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Post-remediation Health Risk Assessment

Oak Walk Site
Emeryville, California

RECEIVED

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OAK
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for

Bay Rock Oaks, LLC

March 2012

Project No.: 0707.1001

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BAYROCK OAKS, LLC

Alameda County Environmental Health Care Services
Local Oversight Program
1131 Harbor Way Parkway, Suite 250
Alameda, California 94502-6577

Date: March 07, 2012

Your Reference: RO2733

Attn. Mr. Mark Detterman

SUBJECT: Health Risk Assessment - Oak Walk Site, Emeryville California

Dear Mr. Detterman:

A copy of the: Post-remediation *Health Risk Assessment - Oak Walk Site, Emeryville California,* prepared by our consultants, Dietz Engineering and Construction, Inc. (**DEC**), is herewith submitted electronically to the Alameda County Environmental Health Care Services CEH website.

With respect to the report I state the following: ***I declare, under penalty of perjury, that the information and recommendations contained in the attached report are true and correct to the best of my knowledge.***

If you have any technical questions about the report please call Dr. Watkins at (510) 336-9118. For administrative questions please call me at (510) 350-7184.

Sincerely,

Marilyn Ponte
BayRock Oaks, LLC

cc: Dr. Dai Watkins, Dietz Engineering and Construction, Inc.

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PROFESSIONAL CERTIFICATION AND LIMITATIONS

This report was prepared under the direction of the engineer whose seal and signature appear below. The work was performed in accordance with generally accepted standards of engineering practice based on information available to us at the time of its preparation and within the limits of the scope of work directed by the client. No other representation, express or implied, and no warranty or guarantee is included or intended as to professional opinions, recommendations, or field or laboratory data provided.

REGISTERED PROFESSIONAL ENGINEER
D. J. WATKINS
No. 28602
Exp. 3/31/14
CIVIL
STATE OF CALIFORNIA

03/05/12

D. J. Watkins, Ph.D., P.E.
Civil Engineer
Dietz Engineering and Construction, Inc.

1.0 INTRODUCTION

This document is the Post-remediation Tier 2 Health Risk Assessment for the Oak Walk Site in Emeryville, California. The assessment was performed by Dietz Engineering and Construction, Inc. (**DEC**) in compliance with the requirements of the American Society for Testing and Materials (**ASTM**) Standard E1739-95, *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (American Society for Testing and Materials 2010).

The environmental condition of the Oak Walk Site and the management of those conditions have been extensively documented in the Environmental Site Characterization Report (The San Joaquin Company Inc. 2005), the Corrective Action Plan (The San Joaquin Company Inc. 2006a, 2006b), the Remediation Report (The San Joaquin Company Inc. 2009b) and Groundwater Quality Monitoring Reports (The San Joaquin Company Inc. 2009a, Dietz Engineering and Construction, Inc. 2010a, 2010b). However, to comply with the requirements of ASTM Standard E1739-95(2010)e1, this document includes sections that address site description and history, site ownership and use, anticipated future use, and other material specified for inclusion by that Standard as well as a technical presentation of the risk assessment procedure employed and the results of that assessment.

1.1 Site Description and History

The location of the subject property is shown on Figure 1 and Figure 2 is a site plan showing the ground floors of the buildings currently on the property. Figure 3 shows the Site prior to the time it was cleared for redevelopment in 2004.

1.1.1 Site North

As is shown on Figures 1 and 2, true north at the Oak Walk Site is slightly to the west of the center line of Adeline Street, which runs along the eastern side of the city block on which the Oak Walk property is located. However, to simplify discussion, in this report we have established a “Site North” that parallels the alignment of San Pablo Avenue, which runs along the western side of the property. Unless otherwise stated, or in cases where true north is shown on drawings, all compass directions referenced in this document should be interpreted in the context of that directional construct.

1.1.2 19th Century and Earlier History

Ohlone Indians were the principal inhabitants of the eastern shore of San Francisco Bay when, in 1820, the neighborhood of the subject property, like most of present-day Alameda County, was awarded by Spain to Luis Maria Peralta. The land grant specified that Peralta promote European settlement of the area, which the Spaniards called Encinal, the "grove of evergreen oaks,” and which Peralta called Rancho San Antonio. By 1842, new settlers had established full-scale logging operations in the oak and redwood forests of the East Bay and the Ohlones and most of their culture had been obliterated by European diseases and settler hostility.

In the late 1800s, Atchison, Topeka and Santa Fe (**AT&SF**) Railroad tracks were constructed to the east of the subject property along the center of Adeline Street on a north-northeast to south-southwest alignment, but at the point that is today the intersection of Adeline and 40th Streets, the line curved west toward San Pablo Avenue before crossing that street and continuing westward into the industrial areas that were, at that time, beginning to develop in the city of Emeryville. At that time, what is today the Oak Walk Site was occupied by residences, each associated with areas of open land, outbuildings and stables.

1.1.3 20th Century History

By 1911, residential sites that were formerly adjacent to the AT&SF Railroad line had become areas of open land and stores and "saloons" had been constructed along the northern portion of the San Pablo Avenue frontage of the subject property and additional residences had been constructed that fronted onto 41st Street. The topographic features of those areas of the site had, therefore, developed more urban characteristics when compared to the low-density residential characteristics that had been the case at the close of the 19th Century. (Note: Changes in the infrastructure on the Oak Walk Site and in neighboring areas over the period 1903 to 1969 can be traced in the Sanborn® maps presented in Appendix A)

With the growth of population in the East Bay, development of industries accelerated in the one-square mile city of Emeryville in the early 20th Century. The AT&SF Railroad transported materials and workers to the industrial areas to the west of San Pablo Avenue along the eastern shore of San Francisco Bay. There were no rail yards or locomotive maintenance shops to the east of that thoroughfare. None of the environmental problems associated with such facilities have been discovered on any of the properties adjacent to the Oak Walk Site.

Industry in many Emeryville neighborhoods expanded rapidly during the 1939 to 1945 World War (World War II), but that development had little effect on the property included within the Oak Walk Site. Plate 2 is an aerial photograph of the subject site that was flown in 1930. However, wholesale storage and warehousing facilities were developed on the previously open lands to the south and north of the AT&SF Railroad line between Adeline and San Pablo Avenue. An automobile service station, which in its last years of existence was known as Celis' Alliance Service Station, had been constructed along the eastern side of San Pablo Avenue on a site that is today covered by 40th Street where it joins the eastern sides of San Pablo Avenue. A wholesale plumbing supply business occupied the building to the east of that service station.

By 1951, a tire sales and service business that included a gasoline and oil dispensing station was located on the southeast corner of the intersection of San Pablo Avenue and 41st Street. (Note: There are no regulatory records regarding the number or location of storage tanks associated with that service station facility.) By 1967, an upholsterer occupied the commercial building shown on Figure 3 at 4086 San Pablo Avenue. That upholstery business later expanded to include carpet sales and occupied the warehouse previously used by the wholesale plumbing supply facility that was located to the rear of the gasoline service station located at 4000 San Pablo Avenue.

Later, in the 1970s, the commercial building that was located at 4070 San Pablo Avenue was constructed and used by the San Francisco French Bread Company (**SFFBC**) as a bakery. That company installed two underground fuel storage tanks: a 10,000-gallon gasoline tank and a 10,000-gallon diesel tank. They were used to fuel their delivery vehicles. The former locations of those tanks, as well as the tank sites at the former service station site at 4000 San Pablo Avenue are shown on Figure 3.

By the 1980s, many of the industrial facilities in western Emeryville had begun to decay and increasingly became idle. In the 1990s, the City of Emeryville through its redevelopment agency, the Emeryville Redevelopment Agency (**ERDA)**, began an ambitious undertaking to clean up and redevelop former industrial areas of the City and other tracts where commercial and residential properties had become rundown. Included in that redevelopment program was construction of a major new thoroughfare formed by extending 40th Street from its previous termination at Adeline Street westward to the frontage of Interstate 80, which passes along the eastern shore of San Francisco Bay, some 0.85 miles to the west of the Oak Walk Site. That highway construction included the extension of 40th Street from Adeline Street to San Pablo Avenue, for which purpose the City of Emeryville procured the land along the alignment of that extension and demolished the former carpet and upholstery warehouse described above. The automobile service station at 4000 San Pablo Avenue was also razed at that time.

Over the period 1993-1995, extensive environmental subsurface investigations were conducted beneath the entire length of the proposed extension of 40th Street between San Pablo Avenue and Adeline Street. Those investigations led to remediation of soil beneath a number of areas of the right-of-way that were in addition to the remediation work undertaken at the Celis and SFFB tank sites prior to construction of the road.

Construction of the extension of 40th Street also took a portion of the land previously occupied by the SFFBC, including the southern half of the former sites of the gasoline and diesel underground storage tanks located on that property. Subsequent to that highway construction, the commercial building at 4070 San Pablo Avenue and its surrounding yard were purchased by the Oaks Club, a California Limited Partnership (**Oaks Club**), which used the building as a carpentry and maintenance shop and converted the frontage land into a private parking lot. In 1989, the Oaks Club also purchased the commercial buildings that were then located at 4086 and 4090 San Pablo Avenue.

The commercial building that had been located at 4086 San Pablo Avenue was, historically, the site of an upholstery business and, later, a specialty hydraulic hose fitting shop that neither dispensed nor used hydraulic oil or similar liquid material. The latter business also occupied the ground floor of the adjacent building at 4090 San Pablo Avenue, which had historically been a restaurant and the upper floor of which, after its purchase by that entity, was occasionally used by the Oaks Club to train its staff.

Following the construction of the extension of 40th Street between Adeline Street and San Pablo Avenue in 1995, the Alameda-Contra Costa Transit District **(AC Transit)** constructed a small building at the corner of Adeline and 40th to serve as a bathroom for transit drivers calling at the bus stops located on both sides of 40th Street. Its location is shown on Figure 3.

The other structures on the Oak Walk Site at the close of the 20th Century were either single or multi-family residential buildings, some of which had garages or other outbuildings. The Oaks Club purchased all of those buildings in December 1991.

1.1.4 21st Century History

None of those structures present on the Oak Walk Site in 2000 were compliant with modern building codes and were generally in a very dilapidated condition. By late 2004, all had become vacant. Plate 1 is an aerial photograph of the Oak Walk Site flown on April 19, 2003 prior to its redevelopment.

The whole of the property was cleared for redevelopment in 2004. However, the residential structures originally located at 1077½, 1079, 1083, 1089 and 1089B 41st Street (see Figure 3 for locations) were not demolished. They were temporarily relocated before they were placed on new foundations on the 41st Street frontage and architecturally restored after remediation work on that portion of the site was completed. The building formerly at 1079 41st Street is now at 1077 41st Street, and the others moved as follows: the building at the 1083 address moved to the new address 1079 41st Street, the building at 1089 moved to 1081 41st Street, the building at 1089B moved to 1083 41st Street and the building at 1077½ moved to 1085 41st Street. Those new locations are shown on Figure 2.

In addition, the three-story residence that had been located at 1077 41st Street (see Figure 3 for location) was moved to a new location which now has the address 4011 Adeline Street and is shown on Figure 2.

On June 30, 2007, Bay Rock Oaks, LLC (**Bay Rock Oaks**) of Oakland California, a California Limited Liability Company, purchased the property within the boundary shown on Figure 3 from the Oaks Club. Subsequently, on March 14, 2008, a small parcel near the intersection of 40th and Adeline Streets to which, as described above, the three story structure formerly located at 1077 41st Street (see Figure 3 for location) had been moved, was transferred from the ownership of Bay Rock Oaks to the City of Emeryville's Redevelopment Agency (**ERDA)** and integrated with adjacent land to the east to form the property now known as 4001 Adeline Street, which is shown on Figure 2. The Housing Consortium of The East Bay (**HCEB**) has redeveloped the structure moved to that site as a four-plex for housing low income persons with developmental disabilities.

Redevelopment of the site within the boundaries shown on Figure 2 was completed in January 2009.

The Oak Walk Site now includes three new structures that are designated Buildings 1, 2, and 3 on Figure 2. Building 1 is located at the intersection of 40th Street and San Pablo Avenue. Its ground floor is occupied by two large retail spaces. Above that are one one-bedroom and one two-bedroom condominium residences. The commercial spaces on the ground floor of Building 1 have the addresses 4000 and 4010 San Pablo Avenue. The residences on the upper floor have the addresses 4002 and 4008 San Pablo Avenue.

Building 2, which has three stories, is located at the northwestern corner of the site at the intersection of 41st Street and San Pablo Avenue. The ground floor of that structure includes a retail space, two two-bedroom town homes and one three-bedroom town home. The upper floors of that building feature two one-bedroom condominiums and two two-bedroom condominiums. The commercial space on the ground floor of Building 2 has the address 4098 San Pablo Avenue. The residences on the ground floor have the addresses 1087, 1089 and 1091 41st Street. The four units on the upper floors of that building have the addresses 1093, 1095, 1097 and 1099 41st Street.

