						68-						
						69-						
						70-	Total Depth of borehole 70 feet.					Total depth: 70 feet.
						71-						
						72-						
						73-						
						74-						
						75-						
						76-						
						77-						
						78-						
						79-						

Boring & Well Construction Log

Erler & Kalinowski, Inc.

BOREHOLE LOCATION	Webb at Reliable Steel Property				BOREHOLE/ WELL NAME	MW-05	
DRILLING COMPANY	West Hazmat				PROJECT NAME	Webb- Monitoring Wells	
DRILLING METHOD	Hollow-Stem Auger (CME-75)				PROJECT NUMBER	961025.02	
CONDUCTOR CASING		DIAMETER (inches)	FROM (feet)	TO	DATE STARTED	10/28/98	DATE COMPLETED 10/28/98
BLANK CASING	PVC	DIAMETER (inches) 4.00in	FROM (feet) 0.0'	TO 40.00'	BOREHOLE SIZE	10.00in	TOTAL DEPTH (feet) 70.00'
PERFORATED CASING	Slotted 0.010in	DIAMETER (inches) 4.00in	FROM (feet) 40.00'	TO 70.00'	DATUM	NGVD 1929	
GROUT	Bentonite		FROM (feet) 0.00'	TO 33.00'	TOP OF CASING		GROUND SURFACE
SEAL	Bentonite Pellets		FROM (feet) 33.00'	TO 38.00'	LOGGED BY	Rob Hesse	
ANNULAR FILL	Sand Filter		FROM (feet) 38.00'	TO 70.00'	CERTIFIED BY	Beth Lamb, CEG	
REMARKS	1.5-inch O.D. Split Spoon Sampler						

TIME COLLECTED	SAMPLE No.	SAMPLE	RECOVERY (ft)	BLOW COUNT	OVM (ppmV)	DEPTH (ft)	MATERIAL DESCRIPTION	Water Level	USCS Code	Graphic Log	WELL CONSTRUCTION	NOTES
									SM			Asphalt 4-6 inches.
						1-	SILTY SAND; Grayish brown (10YR5/2); 15% clay, 30% silt; fine grained sand; micaceous; loose; moist.					
						2-						
						3-						
						4-						
			0.5	3		5-	Decrease fines to 10% clay, 25% silt.					
			0.5	3								
			0.5	3		6-						
						7-						
						8-						
						9-						
			0.5	3		10-	SANDY SILT; grayish brown (10YR5/2); 15% clay, 35% sand; fine grained sand; micaceous; soft to firm; moist to wet.		ML			
	MW-5-11		0.5	3								
			0.5	4		11-						

BOREHOLE LOCATION MW-05 PROJECT NAME Webb-- Monitoring Wells PROJECT NUMBER 961025.02

Boring & Well Construction Log

Erler & Kalinowski, Inc.

TIME COLLECTED	SAMPLE No.	SAMPLE	RECOVERY (ft)	BLOW COUNT	OVM (ppmV)	DEPTH (ft)	MATERIAL DESCRIPTION	Water Level	USCS Code	Graphic Log	WELL CONSTRUCTION	NOTES
						13						
						14						
			0.5	6		15	Increase fines to 20% clay, 25% sand; slightly plastic; firm; wet.					
			0.5	9								
			0.5	13		16						
						17						
						18						
						19						
			0.5	3		20	SILTY SAND, greyish brown (10YR5/2); 15% clay, 30% silt; fine-grained sand; micaceous; soft; moist.		SM			
	MW-5-21		0.5	5								
			0.5	11		21			ML			
						22	CLAYEY SILT with SAND, grayish brown (2.5Y5/2); 25% clay, 15% sand; fine-grained sand; micaceous; low plasticity; low toughness; low dry strength; firm; moist.					
						23						
						24						
			0.5	11		25	SILTY SAND, grayish brown (10YR5/2); 15% clay, 30% silt; fine-grained sand; soft; moist.		SM			
			0.5	7								
			0.5	8		26	SILTY CLAY, grayish brown (2.5Y5/2); 35% silt, 25% sand; fine-grained sand; micaceous, medium plasticity; low toughness; low dry strength; soft to firm, moist.		CL			
						27						
						28						

BOREHOLE LOCATION MW-05 PROJECT NAME Webb- Monitoring Wells PROJECT NUMBER 961025.02

Boring & Well Construction Log

Erler & Kalinowski, Inc.

TIME COLLECTED	SAMPLE No.	SAMPLE	RECOVERY (ft)	BLOW COUNT	OVM (ppmV)	DEPTH (ft)	MATERIAL DESCRIPTION	Water Level	USCS Code	Graphic Log	WELL CONSTRUCTION	NOTES
			0.5	6		30			SM			
	MW-5-31		0.5	11								
			0.4	12		31	SILTY SAND, dark grayish frown (10YR4/2); 15% clay 30% silt; fine grained sand; micaceous; soft to firm; moist.					
						32						
						33						
						34						
			0.5	15		35	SILTY SAND, light brownish gray (2.5Y6/2); 5% clay, 15% silt; fine to medium grained sand; micaceous; quartzitic; poorly graded; soft; moist.					
			0.5	20								
			0.5	20		36						
						37						
						38						
						39						
			0.5	8		40	SANDY SILT, dark greenish gray (10Y4/1); 15% clay, 35% sand; fine grained sand; micaceous; soft to firm; moist.		ML			
	MW-5-41		0.5	8								
			0.5	11		41						
						42						
						43						
						44						
				8		45	Increase sand to 45%; moist to wet.					
				13								

BOREHOLE LOCATION MW-05 PROJECT NAME Webb- Monitoring Wells PROJECT NUMBER 961025.02

Erler & Kalinowski, Inc.

Boring & Well Construction Log

TIME COLLECTED	SAMPLE No.	SAMPLE	RECOVERY (ft)	BLOW COUNT	OVM (ppmV)	DEPTH (ft)	MATERIAL DESCRIPTION	Water Level	USCS Code	Graphic Log	WELL CONSTRUCTION	NOTES
				15								
						47-						
						48-						
						49-						
			0.5	7		50-	Decrease sand to 30%, increase clay to 20%; non-plastic.					
			0.5	9								
			0.3	14		51-						
						52-						
						53-						
						54-						
			0.5	10		55-	Increase sand to 40%, decrease clay to 15%; wet.					
			0.5	12								
			0.5	15		56-						
						57-						
						58-						
						59-						
			0.5	10		60-	SILTY SAND, dark greenish gray (10Y4/1); 10% clay 30% silt; fine to medium grained sand; micaceous; quartzitic; poorly graded; soft; wet to saturated.		SM			
			0.5	15								
			0.5	16		61-						
						62-						

BOREHOLE LOCATION MW-05 PROJECT NAME Webb- Monitoring Wells PROJECT NUMBER 961025.02

Boring & Well Construction Log

Erler & Kalinowski, Inc.

SAMPLES: TIME COLLECTED	SAMPLE No.	SAMPLE	RECOVERY (ft)	BLOW COUNT	OVM (ppmV)	DEPTH (ft)	MATERIAL DESCRIPTION	Water Level	USCS Code	Graphic Log	WELL CONSTRUCTION	NOTES
						64-						
			0.5	10		65-	SILTY SAND, dark greenish gray (10Y4/1); 5% clay, 15% silt; fine to medium grained sand; quartzitic, orthosic, with hornblende; subangular; poorly graded; dense; saturated.		SP			
			0.5	20								
			0.5	50 /(		66-						
						67-						
						68-						
						69-	SANDY SILT, greenish gray (10Y5/1); 15% clay; 25% sand; fine grained sand; micaceous; soft to firm; saturated.		ML			
						70-	Total Depth of borehole: 70 feet					
						71-						
						72-						
						73-						
						74-						
						75-						
						76-						
						77-						
						78-						
						79-						

Attachment 3

Potential to Release Score

Attachment 3 Potential to Release Score

The following two hypothetical scenarios are provided to evaluate the HRS potential to release factor value score for the Jervis B. Webb Co. site (the Site). It is intended to illustrate that, even if comments presented by the Dragun Corporation are correct, the HRS score for the Site would still exceed 28.50 if the potential for release factor value were scored instead of a likelihood of release factor value.

A3.1 Scenario 1

Under this scenario, it is assumed that an observed release of contamination to the aquifer has not been established. All points of contamination identified at the Site are considered eligible for this hypothetical evaluation of the potential to release factor.

A3.1.1 Likelihood of Release Factor Category

Regarding the potential to release factor for the ground water migration pathway, HRS Section 3.1.2, *Potential to release*, states:

> Evaluate potential to release only if an observed release cannot be established for the aquifer. Evaluate potential to release based on four factors: containment, net precipitation, depth to aquifer, and travel time. For sources overlying karst terrain, give any karst aquifer that underlies any portion of the sources at the site special consideration in evaluating depth to aquifer and travel time, as specified in sections 3.1.2.3 and 3.1.2.4.

HRS Section 3.1.2.1, *Containment*, states:

> Assign a containment factor value from table 3-2 to each source at the site. Select the highest containment factor value assigned to those sources with a source hazardous waste quantity value of 0.5 or more (see section 2.4.2.1.5). (Do not include this minimum size requirement in evaluating any other factor of this pathway.) Assign this highest value as the containment factor value for the aquifer being evaluated. Enter this value in Table 3-1.
>
> If no source at the site meets the minimum size requirement, then select the highest value assigned to the sources at the site and assign it as the containment factor value for the aquifer being evaluated. Enter this value in table 3-1.

Page 20 of the HRS documentation record at proposal states that the hazardous waste quantity assigned for Source 1 is a value of greater than zero. Although this does not meet the minimum size requirement of 0.5, it is the sole source at the Site, and therefore the containment value from Source 1 would be used for the purposes of calculating potential to release.

On Source 1 containment, page 12 of the HRS documentation record at proposal states:

> **Source Containment**
>
> Release to ground water:
>
> A site reconnaissance conducted in February 2011 showed that although the Jervis B. Webb Co. property is mostly paved, the pavement is in poor condition and contains

> multiple cracks (Ref. 15, pp. 1, 2). In addition, during the 1997 and 1998 sampling events, there was no evidence that a liner or engineered cover were present at or beneath the ground surface (Ref. 10, pp. 56-91; Ref. 11 pp. 29-43). Precipitation could infiltrate the contaminated soil beneath the pavement (Ref. 15, pp. 1, 2). Therefore, a containment factor value of 10 is assigned (Ref. 1 Sections 2.2.3 and 3.1.2.1 and Table 3-2).

Therefore, the containment value for use in evaluating potential to release is 10.

HRS Section 3.1.2.2, *Net precipitation*, states:

> Assign a net precipitation factor value to the site. Figure 3-2 provides computed net precipitation factor values, based on site location. . . .

HRS Figure 3-2, *Net Precipitation Factor Values*, shows the following:

Based on the location of the Site (see Figure 1 of the HRS documentation record at proposal, which shows the site location relative to the entire state of California), the net precipitation factor assigned is 3.

HRS Section 3.1.2.3, *Depth to aquifer*, states:

> Evaluate depth to aquifer by determining the depth from the lowest known point of hazardous substances at a site to the top of the aquifer being evaluated, considering all

layers in that interval. Measure the depth to an aquifer as the distance from the surface to the top of the aquifer minus the distance from the surface to the lowest known point of hazardous substances eligible to be evaluated for that aquifer. In evaluating depth to aquifer in karst terrain, assign a thickness of 0 feet to a karst aquifer that underlies any portion of the sources at the site. Based on the calculated depth, assign a value from table 3-5 to the depth to aquifer factor.

Determine the depth to aquifer only at locations within 2 miles of the sources at the site, except: if observed ground water contamination attributable to sources at the site extends more than 2 miles beyond these sources, use any location within the limits of this observed ground water contamination when evaluating the depth to aquifer factor for any aquifer that does not have an observed release. If the necessary geologic information is available at multiple locations, calculate the depth to aquifer at each location. Use the location having the smallest depth to assign the factor value. Enter this value in table 3-1.

HRS Table 3-5, *Depth to Aquifer Factor Values*, shows the following:

Table 3-5 Depth to Aquifer Factor Values

Depth to aquifer[a] (feet)	Assigned value
Less than or equal to 25	5
Greater than 25 to 250	3
Greater than 250	1

[a] Use depth of all layers between the hazardous substances and aquifer. Assign a thickness of 0 feet to any karst aquifer that underlies any portion of the sources at the site.

Page 16 of the HRS documentation record at proposal shows three samples (B17-41, B18-41, B19-41) collected at 41 ft bgs, one sample each at borehole locations B17, B18 and B19, where contamination was detected (in Reference 10 of the HRS documentation record at proposal, see p. 32for the relevant TCE and PCE concentrations in these samples).

Page 23 of the HRS documentation record at proposal identifies that "in the South Gate area, shallow ground water occurs at a depth of approximately 45 feet bgs." Therefore, the depth from sample B18-41 at 41ft bgs to ground water is 4 ft, corresponding to an assigned depth to aquifer factor value of 5 (see also Figure A3-1, Borehole B18 Lithologic Information, of this attachment).

HRS Section 3.1.2.4, *Travel time*, states:

Evaluate the travel time factor based on the geologic materials in the interval between the lowest known point of hazardous substances at the site and the top of the aquifer being evaluated. Assign a value to the travel time factor as follows:

- If the depth to aquifer (see section 3.1.2.3) is 10 feet or less, assign a value of 35.
- If, for the interval being evaluated, all layers that underlie a portion of the sources at the site are karst, assign a value of 35.
- Otherwise:
  - Select the lowest hydraulic conductivity layer(s) from within the above interval. Consider only layers at least 3 feet thick. However, do not consider layers or portions of layers within the first 10 feet of the depth to the aquifer.
  - Determine hydraulic conductivities for individual layers from table 3-6 or from in-situ or laboratory tests. Use representative, measured, hydraulic conductivity values whenever available.

- If more than one layer has the same lowest hydraulic conductivity, include all such layers and sum their thicknesses. Assign a thickness of 0 feet to a karst layer that underlies any portion of the sources at the site.
- Assign a value from table 3-7 to the travel time factor, based on the thickness and hydraulic conductivity of the lowest hydraulic conductivity layer(s).

Determine travel time only at locations within 2 miles of the sources at the site, except: if observed ground water contamination attributable to sources at the site extends more than 2 miles beyond these sources, use any location within the limits of this observed ground water contamination when evaluating the travel time factor for any aquifer that does not have an observed release. If the necessary subsurface geologic information is available at multiple locations, evaluate the travel time factor at each location. Use the location having the highest travel time factor value to assign the factor value for the aquifer. Enter this value in table 3-1.

HRS Table 3-6, *Hydraulic Conductivity of Geologic Materials*, lists the following values:

Table 3-6 Hydraulic Conductivity of Geologic Materials

Type of material	Assigned conductivity[a] (cm/sec)
Clay; low permeability till (compact unfractured till); shale; unfractured metamorphic and igneous rocks	10^{-8}
Silt; loesses; silty clays; sediments that are predominantly silts; moderately permeable till (fine-grained, unconsolidated till, or compact till with some fractures); low permeability limestones and dolomites (no karst); low permeability sandstone; low permeability fractured igneous and metamorphic rocks.	10^{-6}
Sands; sandy silts; sediments that are predominantly sand; highly permeable till (coarse-grained, unconsolidated or compact and highly fractured); peat; moderately permeable limestones and dolomites (no karst); moderately permeable sandstone; moderately permeable fractured igneous and metamorphic rocks	10^{-4}
Gravel; clean sand; highly permeable fractured igneous and metamorphic rocks; permeable basalt; karst limestones and dolomites	10^{-2}

[a] Do not round to nearest integer.

HRS Table 3-7, *Travel Time Factor Values*, states:

Table 3-7 Travel Time Factor Values[a]

Hydraulic conductivity (cm/sec)	Thickness of lowest hydraulic conductivity layer(s)[b] (feet)			
	Greater than 3 to 5	Greater than 5 to 100	Greater than 100 to 500	Greater than 500
Greater than or equal to 10^{-3}	35	35	35	25
Less than 10^{-3} to 10^{-5}	35	25	15	15
Less than 10^{-5} to 10^{-7}	15	15	5	5
Less than 10^{-7}	5	5	1	1

[a] If depth to aquifer is 10 feet or less or if, for the interval being evaluated, all layers that underlie a portion of the sources at the site are karst, assign a value of 35.

[b] Consider only layers at least 3 feet thick. Do not consider layers or portions of layers within the first 10 feet of the depth to the aquifer.

As sample B18-41 is located at 41ft bgs, and the depth to aquifer is less than 10 ft, according to HRS Section 3.1.2.4, *Travel time*, quoted above, a travel time factor value of 35 would be assigned (see also Figure A3-1, Borehole B18 Lithologic Information, of this attachment).

HRS Section 3.1.2.5, *Calculation of potential to release factor value*, states:

> Sum the factor values for net precipitation, depth to aquifer, and travel time, and multiply this sum by the factor value for containment. Assign this product as the potential to release factor value for the aquifer. Enter this value in table 3-1.

Thus, the potential to release factor would be (3 + 5 + 35) x 10, or 430.

HRS Section 3.1.3, *Calculation of likelihood of release factor category value*, states:

> If an observed release is established for an aquifer, assign the observed release factor value of 550 as the likelihood of release factor category value for that aquifer. Otherwise, assign the potential to release factor value for that aquifer as the likelihood of release value. Enter the value assigned in table 3-1.

Therefore, the likelihood of release factor category value for the aquifer is 430.

A3.1.2 Waste Characteristics Factor Category

Based on the EPA's September 2011 revision to the TCE toxicological parameters posted in the Integrated Risk Information System (IRIS) database, the toxicity value for TCE has been updated. The updated toxicity value for TCE has been revised from the previous value of 10,000 to 1,000. The EPA's revision to the IRIS database does not result in a change to the mobility factor value for TCE. This change in the TCE toxicological parameters that results in an updated toxicity value for TCE of 1,000 does change the Toxicity/Mobility Factor Value for the Site to 1,000[1]. As explained in section 3.8,

[1] See section 3.8, Consideration of Revisions in TCE Toxicological Parameters, of the Jervis B. Webb Co. support document.

Consideration of Revisions in TCE Toxicological Parameters, of the Jervis B. Webb Co. support document, the resulting Waste Characteristics Factor Category Value has been revised to 10 in the HRS documentation record at promulgation to reflect this toxicity change.

As can be seen in the scoresheet on page 3 of the HRS documentation record at proposal, the ground water migration score for an aquifer is equal to the product of the likelihood of release, waste characteristics, and targets factor category values divided by 82,500 or:

(430 x 10 x 1,373)/82,500 = 71.56

The ground water migration pathway score is equal to the highest aquifer score, or 71.56.

HRS Section 2.1.1, *Calculation of HRS site score*, states that:

> [s]cores are first calculated for the individual pathways as specified in sections 2 through 7 and then are combined for the site using the following root-mean-square equation to determine the overall HRS site score, which ranges from 0 to 100:

Under this hypothetical evaluation, the HRS site score would be 35.78. The Site score would be above 28.50 and sufficient to qualify the site for the NPL; there would be no change in the decision to place the Site on the NPL.

A3.2 Scenario 2

In this hypothetical scenario, the following assumptions have been made based on Dragun's claims **(the EPA does not concede these points)**:

- The ground water chlorinated solvent contamination under the Jervis Webb Co. Site originated at an off-site upgradient source.
- The 2-5 ft thick clay layer beginning at approximately 25 feet below ground surface (ft bgs) at the Site is competent and continuous throughout the Site area.
- The chlorinated solvent contamination in deep soil below the clay layer is a result of ground water contamination migrating upward, not a result of shallow soil contamination above the clay layer migrating downward.

In evaluating the potential to release below, only points of contamination above the clay layer are used to acknowledge the above assumptions. Additionally, as part of this hypothetical Scenario 2, the hazardous constituent quantity is calculated taking into account the recorded mass of volatile organic compounds (VOCs) removed from Site soils above the clay layer by a soil vapor extraction (SVE) system.

A3.2.1 Likelihood of Release Factor Category

Regarding the potential to release for the ground water pathway, HRS Section 3.1.2, *Potential to release*, states:

> Evaluate potential to release only if an observed release cannot be established for the aquifer. Evaluate potential to release based on four factors: containment, net precipitation, depth to aquifer, and travel time. For sources overlying karst terrain, give any karst aquifer that underlies any portion of the sources at the site special consideration in evaluating depth to aquifer and travel time, as specified in sections 3.1.2.3 and 3.1.2.4.

HRS Section 3.1.2.1, *Containment*, states:

> Assign a containment factor value from table 3-2 to each source at the site. Select the highest containment factor value assigned to those sources with a source hazardous waste quantity value of 0.5 or more (see section 2.4.2.1.5). (Do not include this minimum size requirement in evaluating any other factor of this pathway.) Assign this highest value as the containment factor value for the aquifer being evaluated. Enter this value in Table 3-1.
>
> If no source at the site meets the minimum size requirement, then select the highest value assigned to the sources at the site and assign it as the containment factor value for the aquifer being evaluated. Enter this value in table 3-1.

Page 20 of the HRS documentation record at proposal states that the hazardous waste quantity assigned for Source 1 is a value of greater than zero. Though this does not meet the minimum size requirement of 0.5, it is the sole source at the Site, and therefore the containment value from Source 1 is used for the purposes of calculating potential to release.

On Source 1 containment, page 12 of the HRS documentation record at proposal states:

> **Source Containment**
>
> Release to ground water:
>
> A site reconnaissance conducted in February 2011 showed that although the Jervis B. Webb Co. property is mostly paved, the pavement is in poor condition and contains multiple cracks (Ref. 15, pp. 1, 2). In addition, during the 1997 and 1998 sampling events, there was no evidence that a liner or engineered cover were present at or beneath the ground surface (Ref. 10, pp. 56-91; Ref. 11 pp. 29-43). Precipitation could infiltrate the contaminated soil beneath the pavement (Ref. 15, pp. 1, 2). Therefore, a containment factor value of 10 is assigned (Ref. 1 Sections 2.2.3 and 3.1.2.1 and Table 3-2).

Therefore the containment value for use in evaluating potential to release is 10.

HRS Section 3.1.2.2, *Net precipitation*, states:

> Assign a net precipitation factor value to the site. Figure 3-2 provides computed net precipitation factor values, based on site location. . . .

HRS Figure 3-2, *Net Precipitation Factor Values*, shows the following:

Based on the location of the Site (see Figure 1 of the HRS documentation record at proposal, which shows the site location relative to the entire state of California), the net precipitation factor assigned is 3.

HRS Section 3.1.2.3, *Depth to aquifer*, states:

> Evaluate depth to aquifer by determining the depth from the lowest known point of hazardous substances at a site to the top of the aquifer being evaluated, considering all layers in that interval. Measure the depth to an aquifer as the distance from the surface to the top of the aquifer minus the distance from the surface to the lowest known point of hazardous substances eligible to be evaluated for that aquifer. In evaluating depth to aquifer in karst terrain, assign a thickness of 0 feet to a karst aquifer that underlies any portion of the sources at the site. Based on the calculated depth, assign a value from table 3-5 to the depth to aquifer factor.
>
> Determine the depth to aquifer only at locations within 2 miles of the sources at the site, except: if observed ground water contamination attributable to sources at the site extends more than 2 miles beyond these sources, use any location within the limits of this observed ground water contamination when evaluating the depth to aquifer factor for any aquifer that does not have an observed release. If the necessary geologic information is

available at multiple locations, calculate the depth to aquifer at each location. Use the location having the smallest depth to assign the factor value. Enter this value in table 3-1.

HRS Table 3-5, *Depth to Aquifer Factor Values*, shows the following:

Table 3-5 Depth to Aquifer Factor Values

Depth to aquifer[a] (feet)	Assigned value
Less than or equal to 25	5
Greater than 25 to 250	3
Greater than 250	1

[a] Use depth of all layers between the hazardous substances and aquifer. Assign a thickness of 0 feet to any karst aquifer that underlies any portion of the sources at the site.

As previously mentioned, in evaluating the potential to release factor for the purposes of this hypothetical exercise, only points of contamination above the clay layer are used to acknowledge Dragun's claims. The contamination detected in borehole location B18 (near the center of Source 1) at 21 ft bgs will be used for this purpose (in Reference 10 of the HRS documentation record at proposal, see page 32 for the TCE concentration in that sample, and the B18 borehole log on page 85 showing that sample depth is above the clay layer). (See also Figure A3-1, Borehole B18 Lithologic Information, of this attachment.)

Page 23 of the HRS documentation record at proposal identifies that "in the South Gate area, shallow ground water occurs at a depth of approximately 45 feet bgs." Therefore, the depth from sample B18-21 at 21 ft bgs to ground water is 24 ft, corresponding to an assigned depth to aquifer factor value of 5.

HRS Section 3.1.2.4, *Travel time*, states:

Evaluate the travel time factor based on the geologic materials in the interval between the lowest known point of hazardous substances at the site and the top of the aquifer being evaluated. Assign a value to the travel time factor as follows:

- If the depth to aquifer (see section 3.1.2.3) is 10 feet or less, assign a value of 35.
- If, for the interval being evaluated, all layers that underlie a portion of the sources at the site are karst, assign a value of 35.
- Otherwise:
  - Select the lowest hydraulic conductivity layer(s) from within the above interval. Consider only layers at least 3 feet thick. However, do not consider layers or portions of layers within the first 10 feet of the depth to the aquifer.
  - Determine hydraulic conductivities for individual layers from table 3-6 or from in-situ or laboratory tests. Use representative, measured, hydraulic conductivity values whenever available.
  - If more than one layer has the same lowest hydraulic conductivity, include all such layers and sum their thicknesses. Assign a thickness of 0 feet to a karst layer that underlies any portion of the sources at the site.
  - Assign a value from table 3-7 to the travel time factor, based on the thickness and hydraulic conductivity of the lowest hydraulic conductivity layer(s).

Determine travel time only at locations within 2 miles of the sources at the site, except: if observed ground water contamination attributable to sources at the site extends more than 2 miles beyond these sources, use any location within the limits of this observed ground water contamination when evaluating the travel time factor for any aquifer that does not have an observed release. If the necessary subsurface geologic information is available at

multiple locations, evaluate the travel time factor at each location. Use the location having the highest travel time factor value to assign the factor value for the aquifer. Enter this value in table 3-1.

HRS Table 3-6, *Hydraulic Conductivity of Geologic Materials*, lists the following values:

Table 3-6 Hydraulic Conductivity of Geologic Materials

Type of material	Assigned conductivity[a] (cm/sec)
Clay; low permeability till (compact unfractured till); shale; unfractured metamorphic and igneous rocks	10^{-8}
Silt; loesses; silty clays; sediments that are predominantly silts; moderately permeable till (fine- grained, unconsolidated till, or compact till with some fractures); low permeability limestones and dolomites (no karst); low permeability sandstone; low permeability fractured igneous and metamorphic rocks.	10^{-6}
Sands; sandy silts; sediments that are predominantly sand; highly permeable till (coarse-grained, unconsolidated or compact and highly fractured); peat; moderately permeable limestones and dolomites (no karst); moderately permeable sandstone; moderately permeable fractured igneous and metamorphic rocks	10^{-4}
Gravel; clean sand; highly permeable fractured igneous and metamorphic rocks; permeable basalt; karst limestones and dolomites	10^{-2}

[a] Do not round to nearest integer.

HRS Table 3-7, *Travel Time Factor Values*, states:

Table 3-7 Travel Time Factor Values[a]

Hydraulic conductivity (cm/sec)	Thickness of lowest hydraulic conductivity layer(s)[b] (feet) Greater than 3 to 5	Greater than 5 to 100	Greater than 100 to 500	Greater than 500
Greater than or equal to 10^{-3}	35	35	35	25
Less than 10^{-3} to 10^{-5}	35	25	15	15
Less than 10^{-5} to 10^{-7}	15	15	5	5
Less than 10^{-7}	5	5	1	1

[a] If depth to aquifer is 10 feet or less or if, for the interval being evaluated, all layers that underlie a portion of the sources at the site are karst, assign a value of 35.
[b] Consider only layers at least 3 feet thick. Do not consider layers or portions of layers within the first 10 feet of the depth to the aquifer.

As sample B18-21 is located at 21 ft bgs, and the HRS instructs not to consider the first 10 ft of depth to aquifer, the lowest hydraulic conductivity layer at least 3 ft thick between 31 ft bgs and 45 ft bgs is a 4.5-ft thick clayey silt layer (in Reference 10 of the HRS documentation record at proposal, see the B18 borehole log on pp. 84-87, showing the clayey silt layer from approximately 31-35.5 ft). The hydraulic conductivity for a clayey silt layer is 10^{-6} from HRS Table 3-6 above. The corresponding time travel factor value for a 4.5-ft thick layer with a hydraulic conductivity of 10^{-6} would be 15.

HRS Section 3.1.2.5, *Calculation of potential to release factor value*, states:

> Sum the factor values for net precipitation, depth to aquifer, and travel time, and multiply this sum by the factor value for containment. Assign this product as the potential to release factor value for the aquifer. Enter this value in table 3-1.

Thus, the potential to release factor would be (3 + 5 + 15) x 10, or 230.

HRS Section 3.1.3, *Calculation of likelihood of release factor category value*, states:

> If an observed release is established for an aquifer, assign the observed release factor value of 550 as the likelihood of release factor category value for that aquifer. Otherwise, assign the potential to release factor value for that aquifer as the likelihood of release value. Enter the value assigned in table 3-1.

Therefore, the likelihood of release factor category value for the aquifer would be 230.

A3.2.2 Waste Characteristics Factor Category

Under this hypothetical Scenario 2, the estimated 177 pounds of VOCs stated to have been removed from soil at the Site by the SVE system are used to calculate an estimated source hazardous constituent quantity; only the contamination from SVE system points above the clay layer are used for this calculation (see page 5 of Attachment 1, 2008 State of California Department of Toxic Substance Control Consent Order, of the Jervis B. Webb Co. support document). This information was used to calculate a revised waste characteristics factor category value for this hypothetical evaluation.

Also, as mentioned in Scenario 1, the toxicity value for TCE has recently been revised by the EPA, and this is taken into account in Scenario 2.

A3.2.2.1 Determination of Mass of VOCs Removed from Above the Clay Layer

Only soil vapor extraction wells with a screening interval at or above the approximate start of the assumed clay layer (i.e., 25 ft bgs) are evaluated to determine the pounds of VOCs removed from above the clay layer during SVE system operation from June 1999 – October 2001. According to page 10 of Attachment 10, Excerpt of Quarterly Progress Report for April-June 2001, of the Jervis B. Webb Co. support document, wells SVE-1, SVE-3 and VMP-1 were screened at approximately 19-25 ft bgs and SVE-2 was screened at approximately 18-24 ft bgs. Therefore the fraction of the total pounds VOCs removed due to these wells is estimated below.

Pounds Removed Prior to June 2001

Page 14 of Attachment 10, Excerpt of Quarterly Progress Report for April-June 2001, of the Jervis B. Webb Co. support document states that an "estimated 155 pounds of VOCs, including 121 pounds of TCE, have been extracted from soil at the site as of 31 May 2001".

To this end, the following values were calculated from measurements made at individual extraction wells:

1. Total pounds of VOCs removed by extraction wells located above the clay layer – 222.60 pounds[2].

2. Total pounds of VOCs removed by all extraction wells – 311.90 pounds[3].

Therefore, the pounds removed by extraction wells above the clay layer represent approximately 222.60 ÷ 311.90, or 71.36% of the total. Note that these individual extraction well measurements are used only to approximate the percentage of mass removed by all wells due to wells above the clay layer. Measurements for the system as a whole at the "blower influent" are used to determine a more accurate value for the total pounds removed from the SVE system as a whole, because the blower influent measurements are more accurate than those made at individual wells[4].

And, 71.36% of the total 155 pounds of VOCs removed prior to June 2001 by extraction wells located above the assumed clay layer, as measured at the blower influent is 110.60 pounds.

Pounds Removed from June 2001 until SVE System Shutdown

The soil vapor extraction system continued operating after May 31, 2001, specifically; page 5 of Attachment 1, 2008 State of California Department of Toxic Substance Control Consent Order, of the Jervis B. Webb Co. support document states the following:

> In June 1999, four soil vapor extraction (SVE) wells and four vapor monitoring probes were installed to extract and treat VOCs in soil vapor beneath the Webb-Firestone property in the vicinity of the former clarifier. The SVE system started operation on March 16, 2000 and ran nearly continuously until October 2001, removing an estimated total of 177 pounds of VOCs (primarily TCE): the estimated total mass of VOCs in the soil.

Therefore, to estimate the pounds of VOCs removed from the soil above the clay layer after May 31, 2001, the following assumptions were made: 1) an additional 22 pounds of VOCs were removed and 2) the daily mass removal rates by the individual extraction wells did not change significantly during this time period (see page 14 of Attachment 10, Excerpt of Quarterly Progress Report for April-June 2001, of the Jervis B. Webb Co. support document). Based on these assumptions the following values were calculated:

1. Estimated daily removal rate for total VOCs by extraction wells located above the assumed clay layer – 0.069 pounds per day[5].

2. Estimated daily removal rate for total VOCs by all extraction wells – 0.1996 pounds per day[6].

[2] Based on the following estimated cumulative removal rates for total VOCs provided by Attachment 10, Excerpt of Quarterly Progress Report for April-June 2001, of the Jervis B. Webb Co. support document: SVE-1 – 208 pounds (p. 39), SVE-2 – 10 pounds (p. 43), SVE-3 – 2.7 pounds (p. 47) and VMP-1 – 1.9 pounds (p. 49).
[3] Based on the sum total of VOCs removed above the assumed clay layer and the following estimated cumulative removal rates for total VOCs below the assumed clay layer provided by Attachment 10, Excerpt of Quarterly Progress Report for April-June 2001, of the Jervis B. Webb Co. support document: SVE-D1 – 68 pounds (p. 53), VMP-D1 – 5.3 pounds (p. 56) and VMP-D2 – 16 pounds (p. 59).
[4] See page 3-4 of Attachment 11, Excerpt of Quarterly Progress Report for January-March 2000, of the Jervis B. Webb Co. support document.
[5] Based on the following estimated daily removal rates for total VOCs provided by Attachment 10, Excerpt of Quarterly Progress Report for April-June 2001, of the Jervis B. Webb Co. support document: SVE-1 – 0.011 pounds (p. 39), SVE-2 – 0.0090 pounds (p. 43), SVE-3 – 0.027 pounds (p. 47) and VMP-1 – 0.022 pounds (p. 49).

Thus, the pounds removed by extraction wells above the clay layer after May 31, 2001 represent approximately 0.069 ÷ 0.1996, or 34.57% of the total. The pounds removed from above the clay layer after that date is then approximately 34.56% of 22, or 7.60 pounds.

The total estimated pounds of VOCs removed from above the clay layer over the entire SVE system operation would then be 118.20.

A3.2.2.2 HRS Scoring

Regarding the establishment of a waste characteristics factor category value, HRS Section 3.2, *Waste characteristics*, states:

> Evaluate the waste characteristics factor category for an aquifer based on two factors: toxicity/mobility and hazardous waste quantity. Evaluate only those hazardous substances available to migrate from the sources at the site to ground water. Such hazardous substances include:
> - Hazardous substances that meet the criteria for an observed release to ground water.
> - All hazardous substances associated with a source that has a ground water containment factor value greater than 0 (see sections 2.2.2, 2.2.3, and 3.1.2.1).

HRS Section 3.3.2, *Hazardous waste quantity*, states:

> Assign a hazardous waste quantity factor value for the ground water pathway (or aquifer) as specified in section 2.4.2. Enter this value in table 3-1.

Regarding the establishment of a hazardous waste quantity factor value, HRS Section 2.4.2, *Hazardous waste quantity*, states:

> Evaluate the hazardous waste quantity factor by first assigning each source (or area of observed contamination) a source hazardous waste quantity value as specified below. Sum these values to obtain the hazardous waste quantity factor value for the pathway being evaluated.
>
> In evaluating the hazardous waste quantity factor for the three migration pathways, allocate hazardous substances and hazardous wastestreams to specific sources in the manner specified in section 2.2.2, except: consider hazardous substances and hazardous wastestreams that cannot be allocated to any specific source to constitute a separate "unallocated source" for purposes of evaluating only this factor for the three migration pathways. Do not, however, include a hazardous substance or hazardous wastestream in the unallocated source for a migration pathway if there is definitive information indicating that the substance or wastestream could only have been placed in sources with a containment factor value of 0 for that migration pathway.
>
> . . .

[6] Based on the summed daily removal rates of VOCs (pounds) from above the assumed clay layer and the following estimated daily removal rates for VOCs (pounds) below the assumed clay layer provided by Attachment 10, Attachment 10, Excerpt of Quarterly Progress Report for April-June 2001, of the Jervis B. Webb Co. support document: SVE-D1 – 0.041 pounds (p. 53), VMP-D1 – 0.0066 pounds (p. 56) and VMP-D2 – 0.083 pounds (p. 59).

HRS Section 2.4.2.1, *Source hazardous waste quantity*, states:

> For each of the three migration pathways, assign a source hazardous waste quantity value to each source (including the unallocated source) having a containment factor value greater than 0 for the pathway being evaluated. Consider the unallocated source to have a containment factor value greater than 0 for each migration pathway.
>
> . . .
>
> For all pathways, evaluate source hazardous waste quantity using the following four measures in the following hierarchy:
>
> - Hazardous constituent quantity.
> - Hazardous wastestream quantity.
> - Volume.
> - Area.
>
> . . .

HRS Section 2.4.2.1.1, *Hazardous constituent quantity*, states:

> Evaluate hazardous constituent quantity for the source (or area of observed contamination) based solely on the mass of CERCLA hazardous substances (as defined in CERCLA section 101(14), as amended) allocated to the source (or area of observed contamination), except:
>
> . . .
>
> Based on this mass, designated as C, assign a value for hazardous constituent quantity as follows:
> - For the migration pathways, assign the source a value for hazardous constituent quantity using the Tier A equation of table 2-5.
> - For the soil exposure pathway, assign the area of observed contamination a value using the Tier A equation of table 5-2 (section 5.1.2.2).
>
> If the hazardous constituent quantity for the source (or area of observed contamination) is adequately determined (that is, the total mass of all CERCLA hazardous substances in the source and releases from the source [or in the area of observed contamination] is known or is estimated with reasonable confidence), do not evaluate the other three measures discussed below. Instead assign these other three measures a value of 0 for the source (or area of observed contamination) and proceed to section 2.4.2.1.5.
>
> If the hazardous constituent quantity is not adequately determined, assign the source (or area of observed contamination) a value for hazardous constituent quantity based on the available data and proceed to section 2.4.2.1.2.

HRS Table 2-5, *Hazardous Waste Quantity Evaluation Equations*, lists the following equations:

Table 2-5 Hazardous Waste Quantity Evaluation Equations

Tier	Measure	Units	Equation for assigning value [a]
A	Hazardous constituent quantity (C)	lb	C
B[b]	Hazardous wastestream quantity (W)	lb	W/5,000
C[b]			
	Volume (V)		
	Landfill	yd^3	V/2,500
	Surface impoundment	yd^3	V/2.5
	Surface impoundment (buried/backfilled)	yd^3	V/2.5
	Drums [c]	gallon	V/2.5
	Tanks and containers other than drums	yd^3	V/2.5
	Contaminated soil	yd^3	V/2,500
	Pile	yd^3	V/2.5
	Other	yd^3	V/2.5
D[b]			
	Area (A)		
	Landfill	ft^2	A/3,400
	Surface impoundment	ft^2	A/13
	Surface impoundment (buried/backfilled)	ft^2	A/13
	Land treatment	ft^2	A/270
	Pile [d]	ft^2	A/13
	Contaminated soil	ft^2	A/34,000

[a] Do not round to nearest integer.
[b] Convert volume to mass when necessary: 1 ton=2,000 pounds=1 cubic yard=4 drums=200 gallons.
[c] If actual volume of drums is unavailable, assume 1 drum=50 gallons.
[d] Use land surface area under pile, not surface area of pile.

An estimated total of 118.20 pounds of VOCs were removed from the soil located above the assumed clay layer and according to HRS Table 2-5 and HRS Section 2.4.2.1.1, *Hazardous constituent quantity*, a hazardous constituent quantity value of 118.20 would therefore be assigned to Source 1 at the Site.

HRS Section 2.4.2.1.5, *Calculation of source hazardous waste quantity value*, states:

> Select the highest of the values assigned to the source (or area of observed contamination) for the hazardous constituent quantity, hazardous wastestream quantity,

volume, and area measures. Assign this value as the source hazardous waste quantity value. Do not round to the nearest integer.

Therefore, as an estimated minimum of 118.20 of VOCs were present in the soil located above the clay layer prior to the removal action; for the purposes of this analysis, a hazardous waste quantity value of 118.20 would be assigned to Source 1.

HRS Section 2.4.2.2, *Calculation of hazardous waste quantity factor value,* states:

> Sum the source hazardous waste quantity values assigned to all sources (including the unallocated source) or areas of observed contamination for the pathway being evaluated and round this sum to the nearest integer, except: if the sum is greater than 0, but less than 1, round it to 1. Based on this value, select a hazardous waste quantity factor value for the pathway from table 2-6.
>
> For a migration pathway, if the hazardous constituent quantity is adequately determined (see section 2.4.2.1.1) for all sources (or all portions of sources and releases remaining after a removal action), assign the value from table 2-6 as the hazardous waste quantity factor value for the pathway. If the hazardous constituent quantity is not adequately determined for one or more sources (or one or more portions of sources or releases remaining after a removal action) assign a factor value as follows:
>
> - If any target for that migration pathway is subject to Level I or Level II concentrations (see section 2.5), assign either the value from table 2-6 or a value of 100, whichever is greater, as the hazardous waste quantity factor value for that pathway.
> - If none of the targets for that pathway is subject to Level I or Level II concentrations, assign a factor value as follows:
> - If there has been no removal action, assign either the value from table 2-6 or a value of 10, whichever is greater, as the hazardous waste quantity factor value for that pathway.
> - If there has been a removal action:
> - Determine values from table 2-6 with and without consideration of the removal action.
> - **If the value that would be assigned from table 2-6 without consideration of the removal action would be 100 or greater, assign either the value from table 2-6 with consideration of the removal action or a value of 100, whichever is greater, as the hazardous waste quantity factor value for the pathway.** [emphasis added]
> - If the value that would be assigned from table 2-6 without consideration of the removal action would be less than 100, assign a value of 10 as the hazardous waste quantity factor value for the pathway.
>
> . . .

HRS Table 2-6, *Hazardous Waste Quantity Factor Values*, shows the following:

Hazardous waste quantity value	Assigned value
0	0
1[a] to 100	1[b]
Greater than 100 to 10,000	100
Greater than 10,000 to 1,000,000	10,000
Greater than 1,000,000	1,000,000

[a] If the hazardous waste quantity value is greater than 0, but less than 1, round it to 1 as specified in text.
[b] For the pathway, if hazardous constituent quantity is not adequately determined, assign a value as specified in the text; do not assign the value of 1.

For the purposes of this hypothetical evaluation, a hazardous waste quantity value of 118.20 would be assigned, yielding a hazardous waste quantity factor value of 100 according to HRS Table 2-6 and HRS Section 2.4.2.2 .

HRS Section 3.2.3, *Calculation of waste characteristics factor category value*, states:

> Multiply the toxicity/mobility and hazardous waste quantity factor values, subject to a maximum product of $1x10^8$. Based on this product, assign a value from table 2-7 (section 2.4.3.1) to the waste characteristics factor category. Enter this value in table 3-1.

HRS Section 2.4.3.1, *Factor category value*, states:

> For the pathway (or threat) being evaluated, multiply the toxicity or combined factor value, as appropriate, from section 2.4.1.2 and the hazardous waste quantity factor value from section 2.4.2.2, subject to a maximum product of $1x10^8$. Based on this waste characteristics product, assign a waste characteristics factor category value to the pathway (or threat) from table 2-7.

Based on the EPA's September 2011 revision to the TCE toxicological parameters posted in the Integrated Risk Information System (IRIS) database, the toxicity value for TCE has been updated. The updated toxicity value for TCE has been revised from the previous value of 10,000 to 1,000. The EPA's revision to the IRIS database does not result in a change to the mobility factor value for TCE. This change in the TCE toxicological parameters that results in an updated toxicity value for TCE of 1,000 and a Toxicity/Mobility Factor Value for the Site of 1,000.

Thus, a product of $1x10^5$ is calculated by multiplying the Toxicity/Mobility Factor Value of 1,000 for TCE[7] by 100 (hazardous waste quantity factor value).

[7] See Section 3.8, Consideration of Revisions in TCE Toxicological Parameters, of the Jervis B. Webb Co. support document.

HRS Table 2-7, *Waste Characteristics Factor Category Values*, shows the following:

Waste characteristics product	**Assigned value**
0	0
Greater than 0 to less than 10	1
10 to less than $1x10^2$	2
$1x10^2$ to less than $1x10^3$	3
$1x10^3$ to less than $1x10^4$	6
$1x10^4$ to less than $1x10^5$	10
$1x10^5$ to less than $1x10^6$	18
$1x10^6$ to less than $1x10^7$	32
$1x10^7$ to less than $1x10^8$	56
$1x10^8$ to less than $1x10^9$	100
$1x10^9$ to less than $1x10^{10}$	180
$1x10^{10}$ to less than $1x10^{11}$	320
$1x10^{11}$ to less than $1x10^{12}$	560
$1x10^{12}$	1,000

Consequently, for the purposes of this hypothetical exercise, according to HRS table 2-7, a waste characteristics factor category value of 18 would be assigned.

As can be seen in the scoresheet on page 3 of the HRS documentation record at proposal, the ground water migration score for an aquifer is equal to the product of the likelihood of release, waste characteristics and targets factor category values divided by 82,500 or:

(230 x 18 x 1,373)/82,500 = 68.89

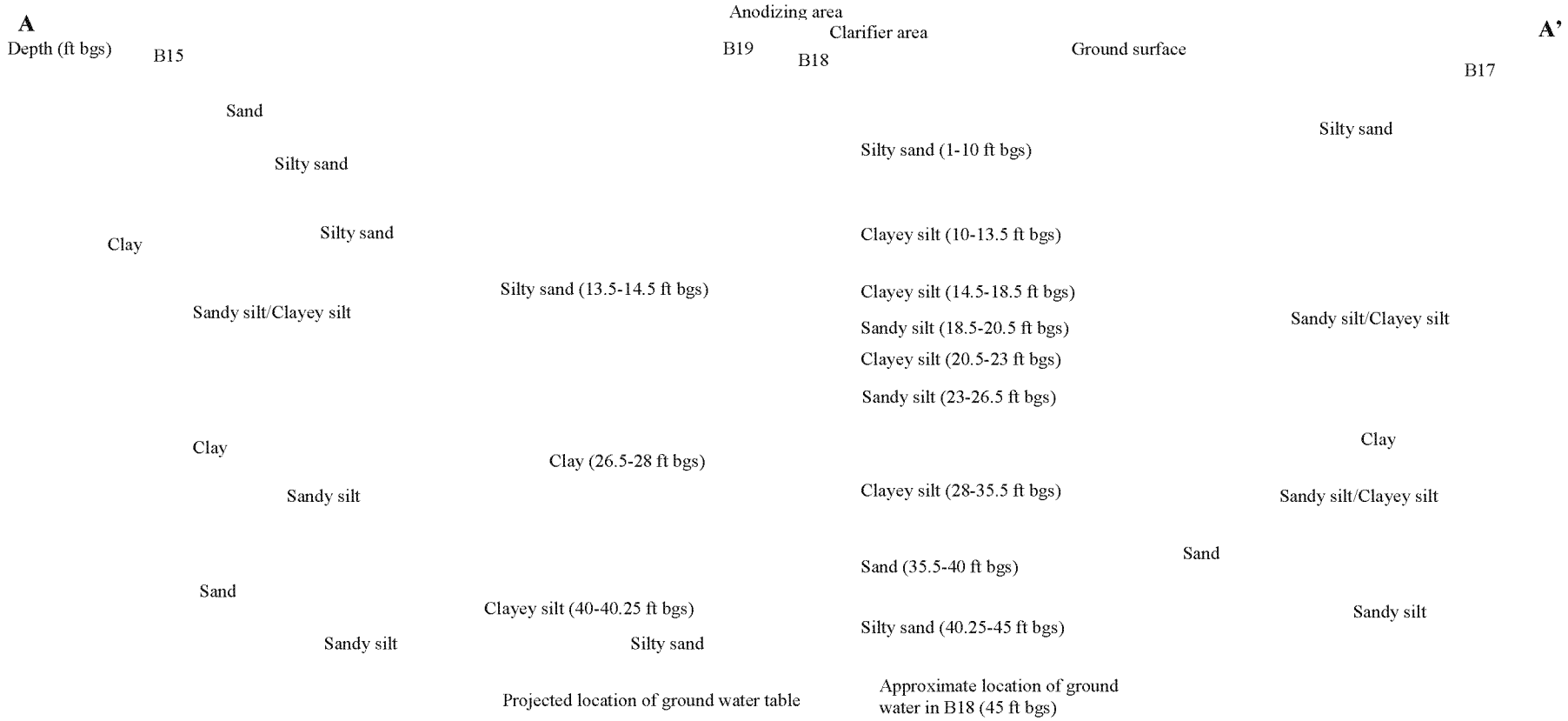
The ground water migration pathway score is equal to the highest aquifer score, or 68.89.

HRS Section 2.1.1, *Calculation of HRS site score*, states that:

> [s]cores are first calculated for the individual pathways as specified in sections 2 through 7 and then are combined for the site using the following root-mean-square equation to determine the overall HRS site score, which ranges from 0 to 100:

Under this hypothetical evaluation, the HRS site score would be 34.44. The Site score would still be above 28.50 and sufficient to qualify the site for the NPL; there would be no change in the decision to place the Site on the NPL.

Figure A3-1 – Borehole B18 Lithologic Information



Legend

Lithologic Contact

Inferred Lithologic Contact

Lowest Hydraulic Conductivity Layer below 31 ft bgs (4.5 ft thick) used in Scenario 2

Sample B18-21 (21 ft bgs) – Scenario 2 lowest point of contamination used

Sample B18-41 (41 ft bgs) – Scenario 1 lowest point of contamination used

Projected location of ground water table

Notes

1. All locations are approximate.
2. Information provided in this figure is based on Figure 10 (p. 43) and the boring log for B18 (pp. 84-87) of Reference 10 of the HRS documentation record at proposal.

Attachment 4

Excerpt of October 2001 Soil Closure Report

Lic # 0744
SSH

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ORANGE COUNTY
PARIS
SAN DIEGO
SAN FRANCISCO
SILICON VALLEY
SINGAPORE
TOKYO
WASHINGTON, D.C.

October 4, 2001

Arthur C. Heath, Ph.D.
Rebecca Chow
Steve Hariri
California Regional Water Quality Control Board
320 W. Fourth Street, Suite 200
Los Angeles, CA 90013

2001 OCT -4 P 1:4

Re: Jervis B. Webb Company of California
City of South Gate
RWQCB LIC File No. 744 (the "Site")

Dear Art, Rebecca & Steve:

Jervis B. Webb Company of California (Webb of California) is pleased to submit the attached Soil Closure Report for the Site. The report presents the results of the five recent confirmation borings in the context of the extensive investigation and remedial efforts conducted at the Site over several years. Based on the extensive investigation of the Site, the removal of contaminant source areas, the SVE system's effective remediation of VOCs, the very low level of remaining residual VOCs, the background levels of naturally occurring arsenic, the lithology and zoning of the Site, we are requesting soil closure of the Site at this time.

Webb of California has expended more than $900,000 in environmental costs at the Site. Webb of California is actively marketing its remaining portion of the property at a listing price significantly less than what it has expended to date. This vacant, non-income-generating property is Webb of California's sole asset.

In light of our efforts to sell the property by year end, we would appreciate your prompt review and consideration of our closure request. We are available to discuss any questions or issues which you may have.

Again, thank you for your attention.

Yours very truly,

Gene A. Lucero

Gene A. Lucero
of LATHAM & WATKINS

Enclosure

633 WEST FIFTH STREET, SUITE 4000 • LOS ANGELES, CALIFORNIA 90071-2007
TELEPHONE: (213) 485-1234 • FAX: (213) 891-8763

IT CORPORATION
A Member of The IT Group

SOIL CLOSURE REPORT

JERVIS B. WEBB COMPANY OF CALIFORNIA
SOUTH GATE, CALIFORNIA

SLIC FILE NO. 744

2001 OCT -4 P 1:09

Prepared by:

IT Corporation
3347 Michelson Drive, Suite 200
Irvine, California 92612

October 3, 2001

IT Corporation Project Number 831461

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TABLE 4d

Soil Vapor Extraction Data: Extraction Well SVE-3

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System shut down on 8/30/00 at 13:30. System restarted on 8/31/00 at 9:00.												
8/31/00	9:00	3,471	1.4	1.0	120	2.6	-					
System shut down on 9/6/00 at 15:00. System restarted on 9/7/00.												
9/7/00	10:30	3,621	1.4	1.0	125	1.2	-					
9/14/00	9:00	3,788	1.5	1.0	140	1.5	**2.5**	0.0012	0.0028	0.71	1.1	4A
System shut down on 9/14/00 at 11:23												
9/28/00	9:52	3,788	-	-	120	8.0	**3.8**	-	-	-	-	
System restarted on 10/1/00 at 6:30.												
10/1/00	6:30	3,791	-	-	-	-	-					
System shut down on 10/1/00 at 10:30. System restarted on 10/5/00 at 7:30.												
10/5/00	7:30	3,795	1.8	1.3	120	4.6	-					
10/12/00	8:00	3,964	1.9	1.3	120	5.6	-					
10/19/00	8:00	4,132	1.9	1.3	120	4.1	-					
10/26/00	8:00	4,301	1.9	1.3	115	4.1	-					
System shut down on 10/31/00 at 9:20. System restarted on 11/2/00 at 8:00.												
11/2/00	8:00	4,422	7.1	4.7	140	0.5	-					
System shut down on 11/2/00 at 19:00. System restarted on 11/9/00 at 7:30.												
11/9/00	7:30	4,433	1.9	1.3	140	25.2	-					
System shut down on 11/9/00 at 15:30. System restarted on 11/16/00 at 10:00.												
11/16/00	10:00	4,441	-	-	140	8.9	-					
System shut down on 11/17/00 at 12:00. System restarted on 11/23/00 at 7:30.												
11/23/00	7:30	4,443	-	-	140	11.9	-					
11/30/00	7:30	4,611	5.6	3.6	140	6.2	-					
System shut down on 12/6/00 at 21:00. System restarted on 12/7/00 at 8:00.												
12/7/00	8:00	4,768	-	-	140	14.4	-					
12/14/00	10:30	4,940	2.3	1.5	140	1.2	**1.2**	0.00089	0.0023	0.76	1.2	4A
System shut down on 12/14/00 at 12:15.												
1/4/01	9:45	4,940	2.1	1.5	120	1.5	**1.3**	-	-	-	-	

TABLE 4d

Soil Vapor Extraction Data: Extraction Well SVE-3

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System restarted on 2/19/01 at 15:45.												
2/19/01	15:45	4,940	3.8	2.5	140	6.0	-					
2/22/01	17:00	5,016	3.4	2.2	140	6.4	-					
3/1/01	12:45	5,180	2.6	1.7	140	6.3	-					
3/8/01	7:30	5,343	2.6	1.7	145	0.0	-					
3/15/01	13:00	5,516	2.6	1.7	145	0.5	-					
3/22/01	13:00	5,682	2.6	1.7	145	3.3	-					
3/29/01	14:30	5,854	2.7	1.7	140	8.3	-					
4/5/01	10:00	6,016	2.7	1.8	140	10	-					
4/11/01	9:00	6,160	2.6	1.7	140	1.9	-					
4/18/01	12:30	6,331	2.5	1.7	135	1.8	-					
4/25/01	13:15	6,500	2.7	1.8	133	3.3	-					
5/2/01	11:45	6,666	2.7	1.8	135	3.1	-					
5/9/01	12:30	6,836	3.5	2.3	135	3.5	-					
5/16/01	11:45	7,002	3.6	2.3	140	1.5	-					
5/23/01	11:00	7,169	3.5	2.3	140	2.5	-					
5/31/01	16:05	7,360	10	6.6	140	5.6	**5.0**	0.016	0.027	1.6	2.7	4A
System shut down on 5/31/01 at 16:35. System restarted on 6/14/01 at 8:00.												
6/14/01	10:02	7,360	5.7	4.1	115	2.0	**1.6**	-	-	-	-	
6/20/01	12:30	7,515	11	7.7	130	0.9	-					
System shut down on 6/21/01 at 14:30. System restarted on 6/28/01 at 6:30.												
6/28/01	6:30	7,540	32	26	81	4.3	-					

TABLE 4d

Soil Vapor Extraction Data: Extraction Well SVE-3

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow		Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates		Cumulative Mass Removal		
			(acfm)	(scfm)				TCE (lb/day)	Total VOCs (lb/day)	TCE (lbs)	Total VOCs (lbs)	Notes

NOTES:

TCE = trichloroethene
acfm = actual cubic feet per minute
°F = degrees Fahrenheit
hrs = hours
in-wc = inches of water column
lb/day = pounds per day
lbs = pounds

PID = photoionization detector
ppmv = parts per million by volume
scfm = standard cubic feet per minute
tr = trace (concentration detected at less than reporting limit)
VOCs = volatile organic compounds
- = no measurement
< = not detected at indicated method detection limit

1. PID calibrated with 100 ppmv of isobutylene.
2. Laboratory analyses were performed by Performance Analytical, Inc. in Simi Valley, California using EPA Method TO-14A.
3. Removal rates are calculated using analyte concentrations from laboratory analyses and the measured flow rate (converted from acfm to scfm using the measured vacuum).
4. Cumulative mass removal amounts are calculated as follows:
   A: Mass removal calculated using an average of the previous and current mass removal rates.
5. On days for which two flow and vacuum readings are provided, the values indicate initial and final readings during the site visit.
6. Although not shown on this table, mass removal rates were calculated for each VOC detected in the samples collected from well SVE-3. The total VOC mass removal rate presented in this table is the sum of the mass removal rates calculated for each VOC that was detected.
7. Extraction well SVE-3 is screened in the shallow vadose zone from 19 to 25 feet below ground surface.

TABLE 4f

Soil Vapor Extraction Data: Extraction Well SVE-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
Static vapor sample collected on 3/16/00.												
3/16/00	8:57	5.6	3.7	3.6	6.0	1,580	**1,000**	1.8	1.9	0	0	
System startup on 3/16/00 at 16:00.												
3/17/00	7:00	20.3	4.6	4.5	10	92	-					
3/18/00	6:30	44.7	5.3	5.2	10	131	-					
System shut down on 3/18/00 at 9:40. System restarted on 3/19/00 at 6:30.												
3/19/00	6:30	48	0.0	0.0	0.0	30	0					
3/20/00	6:30	72	5.8	5.7	9.0	164	0					
3/21/00	7:00	96	2.6	2.6	7.0	560	0					
3/22/00	7:30	121	8.9	8.6	15	70	**440**	1.9	2.0	8.8	9.1	4A
3/30/00	11:00	316	24	22	38	36	0					
4/6/00	11:00	483	25	17	125	30	0					
4/13/00	8:00	648	33	21	150	33	**25**	0.26	0.28	32	34	4A
4/20/00	7:30	815	28	18	145	28	0					
4/27/00	7:00	983	18	16	40	25	0					
5/4/00	8:30	1,152	16	10	135	20	0					
5/11/00	6:30	1,318	13	9.7	95	13	0					
5/18/00	7:00	1,486	20	14	120	37	**8.6**	0.061	0.070	38	40	4A
			26	17	150	37	-	0.071	0.081	-	-	
5/25/00	6:30	1,654	18	11	150	16	-					
6/1/00	6:30	1,822	16	10	150	31	-					
6/8/00	7:00	1,990	21	13	155	31	-					
6/15/00	7:30	2,158	21	13	150	31	-					
System shut down on 6/21/00 at 17:30. Static vapor sample collected on 7/6/00.												
7/6/00	9:34	2,312	0	0	0	30	**92**	-	-	-	-	
System restarted on 7/6/00 at 10:00.												
7/13/00	12:00	2,485	34	22	145	37	**5.1**	0.056	0.25	40	47	4A
7/20/00	7:30	2,648	32	20	150	27	-					
System shut down on 7/26/00 at 6:30. System restarted on 7/27/00 at 6:00.												
7/27/00	6:00	2,791	26	17	140	9.4	-					
8/3/00	8:00	2,961	26	17	140	1.5	-					
8/8/00	14:30	3,086	26	17	140	1.8	-					
System shut down on 8/15/00 at 11:30. System restarted on 8/21/00 at 10:30.												

TABLE 4f

Soil Vapor Extraction Data: Extraction Well SVE-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
8/24/00	12:30	3,226	27	18	140	17	-					
System shut down on 8/30/00 at 13:30. System restarted on 8/31/00 at 9:00.												
8/31/00	9:00	3,471	21	15	120	8.9	-					
System shut down on 9/6/00 at 15:00. System restarted on 9/7/00.												
9/7/00	10:30	3,621	22	15	125	5.8	-					
9/14/00	9:00	3,788	20	13	140	24	**4.0**	0.026	0.23	43	60	4A
System shut down on 9/14/00 at 11:23.												
9/28/00	10:25	3,788	52	36	120	62	**120**	-	-	-	-	
System restarted on 10/1/00 at 6:30.												
10/1/00	6:30	3,791	-	-	-	-	-					
System shut down on 10/1/00 at 10:30. System restarted on 10/5/00 at 7:30.												
10/5/00	7:30	3,795	29	21	120	41	-					
10/12/00	8:00	3,964	28	20	120	72	-					
10/19/00	8:00	4,132	19	14	120	6.2	-					
10/26/00	8:00	4,301	20	14	115	5.8	**2.4**	0.017	0.081	43	63	4A
System shut down on 10/31/00 at 9:20. System restarted on 11/2/00 at 8:00.												
11/2/00	8:00	4,422	22	15	140	1.5	-					
System shut down on 11/2/00 at 19:00. System restarted on 11/9/00 at 7:30.												
11/9/00	7:30	4,433	22	15	140	4.9	-					
System shut down on 11/9/00 at 15:30. System restarted on 11/16/00 at 10:00.												
11/16/00	10:00	4,441	24	15	140	38	-					
System shut down on 11/17/00 at 12:00. System restarted on 11/23/00 at 7:30.												
11/23/00	7:30	4,443	24	16	140	29	-					
11/30/00	7:30	4,611	-	-	140	23	-					
System shut down on 12/6/00 at 21:00. System restarted on 12/7/00 at 8:00.												
12/7/00	8:00	4,768	-	-	140	12	-					
12/14/00	10:30	4,940	16	11	140	3.1	**2.7**	0.014	0.025	44	64	4A
System shut down on 12/14/00 at 12:15.												
1/4/01	10:48	4,940	74	52	120	43	**41**	-	-	-	-	

TABLE 4f

Soil Vapor Extraction Data: Extraction Well SVE-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System restarted on 2/19/01 at 15:45.												
2/19/01	15:45	4,940	23	15	140	43	-					
2/22/01	17:00	5,016	24	15	140	37	-					
3/1/01	12:45	5,180	24	15	140	81	-					
3/8/01	7:30	5,343	23	15	145	103	-					
3/15/01	13:00	5,516	22	14	145	9.4	-					
3/22/01	13:00	5,682	21	14	145	12	-					
3/29/01	14:30	5,854	21	14	130	10	-					
4/5/01	10:00	6,016	22	14	140	31	-					
4/11/01	9:00	6,160	24	16	140	23	-					
4/18/01	12:30	6,331	25	17	135	23	-					
4/25/01	13:15	6,500	25	17	133	18	-					
5/2/01	11:45	6,666	25	16	135	17	-					
5/9/01	12:30	6,836	23	15	135	6.2	-					
5/16/01	11:45	7,002	25	16	140	6.0	-					
5/23/01	11:00	7,169	26	17	140	5.8	-					
5/31/01	15:20	7,360	17	11	140	4.5	**6.4**	0.035	0.041	46	68	4A
System shut down on 5/31/01 at 16:35. System restarted on 6/14/01 at 8:00.												
6/14/01	10:33	7,360	52	38	112	106	**140**	-	-	-	-	
6/20/01	12:30	7,515	13	8.8	130	8.9	-					
System shut down on 6/21/01 at 14:30. System restarted on 6/28/01 at 6:30.												
6/28/01	6:30	7,540	66	54	78	24	-					

TABLE 4f

Soil Vapor Extraction Data: Extraction Well SVE-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow		Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates		Cumulative Mass Removal		
			(acfm)	(scfm)				TCE (lb/day)	Total VOCs (lb/day)	TCE (lbs)	Total VOCs (lbs)	Notes

NOTES:

TCE = trichloroethene
acfm = actual cubic feet per minute
°F = degrees Fahrenheit
hrs = hours
in-wc = inches of water column
lb/day = pounds per day
lbs = pounds

PID = photoionization detector
ppmv = parts per million by volume
scfm = standard cubic feet per minute
tr = trace (concentration detected at less than reporting limit)
VOCs = volatile organic compounds
- = no measurement
< = not detected at indicated method detection limit

1. PID calibrated with 100 ppmv of isobutylene.
2. Laboratory analyses were performed by Performance Analytical, Inc. in Simi Valley, California using EPA Method TO-14A.
3. Removal rates are calculated using analyte concentrations from laboratory analyses and the measured flow rate (converted from acfm to scfm using the measured vacuum).
4. Cumulative mass removal amounts are calculated as follows:
   A: Mass removal calculated using an average of the previous and current mass removal rates.
5. On days for which two flow and vacuum readings are provided, the values indicate initial and final readings during the site visit.
6. Although not shown on this table, mass removal rates were calculated for each VOC detected in the samples collected from well SVE-D1. The total VOC mass removal rate presented in this table is the sum of the mass removal rates calculated for each VOC that was detected.
7. Extraction well SVE-D1 is screened in the shallow vadose zone from 30 to 40 feet below ground surface.