Building 3 is a four-story residential building, which is comprised of a total of 44 one-, two- and three-bedroom condominium and townhome units with a 61 car garage that occupies a portion of the ground floor. The garage is accessible from 40th Street. A restroom facility for AC Transit is located, as shown on Figure 2, on the ground floor of Building 3. It is accessed by a door opening onto 40th Street. The residential units in Building 3 have the address 1122 40th Street, Unit Nos.1 through 44.

As is also shown on Figure 2, an outdoor parking lot is accessed from both San Pablo Avenue and 40th Street and there is a small public playground accessed from 41st Street in the northeastern corner of the site.

1.2 Site Ownership and Use

With the exception of the five single family residences that front onto 41st Street, the whole of the Oak Walk Site is currently owned by Bay Rock Oaks. There are site easements for the public playground that is located on 41st Street and a bathroom for AC Transit drivers that is accessed from 40th Street. The locations of both of those facilities are shown on Figure 2.

The current ownerships of the single family residences, which are located as shown on Figure 2, are as follows:

Address	Owner
1077 41st St.	Evan Pippen
1079 41st St.	Bernadette S. Arias
1081 41st St.	Duong C. Nguyen
1083 41st St.	Jessie B. Pollard
1085 41st St.	Yang Wang

1.3 Anticipated Future Use

The Oak Walk Site is expected to remain in mixed residential and commercial use for the foreseeable future. That use is consistent with the City of Emeryville's planning and zoning requirements.

1.4 Site Characterization Program

The San Joaquin Company Inc. (**SJC**) completed an extensive environmental and geotechnical engineering site characterization program for the Oak Walk Site in 2005 (The San Joaquin Company Inc. 2005, 2004a, b, c). The scope of initial investigation included excavation of eight exploratory trenches (Nos. 1-8), drilling of two cone penetrometer test holes (CPT-1 and CPT-2), two geotechnical engineering borings (BG-1 and BG-2), and six environmental exploratory borings (BE-1 through BE-6) and installation of 21 groundwater-quality monitoring wells (MW-2 through MW-8 and MWT-1 through MWT-14). One existing groundwater extraction well, MCEW-1, which had been installed for the City of Emeryville, was also utilized for the site characterization program. The locations of those trenches, borings and wells are shown on Figure 4. Their latitudes and longitudes and the elevations of the well casing and the ground elevations at the well heads and boring locations at the time they were installed are listed in Table 1. The logs of the trenches, wells and borings are compiled in Appendix F, together with those of off-site wells and borings, the locations of which are shown on Figure 5.

Depths to groundwater measured in the on-site monitoring wells are recorded in Table 5. The results of analyses of soil samples recovered from on-site borings, wells and trenches are compiled in Tables 2 and 3. The results of analyses of groundwater samples recovered from the on-site monitoring wells exploratory trenches and remediation pits are compiled in Table 6.

In addition to the trenches, wells and borings drilled by SJC, geotechnical and geochemical data was available from wells and borings installed for the former Dunne and Boysen Paint Sites, the San Francisco French Bread Site, the Celis Site and the Andante Site (see Figure 5 for locations). The results of analyses of soil samples and groundwater samples recovered from those wells and borings are compiled in Tables 4 and 7, respectively.

SJC’s principal findings derived from the site characterization work are summarized below.

1.4.1 Geology

The subject property is situated on the eastern side of San Francisco Bay in the California Coast Ranges section of the Pacific Border physiographic province.

As is typical of sites in the neighborhood, the subject property is underlain by fill that varies in thickness from approximately 3 to 10 feet. Beneath the fill are strata of alluvial fan deposits of the Quaternary-age Temescal Formation that is comprised of inter-fingering lenses of clayey gravel, sandy silty clay and sand-clay-silt mixtures (Radbruch 1957). At the site, this formation is some 20 ft. to 30 ft. thick and lies unconformably over earlier Quaternary continental and marine sands, clays and gravels of the Alameda Formation, the maximum thickness of which has not been fully explored in the region around the subject property, but is known to exceed 1,050 ft.

1.4.2 Hydrology

Temescal Creek flows in underground culverts along a generally east to west course approximately 0.5 miles to the north of the subject property and discharges into San Francisco Bay, the shore of which is today some 0.85 miles to the west of the site. Prior to circa 1880, after which it was filled to become the site of a housing tract, there was a 30-acre tidal flat that formed an embayment in the shoreline of the Bay at a distance of some 0.6 miles southwest of the Oak Walk Site.

Temescal Creek and the tidal flats of San Francisco Bay dominated the regional hydrology of the area prior to its urbanization in the late 19th Century. However, there were no known streams that existed during the historical period in the vicinity of the Oak Walk Site closer than Temescal Creek.

The majority of precipitation running off the roofs of the structures and the parking lot on the redeveloped Oak Walk property is directed into filtration beds. Water discharged from the filter beds and small areas of paving that drain into street gutters is directed into the City of Emeryville's storm water management system. That system drains to San Francisco Bay. Approximately 95% of precipitation falling on the site is either diverted into the filter beds or percolates into the subsurface.

1.4.3 Hydrogeology

The depth to the groundwater table in the area of the subject property reflects long term weather cycles as well as seasonal variations in local precipitation in the San Francisco Bay Area. Depending upon those factors, the piezometric level of the regional groundwater may be at elevations that vary between approximately 4 and 12 ft. below the ground surface (**BGS**) (The San Joaquin Company Inc. 2005).

The regional direction of groundwater flow in the area of the site is essentially from east to west but, locally, it is greatly influenced by zones and channels of permeable sands and gravels that are present in the subsurface. Areas where channels and zones of high-permeability soils are present extend from east to west across the site. However, such permeable facies are less pronounced along the southern boundary of the site at 40th Street. In close proximity to the northern boundary of the site along 41st Street, they are essentially absent.

Examination of Figure 6 shows that, at the scale of the site, the direction of groundwater flow beneath the Oak Walk property on November 8, 2004, was to the west at an average gradient of 0.0094 ft/ft. However, locally, due to the influence of channels of high permeability sands and gravels in the subsurface which, as is discussed in Sections 1.4.3.1 and 1.4.3.2 below, is otherwise dominantly composed of clayey facies, the direction of groundwater flow may be the northwest or southwest, or in intermediate compass directions, at gradients as great as 0.02 ft/ft. or as little as 0.01 ft/ft.

1.4.3.1 Hydrostratigraphic Sections

Information from the logs of the trenches, borings and wells drilled on the site and on the surrounding streets was synthesized to develop hydrostratigraphic sections along the lines A-A’, B-B’, C-C’, D-D’, E-E’, F-F’, G-G’ and H-H’ that are located as shown on Figure 4. The sections are shown on Figures 7 through 14.

The cross sections show the fill material that covers the site and the underlying alluvial sediments, which are divided into six classes: very low-permeability fill that was used to backfill the excavations from which contaminated soil was removed as part of the site remediation (see Section 1.6 below); very low-permeability soil that was created by excavating and re-compacting soils in other areas of the site; the following undisturbed natural soils: a) the very low-permeability clays and silty clays; b) the slightly more permeable sandy clay and clays with some silt, sand or gravel (*i.e.,* soils that are dominantly clayey, but which have small lenses and inclusions of coarser facies); c) permeable silts, clayey gravels and sands; and d) highly permeable gravels that are free of silty or clayey fractions. That presentation makes it possible to reduce the details of the stratigraphy to a tractable degree of complexity by distinguishing between the different soil types based on the properties that are of importance to the understanding of the distribution and transport of chemicals of concern (**COC**s) in the subsurface. However, it is not intended to represent the detailed geologic stratigraphy of the complex of inter-bedded and lenticular strata and paleo streambed deposits that are present in the alluvial fan on which the Oak Walk Site is located.

Also shown on the cross sections are the locations from which soil samples were recovered on, or close to, the section lines. The concentrations of TPHg, TPHd (which includes diesel, mineral spirits and components of other middle-distillate petroleum hydrocarbons) and the critical analyte, benzene, that were detected in those samples, which were recovered before the site was remediated, are noted adjacent to the sampling locations.

The hydrostratigraphic cross sections reveal that beneath some areas of the Oak Walk Site there are relatively high-permeability facies that include in-filled paleo streambed channels.

1.4.3.2 Net Permeable Facies

To assist with understanding of the distribution of high-permeability channels in the subsurface beneath the Oak Walk Site, the net permeable facies diagram shown on Figure 15 was constructed.

The isochores shown on the Figure are for the 5-20 ft. BGS interval, which is the interval between the typical depth to groundwater and the typical maximum depth to which the subsurface is affected by petroleum hydrocarbons. The permeable intervals summed to compute the net permeable facies were the sandy clays, clays with some silt, sand or gravel, and highly-permeable gravels.

Areas shown on Figure 15, where the net permeable facies in the subsurface exceed 50% in the selected interval are highlighted, provide a good visual image of the areal distribution of permeable zones and channels beneath the site through which contaminants of concern have preferentially migrated across the Oak Walk Site following their release at the paint factory sites to the east of Adeline Street, at the Celis Site beneath 40th Street, and at the former SFFBC site.

The areas and channels of permeable soil detected beneath the Oak Walk Site are not confined to that property alone. They extend westward beneath San Pablo Avenue and eastward beneath the adjoining Ennis property and across Adeline Street under the Frank Dunne and Boysen Paint Sites at least as far as the California Linen Site (**California Linen**), which is located to the east of Linden Street in Oakland. The locations of channels and areas of highly-permeable soil in the neighborhood are shown on Figure 5. That figure was prepared by The San Joaquin Company Inc. (**SJC**) at the request of the ACEHS (Alameda County Health Care Services 2006) and was developed from available data from the Andante Site (The San Joaquin Company Inc. 2003), the Oak Walk Site (The San Joaquin Company Inc. 2009b, 2005, 2004a,b,c), the Frank Dunne Site, the Boysen Paint Site and the California Linen Site.

Figure 5 presents DEC’s best estimates of the courses of the paleo streambed channels that pass through the area and the continuity of the high permeability sand and gravel deposits that are characteristic of those channels. The interpretations are based on a preponderance of the available stratigraphic, hydrogeologic and geochemical data. With the exception of the paleo streambed that crosses from the northern to western boundaries of the Andante property and those that were exposed during the remediation of Oak Walk Site, the location and continuity of the streambed deposits on the other properties and streets as shown on the drawing have not been observed in open excavations.

As is shown on Figure 5 there are two principal channels of high-permeability deposits that cross the Oak Walk Site. One passes from the Ennis property westward towards San Pablo Avenue through the northern portion of the subject property. In addition, there is a second narrow, but well-defined channel of paleo streambed deposits that extends from the southwest portion of the Ennis property across the Oak Walk Site in a northeast to southwest direction and continues beneath 40th Street to cross the boundary of the Andante Property to the south and continues through that site to pass beneath San Pablo Avenue. That paleo channel was originally discovered in 2003 when SJC was remediating the Andante Site (The San Joaquin Company Inc. 2003) and was confirmed to cross 40th Street when its sandy and gravely deposits were again encountered in Exploratory Trenches 3 and 11 (see Figure 4 for locations) on the Oak Walk Site (The San Joaquin Company Inc. 2009b, 2004c).

The streambed deposits on the Andante Site were excavated from the channel and clay plugs were installed across the channel where it crossed the boundaries of that site at 40th Street and at San Pablo Avenue.

As part of the site characterization program conducted at the Oak Walk Site, SJC recovered samples of *in situ* silty clay from boring BG-2 (see Figure 4 for location) at a depth of 6.5 ft. and a second sample of similar material from a depth of 6 ft. in Monitoring Well MW-7. Constant-head permeability tests conducted on those samples found that the soils had hydraulic conductivities of 2.51×10^{-9} cm/sec and 2.95×10^{-8} cm/sec, respectively (The San Joaquin Company Inc. 2005). Those test results confirmed the extremely low permeability of the silty clays beneath the site and supported the interpretation that migration of contaminants in groundwater is controlled by the silts, sands and gravels that were deposited on the site in the paleo streambed channels and other alluvial fan deposits laid down during the Recent geological era.

The hydrogeologic features described above are compatible with the published geology of the region, which is covered by an alluvial fan that, in the neighborhood of the Oak Walk Site, includes bands of stream and levee deposits (California Regional Water Quality Control Board - San Francisco Bay Region 1999).

1.4.4 Chemicals of Concern in Soil and Groundwater

Examination of Tables 2 and 6 and Figures 16 through 17 shows that soil and groundwater over essentially the whole of the Oak Walk Site prior to the remediation of the site was affected by hydrocarbons that are typical of components of a mixture of industrial solvents in the middle distillate range and fuel hydrocarbons that were released at the sources discussed in Section 1.5 below.

Analyses for the presence of petroleum hydrocarbons in both soil and groundwater were performed using gas chromatography/mass spectrometry in compliance with applicable US EPA Standard Methods that included analyses designed to detect compounds having carbon-chain lengths in the same range as diesel fuel, in the same range as gasoline, and in the range of generic mineral spirits.