Attachment 5

Excerpt of EPA Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water

United States
Environmental Protection
Agency

Office of Research and
Development
Washington DC 20460

EPA/600/R-98/128
September 1998

Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water

TECHNICAL PROTOCOL FOR EVALUATING NATURAL ATTENUATION OF CHLORINATED SOLVENTS IN GROUND WATER

by

Todd H. Wiedemeier
Parsons Engineering Science, Inc.
Pasadena, California

Matthew A. Swanson, David E. Moutoux, and E. Kinzie Gordon
Parsons Engineering Science, Inc.
Denver, Colorado

John T. Wilson, Barbara H. Wilson, and Donald H. Kampbell
United States Environmental Protection Agency
National Risk Management Research Laboratory
Subsurface Protection and Remediation Division
Ada, Oklahoma

Patrick E. Haas, Ross N. Miller and Jerry E. Hansen
Air Force Center for Environmental Excellence
Technology Transfer Division
Brooks Air Force Base, Texas

Francis H. Chapelle
United States Geological Survey
Columbia, South Carolina

IAG #RW57936164

Project Officer
John T. Wilson
National Risk Management Research Laboratory
Subsurface Protection and Remediation Division
Ada, Oklahoma

NATIONAL RISK MANAGEMENT RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U. S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

NOTICE

The information in this document was developed through a collaboration between the U.S. EPA (Subsurface Protection and Remediation Division, National Risk Management Research Laboratory, Robert S. Kerr Environmental Research Center, Ada, Oklahoma [SPRD]) and the U.S. Air Force (U.S. Air Force Center for Environmental Excellence, Brooks Air Force Base, Texas [AFCEE]). EPA staff were primarily responsible for development of the conceptual framework for the approach presented in this document; staff of the U.S. Air Force and their contractors also provided substantive input. The U.S. Air Force was primarily responsible for field testing the approach presented in this document. Through a contract with Parsons Engineering Science, Inc., the U.S. Air Force applied the approach at chlorinated solvent plumes at a number of U.S. Air Force Bases. EPA staff conducted field sampling and analysis with support from ManTech Environmental Research Services Corp., the in-house analytical support contractor for SPRD.

All data generated by EPA staff or by ManTech Environmental Research Services Corp. were collected following procedures described in the field sampling Quality Assurance Plan for an in-house research project on natural attenuation, and the analytical Quality Assurance Plan for ManTech Environmental Research Services Corp.

This protocol has undergone extensive external and internal peer and administrative review by the U.S. EPA and the U.S. Air Force. This EPA Report provides technical recommendations, not policy guidance. It is not issued as an EPA Directive, and the recommendations of this EPA Report are not binding on enforcement actions carried out by the U.S. EPA or by the individual States of the United States of America. Neither the United States Government (U.S. EPA or U.S. Air Force), Parsons Engineering Science, Inc., or any of the authors or reviewers accept any liability or responsibility resulting from the use of this document. Implementation of the recommendations of the document, and the interpretation of the results provided through that implementation, are the sole responsibility of the user.

Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

FOREWORD

The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet these mandates, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory is the Agency's center for investigation of technological and management approaches for reducing risks from threats to human health and the environment. The focus of the Laboratory's research program is on methods for the prevention and control of pollution to air, land, water, and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites and ground water; and prevention and control of indoor air pollution. The goal of this research effort is to catalyze development and implementation of innovative, cost-effective environmental technologies; develop scientific and engineering information needed by EPA to support regulatory and policy decisions; and provide technical support and information transfer to ensure effective implementation of environmental regulations and strategies.

The site characterization processes applied in the past are frequently inadequate to allow an objective and robust evaluation of natural attenuation. Before natural attenuation can be used in the remedy for contamination of ground water by chlorinated solvents, additional information is required on the three-dimensional flow field of contaminated ground water in the aquifer, and on the physical, chemical and biological processes that attenuate concentrations of the contaminants of concern. This document identifies parameters that are useful in the evaluation of natural attenuation of chlorinated solvents, and provides recommendations to analyze and interpret the data collected from the site characterization process. It will also allow ground-water remediation managers to incorporate natural attenuation into an integrated approach to remediation that includes an active remedy, as appropriate, as well as natural attenuation.

Clinton W. Hall, Director
Subsurface Protection and Remediation Division
National Risk Management Research Laboratory

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Over the past two decades, numerous laboratory and field studies have demonstrated that subsurface microorganisms can degrade a variety of chlorinated solvents (e.g., Bouwer *et al.*, 1981; Miller and Guengerich, 1982; Wilson and Wilson, 1985; Nelson *et al.*, 1986; Bouwer and Wright, 1988; Lee, 1988; Little *et al.*, 1988; Mayer *et al.*, 1988; Arciero *et al.*, 1989; Cline and Delfino, 1989; Freedman and Gossett, 1989; Folsom *et al.*, 1990; Harker and Kim, 1990; Alvarez-Cohen and McCarty, 1991a, 1991b; DeStefano *et al.*, 1991; Henry, 1991; McCarty *et al.*, 1992; Hartmans and de Bont, 1992; McCarty and Semprini, 1994; Vogel, 1994). Whereas fuel hydrocarbons are biodegraded through use as a primary substrate (electron donor), chlorinated aliphatic hydrocarbons may undergo biodegradation under three different circumstances: intentional use as an electron acceptor; intentional use as an electron donor; or, through cometabolism where degradation of the chlorinated organic is fortuitous and there is no benefit to the microorganism. At a given site, one or all of these circumstances may pertain, although at many sites the use of chlorinated aliphatic hydrocarbons as electron acceptors appears to be most important under natural conditions. In this case, biodegradation of chlorinated aliphatic hydrocarbons will be an electron-donor-limited process. Conversely, biodegradation of fuel hydrocarbons is an electron-acceptor-limited process.

In an uncontaminated aquifer, native organic carbon is used as an electron donor, and dissolved oxygen (DO) is used first as the prime electron acceptor. Where anthropogenic carbon (e.g., as fuel hydrocarbons) is present, it also will be used as an electron donor. After the DO is consumed, anaerobic microorganisms typically use additional electron acceptors (as available) in the following order of preference: nitrate, ferric iron oxyhydroxide, sulfate, and finally carbon dioxide. Evaluation of the distribution of these electron acceptors can provide evidence of where and how chlorinated aliphatic hydrocarbon biodegradation is occurring. In addition, because chlorinated aliphatic hydrocarbons may be used as electron acceptors or electron donors (in competition with other acceptors or donors), isopleth maps showing the distribution of these compounds and their daughter products can provide evidence of the mechanisms of biodegradation working at a site. As with BTEX, the driving force behind oxidation-reduction reactions resulting in chlorinated aliphatic hydrocarbon degradation is electron transfer. Although thermodynamically favorable, most of the reactions involved in chlorinated aliphatic hydrocarbon reduction and oxidation do not proceed abiotically. Microorganisms are capable of carrying out the reactions, but they will facilitate only those oxidation-reduction reactions that have a net yield of energy.

2.2.1.1 Mechanisms of Chlorinated Aliphatic Hydrocarbon Biodegradation

The following sections describe the biodegradation of those compounds that are most prevalent and whose behavior is best understood.

2.2.1.1.1 Electron Acceptor Reactions (Reductive Dehalogenation)

The most important process for the natural biodegradation of the more highly chlorinated solvents is reductive dechlorination. During this process, the chlorinated hydrocarbon is used as an electron acceptor, not as a source of carbon, and a chlorine atom is removed and replaced with a hydrogen atom. Figure 2.2 illustrates the transformation of chlorinated ethenes via reductive dechlorination. In general, reductive dechlorination occurs by sequential dechlorination from PCE to TCE to DCE to VC to ethene. Depending upon environmental conditions, this sequence may be interrupted, with other processes then acting upon the products. During reductive dechlorination, all three isomers of DCE can theoretically be produced. However, Bouwer (1994) reports that under the influence of biodegradation, *cis*-1,2-DCE is a more common intermediate than *trans*-1,2-DCE, and that 1,1-DCE is the least prevalent of the three DCE isomers when they are present as daughter products. Reductive dechlorination of chlorinated solvent compounds is associated with

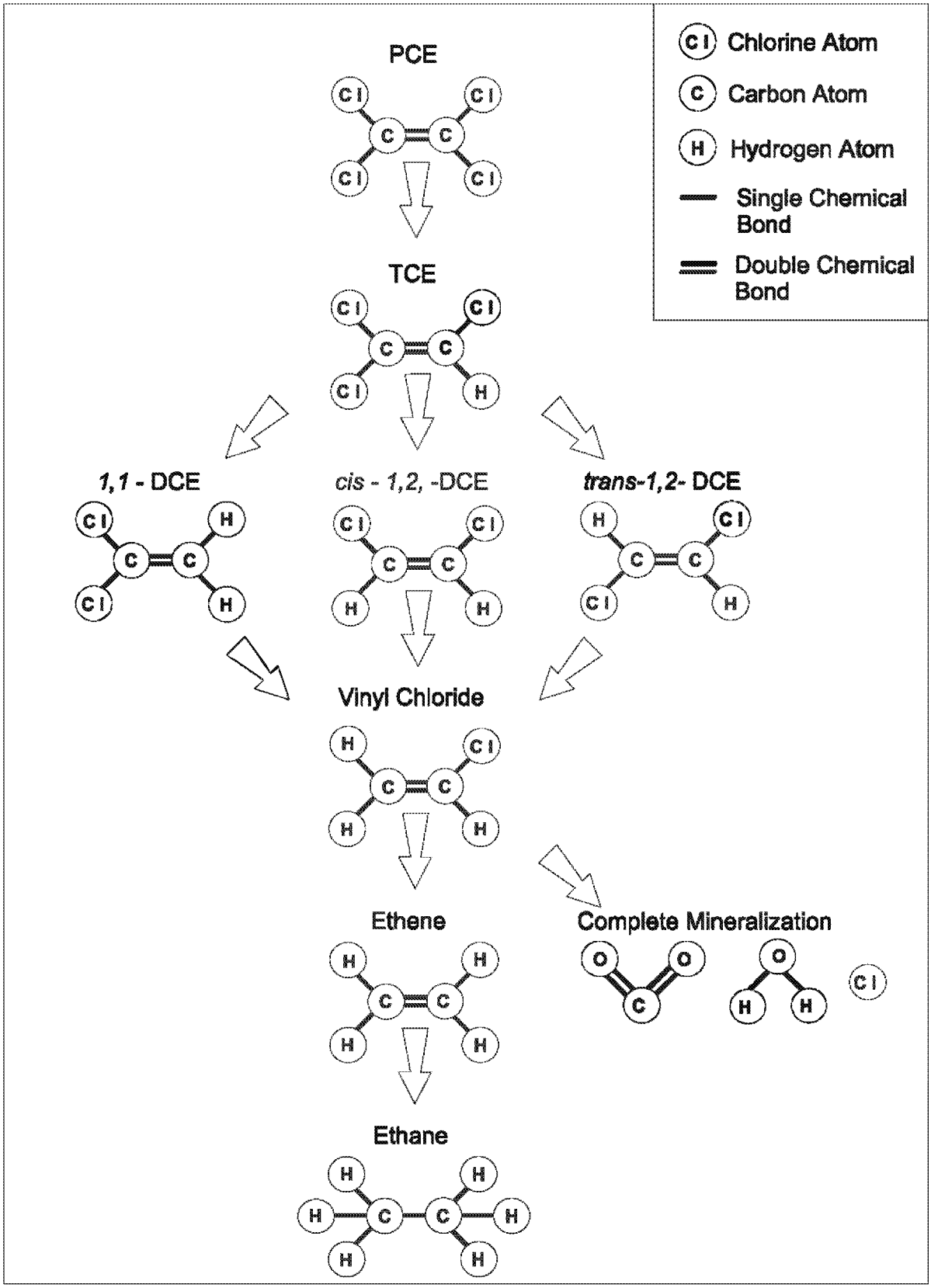

Figure 2.2 *Reductive dehalogenation of chlorinated ethenes.*

the accumulation of daughter products and an increase in the concentration of chloride ions. Reductive dechlorination affects each of the chlorinated ethenes differently. Of these compounds, PCE is the most susceptible to reductive dechlorination because it is the most oxidized. Conversely, VC is the least susceptible to reductive dechlorination because it is the least oxidized of these compounds. As a result, the rate of reductive dechlorination decreases as the degree of chlorination decreases (Vogel and McCarty, 1985; Bouwer, 1994). Murray and Richardson (1993) have postulated that this rate decrease may explain the accumulation of VC in PCE and TCE plumes that are undergoing reductive dechlorination. Reductive dechlorination has been demonstrated under nitrate- and iron-reducing conditions, but the most rapid biodegradation rates, affecting the widest range of chlorinated aliphatic hydrocarbons, occur under sulfate-reducing and methanogenic conditions (Bouwer, 1994). Because chlorinated aliphatic hydrocarbon compounds are used as electron acceptors during reductive dechlorination, there must be an appropriate source of carbon for microbial growth in order for this process to occur (Bouwer, 1994). Potential carbon sources include natural organic matter, fuel hydrocarbons, or other anthropogenic organic compounds such as those found in landfill leachate.

2.2.1.1.2 Electron Donor Reactions

Murray and Richardson (1993) write that microorganisms are generally believed to be incapable of growth using PCE and TCE as a primary substrate (i.e., electron donor). However, under aerobic and some anaerobic conditions, the less oxidized chlorinated aliphatic hydrocarbons (e.g., VC) can be used as the primary substrate in biologically mediated oxidation-reduction reactions (McCarty and Semprini, 1994). In this type of reaction, the facilitating microorganism obtains energy and organic carbon from the degraded chlorinated aliphatic hydrocarbon. In contrast to reactions in which the chlorinated aliphatic hydrocarbon is used as an electron acceptor, only the least oxidized chlorinated aliphatic hydrocarbons can be used as electron donors in biologically mediated oxidation-reduction reactions. McCarty and Semprini (1994) describe investigations in which VC and 1,2-dichloroethane (DCA) were shown to serve as primary substrates under aerobic conditions. These authors also document that dichloromethane has the potential to function as a primary substrate under either aerobic or anaerobic environments. In addition, Bradley and Chapelle (1996) show evidence of mineralization of VC under iron-reducing conditions so long as there is sufficient bioavailable iron (III). Aerobic metabolism of VC may be characterized by a loss of VC mass and a decreasing molar ratio of VC to other chlorinated aliphatic hydrocarbon compounds. In addition, Klier *et al.* (1998) and Bradley and Chapelle (1997) show mineralization of DCE to carbon dioxide under aerobic, Fe(III) reducing, and methanogenic conditions, respectively.

2.2.1.1.3 Cometabolism

When a chlorinated aliphatic hydrocarbon is biodegraded via cometabolism, the degradation is catalyzed by an enzyme or cofactor that is fortuitously produced by the organisms for other purposes. The organism receives no known benefit from the degradation of the chlorinated aliphatic hydrocarbon. Rather, the cometabolic degradation of the chlorinated aliphatic hydrocarbon may in fact be harmful to the microorganism responsible for the production of the enzyme or cofactor (McCarty and Semprini, 1994). Cometabolism is best documented in aerobic environments, although it potentially could occur under anaerobic conditions. It has been reported that under aerobic conditions chlorinated ethenes, with the exception of PCE, are susceptible to cometabolic degradation (Murray and Richardson, 1993; Vogel, 1994; McCarty and Semprini, 1994). Vogel (1994) further elaborates that the rate of cometabolism increases as the degree of dechlorination decreases. During cometabolism, the chlorinated alkene is indirectly transformed by bacteria as they use BTEX or

- **Fuel and Chlorinated Volatile Organic Compounds**: Knowledge of the distribution of contaminants in soil gas can be used as a cost-effective way to estimate the extent of soil contamination.

2.3.2 Ground-water Characterization

To adequately determine the amount and three-dimensional distribution of dissolved contamination and to document the occurrence of natural attenuation, ground-water samples must be collected and analyzed. Biodegradation of organic compounds, whether natural or anthropogenic, brings about measurable changes in the chemistry of ground water in the affected area. By measuring these changes, it is possible to document and quantitatively evaluate the importance of natural attenuation at a site.

Ground-water sampling is conducted to determine the concentrations and distribution of contaminants, daughter products, and ground-water geochemical parameters. Ground-water samples may be obtained from monitoring wells or with point-source sampling devices such as a Geoprobe®, Hydropunch®, or cone penetrometer. All ground-water samples should be collected, handled, and disposed of in accordance with local, State, and Federal guidelines. Appendix A contains suggested procedures for ground-water sample collection. These procedures may need to be modified to comply with local, State, and Federal regulations or to accommodate site-specific conditions.

The analytical protocol for ground-water sample analysis is presented in Table 2.1. This analytical protocol includes all of the parameters necessary to delineate dissolved contamination and to document natural attenuation, including the effects of sorption and biodegradation. Data obtained from the analysis of ground water for these analytes is used to scientifically document natural attenuation and can be used as input into a solute fate and transport model. The following paragraphs describe each ground-water analytical parameter and the use of each analyte in the natural attenuation demonstration.

2.3.2.1 Volatile and Semivolatile Organic Compounds

These analytes are used to determine the type, concentration, and distribution of contaminants and daughter products in the aquifer. In many cases, chlorinated solvents are found commingled with fuels or other hydrocarbons. At a minimum, the volatile organic compound (VOC) analysis (Method SW8260A) should be used, with the addition of the trimethylbenzene isomers if fuel hydrocarbons are present or suspected. The combined dissolved concentrations of BTEX and trimethylbenzenes should not be greater than about 30 mg/L for a JP-4 spill (Smith *et al.*, 1981) or about 135 mg/L for a gasoline spill (Cline *et al.*, 1991; American Petroleum Institute, 1985). If these compounds are found in higher concentrations, sampling errors such as emulsification of LNAPL in the ground-water sample likely have occurred and should be investigated.

Maximum concentrations of chlorinated solvents dissolved in ground water from neat solvents should not exceed their solubilities in water. Appendix B contains solubilities for common contaminants. If contaminants are found in concentrations greater than their solubilities, then sampling errors such as emulsification of NAPL in the ground-water sample have likely occurred and should be investigated.

2.3.2.2 Dissolved Oxygen

Dissolved oxygen is the most thermodynamically favored electron acceptor used by microbes for the biodegradation of organic carbon, whether natural or anthropogenic. Anaerobic bacteria generally cannot function at dissolved oxygen concentrations greater than about 0.5 mg/L and, hence, reductive dechlorination will not occur. This is why it is important to have a source of carbon in the aquifer that can be used by aerobic microorganisms as a primary substrate. During

aerobic respiration, dissolved oxygen concentrations decrease. After depletion of dissolved oxygen, anaerobic microbes will use nitrate as an electron acceptor, followed by iron (III), then sulfate, and finally carbon dioxide (methanogenesis). Each sequential reaction drives the ORP of the ground water downward into the range within which reductive dechlorination can occur. Reductive dechlorination is most effective in the ORP range corresponding to sulfate reduction and methanogenesis, but dechlorination of PCE and TCE also may occur in the ORP range associated with denitrification or iron (III) reduction. Dehalogenation of DCE and VC generally are restricted to sulfate reducing and methanogenic conditions.

Dissolved oxygen measurements should be taken during well purging and immediately before and after sample acquisition using a direct-reading meter. Because most well purging techniques can allow aeration of collected ground-water samples, it is important to minimize the potential for aeration as described in Appendix A.

2.3.2.3 Nitrate

After dissolved oxygen has been depleted in the microbiological treatment zone, nitrate may be used as an electron acceptor for anaerobic biodegradation of organic carbon via denitrification. In order for reductive dechlorination to occur, nitrate concentrations in the contaminated portion of the aquifer must be less than 1.0 mg/L.

2.3.2.4 Iron (II)

In some cases, iron (III) is used as an electron acceptor during anaerobic biodegradation of organic carbon. During this process, iron (III) is reduced to iron (II), which may be soluble in water. Iron (II) concentrations can thus be used as an indicator of anaerobic degradation of fuel compounds, and vinyl chloride (see Section 2.2.1.1.2). Native organic matter may also support reduction of iron (II). Care must be taken when interpreting iron (II) concentrations because they may be biased low by reprecipitation as sulfides or carbonates.

2.3.2.5 Sulfate

After dissolved oxygen and nitrate have been depleted in the microbiological treatment zone, sulfate may be used as an electron acceptor for anaerobic biodegradation. This process is termed "sulfate reduction" and results in the production of sulfide. Concentrations of sulfate greater than 20 mg/L may cause competitive exclusion of dechlorination. However, in many plumes with high concentrations of sulfate, reductive dechlorination still occurs.

2.3.2.6 Methane

During methanogenesis acetate is split to form carbon dioxide and methane, or carbon dioxide is used as an electron acceptor, and is reduced to methane. Methanogenesis generally occurs after oxygen, nitrate, and sulfate have been depleted in the treatment zone. The presence of methane in ground water is indicative of strongly reducing conditions. Because methane is not present in fuel, the presence of methane above background concentrations in ground water in contact with fuels is indicative of microbial degradation of hydrocarbons. Methane also is associated with spills of pure chlorinated solvents (Weaver *et al.*, 1996). It is not known if the methane comes from chlorinated solvent carbon or from native dissolved organic carbon.

2.3.2.7 Alkalinity

There is a positive correlation between zones of microbial activity and increased alkalinity. Increases in alkalinity result from the dissolution of rock driven by the production of carbon dioxide produced by the metabolism of microorganisms. Alkalinity is important in the maintenance of ground-water pH because it buffers the ground water system against acids generated during both

aerobic and anaerobic biodegradation. In the experience of the authors, biodegradation of organic compounds rarely, if ever, generates enough acid to impact the pH of the ground water.

2.3.2.8 Oxidation-Reduction Potential

The ORP of ground water is a measure of electron activity and is an indicator of the relative tendency of a solution to accept or transfer electrons. Oxidation-reduction reactions in ground water containing organic compounds (natural or anthropogenic) are usually biologically mediated, and, therefore, the ORP of a ground water system depends upon and influences rates of biodegradation. Knowledge of the ORP of ground water also is important because some biological processes operate only within a prescribed range of ORP conditions.

ORP measurements can be used to provide real-time data on the location of the contaminant plume, especially in areas undergoing anaerobic biodegradation. Mapping the ORP of the ground water while in the field helps the field scientist to determine the approximate location of the contaminant plume. To map the ORP of the ground water while in the field, it is important to have at least one ORP measurement (preferably more) from a well located upgradient from the plume. ORP measurements should be taken during well purging and immediately before and after sample acquisition using a direct-reading meter. Because most well purging techniques can allow aeration of collected ground-water samples (which can affect ORP measurements), it is important to minimize potential aeration by using a flow-through cell as outlined in Appendix A.

Most discussion of oxidation reduction potential expresses the potential as if it were measured against the standard hydrogen electrode. Most electrodes and meters to measure oxidation-reduction potential use the silver/silver chloride electrode (Ag/AgCl) as the reference electrode. This protocol uses the potential against the Ag/AgCl electrode as the screening potential, not Eh as would be measured against the standard hydrogen electrode.

2.3.2.9 Dissolved Hydrogen

In some ground waters, PCE and TCE appear to attenuate, although significant concentrations of DCE and VC do not accumulate. In this situation, it is difficult to distinguish between Type 3 behavior where the daughter products are not produced, and Type 1 or Type 2 behavior where the daughter products are removed very rapidly. In cases like this, the concentration of hydrogen can be used to identify ground waters where reductive dechlorination is occurring. If hydrogen concentrations are very low, reductive dechlorination is not efficient and Type 3 behavior is indicated. If hydrogen concentrations are greater than approximately 1 nM, rates of reductive dechlorination should have environmental significance and Type 1 or Type 2 behavior would be expected.

Concentrations of dissolved hydrogen have been used to evaluate redox processes, and thus the efficiency of reductive dechlorination, in ground-water systems (Lovley and Goodwin, 1988; Lovley *et al.*, 1994; Chapelle *et al.*, 1995). Dissolved hydrogen is continuously produced in anoxic ground-water systems by fermentative microorganisms that decompose natural and anthropogenic organic matter. This H_2 is then consumed by respiratory microorganisms that use nitrate, Fe(III), sulfate, or CO_2 as terminal electron acceptors. This continuous cycling of H_2 is called *interspecies hydrogen transfer*. Significantly, nitrate-, Fe(III)-, sulfate- and CO_2-reducing (methanogenic) microorganisms exhibit different efficiencies in utilizing the H_2 that is being continually produced. Nitrate reducers are highly efficient H_2 utilizers and maintain very low steady-state H_2 concentrations. Fe(III) reducers are slightly less efficient and thus maintain somewhat higher H_2 concentrations. Sulfate reducers and methanogenic bacteria are progressively less efficient and maintain even higher H_2 concentrations. Because each terminal electron accepting process has a characteristic H_2 concentration associated with it, H_2 concentrations can be an indicator of predominant redox

processes. These characteristic ranges are given in Table 2.5. An analytical protocol for quantifying H_2 concentrations in ground water is given in Appendix A.

Table 2.5 Range of Hydrogen Concentrations for a Given Terminal Electron-Accepting Process

Terminal Electron Accepting Process	Hydrogen (H_2) Concentration (nanomoles per liter)
Denitrification	< 0.1
Iron (III) Reduction	0.2 to 0.8
Sulfate Reduction	1 to 4
Reductive Dechlorination	>1
Methanogenesis	5-20

Oxidation-reduction potential (ORP) measurements are based on the concept of thermodynamic equilibrium and, within the constraints of that assumption, can be used to evaluate redox processes in ground water systems. The H_2 method is based on the ecological concept of interspecies hydrogen transfer by microorganisms and, within the constraints of that assumption, can also be used to evaluate redox processes. These methods, therefore, are fundamentally different. A direct comparison of these methods (Chapelle et al., 1996) has shown that ORP measurements were effective in delineating oxic from anoxic ground water, but that ORP measurements could not distinguish between nitrate-reducing, Fe(III)-reducing, sulfate-reducing, or methanogenic zones in an aquifer. In contrast, the H_2 method could readily distinguish between different anaerobic zones. For those sites where distinguishing between different anaerobic processes is important, H_2 measurements are an available technology for making such distinctions. At sites where concentrations of redox sensitive parameters such as dissolved oxygen, iron (II), sulfide, and methane are sufficient to identify operative redox processes, H_2 concentrations are not always required to identify redox zonation and predict contaminant behavior.

In practice, it is preferable to interpret H_2 concentrations in the context of electron acceptor availability and the presence of the final products of microbial metabolism (Chapelle *et al.*, 1995). For example, if sulfate concentrations in ground water are less than 0.5 mg/L, methane concentrations are greater than 0.5 mg/L, and H_2 concentrations are in the 5 to 20 nM range, it can be concluded with a high degree of certainty that methanogenesis is the predominant redox process in the aquifer. Similar logic can be applied to identifying denitrification (presence of nitrate, H_2<0.1 nM), Fe(III) reduction (production of Fe(II), H_2 concentrations ranging from 0.2 to 0.8 nM), and sulfate reduction (presence of sulfate, production of sulfide, H_2 concentrations ranging from 1 to 4 nM). Reductive dechlorination in the field has been documented at hydrogen concentrations that support sulfate reduction or methanogenesis. If hydrogen concentrations are high enough to support sulfate reduction or methanogenesis, then reductive dechlorination is probably occurring, even if other geochemical indicators as scored in Table 2.3 do not indicate that reductive dechlorination is possible.

2.3.2.10 pH, Temperature, and Conductivity

Because the pH, temperature, and conductivity of a ground-water sample can change significantly within a short time following sample acquisition, these parameters must be measured in the field in unfiltered, unpreserved, "fresh" water collected by the same technique as the samples taken for dissolved oxygen and ORP analyses. The measurements should be made in a clean

container separate from those intended for laboratory analysis, and the measured values should be recorded in the ground-water sampling record.

The pH of ground water has an effect on the presence and activity of microbial populations in ground water. This is especially true for methanogens. Microbes capable of degrading chlorinated aliphatic hydrocarbons and petroleum hydrocarbon compounds generally prefer pH values varying from 6 to 8 standard units.

Ground-water temperature directly affects the solubility of dissolved gasses and other geochemical species. Ground-water temperature also affects the metabolic activity of bacteria.

Conductivity is a measure of the ability of a solution to conduct electricity. The conductivity of ground water is directly related to the concentration of ions in solution; conductivity increases as ion concentration increases.

2.3.2.11 Chloride

Chlorine is the most abundant of the halogens. Although chlorine can occur in oxidation states ranging from Cl^- to Cl^{+7}, the chloride form (Cl^-) is the only form of major significance in natural waters (Hem, 1985). Chloride forms ion pairs or complex ions with some of the cations present in natural waters, but these complexes are not strong enough to be of significance in the chemistry of fresh water (Hem, 1985). Chloride ions generally do not enter into oxidation-reduction reactions, form no important solute complexes with other ions unless the chloride concentration is extremely high, do not form salts of low solubility, are not significantly adsorbed on mineral surfaces, and play few vital biochemical roles (Hem, 1985). Thus, physical processes control the migration of chloride ions in the subsurface. Kaufman and Orlob (1956) conducted tracer experiments in ground water, and found that chloride moved through most of the soils tested more conservatively (i.e., with less retardation and loss) than any of the other tracers tested.

During biodegradation of chlorinated hydrocarbons dissolved in ground water, chloride is released into the ground water. This results in chloride concentrations in ground water in the contaminant plume that are elevated relative to background concentrations. Because of the neutral chemical behavior of chloride, it can be used as a conservative tracer to estimate biodegradation rates, as discussed in Appendix C.

2.3.3 Aquifer Parameter Estimation

Estimates of aquifer parameters are necessary to accurately evaluate contaminant fate and transport.

2.3.3.1 Hydraulic Conductivity

Hydraulic conductivity is a measure of an aquifer's ability to transmit water, and is perhaps the most important aquifer parameter governing fluid flow in the subsurface. The velocity of ground water and dissolved contamination is directly related to the hydraulic conductivity of the saturated zone. In addition, subsurface variations in hydraulic conductivity directly influence contaminant fate and transport by providing preferential paths for contaminant migration. Estimates of hydraulic conductivity are used to determine residence times for contaminants and tracers, and to determine the seepage velocity of ground water.

The most common methods used to quantify hydraulic conductivity are aquifer pumping tests and slug tests (Appendix A). Another method that may be used to determine hydraulic conductivity is the borehole dilution test. One drawback to these methods is that they average hydraulic properties over the screened interval. To help alleviate this potential problem, the screened interval of the test wells should be selected after consideration is given to subsurface stratigraphy.

Attachment 6

Excerpt of ATSDR Toxicological Profile for Trichloroethylene

TOXICOLOGICAL PROFILE FOR TRICHLOROETHYLENE

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry

September 1997

DISCLAIMER

The use of company or product name(s) is for identification only and does not imply endorsement by the Agency for Toxic Substances and Disease Registry.

UPDATE STATEMENT

An update Toxicological Profile for Trichloroethylene was released in April 1993. This edition supersedes any previously released draft or final profile.

Toxicological profiles are revised and republished as necessary, but no less than once every three years. For information regarding the update status of previously released profiles, contact ATSDR at:

Agency for Toxic Substances and Disease Registry
Division of Toxicology/Toxicology Information Branch
1600 Clifton Road NE, E-29
Atlanta, Georgia 30333

FOREWORD

This toxicological profile is prepared in accordance with guidelines* developed by the Agency for Toxic Substances and Disease Registry (ATSDR) and the Environmental Protection Agency (EPA). The original guidelines were published in the *Federal Register* on April 17, 1987. Each profile will be revised and republished as necessary.

The ATSDR toxicological profile succinctly characterizes the toxicologic and adverse health effects information for the hazardous substance described therein. Each peer-reviewed profile identifies and reviews the key literature that describes a hazardous substance's toxicologic properties. Other pertinent literature is also presented, but is described in less detail than the key studies. The profile is not intended to be an exhaustive document; however, more comprehensive sources of specialty information are referenced.

The focus of the profiles is on health and toxicologic information; therefore, each toxicological profile begins with a public health statement that describes, in nontechnical language, a substance's relevant toxicological properties. Following the public health statement is information concerning levels of significant human exposure and, where known, significant health effects. The adequacy of information to determine a substance's health effects is described in a health effects summary. Data needs that are of significance to protection of public health are identified by ATSDR and EPA.

Each profile includes the following:

(A) The examination, summary, and interpretation of available toxicologic information and epidemiologic evaluations on a hazardous substance to ascertain the levels of significant human exposure for the substance and the associated acute, subacute, and chronic health effects;

(B) A determination of whether adequate information on the health effects of each substance is available or in the process of development to determine levels of exposure that present a significant risk to human health of acute, subacute, and chronic health effects; and

(C) Where appropriate, identification of toxicologic testing needed to identify the types or levels of exposure that may present significant risk of adverse health effects in humans.

The principal audiences for the toxicological profiles are health professionals at the Federal, State, and local levels; interested private sector organizations and groups; and members of the public.

This profile reflects ATSDR's assessment of all relevant toxicologic testing and information that has been peer-reviewed. Staff of the Centers for Disease Control and Prevention and other Federal scientists have also reviewed the profile. In addition, this profile has been peer-reviewed by a nongovernmental panel and was made available for public review. Final responsibility for the contents and views expressed in this toxicological profile resides with ATSDR.

David Satcher, M.D., Ph.D.
Administrator
Agency for Toxic Substances and
Disease Registry

The toxicological profiles are developed in response to the Super-fund Amendments and Reauthorization Act (SARA) of 1986 (Public Law 99-499) which amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund). This public law directed ATSDR to prepare toxicological profiles for hazardous substances most commonly found at facilities on the CERCLA National Priorities List and that pose the most significant potential threat to human health, as determined by ATSDR and the EPA. The availability of the revised priority list of 275 hazardous substances was announced in the *Federal Register* on April 29, 1996 (61 FR 18744). For prior versions of the list of substances, see *Federal Register* notices dated April 17, 1987 (52 FR 12866); October 20, 1988 (53 FR 41280); October 26, 1989 (54 FR 43619); October 17,1990 (55 FR 42067); October 17, 1991 (56 FR 52166); October 28, 1992 (57 FR 48801); and February 28, 1994 (59 FR 9486). Section 104(i)(3) of CERCLA, as amended, directs the Administrator of ATSDR to prepare a toxicological profile for each substance on the list.

CONTRIBUTORS

CHEMICAL MANAGER(S)/AUTHOR(S):

Mildred Williams-Johnson, Ph.D., D.A.B.T.
ATSDR, Division of Toxicology, Atlanta, GA

Carol J. Eisenmann, Ph.D.
Sciences International, Inc., Alexandria, VA

Steven G. Donkin, Ph.D.
Sciences International, Inc., Alexandria, VA

The Chemical Manager and Authors acknowledge the contribution of Dr. Ted W. Simon, U.S. EPA, in applying physiologically-based pharmacokinetic modeling to the development of minimal risk levels for trichloroethylene.

THE PROFILE HAS UNDERGONE THE FOLLOWING ATSDR INTERNAL REVIEWS:

1. Green Border Review. Green Border review assures consistency with ATSDR policy.

2. Health Effects Review. The Health Effects Review Committee examines the health effects chapter of each profile for consistency and accuracy in interpreting health effects and classifying end points.

3. Minimal Risk Level Review. The Minimal Risk Level Workgroup considers issues relevant to substance-specific minimal risk levels (MRLs), reviews the health effects database of each profile, and makes recommendations for derivation of MRLs.

PEER REVIEW

A peer review panel was assembled for trichloroethylene. The panel consisted of the following members:

1. Herbert Cornish, Ph.D., Private Consultant, Ypsilanti, MI
2. James Klaunig, Ph.D., Indiana University School of Medicine, Indianapolis, IN
3. Norbert Page, Ph.D., Private Consultant, Gaithersburg, MD

These experts collectively have knowledge of trichloroethylene's physical and chemical properties, toxicokinetics, key health end points, mechanisms of action, human and animal exposure, and quantification of risk to humans. All reviewers were selected in conformity with the conditions for peer review specified in Section 104(i)(13) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended.

Scientists from the Agency for Toxic Substances and Disease Registry (ATSDR) have reviewed the peer reviewers' comments and determined which comments will be included in the profile. A listing of the peer reviewers' comments not incorporated in the profile, with a brief explanation of the rationale for their exclusion, exists as part of the administrative record for this compound. A list of databases reviewed and a list of unpublished documents cited are also included in the administrative record.

The citation of the peer review panel should not be understood to imply its approval of the profile's final content. The responsibility for the content of this profile lies with the ATSDR.

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TABLE 3-2. Physical and Chemical Identity of Trichloroethylene

Property	Information	Reference
Molecular weight	131.40	HSDB 1994
Color	Clear, colorless	HSDB 1994
Physical state	Liquid (at room temperature)	HSDB 1994
Melting point	-87.1°C	McNeill 1979
Boiling point	86.7°C	McNeill 1979
Density:		
at 20°C	1.465 g/mL	McNeill 1979
Odor	Ethereal; chloroform-like; sweet	HSDB 1994
Odor threshold:		
Water	No data	
Air	100 ppm	HSDB 1994
Solubility:		
Water at 20°C	1.070 g/L	McNeill 1979
at 25°C	1.366 g/L	Tewari et al. 1982
Organic solvent(s)	Miscible with many common organic solvents (such as ether, alcohol, and chloroform)	McNeill 1979; Windholz 1983
Partition coefficients:		
Log K_{ow}	2.42	Hansch and Leo 1985
Log K_{oc}	2.03–2.66	Garbarini and Lion 1986
Vapor pressure at 25°C	74 mmHg	Mackay and Shiu 1981
Henry's law constant:		
at 20°C	0.020 atm-m^3/mol	Mackay and Shiu 1981
at 25°C	0.011 atm-m^3/mol	Hine and Mookerjee 1975
Autoignition temperature	None	McNeill 1979
Flashpoint	None	McNeill 1979
Flammability limits at 25°C (explosive limits) (volume % in air)	8.0–10.5	McNeill 1979
Conversion factors		Verschueren 1983
Air at 20°C	1 mg/m^3 = 0.18 ppm; 1 ppm = 5.46 mg/m^3	
Water	1 ppm (weight per volume) = 1 mg/L	
Explosive limits	No data	

Attachment 7

Excerpt of ATSDR Toxicological Profile for Tetrachloroethylene

TOXICOLOGICAL PROFILE FOR TETRACHLOROETHYLENE

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry

September 1997

DISCLAIMER

The use of company or product name(s) is for identification only and does not imply endorsement by the Agency for Toxic Substances and Disease Registry.

UPDATE STATEMENT

A Toxicological Profile for tetrachloroethylene was released in April 1993. This edition supersedes any previously released draft or final profile.

Toxicological profiles are revised and republished as necessary, but no less than once every three years. For information regarding the update status of previously released profiles, contact ATSDR at:

Agency for Toxic Substances and Disease Registry
Division of Toxicology/Toxicology Information Branch
1600 Clifton Road NE, E-29
Atlanta, Georgia 30333

FOREWORD

This toxicological profile is prepared in accordance with guidelines* developed by the Agency for Toxic Substances and Disease Registry (ATSDR) and the Environmental Protection Agency (EPA). The original guidelines were published in the *Federal Register* on April 17, 1987. Each profile will be revised and republished as necessary.

The ATSDR toxicological profile succinctly characterizes the toxicologic and adverse health effects information for the hazardous substance described therein. Each peer-reviewed profile identifies and reviews the key literature that describes a hazardous substance's toxicologic properties. Other pertinent literature is also presented, but is described in less detail than the key studies. The profile is not intended to be an exhaustive document; however, more comprehensive sources of specialty information are referenced.

The focus of the profiles is on health and toxicologic information; therefore, each toxicological profile begins with a public health statement that describes, in nontechnical language, a substance's relevant toxicological properties. Following the public health statement is information concerning levels of significant human exposure and, where known, significant health effects. The adequacy of information to determine a substance's health effects is described in a health effects summary. Data needs that are of significance to protection of public health are identified by ATSDR and EPA.

Each profile includes the following:

(A) The examination, summary, and interpretation of available toxicologic information and epidemiologic evaluations on a hazardous substance to ascertain the levels of significant human exposure for the substance and the associated acute, subacute, and chronic health effects;

(B) A determination of whether adequate information on the health effects of each substance is available or in the process of development to determine levels of exposure that present a significant risk to human health of acute, subacute, and chronic health effects; and

(C) Where appropriate, identification of toxicologic testing needed to identify the types or levels of exposure that may present significant risk of adverse health effects in humans.

The principal audiences for the toxicological profiles are health professionals at the Federal, State, and local levels; interested private sector organizations and groups; and members of the public.

This profile reflects ATSDR's assessment of all relevant toxicologic testing and information that has been peer-reviewed. Staff of the Centers for Disease Control and Prevention and other Federal scientists have also reviewed the profile. In addition, this profile has been peer-reviewed by a nongovernmental panel and was made available for public review. Final responsibility for the contents and views expressed in this toxicological profile resides with ATSDR.

David Satcher, M.D., Ph.D.
Administrator
Agency for Toxic Substances and
Disease Registry

The toxicological profiles are developed in response to the Superftmd Amendments and Reauthorization Act (SARA) of 1986 (Public Law 99-499) which amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund). This public law directed ATSDR to prepare toxicological profiles for hazardous substances most commonty found at facilities on the CERCLA National Priorities List and that pose the most significant potential threat to human health, as determined by ATSDR and the EPA. The availability of the revised priority list of 275 hazardous substances was announced in the Federal Register on April 29, 1996 (61 FR 18744). For prior versions of the list of substances, see Federal Register notices dated April 17, 1987 (52 FR 12866); October 20, 1988 (53 FR 41280); October 26, 1989 (54 FR 43619); October 17,1990 (55 FR 42067); October 17, 1991 (56 FR 52166); October 28, 1992 (57 FR 48801); and February 28, 1994 (59 FR 9486). Section 104(i)(3) of CERCLA, as amended, directs the Administrator of ATSDR to prepare a toxicological profile for each substance on the list.

CONTRIBUTORS

CHEMICAL MANAGER(S)/AUTHOR(S):

Yee-Wan Stevens, MS.
ATSDR, Division of Toxicology, Atlanta, GA

Carol Eisenmann, Ph.D.
Sciences International, Inc., Alexandria, VA

THE PROFILE HAS UNDERGONE THE FOLLOWING ATSDR INTERNAL REVIEWS:

1. Green Border Review. Green Border review assures consistency with ATSDR policy.

2. Health Effects Review. The Health Effects Review Committee examines the health effects chapter of each profile for consistency and accuracy in interpreting health effects and classifying end points.

3. Minimal Risk Level Review. The Minimal Risk Level Workgroup considers issues relevant to substance-specific minimal risk levels (MRLs), reviews the health effects database of each profile, and makes recommendations for derivation of MRLs.

PEER REVIEW

A peer review panel was assembled for tetrachloroethylene. The panel consisted of the following members:

1. Dr. Lee R. Shull, Toxicologist, Poster Wheeler Environmental, Sacramento, California
2. Mr. Lyman K. Skory, Private Consultant, Midland, Michigan
3. Richard D. Stewart, M.D., M.P.H., Adjunct Professor, Department of Pharmacology and Toxicology, The Medical College of Wisconsin, Milwaukee, Wisconsin

These experts collectively have knowledge of tetrachloroethylene's physical and chemical properties, toxicokinetics, key health end points, mechanisms of action, human and animal exposure, and quantification of risk to humans. All reviewers were selected in conformity with the conditions for peer review specified in Section 104(i)(l3) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended.

Scientists from the Agency for Toxic Substances and Disease Registry (ATSDR) have reviewed the peer reviewers' comments and determined which comments will be included in the profile. A listing of the peer reviewers' comments not incorporated in the profile, with a brief explanation of the rationale for their exclusion, exists as part of the administrative record for this compound. A list of databases reviewed and a list of unpublished documents cited are also included in the administrative record.

The citation of the peer review panel should not be understood to imply its approval of the profile's final content. The responsibility for the content of this profile lies with the ATSDR.

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TABLE 3-2. Physical and Chemical Properties of Tetrachloroethylene

Property	Information	Reference
Molecular weight	165.83	Lide 1990
Color	Colorless	Sax and Lewis 1987
Physical state	Liquid (at room temperature)	Sax and Lewis 1987
Melting point	-19°C	Lide 1990
Boiling point	121°C	Lide 1990
Density:		
at 20°C	1.6227 g/mL	Lide 1990
at 25°C	No data	
Odor	Ethereal	HSDB 1996
Odor threshold:		
Water	0.3 ppm	EPA 1987b
Air	1.0 ppm	EPA 1987b
Solubility:		
Water at 25°C	150 mg/L	HSDB 1996
Organic solvent(s)	Miscible with alcohol, ether, chloroform, benzene, solvent hexane, and most of the fixed and volatile oils	HSDB 1996
Partition coefficients:		
Log K_{ow}	3.40	HSDB 1996
Log K_{oc}	2.2–2.7	Seip et al. 1986; Zytner et al. 1989a
Vapor pressure at 25°C	18.47 mmHg	HSDB 1996
Henry's law constant:		
at 25°C	1.8×10^{-2} atm-m^3/mol	Gossett 1987
Autoignition temperature	No data	
Flashpoint	None	HSDB 1996
Flammability limits	Nonflammable	HSDB 1996
Conversion factors ppm to mg/m^3 in air	1 mg/L = 147.4 ppm; 1 ppm = 6.78 mg/m^3	HSDB 1996
Explosive limits	No data	

Attachment 8

Excerpt of IT Group Report on Soil Removal Activities

IT Corporation
3347 Michelson Drive, Suite 200
Irvine, CA 92612
Telephone: 949-261-6441
Fax: 949-474-8309

December 17, 2001

California Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013
ATTN: Steven Hariri

RE: Soil Removal Activities
Jervis B. Webb of California
5030 Firestone Boulevard and 9301 Rayo Avenue
South Gate, CA
SLIC No. 744

Dear Mr. Hariri:

This letter report summarizes the soil removal activities performed by IT Corporation at the Jervis B. Webb of California (Webb) facility on December 14, 2001. In accordance with our Work Plan dated December 12, 2001, which memorialized our conversations and direction from you, we drilled three large diameter borings and removed contaminated soil successfully from each boring at the locations specified by the Board. Pursuant to the Board's direction, a confirmation sample was taken at the bottom of each boring.

Background

IT sampled five confirmation borings (CB-1 to CB-5) at the Webb site on September 13-14, 2001, in order to meet the Los Angeles Regional Water Quality Control Board's (RWQCB) requirements for soil closure. Pursuant to the RWQCB letter response dated December 12, 2001, the Board directed that the elevated levels of TCE in borings CB-3 and CB-4 be removed in order to achieve soil closure. In addition, the RWQCB required the 0.88 mg/kg of hexavalent chromium found previously by EKI in boring B-4 at 10.5 feet be removed.

FIELD WORK

On December 14, 2001, IT drilled three large diameter soil borings, designated CB-3A, CB-4A, and CB-1A, immediately adjacent to confirmation borings CB-3 and CB-4 and EKI Boring B-4, respectively. The borings were drilled using a limited access (low overhead) hollow stem auger rig, since the borings were located inside the Firestone Boulevard building, which has an overhead clearance of about 14 feet. The borings were initially drilled using 6-inch diameter augers and then reamed using 12-inch diameter augers. Boring CB-3A was drilled to a final depth of 36 feet, boring CB-4A to a depth of 37 feet, and boring CB-1A to 18 feet.

the group

Per your request, confirmation soil samples were collected at the bottom of each borehole using a split spoon sampler equipped with brass sleeves. Other confirmation samples were collected to ensure that all elevated levels of TCE and/or hexavalent chromium had been removed from the boring. Samples to be analyzed for VOCs were extracted from the brass sleeve in the field using an Encore™ sampler.

During drilling, the field geologist monitored the headspace of the soil cuttings using a calibrated photo-ionization detector (PID) and logged the readings onto a boring log. The geologist also recorded the relative percentages of sand, silt, and clay, soil color, density, odor, moisture content, and any unusual observations. Copies of the soil boring logs are provided in Appendix A. Upon completion of sampling, the boreholes were backfilled with bentonite chips and saturated with water.

Samples from CB-3A and CB-4A were analyzed for VOCs (EPA Method 8260B) on a 24-hour turnaround by Calscience Environmental Laboratories, Inc., a State-certified laboratory. The sample from CB-1A was analyzed for hexavalent chromium (EPA 7196A) and total chromium (EPA 6010B) on a 24-hour basis. Proper chain of custody procedures were followed.

Laboratory Results

The results of the soil confirmation samples collected from the bottom of each boring are summarized in Table 1. The samples analyzed for VOCs (EPA 8260B) indicated no detectable TCE (< 2 ug/kg) in boring CB-4A at 37 feet and 24 ug/kg of TCE in boring CB-3A at 36 feet. No VOCs other than TCE were detected in either boring.

Hexavalent chromium was found in boring CB-1A at 18 feet depth at a level of 0.24 mg/kg, which is below EPA's Preliminary Remediation Goal (PRG) for industrial soil (64 mg/kg) and residential soil (30 mg/kg) and approximates the California modified PRG (0.20 mg/kg). In addition, a total chromium level of 14.1 mg/kg was detected in this sample. This concentration is much less than the EPA industrial PRG (450 mg/kg) and residential PRG (210 mg/kg) and within the normal background level for total chromium in the soil.

Waste Disposal

The soil cuttings generated by the drilling were contained in 55-gallon drums, labeled, and a drum inventory prepared to identify the contents of each (by footage). A total of 12 drums of soil cuttings were generated by this investigation. The soil is currently being profiled for disposal at a permitted soil disposal facility. The soil will be scheduled for offsite disposal as soon as possible. Documentation of the soil disposal will be provided to the RWQCB under separate cover when the manifests become available.

Request for Soil Closure

Based on the successful removal of soil containing elevated levels of TCE and hexavalent chromium from the three borings of concern, we have completed the last remaining requirement for closure of the site. Therefore, we are requesting soil closure for the Webb site.

Schedule

In accordance with our previous discussion and correspondence, we appreciate the Board's efforts to issue the soil closure letter by Wednesday, December 19, 2001, to meet the requirements of the property transfer.

Please feel free to contact Gary Cronk at 949-660-7511 should you have any questions or comments regarding this report.

Sincerely,
IT Corporation

Gary Cronk

Gary Cronk, P.E.
Sr. Project Manager

REGISTERED PROFESSIONAL ENGINEER
GARY D. CRONK
No. C041873
Exp. 03/31/04
CIVIL
STATE OF CALIFORNIA

Enclosures:
Figure 1: Confirmation Soil Boring Locations
Table 1: Summary of Analytical Results
Appendix A: Soil Boring Logs
Appendix B: Laboratory Analytical Reports and Chain of Custody

cc: Dennis Dickerson, RWQCB
Arthur Heath, RWQCB
Rebecca Chow, RWQCB
Mike Farley, Jervis B. Webb
Michael Feeley, Latham & Watkins
Gene Lucero, Latham & Watkins

N:/Jervis Webb/Webb WQCB letter

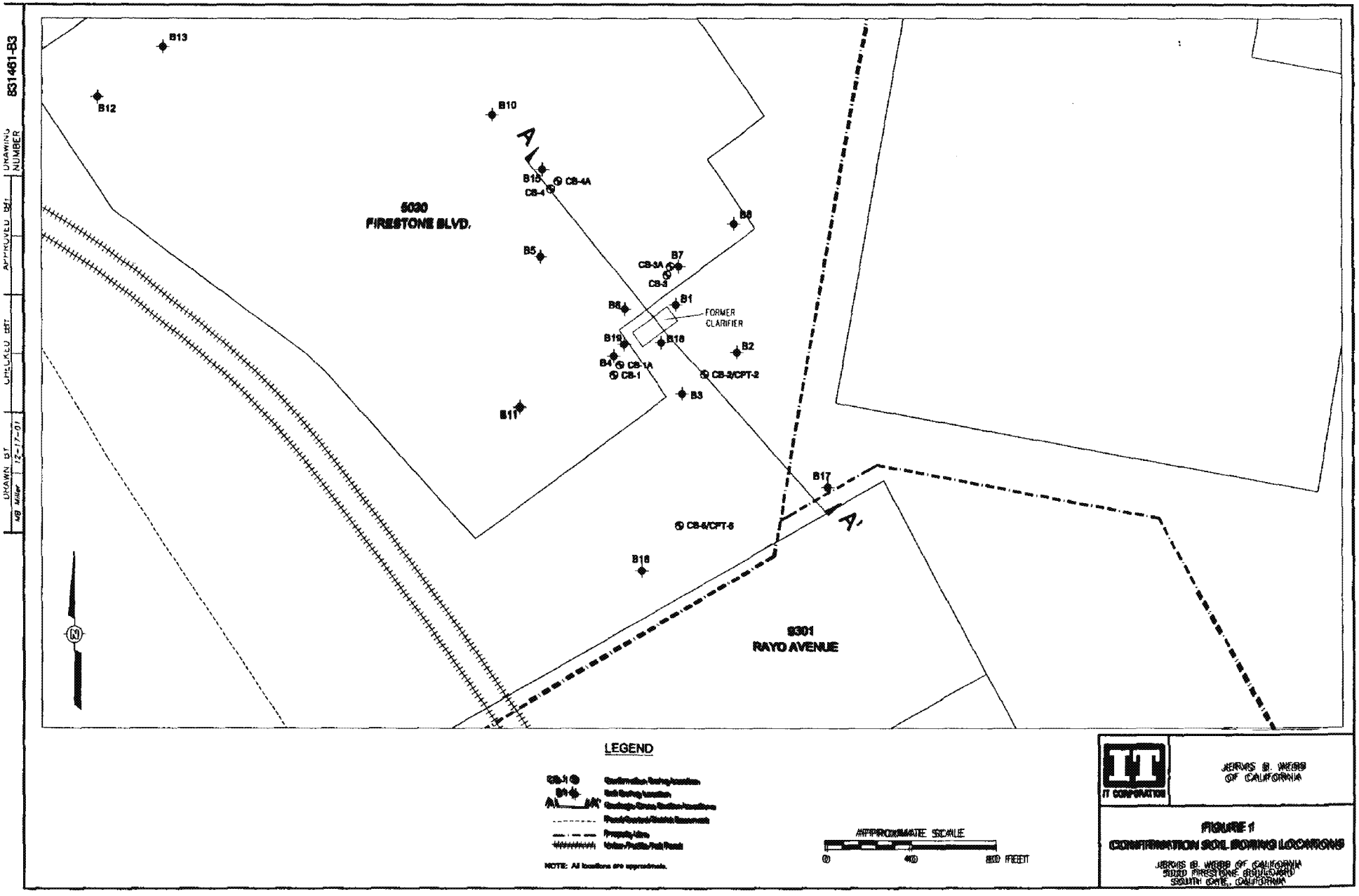
B13
B12
B10
A
B15
CB-4
CB-4A
5020
FIRESTONE BLVD.
B9
B5
B7
CB-3A
CB-3
B1
B6
FORMER
CLARIFIER
B19
B18
B2
B4
CB-1A
CB-1
CB-2/CPT-2
B3
B11
B17
A'
CB-5/CPT-5
B16
5301
RAYO AVENUE
N
LEGEND
NOTE: All locations are approximate.
APPROXIMATE SCALE
0
400
800 FEET
IT
IT CORPORATION
JERVIS B. WEBB
OF CALIFORNIA
FIGURE 1
CONFIRMATION SOIL BORING LOCATIONS
JERVIS B. WEBB OF CALIFORNIA
5020 FIRESTONE BOULEVARD
SOUTH GATE, CALIFORNIA
DRAWN BY
HB Miller
12-17-01
UNCHECKED BY
APPROVED BY
DRAWING NUMBER
831461-B3

Table 1.

Boring No.	Depth (ft)	TCE (ug/kg)	Hexavalent Chromium (mg/kg)	Hex. Chromium Residential Soil PRG (mg/kg)	Total Chromium (mg/kg)	Total Chromium Residential Soil PRG (mg/kg)
CB-3A	36	24	--	--	--	--
CB-4A	37	< 2	--	--	--	--
CB1A	18	--	0.24	0.2*	14.1	210

Footnotes:
TCE = trichloroethylene
PRG = EPA's Preliminary Remediation Goal for Residential Soil
* = California Modified PRG

Attachment 9

Excerpt of July 2006 Cooper Drum Remedial Design

Technical Memorandum

COOPER DRUM COMPANY SUPERFUND SITE
REMEDIAL DESIGN
TECHNICAL MEMORANDUM
for
FIELD SAMPLING RESULTS

Prepared for:

Contract No. 68-W-98-225 / WA No. 247-RDRD-091N
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, California 94105

Prepared by:

URS Group, Inc.
2870 Gateway Oaks Drive, Suite 150
Sacramento, California 95833

July 2006

DISCLAIMER

This technical memorandum has been prepared for the United States Environmental Protection Agency by URS Group, Inc. (URS). This document is intended to transmit the information collected by URS during the remedial design field sampling effort initiated in May 2003 at the Cooper Drum Company Superfund Site.

The limited objective of this memorandum, the ongoing nature of the project, along with the evolving knowledge of site conditions and chemical effects on the environment and human health, must all be considered when evaluating the memorandum because subsequent facts may become known that may make this document premature or inaccurate.

This memorandum has been prepared by URS under the review of registered professionals. The conclusions and recommendations in this memorandum are based upon URS' data evaluation. The interpretation of the data and the conclusions drawn were governed by URS experience and professional judgment.

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Recent Groundwater Analytical Results
VOCs
Cooper Drum Company Site, South Gate, California

Location	Sample Date	PCE	TCE	cis-1,2-DCE	1,1-DCE	trans-1,2-DCE	VC	1,1-DCA	1,2-DCA	Benzene	1,2-DCPA	Other VOCs detected
MW-1	8/29/03	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.2J	<0.5	<0.5	<0.5	Chloroform (0.8)
	1/15/04	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.3	<0.5	<0.5	Toluene (0.25J), xylenes (0.18J)
	11/04/04	<0.5	0.27J	<0.5	<0.5	<0.5	<0.5	<0.5	2.8	<0.5	<0.5	None
MW-2	4/30/03	<25* (<25*)	230 (220)	790 (790)	29 (27)	45 (46)	<25* (<25*)	64 (65)	<25* (<25*)	<25* (<25*)	<25* (<25*)	Bromoform (56J, 41J)
	12/4/03	<1.0	240	810	13	52	17	75	14	5.1	5.6	Toluene (1.6), chlorobenzene (5.6)
	2/26/04	<0.5	220D	770D	12	48D	15	73D	19	5.8	6.3	Toluene (1.6), chlorobenzene (6.2), Methylcyclohexane (0.63)
	4/28/04	<0.5	290D	990D	10J	50D	10	86D	19	6.0	6.6	Toluene (0.92), chlorobenzene (4.0), cyclohexane (0.20J)
	7/19/04	<2.5	220D	730D	15	46	11	64	<2.5	6.1	5.8	Toluene (1.7J), chlorobenzene (5.4)
	11/02/04	<0.5	270D	790D	19	46JD	23	75D	23	8.2	7.7	Methylcyclohexane (0.66J)Toluene (0.93), chlorobenzene (4.1)
MW-3	4/29/03	<0.5	4	2	<0.5	0.3J	<0.5	<0.5	<0.5	<0.5	<0.5	None
	1/15/04	<0.5	4.2	2.8	<0.5	0.29J	<0.5	<0.5	<0.5	<0.5	<0.5	Toluene (0.24J), xylenes (0.27J)
	7/22/04	<0.5	3.3	2.3	<0.5	0.27J	<0.5	<0.5	<0.5	<0.5	<0.5	None
MW-4	4/29/03	<1.0	12	38	7	2	2	8	3	<1.0	<1.0	None
	1/15/04	<0.5	6.8	23	2.6	0.93	0.86	3.7	1.3	0.23J	<0.5	Toluene (0.19J)
	11/01/04	<0.5	15	30D	6.8	3.0	5.0	8.4	<0.5	0.42J	<0.5	None
MW-5	4/29/03	10	88	200J	6J	3J	3J	78	9J	<10*	<10*	Chlorobenzene (9J)
	12/3/03	13	110	270	7	4.4	3.5	110	8.1	1.5	8.3	Acetone (2.2J), 1,1,2-trichloroethane (0.7J), chlorobenzene (7.2), 1,2,3-trichloropropane (8.0)
	2/25/04	13	91D	210D	5.9	4.1	1.9	90D	8.2	1.3	7.6	1,1,2 trichloroethane (0.93), chlorobenzene (4.6)
	4/27/04	9.8	88D	220D	<0.5	3.3J	<0.5	86D	7.1	<0.5	7.0	Toluene (0.12J), chlorobenzene (4.3), 1,1,2- TCA (0.87), cis-1,3-DCP (0.14J)
	7/21/04	12	220D	170D	6.0	4.1	1.6	82D	5.8	1.2	6.7	1,1,2-Trichloroethane (0.72), chlorobenzene (3.6)
	11/01/04	16	100D	220D	8.0	6.0	4.1	92D	8.2	1.8	9.3	1,1,2-Trichloroethane (0.77), chlorobenzene (5.2)
MW-8	1/21/04	<0.5	33D	86D	0.51	3.2	<0.5	<0.5	<0.5	<0.5	<0.5	Toluene (0.17J)

TABLE 15 (Continued)

Location	Sample Date	PCE	TCE	cis-1,2-DCE	1,1-DCE	trans-1,2-DCE	VC	1,1-DCA	1,2-DCA	Benzene	1,2-DCPA	Other VOCs detected
MW-10	5/1/03	<0.5 (<0.5)	26D (25)	9 (8)	0.8 (0.9J)	0.4J (0.3J)	0.2J (<0.5)	0.4J (0.4J)	0.2J (<0.5)	<0.5 (<0.5)	<0.5 (<0.5)	None
	1/21/04	<0.5 (<0.5)	20D (20D)	12 (14)	0.98 (1.1)	0.60 (0.63)	<0.5 (<0.5)	0.55 (0.57)	<0.5 (<0.5)	<0.5 (<0.5)	<0.5 (<0.5)	Toluene (0.17J, 0.17J)
	11/02/04	<0.5 (<0.5)	23D (25D)	20 (19)	1.3 (1.2)	1.0 (0.96)	0.79 (0.81)	0.58 (0.61)	<0.5 (<0.5)	<0.5 (<0.5)	<0.5 (<0.5)	None
MW-12	5/13/03	0.34J	25D	30D	3.6	1.4	<0.5	5.2	<0.5	<0.5	<0.5	None
	1/21/04	<0.5	37D	43D	8.8	2.7	0.75	11	<0.5	0.29J	<0.5	Toluene (0.34J), xylenes (0.45J)
MW-15	5/0103	<10*	250	98	9J	3J	<10*	10J	11	<10*	<10*	Methylene chloride (19J), bromoform (29J)
	1/20/04	0.30J	360D	160D	6.7	6.5	1.2	14	14	0.85	4.1	4-methyl-2-pentanone (0.27J), chlorobenzene (0.56), xylenes (0.24J)
	7/22/04	<0.5	87D	70D	3.9	3.5	1.1	7.3	3.9	0.43J	1.3	None
MW-16	4/28/03	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.2J	<0.5	<0.5	None
	1/12/04	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	None
	11/03/04	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	None
MW-17	4/28/03	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.2J	<0.5	<0.5	None
	1/20/04	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	Toluene (0.53), xylenes (0.53)
	11/02/04	<0.5	0.58	0.52	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	None
MW-18	4/28/03	<0.5	0.2J	0.8J	<0.5	<0.5	<0.5	<0.5	0.2J	<0.5	<0.5	None
	1/12/04	<0.5	0.24J	0.72	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	None
MW-19	5/1/03	<50*	1,000	<50*	<50*	<50*	<50*	<50*	39J	<50*	<50*	Bromoform (93J)
	1/20/04	<0.5	450D	11	2.8J	1.5	0.19J	3	34D	<0.5	<0.5	Chloromethane (0.59BJ), cyclohexane (1.8)
	7/20/04	<0.5	99D	4.5	1.6J	0.65	0.25J	0.77	33D	<0.5	<0.5	Cyclohexane (2.7) carbon disulfide (0.19J)
MW-20	4/30/03	<13*	520	140	<13*	<13*	<13*	41	<13*	<13*	<13*	None
	12/4/03	5.2	570	150	16	7.8	3.6	44	7.6	1.1	4.2	Chlorobenzene (5.4), 1,2,3-trichloropropane (3.8)
	2/26/04	4.1	490D	140D	14	7.3	28	39D	7.8	0.97	4.1	1,1,2-Trichloroethane (0.94), chlorobenzene (4.5)
	4/27/04	5.1	670D	180D	15	8.9	<0.5	48D	8.0	<0.5	4.9	Toluene (0.18J), 1,1,2-Trichloroethane (0.67), chlorobenzene (5.5)
	7/20/04	4.0	470D	140D	16	7.6	3.0	45	7.3	1.1J	4.3	chlorobenzene (3.7)
	11/1/04	5.1	770D	200D	24	11	8.3	58D	12	1.2	5.9	Methylcyclohexane (0.46J), chlorobenzene (4.8)