The laboratory quantified the concentrations of compounds in the gasoline, diesel and mineral spirits range (which is a sub-range of the diesel range) as gasoline, diesel fuel, and mineral spirits, respectively. However, as is reflected in the notes in Tables 2 and 6, the laboratory flagged the instances where the chromatograms obtained from the sample analyses did not match their standard chromatogram for the specific hydrocarbon mixture that was used for the purpose of quantification of the concentrations of chemicals in the samples. These distinctions are important. At sites such as Oak Walk, where solvents in the subsurface in some areas were found to be mixed with fuel hydrocarbons, it is important, to the extent possible, to distinguish between areas where soil and groundwater have been affected only by components of fuels (particularly gasoline), from those that are affected by a commingling of petroleum fuel products and solvents, and from areas that are affected by industrial solvents alone.

Gasoline fuel contains significant concentrations of benzene, toluene, ethylbenzene and xylene isomers (**BTEX** compounds), which, because of their toxic characteristics, are of particular environmental concern. Conversely, if samples are affected by mixtures of gasoline-range hydrocarbon compounds that do not contain, or contain only very low concentrations of BTEX or other chemicals of particular concern, they pose a greatly reduced risk. Such distinctions between fuel hydrocarbons and other products such as industrial solvents are also important to an evaluation of the source or sources of chemicals of concern affecting different areas of the subsurface beneath the Oak Walk Site.

Issues related to the specific mixtures of petroleum hydrocarbons present at different locations in the subsurface of the Oak Walk Site and their relationship to known sources are discussed later in this report in Section 1.5, but, as is discussed in Sections 1.4.4.1 through 1.4.4.6 below, certain of the general characteristics of the hydrocarbon that were detected can be elucidated by a direct examination of the concentrations of analytes detected and the associated laboratory notes that are presented in Tables 2 and 6.

1.4.4.1 Middle Distillate-range Petroleum Hydrocarbons

As can be seen on Figure 18, the areas where the concentrations of middle distillate-range petroleum hydrocarbons were present in soil or groundwater at concentrations in excess of the applicable Environmental Screening Levels (**ESL**s) (Regional Water Quality Control Board - San Francisco Bay Region 2008) are distributed in a wide band that runs from the San Pablo Avenue frontage of the Oak Walk Site eastward to the boundary of the site where it adjoins the Ennis property. That band connects with a similar band that extends northward from the 40th Street frontage of the Oak Walk Site through to the approximate center of the property. That distribution correlates well with the distribution of high-permeability soils, which is shown on the net permeable facies diagram that is presented on Figure 15.

Prior to remediation of the site and installation of additional wells and opening of additional exploratory trenches, the highest concentrations of middle distillate-range hydrocarbons were detected in a groundwater sample recovered from Monitoring Well MWT-11 (see Figure 18 for location) on November 6, 2004 that contained mineral spirits at a concentration of 3,500 μg/L. In that same area of the site, where sand-filled channels were present in the subsurface, concentrations of mineral spirits in groundwater in Monitoring Wells MWT-7 and MWT-14 on November 6, 2004 were also elevated at 3,200 μg/L and 1,200 μg/L, respectively. Relatively high concentrations of middle distillate-range hydrocarbons were, at that time, also present along the southwestern boundary of the site where 3,200 μg/L of mineral spirits were detected in a sample recovered from Monitoring Well MWT-2 and 2,100 μg/L of the same material was detected in groundwater in Monitoring Well MW-2 on May 19, 2004.

> **Note:** At sites where soils contain organic matter, as is the case at the Oak Walk Site, particularly in strata near the surface, dispersed detections of low concentrations of diesel-range compounds often can be ascribed to the vegetable matter rather than a petroleum hydrocarbon (Zemo 1997, Zemo and Synkowiec 1997). This problem can be resolved by using silica gel treatment at the time of analysis, but to ensure that all substances in the subsurface were detected during the pre-remediation site characterization program, that pre-treatment was not used. However, after the range of COCs in the subsurface was well understood, pretreatment with silica gel was used in later phases of the investigation.

1.4.4.2 Gasoline-range Petroleum Hydrocarbons

As is shown on Figure 19, which also applies to conditions prior to site remediation, in the case of gasoline-range petroleum hydrocarbons, the concentrations of those analytes in the subsurface exceeded the ESL over an area that almost completely covers the site. This is reflective of the commingling of gasoline fuel released at the Celis and SFFBC Sites, which are located as shown on Figure 5 and discussed further in Section 1.5 below, with the high concentrations of gasoline-range compounds in the paint solvents that migrated down the groundwater gradient from the Dunne and/or Boysen Paint Sites to the east of Adeline Street (see Figure 1.5 for locations), that are also discussed in Section 1.5.

The very high concentration of gasoline-range hydrocarbons in Monitoring Well MWT-7 (see Figure 17 for location), at 56,000 µg/L on May 19, 2004, was notable because no BTEX compounds, with the exception of a trace of benzene, were detected in the sample of groundwater recovered from that well. That condition indicates that the source of the gasoline-range hydrocarbons in that area of the site was the release of solvents that appeared at the paint manufacturing facilities to the east of Adeline Street rather than the fuel hydrocarbons that were released along 40th Street. However, high concentrations of gasoline-range hydrocarbons that did include BTEX compounds were detected in Monitoring Wells MW-2, MWT-2 and WCEW-1 on May 19, 2004, at 49,000 µg/L, 28,000 µg/L and 3,700 µg/L, respectively. Those data indicated that groundwater contamination in that area of the site originated, to a large part, from the fuel hydrocarbon releases at the former Celis service station and, to a more limited extent, at the former SFFBC tank site.

1.4.4.3 BTEX Compounds

As is shown on Figure 20, concentrations of benzene in soil or groundwater beneath the site prior to remediation that exceed the applicable ESLs were confined to a limited area along the 40th Street frontage of the site. That area extended no more than 55 ft. northward from the Oak Walk Site's frontage with that thoroughfare, but it extends eastward some 210 ft. from San Pablo Avenue. Within that area, the highest concentration of benzene in groundwater was detected in the sample recovered from Monitoring Well MW-2 on May 19, 2004, at a concentration of 7,900 µg/L.

As can be seen by examination of Tables 2 and 6, in addition to benzene, each of the three other compounds in the BTEX group (*i.e.*, toluene, ethylbenzene and xylene isomers) were also present in soil and/or groundwater at some locations beneath the site at concentrations that exceed their ESLs. However, such instances are few, and where they occur, they were generally coincident with the presence of benzene in the subsurface media.

> **Note**: Because the BTEX compounds and fuel oxygenates are volatile organic compounds, they can be measured in analyses that scan for that range of chemicals or by more restricted analyses specifically designed to detect them. This resulted in the BTEX compounds and MTBE being included in the Certificates of Analyses that were for the VOC scans as well as those from the separate analyses for components of gasoline fuel. To simplify presentation, redundant results for BTEX and MTBE are not included in Table 2 and 6. If there was a variance between the concentrations of those chemicals as measured in the two types of tests, the higher value was entered into the Tables.

1.4.4.4 MTBE

As can be seen by examination of Figure 20 and Tables 2 and 6, the concentrations of the gasoline additive MTBE in soil or groundwater beneath the property prior to remediation nowhere exceed its ESL in soil or groundwater.

1.4.4.5 Polynuclear Aromatic Compounds and Other Analytes

Tables 2 and 6 also show that there are a few instances where the polynuclear aromatic compounds (**PNA**s), naphthalene and 2-methyl-naphthalene, were present in soil and groundwater beneath the Oak Walk Site. Those PNAs may be components of diesel fuel or of industrial solvents. At the Oak Walk Site prior to its remediation, napthalene was detected at its highest concentrations in groundwater in samples recovered from monitoring wells MW-2 and MWT-2 (see Figure 4 for locations), at 490 μg/L and 340 μg/L, respectively, which suggests it was principally associated with diesel released from the former Celis service station site. Some very low concentrations of PNAs were detected in some soil samples from more widely-dispersed locations, but the preponderance of those additional detections was also in areas that were affected by fuel hydrocarbons.

Detections of 2-methylnaphthalene occurred in some samples of soil. As can be seen in Table 2, those detections generally occurred in samples of soil that were also affected by naphthalene. None was detected in samples of groundwater. No other PNAs were detected either in soil or groundwater.

The detections of the two PNAs were sparse and widely distributed over the area of the Oak Walk Site. This is consistent with their association with both fuel hydrocarbons and solvents and, for that reason, their presence does not raise unusual concern that releases of additional products may have occurred at some source beyond the known releases of fuels and solvents.

1.4.4.6 Example Chromatograms

To illustrate some of the issues discussed above that relate to the identification of specific petroleum products in soil and groundwater, chromatograms produced from the laboratory analyses of samples of groundwater recovered from Monitoring Well MWT-14 and the soil sample recovered from a depth of 10.5 ft BGS in the boring drilled for the installation of Monitoring Well MWT-6 are presented in Plates 3 through 6. Those chromatograms can be compared with the standard chromatograms for gasoline fuel, mineral spirits, Stoddard Solvent, paint thinner and diesel fuel that are presented in Plates 7 through 11.

The chromatogram from the EPA Method 8260B analysis for gasoline-range compounds performed on the sample of groundwater from Monitoring Well MWT-14 is shown on Plate 3. It clearly does not match the standard chromatogram for gasoline fuel that is shown on Plate 7. Compared to the gasoline fuel standard, the sample’s chromatogram reflects the presence of many more compounds at high concentrations in the 10.0-minute to 12.5-minute range, while it lacks peaks similar to those seen in the standard in the 2.5-minute to 7.5-minute range. As is noted in Table 10, the laboratory could not match the detected mixture of hydrocarbon compounds present in the sample of groundwater recovered from Monitoring Well MWT-14 to gasoline fuel, although for reporting purposes it did quantify its concentration as "equivalent" to 4,600 μg/L of gasoline.

The chromatogram on Plate 4 is from the analysis of a sub-aliquot of sample MWT-14 for total extractable petroleum hydrocarbons (**TEPH**) by EPA Method 8015. It shows the presence of hydrocarbons over a wide range of carbon-chain lengths that correspond to chemicals that emerged into the gas chromatograph in the 3-minute to 9-minute period following the injection of the sample into that equipment. The large numbers of compounds present are concentrated in two groups, those grouped around the 4.6-minute interval and those around the 7.0-minute interval. As can be seen in the standard chromatogram shown on Plate 11, compounds in that range are also present in diesel fuel, but the chromatographic pattern produced by the analysis of Sample MWT-14 for TEPH is dissimilar to the pattern for diesel fuel. The chromatogram does have a multiplicity of peaks in the mineral spirits range and the laboratory quantified the concentration of the detected mixture in terms of a similar concentration of mineral spirits (see Table 6). However, because it did not match either the laboratory standard for diesel fuel, the standard for mineral spirits or any other recognizable petroleum product, the specific product represented by the chromatogram shown on Plate 4 cannot be determined, nor can it be determined whether the chromatographic pattern represents a single product or two separate petroleum hydrocarbon mixtures that have commingled. When that chromatogram is taken together with chromatogram from the gasoline-range analysis of the sample, the most reasonable conclusion that can be reached is that groundwater at the location of monitoring well MWT-14 is affected by a petroleum hydrocarbon product, or a mixture of products, dissimilar in characteristics to fuel hydrocarbons, but which contain components with molecular length in the same range as solvents that are used in the paint manufacturing industry.

The above interpretation is consistent with the location of Monitoring Well MWT-14, which is hydrogeologically remote from sites adjacent to the southern boundary of the Oak Walk Site where releases of fuels are known to have occurred. It is also consistent with the fact that Monitoring Well MWT-14 intersected a zone of permeable facies that appears to be aligned with, and is likely a continuation of, the channels of high-permeability soil found on the former Dunne Paint manufacturing site to the east of Adeline Street.

Chromatograms from analyses performed on the sample of soil recovered from a depth of 10.5 ft. BGS in the boring drilled for Monitoring Well MWT-6 (sample MWT-6-10.5) are shown on Plates 5 and 6. Soil at depth in that boring emitted a solvent odor and, as noted in Table 2, the laboratory detected 51 mg/Kg of a mineral spirits-range compound in a mixture that did match that product's standard. As is reported in Table 2, no other extractable petroleum hydrocarbon compounds were detected by the analyses performed on sample MWT-6-10.5, except for a mixture in the gasoline range at a concentration of 860 mg/Kg which, although quantified as such for reporting purposes, did not match the gasoline fuel standard.

Plate 5 is a reproduction of the chromatogram from the EPA Method 8260B analysis for gasoline-range compounds performed on sample MWT-6-10.5. It clearly does not match the standard chromatogram for gasoline fuel that is shown on Plate 7. As was the case for the groundwater sample from Monitoring Well MWT-14, compared to the gasoline fuel standard, the sample’s chromatogram reflects the presence of many more compounds at high concentrations in the 10.0-

minute to 12.5-minute range, while it lacks peaks similar to those seen in the standard in the 2.5-minute to 7.5-minute range.

The chromatogram from the analysis of TEPH in sample MWT-6-10.5, when compared to the standard chromatogram for diesel that is presented on Plate 11, shows clearly that a diesel fuel product is not present. Only compounds in the approximate 3.5- to 7.0-minute range are prominent in the chromatogram from the sample, while there are no peaks in the remaining 7.0- to 12.0-minute interval where there are abundant peaks on the standard diesel fuel chromatogram. However, as the laboratory reported, the chromatogram from the analysis of sample MWT-6-10.5 for TEPH is a good match for the standard chromatogram for mineral spirits shown on Plate 8.

In summary, the chromatograms from sample MWT-6-10.5 show that the soil at the location of Monitoring MWT-6 appears not to be affected by petroleum hydrocarbons that can be ascribed to a source or sources where fuels were released to the subsurface, but, as is consistent with olfactory indicators detected in the field, the area is affected by solvents, the only known sources of which in the neighborhood of the Oak Walk property are the sites of the former paint manufacturing facilities that, as is shown on Figure 5, were located to the east of Adeline Street.

The various characteristics of the analytical results obtained for the sample of groundwater from Monitoring Well MWT-14 and soil from the boring drilled for Monitoring Well MWT-6 are, in several respects, shared by the results obtained for a large number of other soil and groundwater samples from the Oak Walk Site recovered from locations where the chemicals of concern could not be unambiguously identified as affected by releases of fuels are confined to an area in the south of the property adjacent to 40th Street where their unique chromatographic signatures have been clearly identified by the laboratory.

In the central and northern areas of the property that are to the south of its northern boundary along 41st Street, the subsurface appears to be affected by petroleum hydrocarbon mixtures that were not derived from fuels, but which have characteristics compatible with solvents used in the paint manufacturing industry.

It also appears that, in the southern portion of the site, there has been significant commingling of different petroleum products that include both fuel and solvents that were released from one or more of the sources that have been identified in the neighborhood of the Oak Walk property.

1.4.4.7 Heavy Metals

Table 3 presents the results of analyses of soil beneath the Oak Walk Site for the 17 heavy metals that are of significant regulatory concern at Brownfield sites. No heavy metals were detected at concentrations greater than those that are typical of their natural presence in the alluvial materials that originated in the Oakland Hills to the west of the subject site (Lawrence Berkeley National Laboratory 1995, Bradford *et al* 1996). As can also be seen in the Table, a sample recovered from a depth of 13.5 ft. in boring BE-1 (see Figure 3 for location), was, as a conservative check, analyzed for Chrome VI. None was detected.

1.4.4.8 Pre-remediation Isocons of Analytes of Concern in Soil and Groundwater

When groundwater beneath a site has been affected by contaminants, it is traditional to construct isocons of the concentration of the chemicals of primary concern that have been detected in that medium. Similar isocons are sometimes constructed for contaminant concentration in soil. While the latter plots can be useful, they are often difficult or practically impossible to construct in many instances. This is particularly true at sites, such as is the case on the Oak Walk Site, located on alluvial fans where the subsurface includes channels and zones, often of small representative dimension, of high permeability facies in a matrix of clayey or otherwise low permeability facies.

As expected, prior to site remediation we found that there was insufficient spatial continuity, even over relatively small areas, of the measured concentrations to plot meaningful isocons for many of the chemicals of primary concern, such as benzene, in soil at the Oak Walk Site. This finding simply reflects the fact that zones of sand and other permeable facies are distributed in a complex manner in what is, otherwise, essentially a continuum of nearly impermeable clay and silty clay soils.

It was possible to draw isocons for gasoline-range hydrocarbons and middle distillate petroleum hydrocarbons in groundwater beneath the site prior to remediation. Those plots are shown on Figures 16 and 17, respectively. However, by necessity, they are interpretive and may present a somewhat misleading image of the distributions of those petroleum hydrocarbons across the site. For example, the isocons for gasoline-range compounds on Figure 17 rise to a peak of 56,000 μg/L at Monitoring Well MWT-7 and isocons with a 5,000 μg/L interval are closely clustered around it. This focuses the reader's attention to that spot, but the fact is that over large areas of the site where few, if any, isocons of gasoline-range compounds appear in Figure 17, the concentrations of gasoline-range compounds are interpreted to be as high as 5,000 μg/L, which concentration is greatly elevated compared to the applicable ESL of 210 μg/L. An alternate approach whereby a smaller isocons interval, even one as great as 1,000 μg/L, were selected in an attempt to enable a reader to better understand visually the distributions of high concentrations of the gasoline-range compounds over a greater area of the site would also be impractical. Such selection would render the area around MWT-7 nothing more than a mass of color where the smaller interval isocons would be drawn essentially one upon the other.

The difficulties described above are somewhat less severe in the isocon plot for middle-distillate petroleum hydrocarbons that is shown on Figure 16, but DEC believes, in the case of this site, that the distribution and relative concentration of analytes of concern in the subsurface are best understood by examination of the area plots that are presented on Figures 18 through 21. Those diagrams consider the presence of contaminants in either soil or groundwater and clearly indicate areas of the site that were affected by middle-distillate and gasoline range hydrocarbons and by benzene and MTBE prior to remediation. They also better reflect the source of fuel hydrocarbons affecting the site and the influence of the channels and zones of high-permeability soils that transport solvents from sources to the east of Oak Walk across the site and under San Pablo Avenue. (**Note**: Maps showing the distribution of contaminants in soil and groundwater following remediation of the site are presented in Section 1.8.)

1.5 Sources of Contamination Affecting the Oak Walk Site

The program of environmental site characterization conducted at the Oak Walk Site that is described in Section 1.4 above showed that soil and groundwater beneath the property was affected by both fuel hydrocarbons and solvents (The San Joaquin Company Inc. 2005). Those materials were released into the subsurface at four separate locations. Three of the sources, two where paint solvents were released and one where fuel hydrocarbons were released, are located off the Oak Walk Site, while the fourth, at which a release of fuel hydrocarbons occurred, is today partially outside and partially inside the Oak Walk Site boundary. Each of those sources is discussed below.

1.5.1 The Former Dunne and Boysen Paint Sites

These sites are in close proximity to each other and are situated to the east of the Oak Walk Site beyond the adjacent Ennis property and Adeline Street. Their locations are shown on Figure 5. Paint was manufactured and paint solvents were stored in underground tanks at both of these facilities. In the case of the former Boysen Paint Site (also referred to in the regulatory records as Oakland National Engraving (**ONE Oakland**), contamination is also known to have been released from a sump on that property. Both are cited in regulatory records as sources of releases of regulated materials to the subsurface. Although it is probably the case, with the currently available information it is not possible to be certain whether or not the solvents released at Boysen Paint commingled with solvents released at the Dunne Paint Site. However, both contribute to the plume of paint solvents found to be affecting the subsurface beneath the Oak Walk Site. For the purpose of this report, those two release sites will be treated as if they are a single source.

Petroleum hydrocarbons in the gasoline and middle-distillate ranges, including compounds in the diesel and mineral spirits range, which can be ascribed to releases of solvents at the Dunne Paint Site and at the Boysen Paint/ONE Oakland Site, have been detected over essentially the whole area of the Oak Walk Site. There is also clear evidence that those materials are present at high concentrations in soil and groundwater under the Ennis property, which, as shown on Figure 5, is adjacent to the Oak Walk Site and lies between it and the former paint manufacturing sites.

The Alameda County Department of Environmental Health Department (**ACEH**) has assigned the case number RO72/RO73 to the Dunne Paint Site and the case number RO79 to the Boysen Paint/ONE Oakland Site.

1.5.2 The Former Celis Alliance Automobile Service Station

The location of the former Celis service station, which is today beneath the 40th Street right-of-way and adjacent to the Oak Walk Site, is also shown on Figure 5. Large quantities of fuel hydrocarbons were released from underground storage tanks on that site. The releases contaminated soil and groundwater over a wide area that is, today, occupied by the 40th Street right-of-way, a portion of the Andante condominium housing site to the south, a significant portion of the Oak Walk Site to the north, beneath San Pablo Avenue and property to the west of that thoroughfare. After the City of Emeryville Redevelopment Agency acquired the Celis Site by eminent domain for the purpose of extending 40th Street west from Adeline Street, a portion of the area of the subsurface affected by the release at that site was remediated by removal of contaminated soil down to some 9 ft. BGS and by a limited program of groundwater pumping. Some areas beneath the 40th Street right-of way to the east of, and up the hydrogeologic gradient from, the tanks were also partially remediated by excavation and off-site disposal of contaminated soil.

The Celis Site is recorded in California regulatory databases with the identifiers shown below:

> The California State Water Resources Control Board (**SWRCB**) has established the following Global ID for the Celis Site: T0600101794
>
> The California Regional Water Quality Control Board - San Francisco Bay Region (**RWQCB**) has been assigned the following case number to the Celis Site: 01-1938
>
> The ACEH Local Oversight Program (**LOP**), which is the lead agency for the site, has assigned the following case number to the Celis Site: RO453/RO567

Releases of fuel hydrocarbons and, to limited extent, motor oil from the Celis Site commingled beneath the Oak Walk Site with the paint solvents released at the Boysen and Dunne Paint Sites to the east.

1.5.3 The Former San Francisco French Bread Site

The San Francisco French Bread Company (**SFFBC**) formerly occupied a part of the Oak Walk Site that today fronts onto 40th Street. SFFBC installed two ten thousand-gallon underground storage tanks on their property, which had the address 4070 San Pablo Avenue (see Figure 3). One tank stored diesel and the other stored gasoline for use in the bread company’s fleet of distribution vehicles. The former locations of the tanks are shown on Figures 3, 4 and 5.

When the 1995 extension of 40th Street between Adeline Street and San Pablo Avenue was constructed by the City of Emeryville, the southern half of the tank sites became part of the street right-of-way and the northern half remained within the current boundaries of the Oak Walk Site. At that time, soil was remediated by excavation to a depth of 10 ft. over an approximately 20 ft. by 18 ft. rectangular area at a location coincident with the southern half of the former SFFBC tank pit. No further remediation of the portion of SFFBC tank site that is beneath 40th Street has occurred since then. However, the northern portion of the former SFFBC tank site was included in the remediation work conducted at the Oak Walk Site.

The SFFBC tank site is recorded in California databases with the identifications shown below.

> The SWRCB has established the following Global ID for the SFFBC Site: T0600101186
>
> The RWQCB has been assigned the following case number to the SFFBC Site: 01-1289

The ACEH LOP, which is the lead agency for the site, has assigned the following case number to the SFFBC Site: RO171

1.5.4 Oak Walk Site

With the exception of the small area of the former SFFBC property that is included in the Oak Walk Site, there are no sources of contamination on the subject property. However, in order to provide oversight of the site characterization and remediation of the Oak Walk Site, the ACEH has assigned the following case number to the Oak Walk Site: RO2733. At the request of the ACEH, the SWRCB established the following Geotracker Global ID for the Oak Walk Site: T06019705080.

1.6 Remediation

The Oak Walk Site was remediated in compliance with a Corrective Action Plan (The San Joaquin Company Inc. 2006a,b) that was approved by the ACEH (Alameda County Environmental Health Care Services 2006a,b) and included the following elements.

1.6.1 Remedial Excavations

To remove soil heavily affected by benzene and other petroleum hydrocarbons and to limit the potential health risk due to the presence of such soils beneath residential structures, two remedial excavations were opened at the locations shown on Figure 22. As shown on Figure 23, Remedial Excavation No. 1 (**RE-1**) had dimensions of 60 ft. x 110 ft. x 7 ft. deep, while Remedial Excavation No. 2 (**RE-2**), shown on Figure 24, measured 75 ft. x 215 ft. x 6 ft. deep. A total of 3,096.13 tons of affected soil from the remedial excavations and auxiliary pits required for extraction of contaminated groundwater and planting of trees was removed from the site and disposed at permitted landfills.

Confirmation soil samples were recovered from the floors of the remedial excavations at the locations shown on Figures 23 and 24. Those samples were analyzed for TPHd, TPHms, TPHg and the BTEX compounds. The results of the analyses are presented in Table 8.

The remedial excavations were backfilled with clean low-permeability engineered fill compacted to a minimum relative density of 90%. The hydraulic conductivity of the fill was in the range 1.52 x 10^{-8} to 7.82 x 10^{-8} cm/sec. The highest hydraulic conductivity in that range is less than the hydraulic conductivity of 1.0 x 10^{-7} cm/sec that was used for the design of the corrective action measures (The San Joaquin Company Inc. 2009b).