TABLE 15 (Continued)

Location	Sample Date	PCE	TCE	cis-1,2-DCE	1,1-DCE	trans-1,2-DCE	VC	1,1-DCA	1,2-DCA	Benzene	1,2-DCPA	Other VOCs detected
MW-21	12/3/03	2.3 (2.3)	550 (870)	210 (370)	25 (25)	14 (14)	5 (5.2)	40 (61)	17 (17)	2.7 (2.6)	9.7 (9.5)	Chlorobenzene (3.8J, 3.8), 1,2,3-trichloropropane (7.9, 7.8)
	2/25/04	2.2	680D	330D	27D	16J	4.9	51D	17	2.6	9.3	Chlorobenzene (3.8), methyl acetate (4.7), toluene (0.22J)
	4/27/04	3.0	980D	490D	50D	20	5.0	80D	20	<0.5	11	Chlorobenzene (4.9), toluene (0.28J)
	7/21/04	2.8	640D	340D	29	15	5.8	69	17	2.6	8.3	Chlorobenzene (4.2)
	11/01/04	2.1	720D	430D	24	11	28E	59D	21	3.0	8.2	Methylcyclohexane (0.52)Toluene (0.25J), chlorobenzene (3.9)
MW-22	1/13/04	<0.5	7.2	2.9	<0.5	0.21J	<0.5	<0.5	<0.5	1.8	<0.5	None
	11/03/04	<0.5	9.6	9.7	<0.5	0.53	0.56	0.38J	<0.5	3.7	<0.5	None
MW-23	1/20/04	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	None
	11/02/04	<0.5	<0.5	0.69	<0.5	<0.5	<0.5	0.21J	<0.5	<0.5	<0.5	None
MW-24	1/13/04	<0.5	3.1	1.6	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	Chloromethane (0.28J)
	11/04/04	<0.5	3.1	2.3	<0.5	<0.5	<0.5	<0.5	2.3	<0.5	<0.5	None
MW-25	1/14/04	0.33J (0.37J)	50D (50D)	40D (37D)	1.7 (2.3J)	2.9 (3.9)	0.75 (0.98)	4.7J (6.2)	3.3 (5.5J)	0.35J (0.47J)	<0.5 (1.1)	Chlorobenzene (0.48J, 0.55)
	7/22/04	<0.5	62D	64D	1.2	3.3	0.7	2.2	3.0	0.36J	0.83	Chlorobenzene (0.22J)
MW-26	1/14/04	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	None
	11/04/04	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	None
MW-27	1/13/04	<0.5	4.9	2.4	<0.5	0.17J	<0.5	<0.5	1.8	<0.5	<0.5	None
	7/21/04	<0.5	3.4	2.3	<0.5	0.20J	<0.5	<0.5	1.7	<0.5	<0.5	None
MW-28	1/14/04	<0.5	11	10	<0.5	0.48J	<0.5	<0.5	1.8J	<0.5	<0.5	None
	11/03/04	<0.5	18	21	<0.5	1.1	0.73	<0.5	2.4	<0.5	<0.5	None
MW-29	1/13/04	<0.5	16	4.7	<0.5	0.63	<0.5	<0.5	1.5	<0.5	<0.5	None
	11/03/04	<0.5	21	5.7	0.38J	0.96	0.38J	<0.5	<0.5	<0.5	<0.5	None
MW-30	1/14/04	<0.5	110D	5.1	0.43J	0.84	<0.5	<0.5	2.7	<0.5	<0.5	None
	7/21/04	<0.5	110D	6.1	0.77	1.4	0.20J	0.42J	3.7	<0.5	<0.5	Cyclohexane (0.69)
MW-31	1/19/04	<0.5	79D	22D	1.4	2	<0.5	<0.5	8	0.42J	<0.5	Cyclohexane (2.9), methylcyclohexane (1.8)
	7/21/04	<0.5	63D	17	1.3	1.6	0.26J	0.36J	5.5	0.31J	<0.5	Cyclohexane (2.0), methylcyclohexane (0.65)

TABLE 15 (Continued)

Location	Sample Date	PCE	TCE	cis-1,2-DCE	1,1-DCE	trans-1,2-DCE	VC	1,1-DCA	1,2-DCA	Benzene	1,2-DCPA	Other VOCs detected
MW-32	1/19/04	<0.5 (<0.5)	1.3 (<0.5)	0.17J (<0.5)	<0.5 (<0.5)	<0.5 (<0.5)	<0.5 (<0.5)	<0.5 (<0.5)	<0.5 (<0.5)	<0.5 (<0.5)	<0.5 (<0.5)	2-butanone (0.47J), toluene (0.21J) None
	11/04/04	<0.5	0.46J	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	None
EW-1	4/30/04	<13*	380	170J	19	7J	3J	46	3J	<13*	<13*	Bromoform (24J)
	12/4/04	1.0	480	230	41	9.8	4.1	70	3.7	1.1	1.9	Chlorobenzene (2.6), 1,2,3-trichloropropane (0.8J)
	2/26/04	1.0	450D	210D	39D	9.0J	3.4	65D	5.2	1.3	2.5	Chlorobenzene (2.9)
	4/28/04	1.7	790D	290D	33E	10	<0.5R	83D	5.5	1.9	<0.5	Chlorobenzene (4.2)
	7/20/04	1.9J	600D	230D	39	9.3	3.7	68	5.8	1.7J	3.2	Chlorobenzene (3.7)
	11/01/04	2.9	830D	250E	53E	13	9.7	75E	7.8	2.1	4.2	Chlorobenzene (5.9)
EW-2	4/30/03	<50*	86	1,300J	46J	39J	12J	260	46J	20J	<50*	Bromoform (87J)
	12/3/03	<1.0	16	1,200	72	55	13	320	36	15	11	Chlorobenzene (9.0), 1,2,3-trichloropropane (5.4)
	2/25/04	<0.5 (<0.5)	140D (140D)	1,000D (1,000D)	56D (55D)	43D (44D)	12 (12)	230D (220D)	<40 (43D)	14 (14D)	1.3 (1.3)	Chlorobenzene (9.7, 10.0), methyl acetate (3.6,4.4), toluene (2.6,2.7), 4methyl-2pentonone (3.2J, 3.1J)
	4/28/04	<0.5 (<0.5)	270D (280D)	1,200D (1,200D)	33D (54E)	63E (59E)	84E (78E)	280D (280D)	48E (52E)	20 (19)	15 (15)	Chlorobenzene (10, 10), toluene (3.6,3.6), cyclohexane (0.67, 0.52) See lab sheet for more VOCs
	7/20/04	<2.0 (<2.0)	130D (140D)	390D (400D)	27 (25)	51 (49)	460D (480D)	250D (260D)	39 (36)	14 (14)	11 (11)	Toluene (2.8,2.9), chlorobenzene (6.5, 6.1), xylenes (1.0J)
	11/2/04	<0.5 (<0.5)	130D (130D)	210D (230D)	34E (41JD)	72JD (75JD)	1100D (1200D)	240D (270D)	41E (41E)	20 (20)	15 (16)	Toluene (3.5,3.6), chlorobenzene (7.5, 7.3), xylenes (1.2, 1.2)
SVE-1	12/3/03	2.5	70	1,100	69	18	140	230	8.2	16	15	Chlorobenzene (32), ethylbenzene (76) xylenes (162), toluene (310), see Lab sheet for additional VOCs
	7/22/04	1.7J	47	370D	7.0	26	33	81	5.4	6.8	8.5	Chlorobenzene (29), ethylbenzene (12) xylenes (33), toluene (51), see Lab sheet for additional VOCs
SVE-2	4/29/04	50D	29D	5.9	<0.5	0.55	1.1	76D	<0.5	0.93	<0.5	Acetone (51), 1,1,1-TCA (0.76), See Lab sheet for additional VOCs

TABLE 15 (Continued)

Index: Analytical results in micrograms per liter or parts per billion.

*	=	Detection limit exceeds respective maximum contaminant level for drinking water as established in Title 22 of the California Code of Regulations.

Duplicate Sample results shown in parenthesis.

D	=	detection associated with sample dilution
E	=	concentration exceeds upper instrument calibration range
R	=	The data are unusable. Resampling and reanalysis is necessry for verification.
DCA	=	dichloroethane
DCE	=	dichloroethene
DCPA	=	dichloropropane
J	=	estimated value
PCE	=	tetrachloroethene
TCA	=	trichloroethane
TCE	=	trichloroethene
VC	=	vinyl chloride
VOC	=	volatile organic compound

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-18	10	12	3.2J	2J	46	113
	20	3J	ND	1J	26	62
	30	4J	ND	1J	30	76

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-11R	5	16,000	44,000	11,000	300	260

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-41	10	<4.5	<4.5	<4.5	<4.5	32
	20	<4.7	<4.7	<4.7	<4.7	15
	30	<4.8	<4.8	<4.8	8.7	44

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-40	10	<4.6	<4.6	<4.6	<4.6	12
	20	<4.4	<4.4	<4.4	<4.4	3.2J
	30	<4.6	<4.6	<4.6	14	57

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-39	10	<4.9	<4.9	<4.9	<4.9	3.3J
	20	<4.6	<4.6	<4.6	3.2J	17
	30	3.1J	2.2J	16	66	39

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-20	10	187	ND	30J	777	4,840
	20	486	38J	98J	1,295	2,640
	27	6,873	1,319	1,353J	18,504	22,002

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-12	10	2,800	1,200	26,000	7,000	16,000
	20	13,000	15,000	16,000	41,000	12,000
	30	760	580	1,500	2,000	720

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-4	15	2,200J	890J	4,200J	3,000J	3,000J
	25	6.9J	2.3J	12J	9.9J	10J
	35	6.5J	3.6J	9.3J	10J	7.3J
	45	6.7J	2J	14J	9J	5.7J

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-1	15	44J	5.2J	110J	79J	57J
	25	11J	<2	17J	11J	5.9J
	35	<2	<2	3.4J	2.4J	3.5J
	35 (DUP)	<2	<2	<2	4.5J	<2
	45	8.2J	<2	32J	46J	2.1J

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-19	10	1,154	ND	ND	389	1,100
	10 (DUP)	1,473	ND	ND	463	1,320
	20	120	ND	ND	60	206
	30	71	ND	ND	33	91

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-13	10	37,000	24,000	49,000	<320	<320
	20	6,200	4,900	4,600	270	110
	30	13,000	12,000	6,400	420	67

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-3	15	65J	<2	85J	12J	33J
	25	6J	<2	11J	3.6J	3.9J
	35	8,600J	1,200J	7,900J	8,000J	1,900J
	45	84J	5.4J	ND	65J	8.3J

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-17	10	80	<17	110	2,500	4,600
	10 (DUP)	80	<17	100	2,400	4,200
	20	<0.88	<0.88	1.8	40	42
	30	<8.8	<8.8	12	2,800	160

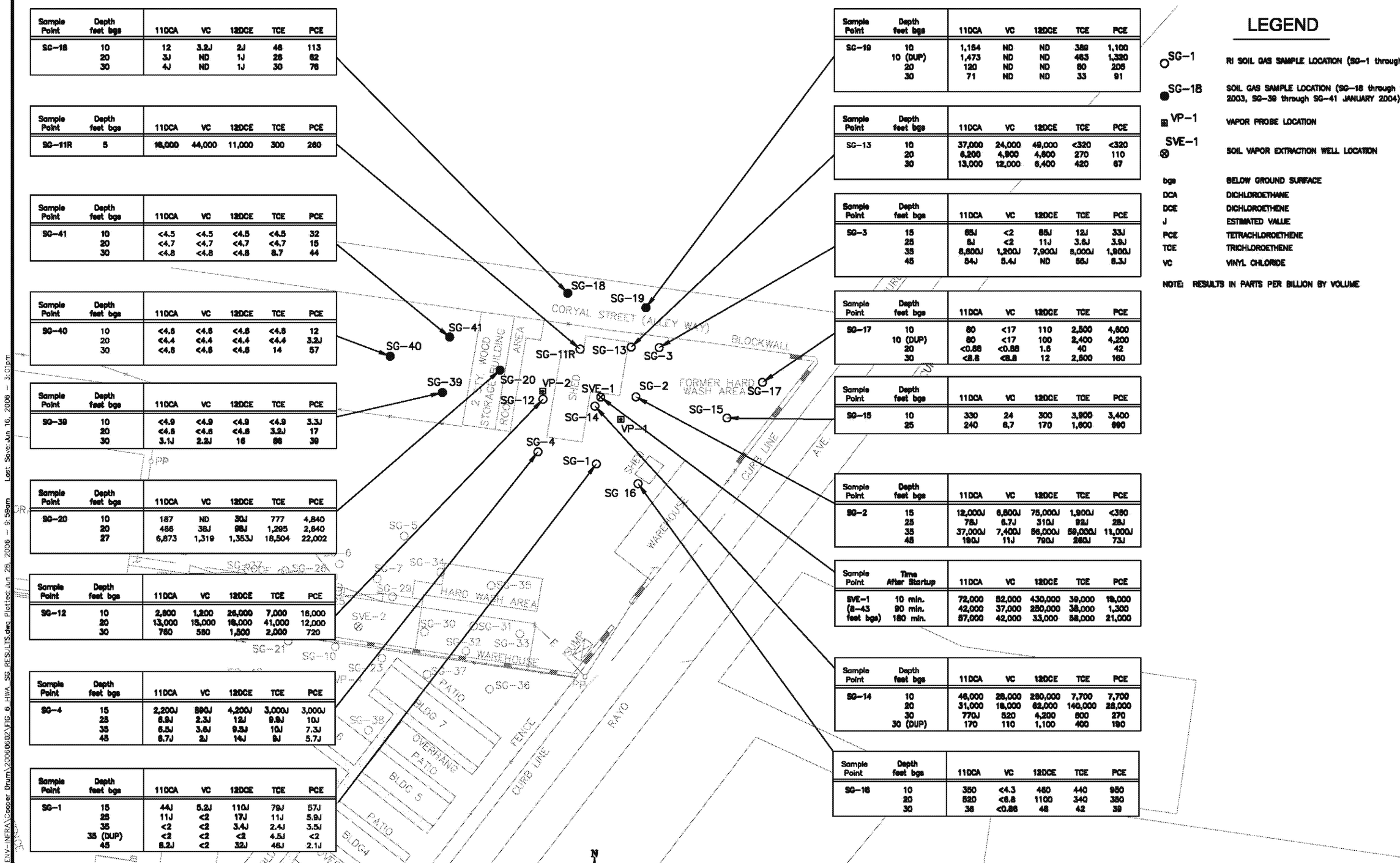
Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-15	10	330	24	300	3,900	3,400
	25	240	6.7	170	1,600	690

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-2	15	12,000J	6,600J	75,000J	1,900J	<380
	25	78J	6.7J	310J	92J	28J
	35	37,000J	7,400J	56,000J	59,000J	11,000J
	45	190J	11J	790J	260J	73J

Sample Point	Time After Startup	11DCA	VC	12DCE	TCE	PCE
SVE-1	10 min.	72,000	52,000	430,000	39,000	19,000
(8-43	90 min.	42,000	37,000	250,000	38,000	1,300
feet bgs)	180 min.	57,000	42,000	33,000	58,000	21,000

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-14	10	46,000	28,000	280,000	7,700	7,700
	20	31,000	18,000	62,000	140,000	28,000
	30	770J	520	4,200	800	270
	30 (DUP)	170	110	1,100	400	190

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-16	10	350	<4.3	460	440	950
	20	520	<6.8	1100	340	380
	30	36	<0.86	48	42	39



LEGEND

SG-1	RI SOIL GAS SAMPLE LOCATION (SG-1 through SG-17)
SG-18	SOIL GAS SAMPLE LOCATION (SG-18 through SG-20 MAY 2003, SG-39 through SG-41 JANUARY 2004)
VP-1	VAPOR PROBE LOCATION
SVE-1	SOIL VAPOR EXTRACTION WELL LOCATION
bgs	BELOW GROUND SURFACE
DCA	DICHLOROETHANE
DCE	DICHLOROETHENE
J	ESTIMATED VALUE
PCE	TETRACHLOROETHENE
TCE	TRICHLOROETHENE
VC	VINYL CHLORIDE

NOTE: RESULTS IN PARTS PER BILLION BY VOLUME

URS
3870 GATEWAY OAKS DRIVE, SUITE 300
SACRAMENTO, CA 95833

Cooper Drum Company
South Gate, California

FIGURE 6
Soil Gas Sampling Results
Former Hard Wash Area

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Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-25	10	38,273	654J	428J	9,822	11,567
	20	7,808	2,483	170J	2,776	3,950
	30	4,908	1,319	115J	1,813	1,457

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-26	10	1,350	18.8J	10J	407	930
	10 (DUP)	1,448	17.5J	11J	428	908
	20	3,191	308	83J	1,038	746

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-6	15	7,800J	1,200J	<180	870J	5,100J
	25	<3	<2	<2	<2	<2
	35	2.5J	<2	<2	<2	2.5J
	45	3J	<2	<2	<2	2.2J

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-7	10	1,100	21	300	190	470
	20	980	<34	280	130	280

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-8	15	43J	<5.6	19J	63J	27J
	25	<2	<2	<2	<2	<2
	25 (DUP)	<2	<2	<2	3J	<2
	35	<2	<2	<2	<2	<2
	45	<2	<2	3.5J	3J	2.5J

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-29	10	46,092	543J	376J	22,305	42,538
	20	5,185	466J	70J	2,036	2,300
	30	14,462	2,638	276J	6,661	3,820

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-9	10	11	<4.4	<4.4	34	1,200
	20	5.7	<1.8	2.3	7.1	22
	30	<0.88	<0.88	<0.88	1.1	18

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-34	10	2.7J	<4.2	<4.2	6.4	14
	20	1.8J	<4.3	<4.3	2.3J	1.7J
	20	27	4.4	5.2	19	9
	30	280	250	34	280	27

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-27	10	81	ND	ND	133	1,340
	23	810	62J	17J	389	587

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-35	10	0.88J	<5.0	<5.0	3.3J	36
	20	0.88J	<4.4	<4.4	1.8J	1.3J
	30	12	10	11	36	1.8J

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-24*	12.5	204	7.7J	ND	278	953
	25	589	54	9J	148	220

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-30	10	9.6	<4.8	<4.8	5.2	17
	20	180	5.7	3.7J	75	87
	30	510	53	15J	230	170
	30	340	43	13J	160	100

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-25*	12.5	54,001	931J	526J	15,173	12,468

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-31	10	<4.8	<4.8	<4.8	<4.8	11
	20	5.6	<4.8	<4.8	2.4J	5.1
	30	24	14	2.9J	24	4.1J

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-9	10	<0.88	<0.82	<0.82	<0.82	7.2

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-33	10	<4.8	<4.8	<4.8	<4.8	13
	20	<4.7	<4.7	<4.7	<4.7	1.7J
	30	0.84J	0.84J	0.85J	6.3	1J

Sample Point	Time After Startup	11DCA	VC	12DCE	TCE	PCE
SVE-2 (2-40 feet bgs)	10 min.	180,000	800J	7,800	80,000	230,000
	30 min.	130,000	1,100	17,000	78,000	180,000
	100 min.	93,000	<2,100	9,500	52,000	180,000
	230 min.	77,000	<1,800	10,000	50,000	170,000

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-32	10	3.3J	<4.5	<4.5	3.8J	39
	20	9.8	<4.4	<4.4	4.7	8.1
	30	5.5	2.1J	<4.5	3.7J	1.8J

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-21	10	1,080	ND	ND	241	567
	20	10,800	1,088	155J	2,776	2,347
	30	23	0.8J	ND	18	29

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-36	10	<4.3	<4.3	<4.3	<4.3	<4.3
	20	<3.0	<3.0	<3.0	<3.0	0.88J
	30	2.6J	1.8J	<4.4	4.3J	<4.4

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-42	10	40	<21	<21	<21	17J
	20	400	<33	<33	30	38
	30	100	28	7.5J	61	140

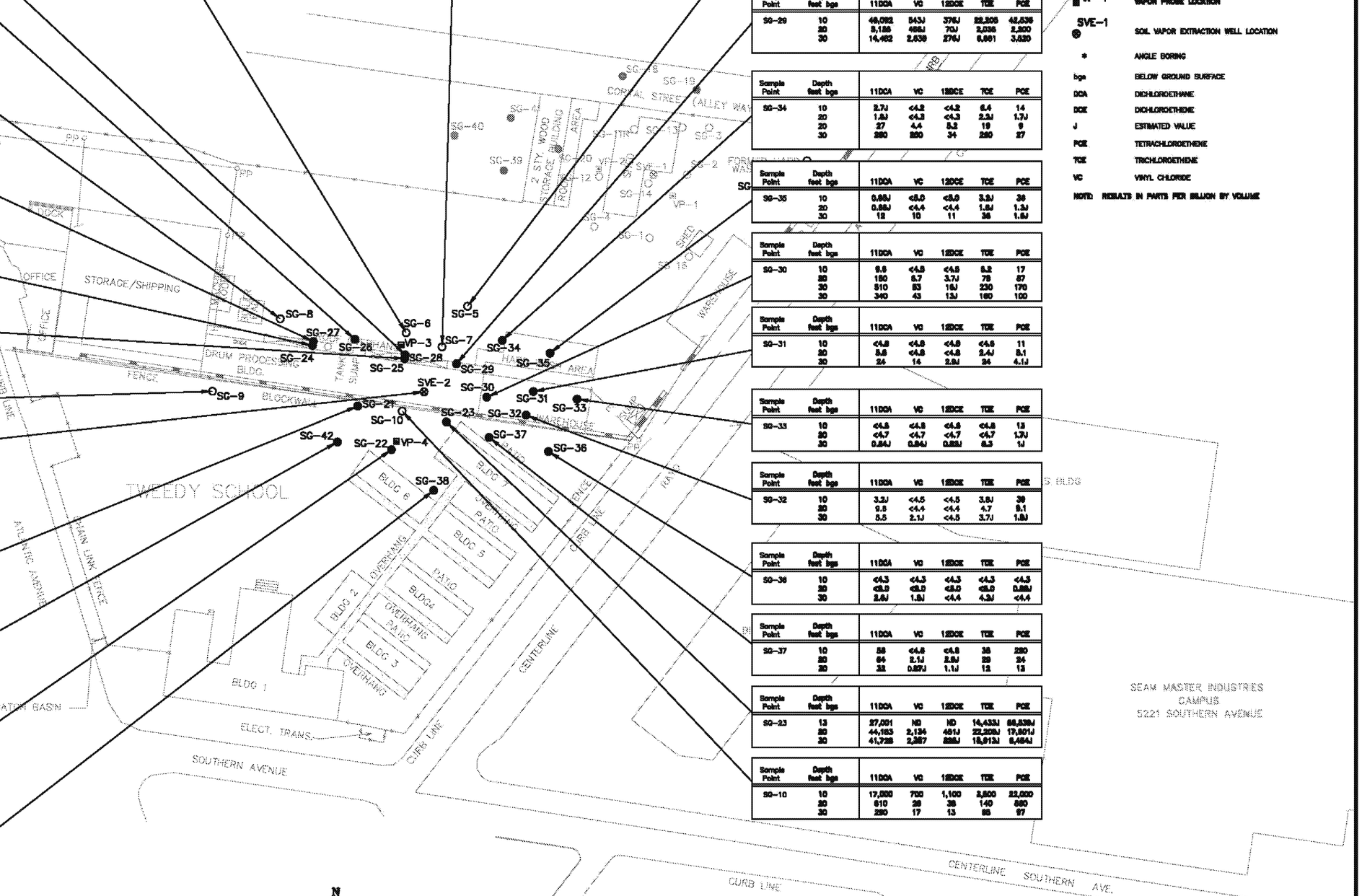
Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-37	10	58	<4.6	<4.6	38	220
	20	64	2.1J	2.8J	28	24
	20	32	0.87J	1.1J	12	13

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-22	10	442	ND	ND	108	1,099
	10 (DUP)	486	ND	ND	98	1,088
	20	12,088	229J	105J	2,220	3,300
	30	5,848	144J	ND	533	382

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-23	13	27,001	ND	ND	14,433J	88,538J
	20	44,183	2,134	461J	22,208J	17,801J
	20	41,728	2,367	288J	18,913J	8,484J

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-10	10	17,000	700	1,100	3,800	22,000
	20	610	28	38	140	880
	30	290	17	13	88	97

Sample Point	Depth feet bgs	11DCA	VC	12DCE	TCE	PCE
SG-39	10	22	<4.4	<4.4	5.1	81
	10 (DUP)	12	<4.4	<4.4	3J	31
	20	78	<4.4	<4.4	12	28
	30	4.7	<4.4	<4.4	<4.4	1.3J



LEGEND

SG-1	RI SOIL GAS SAMPLE LOCATION (SG-1 through SG-17)
SG-18	SOIL GAS SAMPLE LOCATION (SG-18 through SG-20 MAY 2003, SG-39 through SG-41 JANUARY 2004)
VP-1	VAPOR PROBE LOCATION
SVE-1	SOIL VAPOR EXTRACTION WELL LOCATION
*	ANGLE BORING
bgs	BELOW GROUND SURFACE
DCA	DICHLOROETHANE
DCE	DICHLOROETHENE
J	ESTIMATED VALUE
PCE	TETRACHLOROETHENE
TCE	TRICHLOROETHENE
VC	VINYL CHLORIDE

NOTE: RESULTS IN PARTS PER BILLION BY VOLUME

N W E S

100 50 0 100 200

SCALE IN FEET

URS
2870 GATEWAY OAKS DRIVE, SUITE 300
SACRAMENTO, CA 95833

Cooper Drum Company
South Gate, California

FIGURE 7
Soil Gas Sampling Results
Drum Processing Area

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Attachment 10

Excerpt of Quarterly Progress Report for April-June 2001

Quarterly Progress Report
April through June 2001

Jervis B. Webb Company of California
5030 Firestone Boulevard
South Gate, California

24 July 2001

Erler &
Kalinowski, Inc.

Consulting Engineers and Scientists
18022 Cowan Street, Suite 201-E
Irvine, California 92614
(949) 251-9480
Fax: (949) 251-9508

Quarterly Progress Report: April through June 2001
Jervis B. Webb Company of California
5030 Firestone Boulevard, South Gate, California

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Jervis B. Webb Company of California
5030 Firestone Boulevard, South Gate, California

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Jervis B. Webb Company of California
5030 Firestone Boulevard, South Gate, California

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3. SOIL REMEDIATION

3.1. Description of the Soil Vapor Extraction System

3.1.1. Soil Vapor Wells

Four soil vapor extraction wells and four soil vapor monitoring probes were installed at the Site during June 1999 (see Figure 7). The wells and probes were designed to allow for vapor extraction and monitoring in both the shallow and deep vadose zones at the Site. All of the wells were constructed using Schedule 40 PVC casing and screen. More detailed descriptions of well construction and subsurface conditions at the Site are contained in reports previously provided to the RWQCB (see EKI, 14 April 1999; EKI, 13 October 1999).

On 29 June 2000, two of the soil vapor monitoring probes (VMP-D1 and VMP-D2) were converted to extraction wells by connecting the probes to the soil vapor extraction system at the Site with two-inch diameter PVC pipe. These wells have been used as extraction wells during system operation since 6 July 2000. On 8 March 2001, vapor monitoring probe VMP-1 was converted to an extraction well by connecting the probe to the soil vapor extraction system at the Site with a two-inch diameter hose. This well has been used as an extraction well during system operation since 8 March 2001.

Soil Vapor Extraction Wells: The four shallow vadose zone SVE wells (see locations SVE-1, SVE-2, SVE-3, and VMP-1 on Figure 7) are constructed with two-inch diameter PVC casing. Wells SVE-1, SVE-3, and VMP-1 have slotted screen from approximately 19 to 25 ft bgs, and have total depths of approximately 25 ft bgs. Well SVE-2 has slotted screen from approximately 18 to 24 ft bgs, and has a total depth of approximately 24 ft bgs.

The three deep vadose zone SVE wells are wells SVE-D1, VMP-D1, and VMP-D2. Well SVE-D1 is constructed with four-inch diameter PVC casing with slotted screen from approximately 30 to 40 ft bgs, and has a total depth of approximately 44 ft bgs. Deep vadose zone SVE wells VMP-D1 and VMP-D2 are constructed in the same boreholes with shallow vadose zone SVE wells SVE-2 and SVE-3, respectively, and are constructed with 2-inch diameter PVC casing. Well VMP-D1 has slotted screen from approximately 30 to 40 ft bgs, and has a total depth of approximately 43 ft bgs. Well VMP-D2 has slotted screen from approximately 31 to 41 ft bgs, and has a total depth of approximately 44 ft bgs.

Soil Vapor Monitoring Probes: The shallow vadose zone vapor monitoring probe (see location VMP-2 on Figure 7) is constructed with two-inch diameter PVC casing with slotted screen from approximately 19 to 25 ft bgs, and has a total depth of approximately 25 ft bgs.

Quality Assurance/Quality Control ("QA/QC"): Standard laboratory QA/QC procedures used for the project included analyses of laboratory duplicates and method blanks. The relative percentage differences ("RPDs") of the laboratory duplicates were within acceptable ranges. No analytes were detected in the method blank samples analyzed for this project. Laboratory QA/QC results are provided with the laboratory reports in Appendix C.

Duplicate soil vapor samples were collected from the undiluted blower influent on 31 May and 14 June 2001 (see Table 6). The RPDs for TCE were 2.9 and 4.4 percent, respectively. These RPDs indicate an acceptable range of sampling and analytical reproducibility.

EKI collected equipment blanks during sampling activities on 31 May and 14 June 2001. The equipment blanks were collected by pumping ambient air into a tedlar bag using the purge/sampling pump, as described above. Concentrations of TCE detected in the equipment blanks ranged from 0.012 to 0.075 ppmv. The concentrations of TCE detected in vapor samples collected from the vapor wells, vapor probes, and blower influent were at least three times greater than the concentrations of TCE detected in the equipment blank samples.

3.3.2. Estimated VOC Removal Rates

Rates of VOC removal were estimated using measured vacuum readings, flow rates, and analytical data (see Tables 4a through 4h). In most cases, mass removal for a given period of time was calculated using an average of the mass removal rates at the beginning and end of the time period. Exceptions to this averaging method are noted in the tables.

Based on measurements made at the blower influent, it is estimated that 155 pounds of VOCs, including 121 pounds of TCE, have been extracted from soil at the Site as of 31 May 2001 (see Table 4a and Figure 9). It is estimated that 22 pounds of VOCs, including 13 pounds of TCE, were extracted from soil at the Site during the period from 14 December 2000 through 31 May 2001. Therefore, only about 14 percent of the cumulative mass removal by the SVE system occurred during the last five months of system operation. Approximately 55 percent of the mass removal during this reporting period occurred in the shallow vadose zone. The average total mass removal rate by the SVE system during this reporting period was approximately 0.21 pounds of VOCs per day. The daily mass removal rates by the SVE system do not appear to have changed significantly during the last nine months of system operation (see Table 4a). Thus, a relatively small, steady removal of VOCs occurred during this reporting period.