1.6.2 Extraction of Contaminated Groundwater

A groundwater extraction pit, designated Groundwater Extraction Pit No. 1 (**GEP-1**), was opened at the location shown on Figure 22. A total of 21,000 gallons of contaminated groundwater was extracted from this area of the site where 54,000 μg/L of TPHd, 81,000 μg/L of TPHms, 8,200 μg/L of TPHg, 1.4 μg/L of benzene, 3.6 μg/L of toluene and 2.2 μg/L of xylenes had been present. (See results of analysis of Sample No GEP-1A in Table 6). However, the mixtures of compounds present in the sample in the diesel and gasoline range did not have the characteristics of fuel hydrocarbons, which is consistent with the interpretation developed from the site characterization program that groundwater in that area of the Oak Walk Site is primarily affected by mineral spirits and other industrial solvents released at the up-gradient Boysen Paint and Frank Dunne Sites. As is also recorded in Table 6, following the extraction, as measured in sample GEP-1B, the concentrations of those contaminants in groundwater were reduced to 530 μg/L of TPHd, 810 μg/L of TPHms, 1,100 μg/L of TPHg, and no detectable traces of benzene, toluene or xylenes.

1.6.3 Re-engineering of Site-wide Soils

Due to the soft native soils on the Oak Walk Site, construction of foundations for buildings required improvement of the soil in the upper 3 ft. to 6 ft. BGS. To accomplish this, the geotechnical engineering plan (The San Joaquin Company Inc. 2004b) for the site called for soil beneath the whole of Building 3 (see Figure 2 for location) to be excavated to a minimum depth of 6 ft. After conditioning, this soil was returned to the excavation as engineered fill compacted to a relative density of 90%. The re-engineered soil beneath Building 1 has a depth of 7 ft., which was required by the environmental corrective action plan, which in this area exceeded the 6 ft. geotechnical engineering depth requirement. The depth of re-engineered soil beneath Building 2 and the single family residential structures fronting onto 41st Street is a minimum of 4 ft. Soil beneath the paved outdoor parking was re-engineered to a minimum depth of 3 ft. Together with the remedial excavations; those excavations preclude the presence of any previously unknown sources of hydrocarbons on the site.

The effect of the geotechnical engineering soil improvement work described above was to create a stratum of very low permeability soil beneath both the residential and commercial ground floor units in the new building complex that has hydraulic conductivity within the range 1.52 x 10^{-8} to 7.82 x 10^{-8} cm/sec. That range is less than the 5.65 x 10^{-7}cm/sec hydraulic conductivity that was used for the design of the corrective action measures (The San Joaquin Company Inc. 2009b).

1.6.4 Installation of Elastomeric Membrane

As directed by ACEH and specified in the approved Corrective Action Plan (The San Joaquin Company Inc. 2006a, 2006b, Alameda County Health Care Services 2006a,b), a Liquid Boot® elastomeric membrane was placed beneath the floor slabs of all first floor residential and commercial space in the buildings on the Oak Walk Site. Liquid Boot® has a hydraulic conductivity of less than 1.0 x 10^{-11} cm/sec (Tofani 2009) as measured by ASTM Standard Test D4491 (American Society for Testing and Materials 2004). It does not break down in the presence of petroleum hydrocarbons when subjected to the ASTM Standard D543-06 test (American Society for Testing and Materials International 2006) and it has been shown to gain less than 1% in weight when exposed to liquid benzene at a concentration of 136,000 μg/L. At that concentration, a 60 mil thickness of the material has a mean benzene diffusion coefficient of 2.1 x 10^{-13} m^2/day (GeoKinetics, Inc. 2008, Tofani 2009). The competency of Liquid Boot® as a vapor barrier to inhibit the passage of hydrocarbons has been confirmed by the DTSC in their specification that it should be used on sites where the subsurface contains methane that could migrate into the interiors of school buildings. (California Department of Toxic Substances Control 2005) Methane (CH_4) is the smallest of the hydrocarbons and is only one carbon chain unit long.

Benzene (C_6H_6), the smallest molecule of the suite of COCs affecting the Oak Walk Site is much larger than methane. Thus, it is obvious that if Liquid Boot® is specified by the DTSC to mitigate the passage of methane through the floors of buildings, it would be even more effective in inhibiting the migration of benzene vapors and the vapors of even larger molecules present in the fuel hydrocarbons and solvents affecting the Oak Walk site.

The Liquid Boot® membrane was sprayed over a geotextile substrate laid over a 4-in. thick gravel base until it reached a minimum thickness of 60 mils. The membrane was also installed vertically along the interior sides of the buildings' strip footings and column bases, as well as around each utility pipe or other penetration passing through the floor slabs. That technique ensures that there are no gaps anywhere in the completed membrane over the entire area of the occupied space. In addition to the areas beneath ground floor occupied space, a Liquid Boot® membrane was installed so as to fully seal the floor and walls of the elevator pits in Building 3 of the new development.

Following installation and curing, 105 mil thick Liquid Boot® Ultra Shield-1000 geotextile fabric was laid over the membrane to protect it during installation of the concrete floor slabs. Figure 25 illustrates the details of the slab, Liquid Boot® membrane and the protective Ultra Shield fabric.

Figure 26 shows where the floor slabs on the site are underlain by Liquid Boot.®

1.7 Additional Subsurface Investigations and Monitoring Wells

Following site clearance and backfilling of the remedial excavations, it was possible to excavate additional trenches to explore zones where earlier data had indicated the likely presence of permeable zones in the subsurface. Three additional exploratory trenches (Nos. 9 through 11) were excavated. Their locations are shown on Figure 4. The results of analyses of soil samples recovered from them are presented in Table 2.

When the site had been backfilled with engineered fill, at the insistence of a consultant retained by the City of Emeryville, soil-gas tests were conducted at ten locations designated SG-1 through SG-10. The test locations are shown on Figure 4. DEC's Professional Engineer in Responsible Charge of the remediation forcefully pointed out that due to the shallow groundwater and the presence of subsurface soil dominated by clays and silty clays, regulatory specifications (California Department of Toxic Substances Control and California Regional Water Quality Control Board – Los Angeles Region (2003) and the American Society for Testing and Materials (American Society for Testing and Materials (2000d) prohibit use of soil-gas testing at the Oak Walk Site. Despite those prohibitions, the City's consultant was persistent and it was judged to be more practical to perform the tests than attempt to further educate her. The results of the soil-gas tests, including the results of analyses of soil samples recovered from below the bottoms of the gas sampling borings, are presented in Table 11. With one exception, none of the soil samples or gas samples from the soil-gas tests contained any analyte in excess of its applicable ESL (The San Joaquin Company Inc. 2009b). The exception was the gas sample from Location SG-10 which contained an elevated concentration of benzene. However, when a site-specific analysis was performed using the same analytical model used by the RWQCB (California Regional Water Quality Control Board - San Francisco Bay Region (2005), it was shown that the concentration of that analyte in the soil-gas at SG-10 was below the site-specific ESL. Despite those findings, DEC did not rely in any way on the results of the soil-gas analyses because, for the reasons stated in the regulatory guidance and national standard documents, such data is totally unreliable for sites such as the Oak Walk property.

Excavation of the site for environmental and geotechnical engineering remediation required the removal of Monitoring Wells MWT-1 through MWT-10 and MW-6. After the new buildings were constructed, it was possible to install additional monitoring wells (The San Joaquin Company Inc. 2009b). Those were numbered MW-6A, MW-9 through 15 and MW-16A, -16B and -16C and are located as shown on Figure 4 The results of analyses of soil samples recovered from the well borings and groundwater subsequently recovered from the wells are compiled in Tables 2 and 6, respectively.

1.8 Post-remediation Groundwater-quality Monitoring Rounds

In compliance with the approved Corrective Action Plan (The San Joaquin Company Inc. 2006 a,b) as modified by the policy promulgated by the State Water Resources Control Board, on September 21-24 2009, SJC conducted the first post-remediation round of groundwater-quality monitoring at the Oak Walk property. On September 21, 2009, URS, Inc. (**URS**), the City of Emeryville's consultants, conducted a parallel groundwater-quality monitoring round in wells URS MW-1 through URS MW-5 and LFMW-LF-4, which were installed as part of the site characterization program for the Celis' Site (see Figure 5 for locations) (The San Joaquin Company Inc. 2009a). A second round of post-remediation groundwater-quality monitoring was conducted on the site by DEC and the City of Emeryville coordinated a sampling of the Celis Site wells in conjunction with that event (Dietz Engineering and Construction, Inc. 2010b). DEC conducted the third and final round of post-remediation groundwater-quality monitoring required by the Corrective Action Plan at the Oak Walk Site between September 21 and 23, 2010 (Dietz Engineering and Construction, Inc. 2010a). The depths to groundwater measured during the sampling rounds are recorded in Table 5. The results of the analyses of groundwater samples recovered from the wells are presented in Table 6.

Figures 27 through 29 show isocons of middle-distillate hydrocarbons in groundwater beneath the site in September 2009, March 2010 and September 2010, respectively. Figures 30 through 32 show the corresponding isocons for gasoline-range hydrocarbons, Figures 33 through 35 show isocons of benzene for the same sampling events and Figures 36 through 38 are the equivalent set for MTBE.

When reviewing Figures 27 through 38 it is important to recognize that the pattern of isocons of middle-distillate hydrocarbons, gasoline range hydrocarbon and benzene that have a focus around MW-16 does not indicate that there is a source of hydrocarbon fuels as that point. As was detailed in Section 1.6.3 above, the excavation required for environmental and geotechnical engineering remediation of the site preclude a source of contamination in that area. However, as is illustrated on Figure 17 such areas of elevated concentrations of gasoline-range hydrocarbons had been detected at other locations on the site such as was found in the vicinity of Monitoring Well MWT-7 that was discussed in Section 1.4.4.2. Examination of the net permeable facies map on Figure 15 shows that both Monitoring Well MWT-7 and Monitoring Well MW-16 are in areas of the site where the permeable deposits are present and which are connected by channels and zones of permeable deposits to adjoining areas of the site that had been affected by elevated concentrations of petroleum hydrocarbons.

Figures 39 and 40 show, respectively, the areas of the site where soil and groundwater were affected by middle distillate- and gasoline-range compounds in September 2010. Figure 41 shows groundwater contours constructed from the depths to groundwater measured on September 21, 2010 at which time, on a site-wide scale, the groundwater gradient was 0.01 ft./ft., with groundwater flowing to the southwest.

1.9 Tiered Health Risk Screening and Assessment Process

Risk-based environmental assessments address the potential for constituent transport from affected media in the source zone to a point of contact with a human or ecological receptor via one or more exposure pathways that may be present under given circumstances. For the present risk assessment, we are concerned with human receptors. For most sites where remediation is required, the primary exposure pathways of concern to human health are: 1) ingestion of contaminated groundwater; 2) release of contaminants from affected soil to groundwater; 3) ingestion of contaminated soil; 4) direct dermal contact with contaminated soil; and 5) inhalation of vapors released from affected soil and/or groundwater.

Risk assessments are commonly performed using a tiered procedure. At the Tier 1 stage, available information regarding COCs in the subsurface is compared to risk limits developed from generic parameters related to the properties of the COCs, the geotechnical and geochemical properties of the subsurface, the use of the affected site, and the characteristics of the receptors that may be present. Tiered risk assessments are used to screen sites affected by COCs to determine whether the contamination present may be at concentrations sufficient to pose a significant health risk. At the Tier 1 stage, the data regarding geotechnical and geochemical properties of the subsurface may be limited to qualitative data such as the type and thickness of soils, the general groundwater regime, the expected future use of the site, and simple assumptions about the geometry and materials of construction of structures that may be built there. In general terms, if the site is modeled using this type of information and limited data regarding subsurface conditions, the maximum concentrations of one or more COCs that can be present in the affected natural media without risk of a significant deleterious health effect can be assessed without resorting to a more detailed risk analysis process. These limiting concentrations are known as Risk-based Screening Levels (**RBSL**s) (American Society for Testing and Materials 2010).

RBSLs are promulgated by a variety of regulatory agencies that use several alternate nomenclatures. For example, the California Regional Water Quality Control Board - San Francisco Bay Region (**RWQCB**) has set Environmental Screening Levels (**ESL**s) for sites under its jurisdiction in the San Francisco Bay Area (Regional Water Quality Control Board - San Francisco Bay Region 2008). Following the precedent set by the RWQCB, in January 2005 the California Environmental Protection Agency (**Cal/EPA**) promulgated its own compendium of RBSLs which are called California Human Health Screening Levels (**CHHSL**s) for some chemicals of concern (California Environmental Protection Agency January 2005). Based on those agencies' jurisdictions, the applicable RBSLs for an environmental risk analysis for the Oak Walk Site are either the CHHSLs or ESLs, whichever are the more conservative for a given COC.

If the concentrations of COCs at a subject site are less than the applicable RBSLs, the screening process normally permits the site to be used for defined purposes without further evaluation. This is permissible because highly-conservative parametric assumptions and limiting exposures are always assumed when performing a Tier 1 assessment. A finding that a given site has concentrations of COCs present that exceed the RBSLs does not mean that any specified use of the site would be prohibited. Such a finding does, however, indicate that additional, more detailed analysis based on quantitative site-specific data should be performed to determine whether the site could be used for a specified purpose without undue risk to ecological or human health. Such detailed analyses are known as Tier 2 assessments and can be used to assess the maximum permissible concentrations of COCs in natural media at the site. These limiting concentrations are known as Site-specific Target Levels (**SSTL**s) because they are based on site-specific rather than more generalized assessment parameters.

The Tier 2 risk assessment procedure can be used to evaluate the scope of remedial action programs required to render a site free of significant ecological or human health risk as well as to assess the magnitude of any risks that may remain after remediation is complete.

The risk assessment may process to a third stage. Tier 3 risk assessments are not usually performed until detailed databases related to the site-specific conditions and the characteristics of the receptors and their exposures are available and the beneficial effect of remediation programs or the installation of complex systems of engineered barriers to isolate receptors from the sources of COCs. Although the risk assessment analyses reported herein are substantially similar in scope to a Tier 2 risk assessment, they are based on the extensive database that has been accumulated regarding the environmental condition of the Oak Walk Site and consider the effects of the engineered barriers that have been installed on the site they are, in fact, Tier 3 Risk Assessments.

1.9.1 Tier 1 Site-screening Values for Concentrations of COCs in Soil and Groundwater

As noted above, the RWQCB and Cal/EPA, which have jurisdiction over the Oak Walk Site, have published RBSLs for a large number of COCs affecting soil and groundwater for a variety of geological and hydrogeological site conditions that are typical of those commonly found in the San Francisco Bay Region. Those RBSLs, which include levels for residential and commercial and industrial land use, provide useful guidance for site screening at the Tier 1 risk assessment level.

The RWQCB's and Cal/EPA's RBSLs are based on the most restrictive of a number of criteria that include COC concentration limits designed to protect groundwater from contaminants leaching from affected soils, eco-toxicity criteria, ceiling values to prevent odors and similar nuisances, criteria to protect aquatic life, limits to protect the quality of surface waters, as well as concentration limits on soil and groundwater that are set to protect human health. To develop final limiting RBSLs, the human health risk limits are further subdivided into direct and indirect exposures to the COCs, as well as the effects of inhalation of their vapors or gasses in indoor or outdoor air. With respect to limiting values for concentrations of COCs in indoor air, for the purpose of establishing RBSLs, the RWQCB and Cal/EPA made highly-conservative default assumptions about the values of parameters required to perform the risk assessment calculations. In general, those assumptions, as well as others related to the properties of geological media and the carcinogenic and toxic properties of the COCs, are similar to those that appear in ASTM guidance documents (American Society for Testing and Materials 2002). However, for specific risk assessment parameters, the RWQCB elected to use alternate values derived from consideration of California law and regulatory practice, local experience, and the geotechnical, demographic and urban characteristics, and the industrial history that are typical of the San Francisco Bay region.

The RWQCB guidance document for RBSLs used for site-screening in the San Francisco Bay region includes separate sets of tables of limiting COC concentrations for application to sites where groundwater is or is not a current or potential drinking water source. In each case, sites are further subdivided into those at which the depth to the top of affected soil is greater or less than 3 meters BGS. Guidance is also provided regarding the choice of limiting COC concentrations for sites underlain by predominately fine-grained soils as well as those underlain by predominately coarse-grained soils.

Groundwater beneath the Oak Walk Site is not a source of drinking water (California Regional Water Quality Control Board - San Francisco Bay Region 1999). With respect to the depth below the ground surface of the first occurrence of soil affected by COCs, that depth varies across the area of the site in which affected soil exists. However, to provide for a conservative Tier 1 assessment, DEC elected to use limiting COC concentrations used by the RWQCB to derive RBSLs for sites at which the depth to affected soil is less than 3 meters BGS. Similarly, although the surficial soils covering the site are compacted engineered fill composed of highly impermeable clays and silty clays, DEC elected to compare the concentrations of COCs in the subsurface to the guidance values published by the RWQCB for sites underlain by fine-grained soils.

Pathways related to direct ingestion of or exposure to affected soil or groundwater are not present at the Oak Walk Site. As is discussed in Section 2.1 below, the exposure pathways of concern to human health risk on the subject site are those related to inhalation of indoor and outdoor air affected by vaporization of COCs from affected soil and groundwater present beneath the ground surface. For the purpose of making a Tier 1 screening of the potential human health risk due to mixed residential and commercial use of the property, the critical COC concentration limits are those related to the indoor environment. Due to dispersion by winds and volumetric mixing, exposure to COC vapors in outdoor air imposes less restrictive limits than is the case for indoor spaces where vapors might accumulate.

1.9.2 Comparison of COC Concentrations with Tier 1 Screening Values

Limiting screening concentrations for the relevant COCs in soil and groundwater based on parameters selected by the RWQCB and the Cal/EPA for derivation of RBSLs related to human health risks at sites where groundwater is not a source of drinking water, the depth to affected soil is less than 3 meters and the soils underlying the site are predominately fine-grained are presented in Tables 9 and 10. Those values can be compared to the concentrations of the COCs in soil and groundwater currently beneath the Oak Walk Site that are presented in Tables 2, 3, 6 and 8 in which concentrations that exceed the relevant residential Tier 1 limits are in **bold script**.

As can be seen from the instances cited in Tables 2 and 6, there are a sufficient number of samples that contained concentrations of COCs in excess of the Tier 1 limits to justify a Tier 2 analysis in order to assess adequately the environmental risks at the Oak Walk Site.

The concentrations of COCs in soil recovered from the subsurface at the Oak Walk Site are presented in Tables 2, 3 and 8 and the concentrations of COCs in groundwater are presented in Table 6. **Note:** As was described in Section 1.6, in some areas of the Site, soil was remediated by excavation and off-site disposal. In Table 2, COCs detected in samples from locations where soil was shipped off-site and replaced with clean, imported fill are shown in *italic font*. At locations where remediation involved excavation and re-compaction of native soil, the concentrations are shown in smaller font.

The results of analyses of soil and groundwater that indicated the presence of contaminants of concern at concentrations in excess of the applicable ESLs are shown in **bold font** in Tables 1, 2, 3, 6 and 8. (**Note:** Although they are located slightly deeper than 9.84 ft., DEC conservatively considered soil at depths up to 10 ft. to be "shallow" when preparing the Tables.)

2.0 SITE CONCEPTUAL MODEL AND EXPOSURE PATHWAYS

To perform a health risk assessment for site-specific conditions, it is necessary to identify the pathways along which COCs potentially might travel and, if such migration occurs, by what mechanism they may affect a human receptor. These site-specific pathways must then be modeled and their characteristics defined so that the effects of those COCs on the receptors that they may reach can be assessed.

The applicable characteristics of the receptors must also be included in the model so that their sensitivity to the COCs can be properly considered. In addition, different durations and frequencies of exposure to a COC occur on different sites, depending upon the land use, which may be commercial, industrial, recreational, parkland, or residential. In other cases, uses may be mixed and it may be necessary to consider exposures separately due to differing occupancies and use of various areas within a large site.

In the case of the Oak Walk Site, there is a mixture of commercial and residential uses of the buildings on the site. The ground floors of some buildings are used exclusively for commercial purposes, while higher floors are occupied by residential units. In one building, a garage as well as residences occupy the ground floor while the upper stories are entirely residential.

Due to the varying uses of the different buildings on the site, the different types and concentrations of COCs in the subsurface beneath them and the differing depths from their floor slabs to the groundwater table, DEC determined that it was necessary to develop building type-specific models for analyses of the potential health risks that might be present in various locations on the property. However, regardless of the use of a building, because the site as a whole has mixed commercial and residential use, all exterior space on the site was assumed to be used by persons residing in the buildings. The selection of exposure pathways, receptors and construction parameters used in the building-specific models are discussed in Sections 2.1 through Section 2.3 below.

2.1 Exposure Pathways

There are two sources of COCs at the Oak Walk Site: 1) groundwater, and 2) affected subsurface soil beneath the site. Potentially, both the groundwater and affected subsurface soil could release COCs by volatilization. The volatized materials could be released into outdoor air where they would be dispersed, or into enclosed space within buildings where they might accumulate. This affected air could serve as an exposure medium that might adversely affect human receptors. These exposure pathways are shown diagrammatically on Figure 42. (**Note**: There is an additional pathway that may affect construction workers involved in excavation beneath the ground surface during construction at the project. However, such exposures will be of very short duration and the types of and concentrations of COCs in the soil are such that such work will fall into the Level D category, *i.e.*, there will be no need for personal protective equipment [**PPE**] in excess of that required for construction work in any environment.)

Flow paths other than volatilization of COCs into outdoor and indoor air could also have been considered in the site model but they are not of concern to the health risk assessment described herein. For example, flow paths related to lateral contaminant transport are not considered because the Oak Walk property itself is not a significant source of the contamination affecting its subsurface. Soil and groundwater beneath the site have been principally affected by fuel hydrocarbons flowing into it from the former Celis Service Station property to the south and from other off-site locations on the former sites of the paint manufacturing plants to the east across Adeline Street. (See Figure 5 for locations.) Although there will be some degree of cyclical contamination of groundwater beneath the subject property as groundwater rises and falls seasonally through the affected soils, there are no potential points of down-gradient exposure that can be attributed to a primary source of contamination on the Oak Walk property itself. Volatilization to air from affected surficial soils is not included in the models because none of the surficial soil on the site is affected by COCs and all areas of the site are covered in buildings, paving or, in very limited areas, landscaping on clean imported soil.

2.2 Receptors

The health risk assessment must consider three types of human receptors that might be affected by COCs remaining in the subsurface beneath the Oak Walk Site. They can be classified according to their potential exposures to COCs on the property: 1) the occupants of the residential units on the property; 2) persons who work in the commercial spaces that are included on the ground floors of some of the buildings on the property; and 3) construction workers engaged in future work on the site. In the case of the residents, this class of human receptor can be further subdivided by age into adults, youths and young children. DEC's conceptual models used in the health risk analyses permit each of those classes and sub-classes of receptors to be considered.

A total of nine buildings, which are numbered for identification as Buildings 1 through 9, are located on the site. See Figure 2 for locations. All buildings include residential units, but in the case of Building Types 1 and 2A, the ground floor of each is devoted to commercial use. Because of that mixed use, when evaluating health risks due to potential exposures to affected outdoor air, DEC's conceptual models assume that, regardless of a building's use, persons exposed to outdoor air anywhere on the site may include young children. However, where the first floor of a building is dedicated to commercial use, only adult exposures are considered in the models for those buildings; similarly, all construction workers are also assumed to be adults. As is discussed in Sections 3.7.4 and 3.7.5 below, the difference in the duration and frequency of residents', commercial workers' and construction workers' exposure to outdoor or indoor air is also reflected in the models.

2.3 Building-type Models

As is further discussed in Section 3.3, the depth to, and thickness of, affected soil beneath the buildings on the Oak Walk Site varies from one location to another, as do the mean depths to the groundwater table and the concentrations of COCs in the affected soil and groundwater in the subsurface. In addition, the buildings on the site vary significantly in their principal dimensions and in the occupancies of their ground floors. Accordingly, DEC has established a set of "building types" to characterize the various types of residential and commercial units on the ground floor of the development. The building types and their locations are shown on Figure 43. The key building dimensions that are significant with respect to environmental risk assessments are presented in Table 12. This approach permits environmental risk assessments to be performed, as necessary, according to building type rather than redundantly for each ground floor unit. Table 12 includes the occupancies, length east to west and north to south of the building-type perimeters, their plan areas, their perimeter lengths and their ground floor to ceiling heights and the ground floor slab thicknesses. It also cites the ground floor volume to area ratios (*i.e.*, the ratio of the volume of each ground floor unit type divided by its ground floor area). In addition, for reference purposes it cites each unit's ground floor slab elevation relative to the City of Emeryville's local datum, as well as the slab elevations relative to the North American Vertical Datum (**NAVD**), which is used throughout this document for the purpose of making the risk assessments, as is required for compliance with California regulations.

2.3.1 Vulnerable Building Types

By considering the fundamental toxicology and transport parameters of the range of COCs that were detected in the subsurface, it can be established *a priori* that the highest risks will be associated with buildings that are located over areas of the site that have the highest concentrations of benzene, whose floor slabs are separated from the groundwater by the smallest vertical distances, and which have the smallest interior volumes. Based on consideration of these factors, it can be concluded that the most vulnerable units on the proposed development are the ground floor residences of Type 3A and the commercial space on the ground floor of Building Type 1. As can be seen by examination of Figures 35 and 43, the Type 3A units are located in an area of the site that has the highest concentration of benzene in groundwater recorded anywhere on the property and, compared to other units, such as Type 3B in the same area, the Type 3A units have a floor slab elevation that is the lowest of that group and thus are situated the closest to the groundwater (see Table 12). As is also shown in Table 12, the Type 3A units also have the smallest interior volume of the different types of residential units on the site.