3.3.3. Soil Vapor Field Monitoring

Total VOC concentrations in soil vapor samples were also periodically monitored with an organic vapor meter, which utilizes a photoionization detector ("PID") to measure total concentrations of VOCs. The PID does not distinguish between individual compounds, but gives a reading for total VOCs. Samples for PID analyses were collected in Tedlar bags

TABLE 4a

Soil Vapor Extraction Data: Blower Influent

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Operation Time	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal: TCE (lb/day)	Estimated VOC Removal: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System startup on 3/16/00 at 16:00.													
3/16/00	16:45	5.6	0%	4.5	4.1	35	2,000+	860	1.8	1.9	0	0	
3/17/00	7:00	20	100%	5.2	4.7	37	94	-					
3/18/00	6:30	45	100%	5.4	4.9	38	128	-					
System shut down on 3/18/00 at 9:40. System restarted on 3/19/00 at 6:30.													
3/19/00	6:30	48	13%	6.1	5.53	38	103	-					
3/20/00	6:30	72	100%	8.6	7.7	43	145	-					
3/21/00	7:00	96	100%	4.8	4.1	60	745	-					
3/22/00	7:30	121	100%	11	10	15	173	490	2.5	2.6	10	11	4A
3/30/00	11:00	316	100%	20	18	45	39	-					
4/6/00	11:00	483	100%	25	17	125	42	-					
4/13/00	8:00	648	100%	21	13	150	42	70	0.45	0.51	43	45	4A
4/20/00	7:30	815	100%	21	13	145	43	-					
4/27/00	7:00	983	100%	16	10	150	30	-					
5/4/00	8:30	1,152	100%	16	10	150	20	-					
5/11/00	6:30	1,318	100%	14	9.0	150	20	-					
5/18/00	7:00	1,486	100%	19	12	150	38	53	0.32	0.34	56	60	4A
				28	18	150	38	-	0.47	0.50	-	-	
5/25/00	6:30	1,654	100%	18	12	150	19	-					
6/1/00	6:30	1,822	100%	18	11	150	34	-					
6/8/00	7:00	1,990	100%	26	16	155	27	-					
6/15/00	7:30	2,158	100%	26	16	150	28	-					
System shut down on 6/21/00 at 17:30. System restarted on 7/6/00 at 10:00.													
7/6/00	10:23	2,312	30%	142	97	130	20	37	1.8	2.1	72	77	4B
7/13/00	12:00	2,485	102%	122	79	145	23	18	0.70	1.0	81	88	4A
7/20/00	7:30	2,648	100%	115	73	150	15	-					
System shut down on 7/26/00 at 6:30. System restarted on 7/27/00 at 6:00.													
7/27/00	6:00	2,791	86%	75	49	140	14	-					
8/3/00	8:00	2,961	100%	75	49	140	15	-					
8/8/00	14:30	3,086	100%	77	50	140	15	-					
System shut down on 8/15/00 at 11:30. System restarted on 8/21/00 at 10:30.													
8/24/00	12:30	3,326	63%	76	50	140	27	-					
System shut down on 8/30/00 at 13:30. System restarted on 8/31/00 at 9:00.													
8/31/00	9:00	3,471	88%	64	45	120	36	-					

TABLE 4a

Soil Vapor Extraction Data: Blower Influent

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Operation Time	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal: TCE (lb/day)	Estimated VOC Removal: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System shut down on 9/6/00 at 15:00. System restarted on 9/7/00 at 10:30.													
9/7/00	10:30	3,621	88%	66	46	125	9.7	-					
9/14/00	9:00	3,788	100%	66	43	140	13	5.6	0.12	0.29	104	124	4A
System shut down on 9/14/00 at 11:23.													
9/28/00	11:24	3,788	0%	-	-	120	42	54	-	-	-	-	
System restarted on 10/1/00 at 6:30.													
10/1/00	6:30	3,791	4%	-	-	-	-	-					
System shut down on 10/1/00 at 10:30. System restarted on 10/5/00 at 7:30.													
10/5/00	7:30	3,795	4%	73	52	120	296	-					
10/12/00	8:00	3,964	100%	74	52	120	39	-					
10/19/00	8:00	4,132	100%	72	51	120	39	-					
10/26/00	8:00	4,301	100%	75	54	115	18	2.3	0.061	0.15	106	128	4A
System shut down on 10/31/00 at 9:20. System restarted on 11/2/00 at 8:00.													
11/2/00	8:00	4,422	72%	-	-	140	17	-					
System shut down on 11/2/00 at 19:00. System restarted on 11/9/00 at 7:30.													
11/9/00	7:30	4,433	7%	-	-	140	397	-					
System shut down on 11/9/00 at 15:30. System restarted on 11/16/00 at 10:00.													
11/16/00	10:00	4,441	5%	-	-	140	144	-					
System shut down on 11/17/00 at 12:00. System restarted on 11/23/00 at 7:30.													
11/23/00	7:30	4,443	1%	-	-	140	152	-					
11/30/00	7:30	4,611	100%	-	-	140	121	-					
System shut down on 12/6/00 at 21:00. System restarted on 12/7/00 at 8:00.													
12/7/00	8:00	4,768	93%	-	-	140	107	-					
12/14/00	10:30	4,940	100%	57	38	140	6.2	6.7	0.13	0.23	108	133	4A
System shut down on 12/14/00 at 12:15.													
1/4/01	11:37	4,940	0%	170	111	140	44	30	-	-	-	-	

TABLE 4a

Soil Vapor Extraction Data: Blower Influent

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Operation Time	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal: TCE (lb/day)	Estimated VOC Removal: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System restarted on 2/19/01 at 15:45.													
2/19/01	15:45	4,940	0%	-	-	140	42	-					
2/22/01	17:00	5,016	100%	-	-	140	37	-					
3/1/01	12:45	5,180	100%	-	-	140	29	-					
3/8/01	7:30	5,343	100%	-	-	145	48	-					
3/15/01	13:00	5,516	100%	-	-	145	8.5	-					
3/22/01	13:00	5,682	100%	-	-	145	7.8	-					
3/29/01	14:30	5,854	100%	-	-	140	8.5	-					
4/5/01	10:00	6,016	100%	-	-	140	19	-					
4/11/01	9:00	6,160	100%	-	-	140	20	-					
4/18/01	12:30	6,331	100%	145	97	135	25	-					
4/25/01	13:15	6,500	100%	155	104	133	25	-					
5/2/01	11:45	6,666	100%	158	106	135	22	-					
5/9/01	12:30	6,836	100%	162	108	135	19	-					
5/16/01	11:45	7,002	100%	157	103	140	17	-					
5/23/01	11:00	7,169	100%	161	106	140	18	-					
5/31/01	15:36	7,360	100%	60	39	140	4.4	6.8	0.13	0.19	121	155	4A
System shut down on 5/31/01 at 16:35. System restarted on 6/14/01 at 8:00.													
6/14/01	12:20	7,360	0%	84	61	112	25	46	-	-	-	-	
6/20/01	13:30	7,515	100%	110	75	130	18	-					
System shut down on 6/21/01 at 14:30. System restarted on 6/28/01 at 6:30.													
6/28/01	6:30	7,540	14%	-	-	-	-	-					

TABLE 4a

Soil Vapor Extraction Data: Blower Influent

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Operation Time	Flow		Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal		Cumulative Mass Removal		
				(acfm)	(scfm)				TCE (lb/day)	Total VOCs (lb/day)	TCE (lbs)	Total VOCs (lbs)	Notes

NOTES:

TCE = trichloroethene
acfm = actual cubic feet per minute
°F = degrees Fahrenheit
hrs = hours
in-wc = inches of water column
lb/day = pounds per day
lbs = pounds

PID = photoionization detector
ppmv = parts per million by volume
scfm = standard cubic feet per minute
tr = trace (concentration detected at less than reporting limit)
VOCs = volatile organic compounds
- = no measurement
< = not detected at indicated method detection limit

1. PID calibrated with 100 ppmv of isobutylene.
2. Laboratory analyses were performed by Performance Analytical, Inc. in Simi Valley, California using EPA Method TO-14A.
3. Removal rates are calculated using analyte concentrations from laboratory analyses and the measured flow rate (converted from acfm to scfm using the measured vacuum).
4. Cumulative mass removal amounts are calculated as follows (see Notes column in table):
   A: Mass removal calculated using an average of the previous and current mass removal rates.
   B: Mass removal calculated using the previous mass removal rate.
5. On days for which two flow and vacuum readings are provided, the values indicate initial and final readings during the site visit.
6. Although not shown on this table, mass removal rates were calculated for each VOC detected in the samples of undiluted blower influent. The total VOC mass removal rate presented in this table is the sum of the undiluted mass removal rates calculated for each VOC that was detected.

TABLE 4b

Soil Vapor Extraction Data: Extraction Well SVE-1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
Static vapor sample collected on 3/16/00.												
3/16/00	9:25	5.6	0.04	0.04	35	865	10,000	0.18	0.19	0	0	
System startup on 3/16/00 at 16:00.												
3/17/00	7:00	20	0.04	0.04	37	191	-					
3/18/00	6:30	45	0.06	0.05	38	195	-					
System shut down on 3/18/00 at 9:40. System restarted on 3/19/00 at 6:30.												
3/19/00	6:30	48	0.70	0.63	38	2,000+	-					
3/20/00	6:30	72	0.63	0.56	43	2,000+	-					
3/21/00	7:00	96	0.61	0.52	60	2,000+	-					
3/22/00	7:30	121	0.58	0.56	15	2,000+	10,000	2.8	2.9	7.1	7.3	4A
3/30/00	11:00	316	0.87	0.79	38	1,799	-					
4/6/00	11:00	483	0.45	0.31	125	719	-					
4/13/00	8:00	648	0.85	0.54	150	716	6,500	1.7	1.8	57	58	4A
4/20/00	7:30	815	0.70	0.45	145	868	-					
4/27/00	7:00	983	0.87	0.55	150	915	-					
5/4/00	8:30	1,152	0.89	0.56	150	1,427	-					
5/11/00	6:30	1,318	0.92	0.58	150	2,000+	-					
5/18/00	7:00	1,486	1.1	0.68	150	276	3,700	1.2	1.3	109	112	4A
			1.1	0.69	150	276	-	1.3	1.3	-	-	
5/25/00	6:30	1,654	1.3	0.84	150	146	-					
6/1/00	6:30	1,822	0.65	0.41	150	128	-					
6/8/00	7:00	1,990	0.67	0.41	155	112	-					
6/15/00	7:30	2,158	0.65	0.41	150	105	-					
System shut down on 6/21/00 at 17:30. Static vapor sample collected on 7/6/00.												
7/6/00	9:49	2,312	1.3	0.89	130	1,582	3,300	-	-	-	-	
System restarted on 7/6/00 at 10:00.												
7/13/00	12:00	2,485	1.3	0.84	145	2,000+	2,200	0.92	0.95	154	159	4A
7/20/00	7:30	2,648	1.3	0.83	150	154	-					
System shut down on 7/26/00 at 6:30. System restarted on 7/27/00 at 6:00.												
7/27/00	6:00	2,791	2.0	1.3	140	77	-					
8/3/00	8:00	2,961	2.1	1.4	140	89	-					
8/8/00	14:30	3,086	2.1	1.4	140	92	-					
System shut down on 8/15/00 at 11:30. System restarted on 8/21/00 at 10:30.												

TABLE 4b

Soil Vapor Extraction Data: Extraction Well SVE-1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
8/24/00	12:30	3,326	2.3	1.5	140	622	-					
System shut down on 8/30/00 at 13:30. System restarted on 8/31/00 at 9:00.												
8/31/00	9:00	3,471	0.96	0.68	120	1,820	-					
System shut down on 9/6/00 at 15:00. System restarted on 9/7/00.												
9/7/00	10:30	3,621	1.1	0.78	125	62	-					
9/14/00	9:00	3,788	1.6	1.0	140	76	300	0.15	0.16	183	189	4A
System shut down on 9/14/00 at 11:23.												
9/28/00	11:07	3,788	1.6	1.1	120	2,000+	230	-	-	-	-	
System restarted on 10/1/00 at 6:30.												
10/1/00	6:30	3,791	-	-	-	-	-					
System shut down on 10/1/00 at 10:30. System restarted on 10/5/00 at 7:30.												
10/5/00	7:30	3,795	2.3	1.6	120	2,000+	-					
10/12/00	8:00	3,964	2.4	1.7	120	1,687	-					
10/19/00	8:00	4,132	2.4	1.7	120	651	-					
10/26/00	8:00	4,301	2.4	1.7	115	385	140	0.12	0.12	186	192	4A
System shut down on 10/31/00 at 9:20. System restarted on 11/2/00 at 8:00.												
11/2/00	8:00	4,422	3.6	2.4	140	289	-					
System shut down on 11/2/00 at 19:00. System restarted on 11/9/00 at 7:30.												
11/9/00	7:30	4,433	2.5	1.6	140	2,000+	-					
System shut down on 11/9/00 at 15:30. System restarted on 11/16/00 at 10:00.												
11/16/00	10:00	4,441	2.7	1.7	140	2,000+	-					
System shut down on 11/17/00 at 12:00. System restarted on 11/23/00 at 7:30.												
11/23/00	7:30	4,443	2.5	1.7	140	2,000+	-					
11/30/00	7:30	4,611	12.4	8.1	140	748	-					
System shut down on 12/6/00 at 21:00. System restarted on 12/7/00 at 8:00.												
12/7/00	8:00	4,768	8.3	5.4	140	111	-					
12/14/00	10:30	4,940	2.4	1.6	140	43	260	0.21	0.22	191	197	4A
System shut down on 12/14/00 at 12:15.												
1/4/01	11:02	4,940	2.3	1.6	120	515	350	-	-	-	-	

TABLE 4b

Soil Vapor Extraction Data: Extraction Well SVE-1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System restarted on 2/19/01 at 15:45.												
2/19/01	15:45	4,940	2.5	1.6	140	875	-					
2/22/01	17:00	5,016	2.6	1.7	140	801	-					
3/1/01	12:45	5,180	2.5	1.7	140	1,505	-					
3/8/01	7:30	5,343	2.5	1.6	145	79	-					
3/15/01	13:00	5,516	2.5	1.6	145	37	-					
3/22/01	13:00	5,682	2.6	1.6	145	53	-					
3/29/01	14:30	5,854	2.3	1.6	130	38	-					
4/5/01	10:00	6,016	-	-	140	19	-					
4/11/01	9:00	6,160	2.3	1.5	140	19	-					
4/18/01	12:30	6,331	2.3	1.5	135	17	-					
4/25/01	13:15	6,500	2.4	1.6	133	16	-					
5/2/01	11:45	6,666	2.4	1.6	135	18	-					
5/9/01	12:30	6,836	2.6	1.7	135	16	-					
5/16/01	11:45	7,002	2.6	1.7	140	18	-					
5/23/01	11:00	7,169	2.7	1.7	140	19	-					
5/31/01	15:58	7,360	2.6	1.7	140	5.6	**7.8**	0.0066	0.011	201	208	4A
System shut down on 5/31/01 at 16:35. System restarted on 6/14/01 at 8:00.												
6/14/01	11:06	7,360	29	21	112	7.1	11	-	-	-	-	
6/20/01	12:30	7,515	17	11	130	0.0	-					
System shut down on 6/21/01 at 14:30. System restarted on 6/28/01 at 6:30.												
6/28/01	6:30	7,540	25	20	82	9.2	-					

TABLE 4b

Soil Vapor Extraction Data: Extraction Well SVE-1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow		Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates		Cumulative Mass Removal		
			(acfm)	(scfm)				TCE (lb/day)	Total VOCs (lb/day)	TCE (lbs)	Total VOCs (lbs)	Notes

NOTES:

TCE = trichloroethene
acfm = actual cubic feet per minute
°F = degrees Fahrenheit
hrs = hours
in-wc = inches of water column
lb/day = pounds per day
lbs = pounds

PID = photoionization detector
ppmv = parts per million by volume
scfm = standard cubic feet per minute
tr = trace (concentration detected at less than reporting limit)
VOCs = volatile organic compounds
- = no measurement
< = not detected at indicated method detection limit

1. PID calibrated with 100 ppmv of isobutylene.
2. Laboratory analyses were performed by Performance Analytical, Inc. in Simi Valley, California using EPA Method TO-14A.
3. Removal rates are calculated using analyte concentrations from laboratory analyses and the measured flow rate (converted from acfm to scfm using the measured vacuum).
4. Cumulative mass removal amounts are calculated as follows:
   A: Mass removal calculated using an average of the previous and current mass removal rates.
5. On days for which two flow and vacuum readings are provided, the values indicate initial and final readings during the site visit.
6. Although not shown on this table, mass removal rates were calculated for each VOC detected in the samples collected from well SVE-1. The total VOC mass removal rate presented in this table is the sum of the mass removal rates calculated for each VOC that was detected.
7. Extraction well SVE-1 is screened in the shallow vadose zone from 19 to 25 feet below ground surface.

TABLE 4c

Soil Vapor Extraction Data: Extraction Well SVE-2

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
Static vapor sample collected on 3/16/00.												
3/16/00	10:10	5.6	0.61	0.56	35	227	75	0.021	0.021	0	0	
System Startup on 3/16/00 at 16:00.												
3/17/00	7:00	20.3	0.61	0.55	37	191	-					
3/18/00	6:30	44.7	0.61	0.55	38	33	-					
System shut down on 3/18/00 at 9:40. System restarted on 3/19/00 at 6:30.												
3/19/00	6:30	47.9	0.65	0.59	38	298	-					
3/20/00	6:30	72.2	0.94	0.84	43	235	-					
3/21/00	7:00	96.3	0.89	0.76	60	227	-					
3/22/00	7:30	120.5	0.57	0.55	15	93	-					
3/30/00	11:00	316	0.59	0.53	38	78	-					
4/6/00	11:00	483	0.74	0.51	125	38	-					
4/13/00	8:00	648	2.5	1.6	150	26	-					
4/20/00	7:30	815	1.1	0.71	145	5.4	-					
4/27/00	7:00	983	2.4	1.5	150	2.7	-					
5/4/00	8:30	1,152	2.3	1.5	150	5.8	-					
5/11/00	6:30	1,318	2.2	1.4	150	5.2	-					
5/18/00	7:00	1,486	2.2	1.4	150	13	-					
			2.0	1.3	150	13	-					
5/25/00	6:30	1,654	2.1	1.3	150	6.8	-					
6/1/00	6:30	1,822	2.1	1.3	150	28	-					
6/8/00	7:00	1,990	2.1	1.3	155	42	-					
6/15/00	7:30	2,158	2.1	1.3	150	38	-					
System shut down on 6/21/00 at 17:30. Static vapor sample collected on 7/6/00.												
7/6/00	9:25	2,312	1.2	0.83	130	37	120	0.050	0.054	3.4	3.6	4A
System restarted on 7/6/00 at 10:00.												
7/13/00	12:00	2,485	1.3	0.80	145	6.8	-					
7/20/00	7:30	2,648	1.3	0.80	150	27	-					
System shut down on 7/26/00 at 6:30. System restarted on 7/27/00 at 6:00.												
7/27/00	6:00	2,791	1.6	1.1	140	18	-					
8/3/00	7:30	2,961	1.6	1.0	140	17	-					
8/8/00	14:30	3,086	1.6	1.0	140	14	-					
System shut down on 8/15/00 at 11:30. System restarted on 8/21/00 at 10:30.												
8/24/00	12:30	3,326	1.9	1.2	140	1.7	-					

TABLE 4c

Soil Vapor Extraction Data: Extraction Well SVE-2

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System shut down on 8/30/00 at 13:30. System restarted on 8/31/00 at 9:00.												
8/31/00	9:00	3,471	1.5	1.1	120	22	-					
System shut down on 9/6/00 at 15:00. System restarted on 9/7/00.												
9/7/00	10:30	3,621	1.6	1.1	125	16	-					
9/14/00	9:00	3,788	1.6	1.1	140	20	77	0.041	0.042	6.2	6.5	4A
System shut down at 11:23.												
9/28/00	10:50	3,788	1.4	1.0	120	61	110	-	-	-	-	
System restarted on 10/1/00 at 6:30.												
10/1/00	6:30	3,791	-	-	-	-	-					
System shut down on 10/1/00 at 10:30. System restarted on 10/5/00 at 7:30.												
10/5/00	7:30	3,795	1.9	1.4	120	9.7	-					
10/12/00	8:00	3,964	1.9	1.4	120	97	-					
10/19/00	8:00	4,132	1.9	1.3	120	33	-					
10/26/00	8:00	4,301	2.1	1.5	115	28	-					
System shut down on 10/31/00 at 9:20. System restarted on 11/2/00 at 8:00.												
11/2/00	8:00	4,422	-	-	140	6.0	-					
System shut down on 11/2/00 at 19:00. System restarted on 11/9/00 at 7:30.												
11/9/00	7:30	4,433	-	-	140	8.2	-					
System shut down on 11/9/00 at 15:30. System restarted on 11/16/00 at 10:00.												
11/16/00	10:00	4,441	-	-	140	810	-					
System shut down on 11/17/00 at 12:00. System restarted on 11/23/00 at 7:30.												
11/23/00	7:30	4,443	-	-	140	7.5	-					
11/30/00	7:30	4,611	-	-	140	5.3	-					
System shut down on 12/6/00 at 21:00. System restarted on 12/7/00 at 8:00.												
12/7/00	8:00	4,768	-	-	140	40	-					
12/14/00	10:30	4,940	2.9	1.9	140	9.7	29	0.027	0.029	7.8	8.2	4A
System shut down on 12/14/00 at 12:15.												
1/4/01	10:20	4,940	1.9	1.3	120	25	34	-	-	-	-	

TABLE 4c

Soil Vapor Extraction Data: Extraction Well SVE-2

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System restarted on 2/19/01 at 15:45.												
2/19/01	15:45	4,940	-	-	140	38	-					
2/22/01	17:00	5,016	-	-	140	46	-					
3/1/01	12:45	5,180	-	-	140	61	-					
3/8/01	7:30	5,343	-	-	145	33	-					
3/15/01	13:00	5,516	-	-	145	5.8	-					
3/22/01	13:00	5,682	-	-	145	3.7	-					
3/29/01	14:30	5,854	-	-	140	7.5	-					
4/5/01	10:00	6,016	-	-	140	16	-					
4/11/01	9:00	6,160	2.3	1.5	140	11	-					
4/18/01	12:30	6,331	2.3	1.6	135	6.3	-					
4/25/01	13:15	6,500	2.4	1.6	133	5.1	-					
5/2/01	11:45	6,666	2.4	1.6	135	4.8	-					
5/9/01	12:30	6,836	3.1	2.1	135	3.5	-					
5/16/01	11:45	7,002	3.4	2.2	140	1.3	-					
5/23/01	11:00	7,169	3.5	2.3	140	2.0	-					
5/31/01	15:50	7,360	2.3	1.5	140	6.1	10	0.0075	0.0090	9.6	10	4A
System shut down on 5/31/01 at 16:35. System restarted on 6/14/01 at 8:00.												
6/14/01	10:54	7,360	43	31	115	8.4	22	-	-	-	-	
6/20/01	12:30	7,515	16	11	130	1.1	-					
System shut down on 6/21/01 at 14:30. System restarted on 6/28/01 at 6:30.												
6/28/01	6:30	7,540	30	25	78	24	-					

TABLE 4c

Soil Vapor Extraction Data: Extraction Well SVE-2

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow		Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates		Cumulative Mass Removal		
			(acfm)	(scfm)				TCE (lb/day)	Total VOCs (lb/day)	TCE (lbs)	Total VOCs (lbs)	Notes

NOTES:

TCE = trichloroethene
acfm = actual cubic feet per minute
°F = degrees Fahrenheit
hrs = hours
in-wc = inches of water column
lb/day = pounds per day
lbs = pounds

PID = photoionization detector
ppmv = parts per million by volume
scfm = standard cubic feet per minute
tr = trace (concentration detected at less than reporting limit)
VOCs = volatile organic compounds
- = no measurement
< = not detected at indicated method detection limit

1. PID calibrated with 100 ppmv of isobutylene.
2. Laboratory analyses were performed by Performance Analytical, Inc. in Simi Valley, California using EPA Method TO-14A.
3. Removal rates are calculated using analyte concentrations from laboratory analyses and the measured flow rate (converted from acfm to scfm using the measured vacuum).
4. Cumulative mass removal amounts are calculated as follows:
   A: Mass removal calculated using an average of the previous and current mass removal rates.
5. On days for which two flow and vacuum readings are provided, the values indicate initial and final readings during the site visit.
6. Although not shown on this table, mass removal rates were calculated for each VOC detected in the samples collected from well SVE-2. The total VOC mass removal rate presented in this table is the sum of the mass removal rates calculated for each VOC that was detected.
7. Extraction well SVE-2 is screened in the shallow vadose zone from 18 to 24 feet below ground surface.

TABLE 4d

Soil Vapor Extraction Data: Extraction Well SVE-3

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
Static vapor sample collected on 3/16/00.												
3/16/00	9:57	5.6	0.41	0.37	35	31	25	0.0047	0.0054	0	0	
System Startup on 3/16/00 at 16:00.												
3/17/00	7:00	20.3	0.98	0.89	37	6.1	-					
3/18/00	6:30	44.7	0.98	0.89	38	8.3	-					
System shut down on 3/18/00 at 9:40. System restarted on 3/19/00 at 6:30.												
3/19/00	6:30	47.9	0.98	0.89	38	45	-					
3/20/00	6:30	72.2	0.98	0.88	43	7.4	-					
3/21/00	7:00	96.3	1.0	0.85	60	11	-					
3/22/00	7:30	120.5	0.95	0.91	15	10	-					
3/30/00	11:00	316.0	0.76	0.69	38	29	-					
4/6/00	11:00	483.0	1.6	1.1	125	25	-					
4/13/00	8:00	648.0	2.1	1.3	150	22	-					
4/20/00	7:30	815.0	1.7	1.1	145	6.8	-					
4/27/00	7:00	983.0	1.2	0.78	150	4.3	-					
5/4/00	8:30	1,152.0	1.6	0.98	150	2.8	-					
5/11/00	6:30	1,318.0	1.6	1.0	150	2.2	-					
5/18/00	7:00	1,486.0	1.6	0.98	150	9.0	-					
			1.6	0.98	150	9.0	-					
5/25/00	6:30	1,654.0	1.6	0.99	150	4.2	-					
6/1/00	6:30	1,822.0	1.5	0.95	150	7.5	-					
6/8/00	7:00	1,990.0	1.4	0.88	155	5.2	-					
6/15/00	7:30	2,158.0	1.4	0.90	150	4.9	-					
System shut down on 6/21/00 at 17:30. Static vapor sample collected on 7/6/00.												
7/6/00	8:46	2,312	2.3	1.5	130	7.3	7.4	0.0057	0.0095	0.50	0.71	4A
System restarted on 7/6/00 at 10:00.												
7/13/00	12:00	2,485	2.3	1.5	145	3.5	-					
7/20/00	7:30	2,648	2.2	1.4	150	4.1	-					
System shut down on 7/26/00 at 6:30. System restarted on 7/27/00 at 6:00.												
7/27/00	6:00	2,791	1.9	1.3	140	5.1	-					
8/3/00	8:00	2,961	1.9	1.2	140	2.2	-					
8/8/00	14:30	2,961	1.9	1.3	140	2.3	-					
System shut down on 8/15/00 at 11:30. System restarted on 8/21/00 at 10:30.												
8/24/00	12:30	3,326	2.0	1.3	140	1.9	-					

TABLE 4d

Soil Vapor Extraction Data: Extraction Well SVE-3

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System shut down on 8/30/00 at 13:30. System restarted on 8/31/00 at 9:00.												
8/31/00	9:00	3,471	1.4	1.0	120	2.6	-					
System shut down on 9/6/00 at 15:00. System restarted on 9/7/00.												
9/7/00	10:30	3,621	1.4	1.0	125	1.2	-					
9/14/00	9:00	3,788	1.5	1.0	140	1.5	2.5	0.0012	0.0028	0.71	1.1	4A
System shut down on 9/14/00 at 11:23												
9/28/00	9:52	3,788	-	-	120	8.0	3.8	-	-	-	-	
System restarted on 10/1/00 at 6:30.												
10/1/00	6:30	3,791	-	-	-	-	-					
System shut down on 10/1/00 at 10:30. System restarted on 10/5/00 at 7:30.												
10/5/00	7:30	3,795	1.8	1.3	120	4.6	-					
10/12/00	8:00	3,964	1.9	1.3	120	5.6	-					
10/19/00	8:00	4,132	1.9	1.3	120	4.1	-					
10/26/00	8:00	4,301	1.9	1.3	115	4.1	-					
System shut down on 10/31/00 at 9:20. System restarted on 11/2/00 at 8:00.												
11/2/00	8:00	4,422	7.1	4.7	140	0.5	-					
System shut down on 11/2/00 at 19:00. System restarted on 11/9/00 at 7:30.												
11/9/00	7:30	4,433	1.9	1.3	140	25.2	-					
System shut down on 11/9/00 at 15:30. System restarted on 11/16/00 at 10:00.												
11/16/00	10:00	4,441	-	-	140	8.9	-					
System shut down on 11/17/00 at 12:00. System restarted on 11/23/00 at 7:30.												
11/23/00	7:30	4,443	-	-	140	11.9	-					
11/30/00	7:30	4,611	5.6	3.6	140	6.2	-					
System shut down on 12/6/00 at 21:00. System restarted on 12/7/00 at 8:00.												
12/7/00	8:00	4,768	-	-	140	14.4	-					
12/14/00	10:30	4,940	2.3	1.5	140	1.2	1.2	0.00089	0.0023	0.76	1.2	4A
System shut down on 12/14/00 at 12:15.												
1/4/01	9:45	4,940	2.1	1.5	120	1.5	1.3	-	-	-	-	

TABLE 4d

Soil Vapor Extraction Data: Extraction Well SVE-3

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System restarted on 2/19/01 at 15:45.												
2/19/01	15:45	4,940	3.8	2.5	140	6.0	-					
2/22/01	17:00	5,016	3.4	2.2	140	6.4	-					
3/1/01	12:45	5,180	2.6	1.7	140	6.3	-					
3/8/01	7:30	5,343	2.6	1.7	145	0.0	-					
3/15/01	13:00	5,516	2.6	1.7	145	0.5	-					
3/22/01	13:00	5,682	2.6	1.7	145	3.3	-					
3/29/01	14:30	5,854	2.7	1.7	140	8.3	-					
4/5/01	10:00	6,016	2.7	1.8	140	10	-					
4/11/01	9:00	6,160	2.6	1.7	140	1.9	-					
4/18/01	12:30	6,331	2.5	1.7	135	1.8	-					
4/25/01	13:15	6,500	2.7	1.8	133	3.3	-					
5/2/01	11:45	6,666	2.7	1.8	135	3.1	-					
5/9/01	12:30	6,836	3.5	2.3	135	3.5	-					
5/16/01	11:45	7,002	3.6	2.3	140	1.5	-					
5/23/01	11:00	7,169	3.5	2.3	140	2.5	-					
5/31/01	16:05	7,360	10	6.6	140	5.6	5.0	0.016	0.027	1.6	2.7	4A
System shut down on 5/31/01 at 16:35. System restarted on 6/14/01 at 8:00.												
6/14/01	10:02	7,360	5.7	4.1	115	2.0	1.6	-	-	-	-	
6/20/01	12:30	7,515	11	7.7	130	0.9	-					
System shut down on 6/21/01 at 14:30. System restarted on 6/28/01 at 6:30.												
6/28/01	6:30	7,540	32	26	81	4.3	-					

TABLE 4d

Soil Vapor Extraction Data: Extraction Well SVE-3

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow		Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates		Cumulative Mass Removal		
			(acfm)	(scfm)				TCE (lb/day)	Total VOCs (lb/day)	TCE (lbs)	Total VOCs (lbs)	Notes

NOTES:

TCE = trichloroethene
acfm = actual cubic feet per minute
°F = degrees Fahrenheit
hrs = hours
in-wc = inches of water column
lb/day = pounds per day
lbs = pounds

PID = photoionization detector
ppmv = parts per million by volume
scfm = standard cubic feet per minute
tr = trace (concentration detected at less than reporting limit)
VOCs = volatile organic compounds
- = no measurement
< = not detected at indicated method detection limit

1. PID calibrated with 100 ppmv of isobutylene.
2. Laboratory analyses were performed by Performance Analytical, Inc. in Simi Valley, California using EPA Method TO-14A.
3. Removal rates are calculated using analyte concentrations from laboratory analyses and the measured flow rate (converted from acfm to scfm using the measured vacuum).
4. Cumulative mass removal amounts are calculated as follows:
   A: Mass removal calculated using an average of the previous and current mass removal rates.
5. On days for which two flow and vacuum readings are provided, the values indicate initial and final readings during the site visit.
6. Although not shown on this table, mass removal rates were calculated for each VOC detected in the samples collected from well SVE-3. The total VOC mass removal rate presented in this table is the sum of the mass removal rates calculated for each VOC that was detected.
7. Extraction well SVE-3 is screened in the shallow vadose zone from 19 to 25 feet below ground surface.