Although the first floor of the structure in the southwest corner of the site, which has been designated Building Type 1, will have a commercial use so that its occupants will have a reduced exposure to vapors that may accumulate in its interior and it is located in an area of the site where benzene concentrations are lower than those around the Type 3A units, due to the low elevation of its floor slab at 42.28 ft. NAVD, its interior might be susceptible to accumulation of vapors of COCs. Accordingly, it merits specific analysis as part of the health risk for the Oak Walk Site.

2.4 Risk Assessment Software

DEC used Version 2.6 of the RBCA Tool Kit for Chemical Releases software published by Groundwater Services of Houston, Texas (Groundwater Services, Inc. 2011) to perform the computations necessary to compute the potential health risks at the Oak Walk Site. The risk-based site evaluation process simulated by the software is described in detail in Appendix D. Appendix E describes the fate and transport modeling methods that are employed in the software, including features that permit selection or de-selection of specific COC transport pathways or to select alternate equations used to simulate specific COC transport mechanisms.

2.4.1 Use of Johnson-Ettinger Model for Air Volatilization Computations

The RBCA Tool Kit for Chemical Releases software includes three methods for computation of air volatilization factors. The air volatilization factor is the predicted ambient air concentration, which may be either indoor or outdoor, divided by the source media concentration (*i.e.,* the concentration in soil or groundwater). For indoor air, the user may elect to use the Johnson-Ettinger model (Johnson and Ettinger 1991) for volatilization for either soil or groundwater, or may specify indoor air volatilization factors computed from other models and input them directly into the software. The equations used for the Johnson-Ettinger model computation for volatilization factors to indoor air from subsurface soil and groundwater are presented as equations CM-4 and CM-6, respectively, on Figure B.2 in Appendix E.

Although the Johnson-Ettinger model may overestimate the concentration of COCs in indoor air by a factor varying from 10 to 1,000 (Hartman, 2002), it is widely used in risk assessment analyses and has been approved by the United States Environmental Protection Agency (**USEPA**) (United States Environmental Protection Agency 1995b). Regulatory agencies that have approved the use of the Johnson-Ettinger model include those of the State of Michigan, whose Environmental Science Board confirmed its suitability for predicting vapor concentrations in the interiors of buildings after subjecting the method to a rigorous evaluation (Fisher *et al* 2001). Because of its established conservatism and wide regulatory acceptance, DEC elected to use the Johnson-Ettinger model for computing volatilization factors for indoor air.

For outdoor air volatilization factors, users of the RBCA Tool Kit for Chemical Releases software can elect to specify those factors derived by use of one or more alternate simulations. These include direct input to the software from any model or procedure of the user’s choice or they can either: a) make use of the Johnson-Ettinger model to predict volatilization from groundwater (see Equation CM-5 on Figure B.2 in Appendix E) but employ the ASTM’s suggested model, which is shown in mathematical form in Equation CM-1 on Figure B.2 in Appendix E for surface soil volatilization (American Society for Testing and Materials 2000b) from both subsurface and surficial soils; or b) use the Johnson-Ettinger model to predict volatilization from groundwater and apply the volatilization factor computed by either the Johnson-Ettinger model for soils beneath the surface (Equation CM-3 on Figure B.2 in Appendix E) or the volatilization factor computed using the ASTM model for surficial soils (Equation CM-5 on Figure B.2 in Appendix E), whichever is greater.

Because the ASTM model for volatilization from surficial soils provides a conservative upper-bound limit value on the volatilization factor that otherwise might be erroneously computed by using the Johnson-Ettinger model for volatilization from affected subsurface soil, DEC selected the software option that uses the greater of the values computed by the ASTM model or the Johnson-Ettinger model to assess health risks related to the potential presence of COCs in outdoor air.

3.0 RISK ASSESSMENT PARAMETERS

The ASTM Standard Guide for Risk-Based Corrective Action ASTM E1739 - 95(2010)e1 (American Society for Testing and Materials 2000a) includes suggested values for each of the parameters required for a health risk calculation. If these “default” values were used to compute health risks at a site, it would only be necessary to specify the COCs and their concentrations in soil and groundwater. However, although many of the values cited in the E2081-00 document can be appropriately applied to conditions at actual sites, ASTM did not intend for the values presented in the guidance standard to be universally applied without regard to site-specific conditions. Accordingly, DEC chose risk assessment parameters for the Oak Walk Site based on measured site-specific conditions and made extremely-conservative assumptions designed to ensure that the health risks assessment would yield potentially carcinogenic risk and toxic hazard values highly protective of the health of the site’s inhabitants. In many cases, the parameter values selected were considerably more conservative than those suggested for initial screening purposes in the ASTM guidance document. For convenience of reference, the parameter values cited in the ASTM E1739 - 95(2010)e1 standard will be referred to as the ASTM “default” values.

For the exposure pathways that must be considered at the subject property, the model input parameters can be categorized into those concerning the following elements of a health risk assessment model:

1. Chemicals of concern in soil
2. Chemicals of concern in groundwater
3. Chemical-specific parameters
4. Site-specific soil transport parameters
5. Site- and building-specific air parameters
6. Receptor-specific parameters
7. Acceptable health risks

The site-specific data and the parametric assumptions made by DEC for the purpose of performing the Health Risk Assessment for the Oak Walk Site are discussed below.

> **Note**: The software used to perform the risk calculations is capable of analyzing risks associated with many exposure pathways that are not applicable to conditions at the subject property. Accordingly, the following discussion is limited to a description of the input parameters of relevance to the site conceptual model discussed in Sections 2.0 and 2.1 above.

3.1 Chemicals of Concern in Soil

The subsurface beneath essentially all of the subject property is affected by releases of fuel hydrocarbons and by paint solvents including Mineral Spirits. Each of those materials is a mixture of a large number of organic chemicals. Mineral spirits, diesel, and gasoline are each composed of hundreds of individual chemicals. Some of those chemicals are carcinogenic and others are toxic to humans, but the large majority are not known to cause adverse health effects to persons exposed to them.

At sites where the subsurface has been affected by a discharge of petroleum hydrocarbons it is standard practice to quantify the petroleum hydrocarbons present in soil according to one or more classifications of those materials. The classifications are made by consideration of the number of carbon units in the molecular chains of the components of a given petroleum product such as gasoline, diesel, jet fuel, paint thinners, or bunker oil. That practice was followed at the Oak Walk Site where, as is shown in Tables 2 and 6, petroleum compounds detected in soil and groundwater having molecular lengths typical of those found in gasoline, diesel fuel and mineral spirits were separately quantified as TPHg, TPHd and TPHms, respectively. However, evaluation of environmental risks, especially health risks, due to the effects of fuel hydrocarbons based on quantification of such gross classifications of ranges of petroleum hydrocarbons in affected media does *not* provide sufficient information about the concentration of individual carcinogenic or toxic chemicals that are actually present in the affected subsurface media to permit health risks to be reliably computed. They can, however, be useful in cases where there is significant concern about environmental nuisances such as odors (as opposed to health risks).

Because large-scale sampling and analysis of specific chemicals of concern is very costly, efforts have been made to develop RBSLs for petroleum hydrocarbons based on the concept of dividing the multitude of chemicals in petroleum products into a manageably small number of “fractions,” with each fraction being composed of a group of petroleum hydrocarbons having similar physical-chemical properties. That approach is more refined than a system based on the broader classification that discriminates between a few carbon-chain length groups (or product types) that was described above. Such “fractional” approaches include that developed by the Total Petroleum Hydrocarbon Criteria Working Group that divided petroleum hydrocarbons into thirteen fractions (Gustafson, Tell and Orem 1997). However, because the developers of the methodology recognized that it is not advisable to base health risk assessment on the presence of chemicals in the subsurface that are known human carcinogens or are highly toxic on the average properties of a number of chemicals in a fraction of a petroleum product, they specifically segregated benzene (a human carcinogen) and toluene (a human toxin) into two separate fractions of which benzene and toluene were the sole chemical members. They further specified that, following initial screening of a site based on the “fractional” approach, risk assessments should be performed for each known carcinogen found at the site. Furthermore, ASTM Standard E1739-95(210)e1 specifically states that *"…TPH should not be used for 'individual constituent' risk assessments because the general measure of TPH provides insufficient information about the amounts of individual components present"* (American Society of Testing and Materials 2010).

In compliance with the requirements of ASTM Standard E1739-95(2010)e1, the health risk assessments described in this document are based on consideration of the specific human carcinogens and highly toxic petroleum hydrocarbons actually detected in the subsurface beneath the Oak Walk Site.

As part of the earliest stage of site investigation of the Oak Walk Site that was conducted in December 2003, SJC analyzed soil samples for petroleum hydrocarbons, the BTEX compounds, volatile and semi-volatile organic compounds and polynuclear aromatic compounds (**PNA**s) in order to establish the range of COCs that were present on the site (The San Joaquin Company Inc. 2004). Later, to obtain an appropriately-inclusive inventory of chemicals of concern in soil during the major phases of the site investigation in the Spring and Fall of 2004, SJC analyzed samples recovered from 29 environmental and geotechnical engineering borings for the same suite of analytes (The San Joaquin Company Inc. 2005). As is documented in Table 2, concentrations of the following components of petroleum hydrocarbons were detected in soil beneath the site. (**Note:** the listing below includes *all* detected components of petroleum hydrocarbons in soil, regardless of how small the amount or how infrequently the COC was encountered.)

COCs in Soil at the Oak Walk Site

BTEX Compounds and Fuel Oxygenates (EPA Method 8260B)

Benzene
Toluene
Ethylbenzene
Total Xylene Isomers
Methyl tert-butyl ether

Other Volatile Organic Compounds (EPA Method 8260B)

Acetone
2-Butanone
n-Butylbenzene
sec-Butylbenzene
tert-Butylbenzene
Isopropylbenzene
p-Isopropylbenzene
p-Isopropyltoluene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene

Polynuclear Aromatic Compounds (EPA Method 8270C)

Naphthalene
2-Methylnaphthalene

Total Petroleum Hydrocarbons

Total Petroleum Hydrocarbons (quantified as Diesel)	EPA Method 8015M
Total Petroleum Hydrocarbons (quantified as Mineral Spirits)	EPA Method 8015M
Total Petroleum Hydrocarbons (quantified as Gasoline)	EPA Method 8260B

3.2 Chemicals of Concern in Groundwater

For the same reasons that were described in Section 3.1 above for soil, SJC's site characterization program included analyses of groundwater for TPHd, TPHms and TPHd. SJC analyzed groundwater samples for each of the 67 chemicals included in EPA Method 8260B for analysis of volatile organic compounds (**VOC**s), all 17 chemicals included in EPA Method 8270C for analysis of Polynuclear Aromatic Compounds (**PNA**s) and, in addition, SJC made separate analyses for the BTEX compounds and the fuel oxygenate MTBE. As is documented in Table 6, by using those procedures, concentrations of the following COCs were detected in groundwater beneath the site. (**Note:** the listing below includes *all* detected COCs in groundwater, regardless of how low or infrequently detected.)

COCs in Groundwater at the Oak Walk Site

BTEX Compounds and Fuel Oxygenates (EPA Method 8260B)

Benzene
Total Xylene Isomers
Toluene
Methyl tert-butyl ether
Ethylbenzene
Tertiary butyl alcohol

Other Volatile Organic Compounds (EPA Method 8260B)

n-Butylbenzene
Isopropylbenzene
1,3,5-Trimethylbenzene
sec-Butylbenzene
p-Isopropylbenzene
tert-Butylbenzene
1,2,4-Trimethylbenzene

Polynuclear Aromatic Compounds (EPA Method 8270C)

Naphthalene

Total Petroleum Hydrocarbons

Total Petroleum Hydrocarbons (quantified as Diesel)	EPA Method 8015M
Total Petroleum Hydrocarbons (quantified as Mineral Spirits)	EPA Method 8015M
Total Petroleum Hydrocarbons (quantified as Gasoline)	EPA Method 8260B

3.3 Representative Concentrations of Chemicals of Concern in Soil and Groundwater

The RBCA Tool Kit for Chemical Releases software permits the concentrations of COCs in soil and groundwater beneath a site to be specified at more than one location. This enables representative concentrations to be used in the risk assessment analyses performed for sites where there is significant variability in the concentrations from location to location within the subsurface. The software provides several options for computing a representative concentration for a COC in either soil or groundwater from a suite of location-specific concentrations. These options include computation of a mean, a maximum, or an upper confidence limit value.

As can be seen by an examination of Tables 2 and 6 and Figures 27 through to 40, such variability of COCs is present beneath the Oak Walk Site. However, for the purposes of the present health risk analyses, a more conservative approach will be taken. The highest concentrations of COCs in soil and groundwater beneath the most vulnerable individual residential and commercial buildings on the site will be used to assess the risk associated with the presence of COCs in the subsurface beneath them.

> **Note:** Because some of the secondary COCs that have been detected in the subsurface at a few sparsely distributed locations on the Oak Walk Site were not necessarily present in the areas around a given vulnerable building, not all of the COCs listed in Section 3.2 above needed to be considered in the health risk assessments for a specific building.