TABLE 4e

Soil Vapor Extraction Data: Monitoring/Extraction Well VMP-1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
Static vapor sample collected on 3/16/00.												
3/16/00	11:35	5.6	0	0	0	65	29	-	-	-	-	
System startup on 3/16/00 at 16:00 with VMP-1 used as a monitoring well.												
4/6/00	11:00	483	0	0	0	6.4	-					
4/13/00	8:00	648	0	0	0	8.2	-					
Static vapor sample collected on 7/6/00.												
7/6/00	8:06	2,312	0	0	0	0.0	0.13	-	-	-	-	
Vapor sample collected on 9/14/00.												
9/14/00	11:08	3,788	0	0	0	0.5	0.29	-	-	-	-	
Static vapor sample collected on 9/28/00.												
9/28/00	8:51	3,788	0	0	0	1.3	0.47	-	-	-	-	
10/26/00	8:00	4,301	0	0	0	13	-					
Static vapor sample collected on 1/4/01.												
1/4/01	9:15	4,940	0	0	0	0.9	0.93	-	-	-	-	
VMP-1 converted to extraction well on 3/8/01.												
3/8/01	7:30	5,343	-	-	145	6.4	-					
3/15/01	13:00	5,516	-	-	145	1.9	-					
3/22/01	13:00	5,682	-	-	145	4.1	-					
3/29/01	14:30	5,854	-	-	140	3.8	-					
4/5/01	10:00	6,016	-	-	140	26	-					
4/11/01	9:00	6,160	-	-	140	3.2	-					
4/18/01	12:30	6,331	-	-	135	1.5	-					
4/25/01	13:15	6,500	-	-	133	2.9	-					
5/2/01	11:45	6,666	-	-	135	2.3	-					
5/9/01	12:30	6,836	-	-	135	3.0	-					
5/16/01	11:45	7,002	14	8.9	140	2.3	-					
5/23/01	11:00	7,169	11	7.2	140	2.1	-					
5/31/01	14:43	7,360	4.5	3.0	140	8.5	9.7	0.014	0.022	1.2	1.9	4A
System shut down on 5/31/01 at 16:35. System restarted on 6/14/01 at 8:00.												
6/14/01	9:33	7,360	4.4	3.1	113	0.1	0.27	-	-	-	-	
6/20/01	12:30	7,515	14	9.6	130	1.0	-					

TABLE 4e

Soil Vapor Extraction Data: Monitoring/Extraction Well VMP-1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System shut down on 6/21/01 at 14:30. System restarted on 6/28/01 at 6:30.												
6/28/01	6:30	7,540	30	24	79	8.8	-					

NOTES:

TCE = trichloroethene
acfm = actual cubic feet per minute
°F = degrees Fahrenheit
hrs = hours
in-wc = inches of water column
lb/day = pounds per day
lbs = pounds

PID = photoionization detector
ppmv = parts per million by volume
scfm = standard cubic feet per minute
tr = trace (concentration detected at less than reporting limit)
VOCs = volatile organic compounds
- = no measurement
< = not detected at indicated method detection limit

1. PID calibrated with 100 ppmv of isobutylene.
2. Laboratory analyses were performed by Performance Analytical, Inc. in Simi Valley, California using EPA Method TO-14A.
3. Removal rates are calculated using analyte concentrations from laboratory analyses and the measured flow rate (converted from acfm to scfm using the measured vacuum).
4. Cumulative mass removal amounts are calculated as follows:
   A: Mass removal calculated using the current mass removal rate.
5. Well VMP-1 was first used as an extraction well on 8 March 2001.
6. Although not shown on this table, mass removal rates were calculated for each VOC detected in the samples collected from well VMP-1. The total VOC mass removal rate presented in this table is the sum of the mass removal rates calculated for each VOC that was detected.
7. Extraction well VMP-1 is screened in the shallow vadose zone from 19 to 25 feet below ground surface.

TABLE 4f

Soil Vapor Extraction Data: Extraction Well SVE-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
Static vapor sample collected on 3/16/00.												
3/16/00	8:57	5.6	3.7	3.6	6.0	1,580	**1,000**	1.8	1.9	0	0	
System startup on 3/16/00 at 16:00.												
3/17/00	7:00	20.3	4.6	4.5	10	92	-					
3/18/00	6:30	44.7	5.3	5.2	10	131	-					
System shut down on 3/18/00 at 9:40. System restarted on 3/19/00 at 6:30.												
3/19/00	6:30	48	0.0	0.0	0.0	30	0					
3/20/00	6:30	72	5.8	5.7	9.0	164	0					
3/21/00	7:00	96	2.6	2.6	7.0	560	0					
3/22/00	7:30	121	8.9	8.6	15	70	**440**	1.9	2.0	8.8	9.1	4A
3/30/00	11:00	316	24	22	38	36	0					
4/6/00	11:00	483	25	17	125	30	0					
4/13/00	8:00	648	33	21	150	33	**25**	0.26	0.28	32	34	4A
4/20/00	7:30	815	28	18	145	28	0					
4/27/00	7:00	983	18	16	40	25	0					
5/4/00	8:30	1,152	16	10	135	20	0					
5/11/00	6:30	1,318	13	9.7	95	13	0					
5/18/00	7:00	1,486	20	14	120	37	**8.6**	0.061	0.070	38	40	4A
			26	17	150	37	-	0.071	0.081	-	-	
5/25/00	6:30	1,654	18	11	150	16	-					
6/1/00	6:30	1,822	16	10	150	31	-					
6/8/00	7:00	1,990	21	13	155	31	-					
6/15/00	7:30	2,158	21	13	150	31	-					
System shut down on 6/21/00 at 17:30. Static vapor sample collected on 7/6/00.												
7/6/00	9:34	2,312	0	0	0	30	**92**	-	-	-	-	
System restarted on 7/6/00 at 10:00.												
7/13/00	12:00	2,485	34	22	145	37	**5.1**	0.056	0.25	40	47	4A
7/20/00	7:30	2,648	32	20	150	27	-					
System shut down on 7/26/00 at 6:30. System restarted on 7/27/00 at 6:00.												
7/27/00	6:00	2,791	26	17	140	9.4	-					
8/3/00	8:00	2,961	26	17	140	1.5	-					
8/8/00	14:30	3,086	26	17	140	1.8	-					
System shut down on 8/15/00 at 11:30. System restarted on 8/21/00 at 10:30.												

TABLE 4f

Soil Vapor Extraction Data: Extraction Well SVE-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
8/24/00	12:30	3,226	27	18	140	17	-					
System shut down on 8/30/00 at 13:30. System restarted on 8/31/00 at 9:00.												
8/31/00	9:00	3,471	21	15	120	8.9	-					
System shut down on 9/6/00 at 15:00. System restarted on 9/7/00.												
9/7/00	10:30	3,621	22	15	125	5.8	-					
9/14/00	9:00	3,788	20	13	140	24	4.0	0.026	0.23	43	60	4A
System shut down on 9/14/00 at 11:23.												
9/28/00	10:25	3,788	52	36	120	62	120	-	-	-	-	
System restarted on 10/1/00 at 6:30.												
10/1/00	6:30	3,791	-	-	-	-	-					
System shut down on 10/1/00 at 10:30. System restarted on 10/5/00 at 7:30.												
10/5/00	7:30	3,795	29	21	120	41	-					
10/12/00	8:00	3,964	28	20	120	72	-					
10/19/00	8:00	4,132	19	14	120	6.2	-					
10/26/00	8:00	4,301	20	14	115	5.8	2.4	0.017	0.081	43	63	4A
System shut down on 10/31/00 at 9:20. System restarted on 11/2/00 at 8:00.												
11/2/00	8:00	4,422	22	15	140	1.5	-					
System shut down on 11/2/00 at 19:00. System restarted on 11/9/00 at 7:30.												
11/9/00	7:30	4,433	22	15	140	4.9	-					
System shut down on 11/9/00 at 15:30. System restarted on 11/16/00 at 10:00.												
11/16/00	10:00	4,441	24	15	140	38	-					
System shut down on 11/17/00 at 12:00. System restarted on 11/23/00 at 7:30.												
11/23/00	7:30	4,443	24	16	140	29	-					
11/30/00	7:30	4,611	-	-	140	23	-					
System shut down on 12/6/00 at 21:00. System restarted on 12/7/00 at 8:00.												
12/7/00	8:00	4,768	-	-	140	12	-					
12/14/00	10:30	4,940	16	11	140	3.1	2.7	0.014	0.025	44	64	4A
System shut down on 12/14/00 at 12:15.												
1/4/01	10:48	4,940	74	52	120	43	41	-	-	-	-	

TABLE 4f

Soil Vapor Extraction Data: Extraction Well SVE-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
System restarted on 2/19/01 at 15:45.												
2/19/01	15:45	4,940	23	15	140	43	-					
2/22/01	17:00	5,016	24	15	140	37	-					
3/1/01	12:45	5,180	24	15	140	81	-					
3/8/01	7:30	5,343	23	15	145	103	-					
3/15/01	13:00	5,516	22	14	145	9.4	-					
3/22/01	13:00	5,682	21	14	145	12	-					
3/29/01	14:30	5,854	21	14	130	10	-					
4/5/01	10:00	6,016	22	14	140	31	-					
4/11/01	9:00	6,160	24	16	140	23	-					
4/18/01	12:30	6,331	25	17	135	23	-					
4/25/01	13:15	6,500	25	17	133	18	-					
5/2/01	11:45	6,666	25	16	135	17	-					
5/9/01	12:30	6,836	23	15	135	6.2	-					
5/16/01	11:45	7,002	25	16	140	6.0	-					
5/23/01	11:00	7,169	26	17	140	5.8	-					
5/31/01	15:20	7,360	17	11	140	4.5	6.4	0.035	0.041	46	68	4A
System shut down on 5/31/01 at 16:35. System restarted on 6/14/01 at 8:00.												
6/14/01	10:33	7,360	52	38	112	106	140	-	-	-	-	
6/20/01	12:30	7,515	13	8.8	130	8.9	-					
System shut down on 6/21/01 at 14:30. System restarted on 6/28/01 at 6:30.												
6/28/01	6:30	7,540	66	54	78	24	-					

TABLE 4f

Soil Vapor Extraction Data: Extraction Well SVE-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow		Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates		Cumulative Mass Removal		
			(acfm)	(scfm)				TCE (lb/day)	Total VOCs (lb/day)	TCE (lbs)	Total VOCs (lbs)	Notes

NOTES:

TCE = trichloroethene
acfm = actual cubic feet per minute
°F = degrees Fahrenheit
hrs = hours
in-wc = inches of water column
lb/day = pounds per day
lbs = pounds

PID = photoionization detector
ppmv = parts per million by volume
scfm = standard cubic feet per minute
tr = trace (concentration detected at less than reporting limit)
VOCs = volatile organic compounds
- = no measurement
< = not detected at indicated method detection limit

1. PID calibrated with 100 ppmv of isobutylene.
2. Laboratory analyses were performed by Performance Analytical, Inc. in Simi Valley, California using EPA Method TO-14A.
3. Removal rates are calculated using analyte concentrations from laboratory analyses and the measured flow rate (converted from acfm to scfm using the measured vacuum).
4. Cumulative mass removal amounts are calculated as follows:
   A: Mass removal calculated using an average of the previous and current mass removal rates.
5. On days for which two flow and vacuum readings are provided, the values indicate initial and final readings during the site visit.
6. Although not shown on this table, mass removal rates were calculated for each VOC detected in the samples collected from well SVE-D1. The total VOC mass removal rate presented in this table is the sum of the mass removal rates calculated for each VOC that was detected.
7. Extraction well SVE-D1 is screened in the shallow vadose zone from 30 to 40 feet below ground surface.

TABLE 4g

Soil Vapor Extraction Data: Monitoring/Extraction Well VMP-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
Static vapor sample collected on 3/16/00.												
3/16/00	10:32	5.6	0	0	0	282	460					
System startup on 3/16/00 at 16:00 with VMP-D1 used as a monitoring well.												
4/6/00	11:00	483	0	0	0	3.5	-					
4/13/00	8:00	648	0	0	0	23	-					
System shut down on 6/21/00 at 17:30. Static vapor sample collected on 7/6/00.												
7/6/00	8:57	2,312	35	24	130	30	9.4	0.11	0.12	0	0	
System restarted on 7/6/00 at 10:00 with VMP-D1 operating as an extraction well.												
7/13/00	12:00	2,485	33	21	145	3.6	0					
7/20/00	7:30	2,648	34	22	150	3.2	-					
7/27/00	6:00	2,791	26	17	140	9.4	-					
8/3/00	8:00	2,961	25	16	140	1.5	-					
8/8/00	14:30	3,086	24	16	140	1.6	-					
System shut down on 8/15/00 at 11:30. System restarted on 8/21/00 at 10:30.												
8/24/00	12:30	3,326	22	15	140	2.1	-					
System shut down on 8/30/00 at 13:30. System restarted on 8/31/00 at 9:00.												
8/31/00	9:00	3,471	19	14	120	0.9	-					
System shut down on 9/6/00 at 15:00. System restarted on 9/7/00.												
9/7/00	10:30	3,621	20	14	125	0.2	-					
9/14/00	9:00	3,788	20	-	140	1.2	1.4	0.0090	0.012	3.7	4.2	4A
System shut down on 9/14/00 at 11:23.												
9/28/00	10:08	3,788	59	41	120	6.3	8.6	-	-	-	-	
System restarted on 10/1/00 at 6:30.												
10/1/00	6:30	3,791	-	-	-	-	-					
System shut down on 10/1/00 at 10:30. System restarted on 10/5/00 at 7:30.												
10/5/00	7:30	3,795	25	18	120	8.4	-					
10/12/00	8:00	3,964	24	17	120	6.7	-					
10/19/00	8:00	4,132	25	17	120	9.4	-					
10/26/00	8:00	4,301	22	16	115	24	-					
System shut down on 10/31/00 at 9:20. System restarted on 11/2/00 at 8:00.												

TABLE 4g

Soil Vapor Extraction Data: Monitoring/Extraction Well VMP-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
11/2/00	8:00	4,422	26	17	140	0	-					
System shut down on 11/2/00 at 19:00. System restarted on 11/9/00 at 7:30.												
11/9/00	7:30	4,433	-	-	140	59	-					
System shut down on 11/9/00 at 15:30. System restarted on 11/16/00 at 10:00.												
11/16/00	10:00	4,441	64	42	140	8.6	-					
System shut down on 11/17/00 at 12:00. System restarted on 11/23/00 at 7:30.												
11/23/00	7:30	4,443	60	40	140	87.4	-					
11/30/00	7:30	4,611	39	26	140	27.9	-					
System shut down on 12/6/00 at 21:00. System restarted on 12/7/00 at 8:00.												
12/7/00	8:00	4,768	42	27	140	29.3	-					
12/14/00	10:30	4,940	15	10	140	0.3	0.95	0.0047	0.0065	4.0	4.6	4A
System shut down on 12/14/00 at 12:15.												
1/4/01	9:57	4,940	76	53	120	0.6	1.6	-	-	-	-	
System restarted on 2/19/01 at 15:45.												
2/19/01	15:45	4,940	22	15	140	1.2	-					
2/22/01	17:00	5,016	23	15	140	0.0	-					
3/1/01	12:45	5,180	18	12	140	0.0	-					
3/8/01	7:30	5,343	19	12	145	0.0	-					
3/15/01	13:00	5,516	18	12	145	0.8	-					
3/22/01	13:00	5,682	19	12	145	0.2	-					
3/29/01	14:30	5,854	19	13	140	0.6	-					
4/5/01	10:00	6,016	28	19	140	0.9	-					
4/11/01	9:00	6,160	19	12	140	0.4	-					
4/18/01	12:30	6,331	25	17	135	0.5	-					
4/25/01	13:15	6,500	22	15	133	2.0	-					
5/2/01	11:45	6,666	28	19	135	2.5	-					
5/9/01	12:30	6,836	29	20	135	0.0	-					
5/16/01	11:45	7,002	24	16	140	0.0	-					
5/23/01	11:00	7,169	25	16	140	0.0	-					
5/31/01	14:54	7,360	11	7.5	140	0.8	1.1	0.0041	0.0066	4.4	5.3	4A
System shut down on 5/31/01 at 16:35. System restarted on 6/14/01 at 8:00.												

TABLE 4g
Soil Vapor Extraction Data: Monitoring/Extraction Well VMP-D1

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
6/14/01	9:50	7,360	47	33	115	2.7	5.7	-	-	-	-	
6/20/01	12:30	7,515	14	9.3	130	0.6	-					
System shut down on 6/21/01 at 14:30. System restarted on 6/28/01 at 6:30.												
6/28/01	6:30	7,540	26	21	78	6.3	-					

NOTES:

TCE = trichloroethene
acfm = actual cubic feet per minute
°F = degrees Fahrenheit
hrs = hours
in-wc = inches of water column
lb/day = pounds per day
lbs = pounds

PID = photoionization detector
ppmv = parts per million by volume
scfm = standard cubic feet per minute
tr = trace (concentration detected at less than reporting limit)
VOCs = volatile organic compounds
- = no measurement
< = not detected at indicated method detection limit

1. PID calibrated with 100 ppmv of isobutylene.
2. Laboratory analyses were performed by Performance Analytical, Inc. in Simi Valley, California using EPA Method TO-14A.
3. Removal rates are calculated using analyte concentrations from laboratory analyses and the measured flow rate (converted from acfm to scfm using the measured vacuum).
4. Cumulative mass removal amounts are calculated as follows:
   A: Mass removal calculated using an average of the previous and current mass removal rates.
5. Well VMP-D1 was first used as an extraction well on 6 July 2000.
6. Although not shown on this table, mass removal rates were calculated for each VOC detected in the samples collected from well VMP-D1. The total VOC mass removal rate presented in this table is the sum of the mass removal rates calculated for each VOC that was detected.
7. Extraction well VMP-D1 is screened in the deep vadose zone from 30 to 40 feet below ground surface.

TABLE 4h

Soil Vapor Extraction Data: Monitoring/Extraction Well VMP-D2

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
Static vapor sample collected on 3/16/00.												
3/16/00	10:50	5.6	0	0	0	76	39					
System startup on 3/16/00 at 16:00 with VMP-D2 used as a monitoring well.												
4/6/00	11:00	483	0	0	0	150	-					
4/13/00	8:00	648	0	0	0	27	-					
System shut down on 6/21/00 at 17:30. Static vapor sample collected on 7/6/00.												
7/6/00	9:12	2,312	44	30	130	5.2	5.7	0.085	0.10	0	0	
System restarted on 7/6/00 at 10:00 with VMP-D2 operating as an extraction well.												
7/13/00	12:00	2,485	41	26	145	5.8	-					
7/20/00	7:30	2,648	42	27	150	3.8	-					
7/27/00	6:00	2,791	21	14	140	8.7	-					
8/3/00	8:00	2,961	21	14	140	4.8	-					
8/8/00	14:30	3,086	22	14	140	4.3	-					
System shut down on 8/15/00 at 11:30. System restarted on 8/21/00 at 10:30.												
8/24/00	12:30	3,326	26	17	140	8.8	-					
System shut down on 8/30/00 at 13:30. System restarted on 8/31/00 at 9:00.												
8/31/00	9:00	3,471	18	13	120	1.5	-					
System shut down on 9/6/00 at 15:00. System restarted on 9/7/00.												
9/7/00	10:30	3,621	17	12	125	0.6	-					
9/14/00	9:00	3,788	17	11	140	9.6	0.71	0.0040	0.038	2.8	4.4	4A
System shut down on 9/14/00 at 11:23.												
9/28/00	9:35	3,788	42	29	125	39	9.3	-	-	-	-	
System restarted on 10/1/00 at 6:30.												
10/1/00	6:30	3,791	-	-	-	-	-					
System shut down on 10/1/00 at 10:30. System restarted on 10/5/00 at 7:30.												
10/5/00	7:30	3,795	23	16	120	24	-					
10/12/00	8:00	3,964	26	18	120	9.1	-					
10/19/00	8:00	4,132	25	18	120	10	-					
10/26/00	8:00	4,301	19	14	115	26	-					
System shut down on 10/31/00 at 9:20. System restarted on 11/2/00 at 8:00.												

TABLE 4h

Soil Vapor Extraction Data: Monitoring/Extraction Well VMP-D2

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
11/2/00	8:00	4,422	23	15	140	0	-					
System shut down on 11/2/00 at 19:00. System restarted on 11/9/00 at 7:30.												
11/9/00	7:30	4,433	-	-	140	14	-					
System shut down on 11/9/00 at 15:30. System restarted on 11/16/00 at 10:00.												
11/16/00	10:00	4,441	-	-	140	15	-					
System shut down on 11/17/00 at 12:00. System restarted on 11/23/00 at 7:30.												
11/23/00	7:30	4,443	47	31	140	63	-					
11/30/00	7:30	4,611	28	18	140	45	-					
System shut down on 12/6/00 at 21:00. System restarted on 12/7/00 at 8:00.												
12/7/00	8:00	4,768	11	7.4	140	40	-					
12/14/00	10:30	4,940	18	12	140	14	**1.3**	0.0078	0.091	3.0	7.5	4A
System shut down on 12/14/00 at 12:15.												
1/4/01	9:57	4,940	78	55	120	3.4	**3.0**	-	-	-	-	
System restarted on 2/19/01 at 15:45.												
2/19/01	15:45	4,940	21	14	140	73.4	-					
2/22/01	17:00	5,016	21	14	140	81.9	-					
3/1/01	12:45	5,180	20	13	140	185.4	-					
3/8/01	7:30	5,343	22	14	145	153.3	-					
3/15/01	13:00	5,516	24	15	145	5.2	-					
3/22/01	13:00	5,682	15	10	145	3.2	-					
3/29/01	14:30	5,854	19	13	140	2.6	-					
4/5/01	10:00	6,016	17	11	140	4.7	-					
4/11/01	9:00	6,160	23	15	140	4.1	-					
4/18/01	12:30	6,331	22	15	135	5.0	-					
4/25/01	13:15	6,500	29	19	133	3.9	-					
5/2/01	11:45	6,666	27	18	135	3.4	-					
5/9/01	12:30	6,836	28	19	135	3.1	-					
5/16/01	11:45	7,002	26	17	140	2.9	-					
5/23/01	11:00	7,169	29	19	140	1.7	-					
5/31/01	15:15	7,360	14	9.2	140	12	**11**	0.050	0.083	6.0	16	4A
System shut down on 5/31/01 at 16:35. System restarted on 6/14/01 at 8:00.												

TABLE 4h

Soil Vapor Extraction Data: Monitoring/Extraction Well VMP-D2

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	Time	Elapsed Time on Hour Meter (hrs)	Flow (acfm)	Flow (scfm)	Vacuum (in-wc)	Total VOCs by PID (ppmv)	TCE Conc. by Lab (ppmv)	Estimated VOC Removal Rates: TCE (lb/day)	Estimated VOC Removal Rates: Total VOCs (lb/day)	Cumulative Mass Removal: TCE (lbs)	Cumulative Mass Removal: Total VOCs (lbs)	Notes
6/14/01	10:15	7,360	42	30	110	3.0	5.4	-	-	-	-	
6/20/01	12:30	7,515	16	11	130	4.8	-					
System shut down on 6/21/01 at 14:30. System restarted on 6/28/01 at 6:30.												
6/28/01	6:30	7,540	21	17	80	13	-					

NOTES:

TCE = trichloroethene
acfm = actual cubic feet per minute
°F = degrees Fahrenheit
hrs = hours
in-wc = inches of water column
lb/day = pounds per day
lbs = pounds

PID = photoionization detector
ppmv = parts per million by volume
scfm = standard cubic feet per minute
tr = trace (concentration detected at less than reporting limit)
VOCs = volatile organic compounds
- = no measurement
< = not detected at indicated method detection limit

1. PID calibrated with 100 ppmv of isobutylene.
2. Laboratory analyses were performed by Performance Analytical, Inc. in Simi Valley, California using EPA Method TO-14A.
3. Removal rates are calculated using analyte concentrations from laboratory analyses and the measured flow rate (converted from acfm to scfm using the measured vacuum).
4. Cumulative mass removal amounts are calculated as follows:
   A: Mass removal calculated using an average of the previous and current mass removal rates.
5. Well VMP-D1 was first used as an extraction well on 6 July 2000.
6. Although not shown on this table, mass removal rates were calculated for each VOC detected in the samples collected from well VMP-D2. The total VOC mass removal rate presented in this table is the sum of the mass removal rates calculated for each VOC that was detected.
7. Extraction well VMP-D2 is screened in the deep vadose zone from 30 to 40 feet below ground surface.

TABLE 5

Field Data for Soil Vapor Monitoring Probes

Quarterly Progress Report for April through June 2001

Jervis B. Webb Company of California, 5030 Firestone Boulevard, South Gate, California

Date	VMP-1		VMP-2		VMP-D1		VMP-D2	
	Vacuum (in-wc)	Total VOCs by PID (1,2) (ppmv)	Vacuum (in-wc)	Total VOCs by PID (1,2) (ppmv)	Vacuum (in-wc)	Total VOCs by PID (1,3) (ppmv)	Vacuum (in-wc)	Total VOCs by PID (1,3) (ppmv)
3/16/00	-	68	-	150	-	530	-	71
3/17/00	1.8	-	1.0	-	4.7	-	5.2	-
3/18/00	1.3	-	1.1	-	6.6	-	6.0	-
3/19/00	1.1	-	0.7	-	2.2	-	2.4	-
3/20/00	2.1	-	1.4	-	2.6	-	3.5	-
3/21/00	2.4	-	2.2	-	5.4	-	6.8	-
3/22/00	2.6	-	2.3	-	5.8	-	4.5	-
3/30/00	1.8	-	1.8	-	15	-	16	-
4/6/00	2.8	6.4	4.2	7.4	23	3.5	24	150
4/13/00	4.0	8.2	2.5	6.2	21	23	22	27
5/11/00	4.6	-	4.0	-	19	-	16	-
5/18/00	3.2	-	3.4	-	17	-	18	-
	3.8	-	2.7	-	21	-	22	-
7/6/00	-	0.0	-	2.6	-	-	-	-
7/13/00	2.6	-	1.9	-	-	-	-	-
7/20/00	2.9	-	2.1	-	-	-	-	-
7/27/00	2.6	-	1.9	-	-	-	-	-
9/14/00	5.2	0.5	2.4	0.7	-	-	-	-
9/28/00	-	1.3	-	2.4	-	-	-	-
10/26/00	11.5	13.2	11.5	2.2	-	-	-	-
12/14/00	7.3	-	0.6	-	-	-	-	-
1/4/01	-	0.9	-	0.4	-	-	-	-
6/14/01	-	-	0.1	0.0	-	-	-	-

NOTES:

in-wc = inches of water column
PID = photoionization detector
ppmv = parts per million by volume
VOCs = volatile organic compounds
- = no measurement

1. PID calibrated with 100 ppmv of isobutylene.
2. Each shallow vapor monitoring probe was purged of approximately 5 to 7 cubic feet of vapor and then sampled and analyzed using a PID.
3. Each deep vapor monitoring probe was purged of approximately 50 to 65 cubic feet of vapor and then sampled and analyzed using a PID.
4. On days for which two vacuum and PID readings are provided, the values indicate initial and final readings during the site visit.
5. Probes VMP-D1 and VMP-D2 have been used as extraction wells since 6 July 2000. For data collected at wells VMP-D1 and VMP-D2, see Tables 4f and 4g, respectively.
6. Probe VMP-1 has been used as an extraction well since 8 March 2001 (see Table 4h).
7. Soil vapor monitoring probes VMP-1 and VMP-2 are screened in the shallow vadose zone from approximately 19 to 25 feet beneath the ground surface.
8. Soil vapor monitoring probes VMP-D1 and VMP-D2 are screened in the deep vadose zone from approximately 30 to 40 and 31 to 41 feet beneath the ground surface, respectively.

Attachment 11

Excerpt of Quarterly Progress Report for January-March 2000

Quarterly Progress Report for January through March 2000

Jervis B. Webb Company of California
5030 Firestone Boulevard
South Gate, California

27 April 2000

Erler & Kalinowski, Inc.

Consulting Engineers and Scientists
2951 28th Street, Suite 1020
Santa Monica, California 90405
(310) 314-8855
Fax: (310) 314-8860

Quarterly Progress Report for January through March 2000
Jervis B. Webb Company of California
5030 Firestone Boulevard, South Gate, California

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Quarterly Progress Report for January through March 2000
Jervis B. Webb Company of California
5030 Firestone Boulevard, South Gate, California

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SVE Blower Influent: TCE, toluene, PCE, and 1,1-DCE were detected in the soil vapor sample collected from the SVE system total influent on 16 March 2000 at concentrations of 860, 49, 19, and 8.2 ppmv, respectively. No other chemicals were detected. EKI collected an additional soil vapor sample from the SVE system total influent on 22 March 2000. TCE, PCE, toluene, and 1,1,1-TCA were detected at concentrations of 490, 11, 3.9, and 3.0 ppmv, respectively. No other chemicals were detected.

3.3.2. Estimated VOC Removal Rates

VOC removal rates were calculated using measured vacuum readings, flow rates, and analytical data (see Tables 3a through 3e). Laboratory data were used to calculate VOC removal rates on days when samples were collected for laboratory analyses. For the end of the quarter on 30 March 2000, no samples were collected for laboratory analysis. Therefore, ratios of photo-ionization detector ("PID") readings were multiplied by earlier calculated removal rates to estimate mass removal rates on 30 March 2000.

Based on measurements made at the blower influent, an estimated 26 pounds of VOCs, including 24 pounds of TCE, have been extracted from soil at the site as of 30 March 2000 (see Table 3a). Based on measurements made at individual extraction wells, an estimated 32 pounds of VOCs, including 31 pounds of TCE have been extracted from the shallow soil zone as of 30 March 2000 (see Tables 3b,3c, and 3d), and an estimated 28 pounds of VOCs, including 27 pounds of TCE have been extracted from the deep soil zone as of 30 March 2000 (see Table 3e).

The sum of the mass removal calculated for each of the extraction wells is higher than the estimated mass removal for the system as a whole, as measured at the blower influent. This anomaly is caused in part by low precision in measuring the relatively low flow rates in the shallow extraction wells, as magnified by the high TCE concentration measured in well SVE-1. The measurements made at the blower influent are considered to be the more reliable measurements of total VOC mass removal.

3.3.3. Monitoring Well Field Sampling

Total VOC concentrations in soil vapor samples were also occasionally monitored with an organic vapor meter, which utilizes a PID to measure total concentrations of VOCs. The PID does not distinguish between individual compounds, but gives a reading for total VOCs. Samples for PID analyses were collected in a Tedlar bag using the method described in Section 3.3.1. The PID was calibrated with 100 ppmv of isobutylene.

PID readings from samples collected at the extraction wells and vapor monitoring probes are presented in Tables 3a through 3e and in Table 4. PID readings suggest that total VOC concentrations in extraction well SVE-1 increased during the first few days of operation, and then decreased slightly. However, laboratory data suggest that concentrations decreased or were stable throughout the observed period of operation (see Table 3b). PID readings suggest that total VOC concentrations in extraction wells SVE-2, SVE-3, and SVE-D1 have

Attachment 12

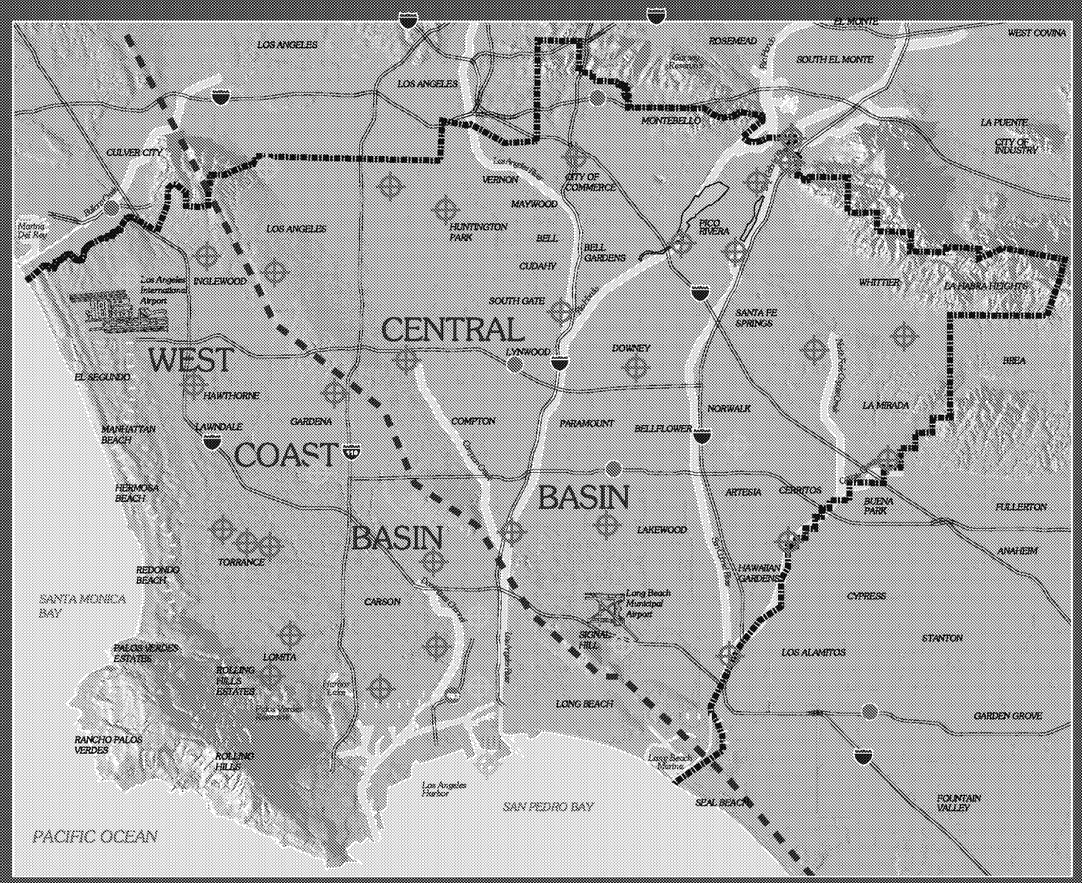
Excerpt of 2000 Regional Groundwater Monitoring Report

WRD
Water Replenishment District
of Southern California
12621 East 166th Street
Cerritos, CA 90703
(562) 921-5521
(562) 921-6101 Fax
www.wrd.org

Regional Groundwater Monitoring Report

July 2000

Water Replenishment District
of Southern California



REGIONAL GROUNDWATER MONITORING REPORT
WATER YEAR 1998 - 1999

Central and West Coast Basins
Los Angeles County, California

July 2000

WRD

REGIONAL GROUNDWATER MONITORING REPORT
CENTRAL AND WEST COAST BASINS
LOS ANGELES COUNTY, CALIFORNIA
WATER YEAR 1998-1999

Water Replenishment District of
Southern California
12621 E. 166th Street
Cerritos, California 90703
(562) 921-5521

Division 1	**Willard Murray, Secretary**
Division 2	**Robert Goldsworthy, President**
Division 3	**Leo J. Vander Lans, Treasurer**
Division 4	**M. Susan Carrillo, Vice President**
Division 5	**Albert Robles, Director**

Brian Brady	**Interim General Manager**
Robb Whitaker	**District Engineer**

Prepared by:

Ted Johnson	**Senior Hydrogeologist**
Tony Kirk	**Hydrogeologist**
Nancy Matsumoto	**Hydrogeologist**
Tracy Parr	**GIS Specialist**
Benny Chong	**Hydrogeologist Intern**
Jim Meuse	**GIS Intern**
Hélène Mendoza	**Technical Secretary**

JULY 2000

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Well 3S/14W-22L1 and Well 4S/13W-22P1 (**Figure 3.5**) have been used historically to represent the condition of groundwater levels in the West Coast Basin. Water levels in these wells experienced net decreases of less than 5 feet between Fall 1998 and Fall 1999. In contrast, in the Carson "pumping hole" area, water levels declined up to 60 feet (**Figure 3.3**). In other areas of the basin, some water level increases were observed. As with the Central Basin Pressure Area, rises in water levels are probably related to reductions in pumping, while falls are related to increased pumping and reduced recharge.

Well 2S/11W-18K2, Well 2S/12W-24M8, and Well 3S/12W-1A6 (**Figure 3.6**) have been used historically to represent the condition of groundwater levels in the Montebello Forebay. During Water Year 1998-1999, rainfall was nearly half of the long-term average. This dry year, along with suspension of imported water spreading due to construction activities, caused water levels to drop up to 20 feet in these wells, and up to 60 feet in other portions of the forebay between Fall 1998 and Fall 1999 (**Figure 3.3**).

Well 2S/13W-10A1 (**Figure 3.7**) has been used historically to represent the condition of groundwater levels in the Los Angeles Forebay. The water level in this well declined about 15 feet between 1998 and 1999, and water levels dropped up to 60 feet in other parts of the Los Angeles Forebay (**Figure 3.3**). These declines are related to the dry year, increased pumping, and reduced artificial recharge.

Aquifer-Specific Water Levels

The accurate measurement of water levels in wells, and knowledge of which aquifer is represented by a particular water level measurement, is critical to construct reliable groundwater elevation contour maps and hydrographs from which important conclusions and decisions are made as to the state of the basin. It has been stated previously that production wells often provide average water quality results because they are tapped into multiple aquifers. This is also true of water levels. Specific aquifers usually have different elevation heads because of pressure differences within the aquifers.

Table 1.1 presented the construction information for WRD monitoring wells. **Table 3.2** presents groundwater elevation (head) measurements from WRD nested monitoring wells. These data demonstrate the head differences between individual aquifers at each WRD nested monitoring well location. The differences in head are caused primarily by the amount of local pumping, the proximity to recharge sources, and the degree of separation between aquifers caused by aquitards.

Nested wells show meaningful differences between zones, reflecting both hydrogeologic and pumping conditions. Head differences from about 1 to 60 feet occur between zones above and below the producing zones. The greatest head differences tend to occur in the pumping holes of the Central and West Coast Basin Pressure Areas, while the smallest differences occur in the Montebello Forebay recharge area and the Torrance area (which have thick, merged aquifers). Nested well locations showing largest differences in heads between aquifers typically exhibit the lower head in the Silverado and adjacent producing zones, because these are the most heavily pumped.

At this time, WRD has completed 24 nested monitoring wells. This network of wells provides outstanding vertical and areal coverage of water level (and water quality) trends across the CWCB. The following discussion focuses on vertical water level differences observed in WY 98-99 at several WRD nested well sites and how those differences infer the connectivity of aquifers.

Downey #1 (Figure 3.8): This well is located in the Central Basin Pressure Area near the boundary with the Montebello forebay. During WY 1998-1999, water levels in zones 1 through 4 (Sunnyside, Silverado, Hollydale, and Jefferson Aquifers) generally tracked well, suggesting similar responses to pumping and recharge. Water level highs occurred in December 1998 and January 1999, with lows occurring in August 1999. Zones 5 (Exposition Aquifer) and 6 (Gaspur Aquifer), however, have heads 15 to 30 feet higher than the deeper aquifers, and their elevations fluctuate only several feet per year versus tens of feet for the deeper aquifers. This suggests the shallower two aquifers are not immediately connected to the deeper ones, and do not respond to pumping and recharge

as strongly as the deeper aquifers.

Carson #1(Figure 3.9): This well, located in the center of the Carson pumping hole, shows a 50-foot difference in head between the Silverado aquifer (elevation approximately 75 feet below MSL) and the overlying Lynwood aquifer (elevation approximately 25 fee below MSL). The Silverado and underlying Sunnyside aquifers exhibit similar heads and trends through the year, as do the Lynwood and Gage aquifers.

Rio Hondo #1(Figure 3.10): This well is located in the Central Basin Non-Pressure Area (at the Montebello Forebay spreading grounds). With the exception of Zones 2 and 3 (both in the Sunnyside aquifer) which have nearly identical heads throughout the year, there are several feet of vertical head differences between aquifers. The most significant finding is that Zone 4 (Silverado aquifer) has the lowest head of all measured aquifers, suggesting that this aquifer is the most heavily pumped in the area. Because it has the lowest head, it should be expected to receive recharge waters from above and below the Silverado. Water level highs in all zones were generally observed in April 1999 and lows in September 1999.

Huntington Park #1(Figure 3.11): This well, located in the Los Angeles Forebay, shows only slight differences in head between the Silverado aquifer (average elevation approximately 25 feet below MSL) and the overlying Jefferson and Gage aquifers. There is over 30 feet head difference between Zones 3 and 4. Heads remained relatively level except for Zone 2 which dropped 9 feet.

TABLE 1.1
CONSTRUCTION INFORMATION
WRD NESTED MONITORING WELLS

Well Name	Zone	WRD ID Number	Depth of Well (feet)	Top of Perforation (feet)	Bottom of Perforation (feet)	Aquifer Designation
Carson #1	1	100030	1010	990	1010	Sunnyside
	2	100031	760	740	760	Silverado
	3	100032	480	460	480	Lynwood
	4	100033	270	250	270	Gage
Cerritos #1	1	100870	1215	1155	1175	Sunnyside
	2	100871	1020	1000	1020	Sunnyside
	3	100872	630	610	630	Silverado
	4	100873	290	270	290	Hollydale
	5	100874	200	180	200	Gage
	6	100875	135	125	135	Artesia
Chandler #3b	1	100062	363	341	363	Gage/Lynwood/Silverado
Chandler #3a	2	100083	192	165	192	Gage/Lynwood/Silverado
Columbia	1	100042	600	555	595	Lower San Pedro
	2	100043	505	460	500	Silverado
	3	100044	285	240	280	Lynwood
	4	100045	205	160	200	Gage
Commerce #1	1	100881	1390	1330	1390	Pico Formation
	2	100882	960	940	960	Sunnyside
	3	100883	780	760	780	Sunnyside
	4	100884	590	570	590	Silverado
	5	100885	345	325	345	Hollydale
	6	100886	225	205	225	Exposition/Gage
Downey #1	1	100010	1190	1170	1190	Sunnyside
	2	100011	960	940	960	Silverado
	3	100012	600	580	600	Silverado
	4	100013	390	370	390	Hollydale/Jefferson
	5	100014	270	250	270	Exposition
	6	100015	110	90	110	Gaspur
Gardena #1	1	100020	990	970	990	Sunnyside
	2	100021	465	445	465	Silverado
	3	100022	365	345	365	Lynwood
	4	100023	140	120	140	Gage
Hawthorne #1	1	100887	990	910	950	Pico Formation
	2	100888	730	710	730	Lower San Pedro/Sunnyside
	3	100889	540	520	540	Lower San Pedro/Sunnyside
	4	100890	420	400	420	Silverado
	5	100891	260	240	260	Lynwood
	6	100892	130	110	130	Gage
Huntington Park #1	1	100005	910	890	910	Silverado
	2	100006	710	690	710	Jefferson
	3	100007	440	420	440	Gage
	4	100008	295	275	295	Exposition
	5	100009	134	114	134	Gaspur
Inglewood #1	1	100091	1400	1380	1400	Pico Formation
	2	XXXXXXXXXX	XXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
	3	100093	450	430	450	Silverado
	4	100094	300	280	300	Lynwood
	5	100095	170	150	170	Gage
Inglewood #2	1	100824	860	800	840	Pico Formation
	2	100825	470	450	470	Pico Formation
	3	100826	350	330	350	Silverado
	4	100827	245	225	245	Lynwood
Lakewood #1	1	100024	1009	989	1009	Sunnyside
	2	100025	660	640	660	Silverado
	3	100026	470	450	470	Lynwood
	4	100027	300	280	300	Hollydale
	5	100028	160	140	160	Artesia
	6	100029	90	70	90	semi-perched
La Mirada #1	1	100876	1150	1130	1150	Sunnyside
	2	100877	985	965	985	Silverado
	3	100878	710	690	710	Lynwood
	4	100879	490	470	490	Jefferson
	5	100880	245	225	245	Gage
Lomita #1	1	100818	1340	1240	1260	Lower San Pedro
	2	100819	720	700	720	Silverado
	3	100820	570	550	570	Silverado
	4	100821	420	400	420	Silverado
	5	100822	240	220	240	Gage
	6	100823	120	100	120	Gage
Long Beach #1	1	100920	1470	1430	1450	Sunnyside
	2	100921	1250	1230	1250	Sunnyside
	3	100922	990	970	990	Silverado
	4	100923	619	599	619	Lynwood
	5	100924	420	400	420	Gage
	6	100925	175	155	175	Artesia
Long Beach #2	1	101740	1090	970	990	Pico Formation
	2	101741	740	720	740	Sunnyside
	3	101742	470	450	470	Silverado
	4	101743	300	280	300	Lynwood
	5	101744	180	160	180	Gage
	6	101745	115	95	115	Gaspur
Los Angeles #1	1	100926	1370	1350	1370	Pico Formation
	2	100927	1100	1080	1100	Sunnyside
	3	100928	940	920	940	Silverado
	4	100929	660	640	660	Lynwood
	5	100930	370	350	370	Gage

TABLE 1.1
CONSTRUCTION INFORMATION
WRD NESTED MONITORING WELLS

Well Name	Zone	WRD ID Number	Depth of Well (feet)	Top of Perforation (feet)	Bottom of Perforation (feet)	Aquifer Designation
Madrid	1	100034	685	640	680	Lower San Pedro
	2	100035	525	480	520	Silverado
	3	100036	285	240	280	Lynwood
	4	100037	190	145	185	Gage
Mariner	1	100038	715	670	710	Lower San Pedro
	2	100039	545	500	540	Silverado
	3	100040	385	340	380	Lynwood
	4	100041	245	200	240	Gage
Pico #1	1	100001	900	860	900	Pico Formation
	2	100002	480	460	480	Silverado
	3	100003	400	380	400	Silverado
	4	100004	190	170	190	Jefferson
Pico #2	1	100085	1200	1180	1200	Sunnyside
	2	100086	850	830	850	Sunnyside
	3	100087	580	560	580	Sunnyside
	4	100088	340	320	340	Silverado
	5	100089	255	235	255	Lynwood
	6	100090	120	100	120	Gaspur
Rio Hondo #1	1	100064	1150	1110	1130	Sunnyside
	2	100065	930	910	930	Sunnyside
	3	100066	730	710	730	Sunnyside
	4	100067	450	430	450	Silverado
	5	100068	300	280	300	Lynwood
	6	100069	160	140	160	Gardena
Santa Fe Springs #1	1	100096	1410	1290	1310	Pico Formation
	2	100097	845	825	845	Sunnyside
	3	100098	560	540	560	Sunnyside
	4	100099	285	265	285	Silverado
	5	XXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
South Gate #1	1	100893	1460	1440	1460	Sunnyside
	2	100894	1340	1320	1340	Sunnyside
	3	100895	930	910	930	Sunnyside
	4	100896	585	565	585	Lynwood/Silverado
	5	100897	250	220	240	Exposition
Whittier #1	1	101735	1298	1180	1200	Pico Formation
	2	101736	940	920	940	Sunnyside
	3	101737	620	600	620	Silverado
	4	101738	470	450	470	Jefferson
	5	101739	220	200	220	Gage
Willowbrook #1	1	100016	905	885	905	Pico Formation
	2	100017	520	500	520	Silverado
	3	100018	380	360	380	Lynwood
	4	100019	220	200	220	Gage
Wilmington #1	1	100070	1040	915	935	Lower San Pedro
	2	100071	800	780	800	Silverado
	3	100072	570	550	570	Silverado
	4	100073	245	225	245	Lynwood
	5	100074	140	120	140	Gage
Wilmington #2	1	100075	1030	950	970	Lower San Pedro
	2	100076	775	755	775	Silverado
	3	100077	560	540	560	Silverado
	4	100078	410	390	410	Lynwood
	5	100079	140	120	140	Gage

TABLE 3.2
GROUNDWATER ELEVATIONS, WATER YEAR 1998 - 1999
WRD NESTED MONITORING WELLS

ZONE	1	2	3	4	5	6
CARSON #1						Reference Point Elevation: 24.16
Depth of Well	1010	760	480	270		
Aquifer Name	Sunnyside	Silverado	Lynwood	Gage		
10/2/98	-77.52	-75.49	-27.67	-24.83		
11/19/98	-76.31	-74.22	-27.52	-24.76		
2/4/99	-73.85	-72.01	-27.42	-24.73		
5/11/99	-74.1	-72.12	-27.04	-24.31		
7/9/99	-75.58	-73.74	-26.97	-24.3		
7/30/99	-74.72	-73	-27.1	-24.43		
9/22/99	-76.17	-74.42	-27.28	-24.58		
CERRITOS #1						Reference Point Elevation: 40.72
Depth of Well	1215	1020	630	290	200	135
Aquifer Name	Sunnyside	Sunnyside	Silverado	Hollydale	Gage	Artesia
4/2/99	-22.52	-18.74	-25.44	16.5	20.74	21.63
6/21/99	-	-38.07	-42.35	-44.43	13.61	19.24
7/29/99	-51.24	-54.89	-55.53	8.26	14.57	14.53
CHANDLER #3						Reference Point Elevation: 153.2
Depth of Well	363	192				
Aquifer Name	Gage/Lyn/Silv	Gage/Lyn/Silv				
10/5/98	-28.72	-28.5				
3/5/99	-27.62	-				
8/4/99	-27.46	-27.19				
COLUMBIA						Reference Point Elevation: 78.42
Depth of Well	600	505	285	205		
Aquifer Name	Lower San Pedro	Silverado	Lynwood	Gage		
10/7/98	-12.29	-12.28	-9.71	-8.91		
2/18/99	-11.74	-10.88	-8.43	-8.77		
COMMERCE #1						Reference Point Elevation: 170.09
Depth of Well	1390	960	780	590	345	225
Aquifer Name	Pico Formation	Sunnyside	Sunnyside	Silverado	Hollydale	Exposition/Gage
6/24/99	67.91	68.29	63.24	27.47	52.41	59.6
8/5/99		62.4	58.77	25.39	18.05	58.94
DOWNEY #1						Reference Point Elevation: 97.21
Depth of Well	1190	960	600	390	270	110
Aquifer Name	Sunnyside	Silverado	Silverado	Hollydale/Jefferson	Exposition	Gasper
10/6/98	16.97	21.47	25.47	23.96	51.02	53.98
10/21/98	18.53	23.06	29.73	29.81	51.31	53.89
12/7/98	23.39	27.04	34.39	33.1	51.53	53.44
2/10/99	27.55	28.9	32.7	32.76	51.31	53.42
6/30/99	17.86	19.12	19.16	16.72	47.92	51.87

TABLE 3.2
GROUNDWATER ELEVATIONS, WATER YEAR 1998 - 1999
WRD NESTED MONITORING WELLS

ZONE	1	2	3	4	5	6
GARDENA #1						Reference Point Elevation: 79.9
Depth of Well	990	465	365	140		
Aquifer Name	Sunnyside	Silverado	Lynwood	Gage		
10/5/98	-47.55	-71.13	-58.94	-12.41		
11/25/98	-47.07	-70.21	-56.76	-12.48		
HAWTHORNE #1						Reference Point Elevation: 86.35
Depth of Well	990	730	540	420	260	130
Aquifer Name	Pico Formation	LSP/Sunnyside	LSP/Sunnyside	Silverado	Lynwood	Gage
7/13/99	-80.43	-26.15	-24.55	-24.24	-17.91	-4.68
8/4/99	-83.05	-26.9	-25.22	-24.98	-18.65	-2.94
8/29/99	-84.21	-26.53	-25.02	-24.69	-18.59	-5.67
HUNTINGTON PARK #1						Reference Point Elevation: 177.08
Depth of Well	910	710	440	295	134	
Aquifer Name	Silverado	Jefferson	Gage	Exposition	Gasper	
10/6/98	-29.34	-31.59	-20.2	15.84	46.8	
12/1/98	-30.92	-32.91	-17.52	16.75	-	
2/19/99	-	-	-	17.9	45.34	
2/24/99	-28.62	-30.6	-17.54	17.59	45.29	
7/8/99	-32.66	-39.87	-21.88	16.66	-	
INGLEWOOD #1						Reference Point Elevation: 110.56
Depth of Well	1400	885	450	300	170	
Aquifer Name	Pico Formation	Pico Formation	Silverado	Lynwood	Gage	
10/5/98	-32.02	2.53	-34.67	-3.17	2.67	
12/8/98	-34.04	2.58	-32.08	-3.01	2.61	
2/17/99	-34.06	3.25	-32.86	-2.22	3.25	
5/19/99	-35.06	-	-36.78	-6.3	-0.96	
5/22/99	-32.04	3.15	-32.46	-1.97	3.43	
8/4/99	-30.83	3.33	-34.95	-2.27	3.61	
9/10/99	-30.83	3.48	-35.93	-2.28	3.64	
INGLEWOOD #2						Reference Point Elevation: 217.33
Depth of Well	860	470	350	245		
Aquifer Name	Pico Formation	Pico Formation	Silverado	Lynwood		
2/24/99	-24.43	-	-12.2	-6.2		
3/19/99	-24.28	-23.68	-12.13	-6.17		
7/7/99	-23.57	-22.75	-11.72	-5.8		
9/5/99	-23.65	-22.95	-12.01	-6.07		

TABLE 3.2
GROUNDWATER ELEVATIONS, WATER YEAR 1998 - 1999
WRD NESTED MONITORING WELLS

ZONE	1	2	3	4	5	6
LA MIRADA #1					Reference Point Elevation: 75.85	
Depth of Well	1150	985	710	490	245	
Aquifer Name	Sunnyside	Silverado	Lynwood	Jefferson	Gage	
3/8/99	9.87	6.65	-13.06	-37.36	-9.65	
4/2/99	10.67	7.02	-12.64	4.58	-8.21	
6/2/99	-6.26	-7.28	-13.29	-37.89	-17.6	
6/21/99	19.16	-	-	-	-	
8/3/99	-17.02	-16.88	-30.03	-51.92	-23.72	
8/9/99	-18.45	-18.3	-31.78	-53.01	-23.73	
8/27/99	-22.04	-21.61	-34.74	-56.45	-25.26	
LAKEWOOD #1				Reference Point Elevations: 37.91 (Zones 1, 2, 3, 4) and 37.93 (Zones 5 and 6)		
Depth of Well	1009	660	470	300	160	90
Aquifer Name	Sunnyside	Silverado	Lynwood	Hollydale	Artesia	semi-perched
10/5/98	-36.98	-28.84	-27.81	-11.12	3.22	26.52
11/23/98	-21.47	-20.22	-17.64	-2.49	9.52	26.74
2/18/99	-31.75	-25.43	-23.22	1.8	12.88	28.17
7/1/99	-66.84	-54.02	-51.85	-26.18	-13.3	13.08
9/9/99	-79.94	-62.87	-61.74	-30.99	-16.72	11.42
LOMITA #1					Reference Point Elevation: 76.91	
Depth of Well	1340	720	570	420	240	120
Aquifer Name	Lower San Pedro	Silverado	Silverado	Silverado	Gage	Gage
12/2/98	-45.57	-	-29.82	-31.75	-27.78	-
2/4/99	-42.06	-33.92	-30.54	-33.3	-27.63	-30.44
3/19/99	-41.96	-32.99	-29.84	-32.6	-27.35	-30.31
5/28/99	-41.07	-31.68	-30.37	-30.65	-25.54	-30.53
6/16/99	-43.11	-33.94	-32.26	-32.58	-27.22	-31.07
7/10/99	-41.05	-32.02	-30.31	-30.81	-25.2	-29.19
7/30/99	-41.58	-34.5	-32.58	-33.23	-27.16	-31.22
9/28/99	-39.23	-31.99	-31.24	-33.1	-25.63	-30.26
MADRID					Reference Point Elevation: 70.68	
Depth of Well	685	525	285	190		
Aquifer Name	Lower San Pedro	Silverado	Lynwood	Gage		
10/7/98	-25.81	-21.14	-20.87	-20.87		
11/24/98	-24.56	20.68	-20.37	-20.3		
2/18/99	-24.55	-20.62	-20.45	-20.44		
6/18/99	-19.11	-14.94	-14.78	-14.74		
9/28/99	-19.38	-14.9	-14.75	-14.71		

TABLE 3.2
GROUNDWATER ELEVATIONS, WATER YEAR 1998 - 1999
WRD NESTED MONITORING WELLS

ZONE	1	2	3	4	5	6
MARINER						Reference Point Elevation: 97.7
Depth of Well	715	545	385	245		
Aquifer Name	Lower San Pedro	Silverado	Lynwood	Gage		
10/7/98	-7.95	-2.24	-0.37	-0.32		
2/5/99	-7.49	-1.75	0.1	0.15		
9/26/99	-12.06	-6.1	-	-3.74		
PICO #1						Reference Point Elevation: 181.06
Depth of Well	900	480	400	190		
Aquifer Name	Pico Formation	Silverado	Silverado	Jefferson		
10/6/98	152.25	133.26	131.8	141.09		
10/21/98	151.38	136.02	133.74	140.15		
12/9/98	151.68	141.88	141.64	141.06		
2/11/99	149.4	143.23	142.95	142.34		
4/5/99	148.6	-	-	-		
5/21/99	150.2	-	-	-		
6/8/99	149.09	-	-	-		
6/29/99	147.38	136.3	136.41	136.77		
7/23/99	145.26	136.51	135.97	134.21		
8/2/99	144.53	135.71	135.13	133.15		
PICO #2						Reference Point Elevation: 149.6
Depth of Well	1200	850	580	340	255	120
Aquifer Name	Sunnyside	Sunnyside	Sunnyside	Silverado	Lynwood	Gasper
10/6/98	90.98	90.47	100.02	113.85	112.6	123.25
10/21/98	90.31	90.63	100.11	112.33	111.29	118.97
12/11/98	92.1	95.47	102.58	114.26	113.37	120.94
2/11/99	95.34	97.4	103.37	110.9	111.41	119.47
6/23/99	85.46	87.6	97.07	115.19	114.64	123.98
RIO HONDO #1						Reference Point Elevation: 144.36
Depth of Well	1150	930	730	450	300	160
Aquifer Name	Sunnyside	Sunnyside	Sunnyside	Silverado	Lynwood	Gardena
10/6/98	87.72	85.71	84.84	71.27	89.38	93.64
10/21/98	87.62	84.99	84.1	71.94	90.42	94.43
12/3/98	87.14	86.99	86.19	78.07	91.34	94.62
2/8/99	89.76	88.75	88.91	80.01	91.3	94.03
6/28/99	83.05	78.64	77.73	69.83	85.02	87.71

TABLE 3.2
GROUNDWATER ELEVATIONS, WATER YEAR 1998 - 1999
WRD NESTED MONITORING WELLS

ZONE	1	2	3	4	5	6
SANTA FE SPRINGS #1						Reference Point Elevation: 168.83
Depth of Well	1410	845	560	285	190	
Aquifer Name	Pico Formation	Sunnyside	Sunnyside	Silverado	Lynwood	
5/20/99	-	83.81	66.37	67.56	-	
6/22/99	76.72	84.1	67.65	63.82	-	
SOUTH GATE #1						Reference Point Elevation: 90.96
Depth of Well	1460	1340	930	585	250	
Aquifer Name	Sunnyside	Sunnyside	Sunnyside	Lynwood/Silverado	Exposition	
7/6/99	-1.38	-2.63	-1.28	-0.98	40.81	
7/7/99	-1.49	-2.97	-1.28	-0.98	40.81	
8/4/99	-4.3	-5.34	-3.43	-5.8	40.36	
9/2/99	-6.16	-7.24	-5.53	-7.55	39.82	
9/10/99	-6.14	-6.26	-3.77	-4.03	39.91	
WILLOWBROOK #1						Reference Point Elevation: 96.21
Depth of Well	885	500	360	200		
Aquifer Name	Pico Formation	Silverado	Lynwood	Gage		
10/8/98	-41.69	-41.69	-21.73	-21.31		
1/26/99	-31.13	-26.52	-18.28	-17.92		
6/3/99	-25.65	-25.99	-19.63	-19.13		
WILMINGTON #1						Reference Point Elevation: 37.96
Depth of Well	915	780	550	225	120	
Aquifer Name	Lower San Pedro	Silverado	Silverado	Lynwood	Gage	
10/5/98	-74.36	-74.29	-74.63	-34.35	-30.13	
11/18/98	-72.5	-72.4	-72.74	-34.17	-30.15	
2/5/99	-70.17	-70.13	-70.51	-32.89	-29	
4/23/99	-70.67	-70.62	-71.03	-32.5	-28.56	
5/12/99	-70.75	-70.83	-71.07	-32	-27.99	
9/23/99	-72.47	-72.59	-72.78	-31.69	-31.63	
WILMINGTON #2						Reference Point Elevation: 29.78
Depth of Well	950	755	540	390	120	
Aquifer Name	Lower San Pedro	Silverado	Silverado	Lynwood	Gage	
10/5/98	-54.51	-47.9	-42.91	-42.06	-12.1	
11/17/98	-53.44	-47.08	-42.17	-41.46	-12.33	
2/4/99	-51.87	-46.05	-40.52	-39.54	-12.32	
5/26/99	-52.19	-46.07	-40.68	-39.76	-12.21	

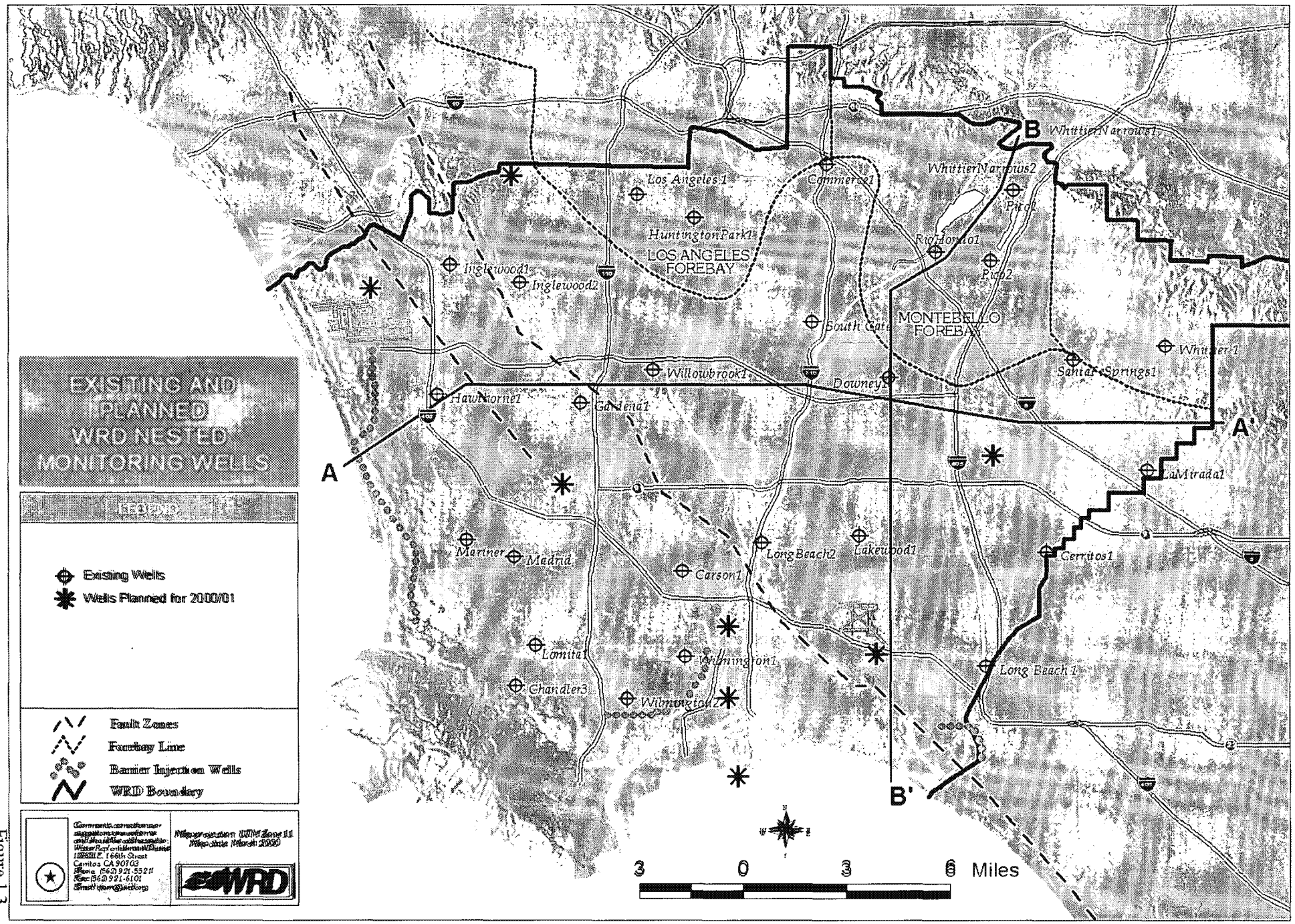
EXISITING AND PLANNED WRD NESTED MONITORING WELLS
LEGEND
Existing Wells
Wells Planned for 2000/01
Fault Zones
Forebay Line
Barrier Injection Wells
WRD Boundary
Projection: UTM Zone 11
Map date: March 2000
WRD
LOS ANGELES FOREBAY
MONTEBELLO FOREBAY
Los Angeles1
Commerce1
WhittierNarrows1
WhittierNarrows2
Pico1
Pico2
HuntingtonPark1
Inglewood1
Inglewood2
South Gate
Whittier 1
SantaFeSprings1
Willowbrook1
Downey1
Hawthorne1
Gardena1
LaMirada1
Mariner
Madrid
LongBeach2
Lakewood1
Cerritos1
Carson1
Lomita1
Wilmington1
Long Beach 1
Chandler3
Wilmington2
A
A'
B
B'
3 0 3 6 Miles

Figure 1.3