3.3.1 Concentrations of COCs in Groundwater Used in Risk Assessment Computations

As can be deduced from an examination of Figure 35 and Table 6, in the case of Building Type 3A, the concentrations of the BTEX compounds and fuel oxygenates to be considered are those in Monitoring Well MW-16A, the groundwater sample recovered from which, on September 23, 2010, contained benzene at a concentration of 14,000 μg/L. The concentrations of other COCs in groundwater that had been detected in the area of Building Type 3A were taken from the results of the analysis of the sample recovered from Monitoring Well MWT-2 on May 19, 2004. The location of Monitoring Well MWT-2 is shown on Figure 4 and the results of the analysis of the groundwater sample recovered from that well in May 2004 are presented in Table 6.

In the case of Building Type 1, none of the BTEX compounds were detected in samples recovered on September 23, 2010 from Monitoring Wells WCEW-1, MW-5 or MW-15 which, as is shown on Figure 4, are arrayed around the perimeter of that building. However, low concentrations of the fuel oxygenate MTBE were detected in the samples recovered on that date from each of those wells. The highest concentration of the BTEX compounds and MTBE detected in any of those three wells were used in the health risk analysis for Building Type 1. The highest concentrations of other COCs in groundwater samples that had been detected in the area of Building Type 1 were taken from the results of the analyses of the samples recovered from Monitoring Wells WCEW-1, MWT-1 and MW-5 on May 19, 2004. Those data are included in Table 6.

The concentrations of COCs in groundwater used in the health risk analyses for Building Types 3A and 1 are presented in Table 14.

3.3.2 Concentrations of COCs in Soil Used in Risk Assessment Computations

The representative concentrations of the COCs in soil used in the risk assessments for Building Types 3A and Type 1 were derived in a manner similar to that used for groundwater, except that the COC concentrations used were those associated with the conditions found in soil samples recovered from beneath those buildings.

In the case of Building Type 3A, the concentrations of BTEX compounds in soil used for the risk assessment were the average of those found in samples recovered from the floor of Remedial Excavation No. 2 in the area that is now beneath Building Type 3A. Those samples included Sample Nos. W150N0 through W150N75, W175N0 through W175N75, W200N0 through W200N75 and W213N15, the locations of which are shown on Figure 24 and the results of their analyses are complied in Table 8. Those averages are presented in Table 15. To account for the presence of other COCs that had been detected in that area of Building Type 3A, the mean concentrations detected of the applicable chemicals in the samples recovered in May 2004 from 10 ft. BGS in Boring BE-1 and Monitoring Well MWT-2 (see Table 2 for analytical data and Figure 4 for boring locations). (**Note**: Soil from depths shallower that 6 ft. BGS in the area below Building Type 3A, as the surface elevation was at the time of excavation of Remedial Excavation No. 2, was removed from the site.) The concentrations of COCs in soil that were used in the health risk assessment for Building Type 3A are presented in Table 15.

In the case of Building Type 1, the characterizing concentrations of the BTEX compounds in soil were taken to be the average of the concentrations found in all of the samples recovered from the floor of Excavation No. 1, the locations of which are shown in Figure 23, and for which the analytical results are compiled in Table 8. The concentrations of other COCs that had been historically detected in soil beneath the area of the Site around Building Type 1 were taken to be the mean of those from the results of the samples recovered from 10 ft. BGS in Boring BG-1 and Monitoring Well MW-5 and from 11.5 ft. BGS in Monitoring Wells MWT-1. Those borings are also located as shown on Figure 4, the geochemical data are compiled in Table 2 and the concentrations used in the risk assessment and are included in Table 15. (**Note:** Soil from depths shallower that 7 ft. BGS, as the surface elevation was at the time of Excavation of Remedial Excavation No. 1, was removed from the site.)

3.4 Chemical-specific Parameters

The physical, chemical, toxicological and carcinogenic properties of the COCs listed in the outputs from the risk assessment software are included in Appendices B and C. In most cases, the suite of parameters was taken from the library of chemical databases provided in the modeling software by its developer, Groundwater Services, Inc. (2011). All of those COC parameter values were obtained from sources in the standard chemical and risk assessment literature. However, since their original publication, the California Office of Environmental Health Hazard Assessment (**OEHHA**) has changed the toxicity and carcinogenic risk factors for some chemicals that now differ from other national standards. (California Office of Environmental Health Hazard Assessment 2010). For example, that agency now categorizes naphthalene and ethylbenzene as carcinogens. In such instances, DEC modified the parameters used in the software's library to comport with the OEHHA standards.

To deal with the lack of complete sets of chemical-specific risk assessment parameters for p-isopropyltoluene (also known as p-cymene), DEC used the parameters for cymene. P-cymene and cymene are homologues with both having the chemical formula $C_{10}H_{14,}$ and p-cymene being a natural isotope of cymene. Thus, given the absence of other information, it is reasonable to model the properties of p-isopropyltoluene as being similar to the properties of cymene and to account for its risks by using an equivalent concentration of cymene in soil or groundwater in the risk assessment analyses.

> **Note:** The chemical data for the COCs that are included in the output documentation generated by the software also cite additional properties of the chemicals beyond those required for the health risk analyses discussed in this

report, but those relate to exposure pathways not present on the Oak Walk property.

3.5 Site-specific Soil Transport Parameters

The relevant soil transport parameters are discussed below.

3.5.1 Soil Column Properties

As has been discussed in Section 1.6.3, the surficial soils beneath the structures at the Oak Walk Site are highly-impermeable engineered fill composed of silty clays. Based on those subsurface conditions, the following condition-specific soil column characteristics and soil properties were used.

3.5.1.1 Hydraulic Conductivity

The ASTM default value for vertical hydraulic conductivity of soil is 1.0 x 10^{-2} cm/sec, which is typical of a sand or silty sand. That permeability is clearly invalid for the compacted silty clay beneath the structures on the Oak Walk Site.

To obtain reliable site-specific values for vertical conductivity of the compacted silty clay soils present, SJC obtained direct laboratory measurements of the hydraulic conductivity of two representative samples of the fill. The hydraulic conductivity of both samples was measured for SJC by the Fugro West, Inc. laboratory in Oakland, California. In each case, a constant head permeameter was used to measure the hydraulic conductivity of the soil after it had been compacted to 90% relative density, according to procedure D1557-00 published by the ASTM (American Society for Testing and Materials 2000c). The vertical permeability of one of those samples was found to be 1.52 x 10^{-9} cm/sec and the permeability of the other was measured at 7.82 x 10^{-8} cm/sec (The San Joaquin Company Inc. 2009b). Although the great majority of the compaction tests conducted on the fill and re-engineered soil that now covers the Oak Walk Site exceeded 90% relative compaction (The San Joaquin Company 2009c), for the purpose of the risk assessment analysis the hydraulic conductivities measured on the samples compacted to 90% relative compaction were used, but to maintain the appropriate degree of conservatism, the higher value of 7.82 x 10^{-8} cm/sec was employed in the analyses.

In summary, the following hydraulic conductivity was used in the health risk assessment for the vulnerable buildings on the Oak Walk Site:

Hydraulic Conductivity: 7.82 x 10^{-8} cm/sec.

3.5.1.2 Dry Bulk Density

The ASTM default value for dry bulk density is 1.7 Kg/L. The dry bulk density of the backfill material used beneath the structures at the Oak Walk Site, when it was compacted to a relative density of 90%, was 100.3 lb/ft^3 (The San Joaquin Company Inc. 2009b). In Standard International Units, that density is expressed as 1.61 Kg/L.

3.5.1.3 Volumetric Water Content

The ASTM default values for volumetric water content of soil are 12.0% for the vadose zone and 34.2% for the capillary fringe, which numbers are typical for fine to medium sand.

The water content of the fill material at the Oak Walk Site, when compacted to 90%, was measured at 18.7% by weight (The San Joaquin Company Inc. 2009b), which is equivalent to a volumetric moisture content of 22.75%.

3.5.1.4 Total Porosity

Total porosity is defined as the ratio between the volume of voids in soil to the total volume. The ASTM default value for porosity is 0.38, which is appropriate for medium to coarse sands. For the compacted silty clay fill beneath the structures at the Oak Walk Site, DEC used the value 0.5, which is conservative and at the upper range of total porosity for silty clay material.

3.5.1.5 Volumetric Air Content

The volumetric air content of a soil is defined as the ratio of the volume of air in the sample to the total volume of the sample. At full saturation, such as occurs in the capillary zone, the theoretical volumetric air content of that soil would be zero and water would completely fill all of the void space. Conversely, when the soil is completely dry, the pores in the soil would contain only air and the volumetric air content would be equal to the total porosity of the sample. At intermediate moisture contents, such as occurs in the vadose zone, the volumetric air content of that soil is equal to the difference between its volumetric water content and the total porosity.

The procedures used to set the volumetric air content parameters in the vadose and capillary zones for the purpose of this health risk assessment are discussed below.

3.5.1.5.1 Vadose Zone

As was noted above, the volumetric moisture content of the soil beneath the structures on the Oak Walk Site in the vadose zone is estimated to be 22.75% and the total porosity of that soil is assumed to be 0.5. Thus, as is noted above, in the vadose zone, the unsaturated volumetric water content of the soil is 22.75%, but when the soil is fully saturated, its moisture content will be 34.2%, so that:

Volumetric Air Content in the Vadose Zone = 0.5000 - 0.2275
= 27.25%

3.5.1.5.2 Capillary Fringe

In a situation where the soil is formed from fine to medium sands only moderate capillary pressures are generated. In such materials, in the capillary fringe above the water table, all pore space would theoretically be completely full of water and its volumetric air content theoretically would be zero. But, in compacted silty clays, capillary pressures can be considerable greater. However, to provide for a thoroughly conservative risk assessment, we assumed that a small amount of air would actually be present in the capillary fringe, and assigned a volumetric air content of 0.010 to that zone. That selection is based on the available literature that addresses air entrainment in the capillary zone (Connor, *et. al.*, 1997). Thus, for the purpose of the health risk analysis, the

Volumetric Air Content in Capillary Fringe = 1.0%

Note: Because it was assumed that soil in the capillary fringe contained some air, it was necessary to adjust the volumetric water content in that zone. The adjusted capillary zone volumetric water content, M_v, is computed as follows.

M_v Capillary Fringe = Porosity (*n*) - Volumetric air content of capillary fringe

so that,

M_v Capillary Fringe = 0.50 -0.01

which equals 0.49

and therefore

M_v Capillary Fringe = 49%

3.5.1.6 Vapor Permeability

Due to the formation of water menisci at the locations where soil particles touch, the gas or vapor permeability of a partially-saturated soil is extremely low. In practice this parameter is difficult to measure, even in a laboratory. The ASTM default value is 9.8×10^{-4} cm/sec (1.1×10^{-11} ft^2), which is appropriate for sand. However, based on the available literature, an appropriate value for the compacted silty clays that are present beneath the structures on the Oak Walk Site is 9.8×10^{-9} cm/sec (1.1×10^{-16} ft^2) (Connor, *et. al.*, 1997). Accordingly, that value was used for the health risk assessments made for the Oak Walk Site.

3.5.1.7 Capillary Zone Thickness

The ASTM default for capillary zone thickness is 0.16 ft. (5 cm). That value is appropriate for sandy soils. However, it is grossly inadequate for the compacted silty clays that form the shallow soils beneath the Oak Walk structures. DEC assumed a capillary thickness of 5.0 ft. That value is appropriately conservative and compatible with data available in the standard literature (Guymon 1994, Technical Advisory Committee 1996).

3.5.1.8 Partitioning Parameters

The values used in the health risk analyses for the fraction of organic carbons and pH in the soil beneath the site that affect phase partitioning of the COCs in the affected soil zone are described below.

3.5.1.8.1 Fraction Organic Carbon

The ASTM default value for the fraction of organic carbon in soil is 0.01. The fraction of organic carbon in soils has a major effect on the ability of chemicals to sorb to soil particles. However, even if no organic carbon is present, the out of balance electromagnetic molecular forces on the surface of very fine soil particles such as those that form clay can cause chemicals to adsorb onto them. When soil has an organic content, as is the case in the silty organic clays at the Oak Walk Site, adsorption increases rapidly with increasing organic carbon content. Thus, while the ASTM default value of 0.01 may be appropriate for a sand formation, it significantly under-represents chemical adsorption onto clayey soils, which, in addition to their electromagnetic adsorption capacity, frequently contain significant fractions of organic carbons. Accordingly, DEC used an organic carbon fraction of 0.02 for the health risk analyses reported herein. That value is actually conservative for silty clays, but is compatible with reported values for local soils on the eastern shores of San Francisco Bay (Spence and Gomez 1999a), which was the source of the backfill placed on the Oak Walk Site.

3.5.1.8.2 Soil/Water pH

The ASTM default value for the pH of the soil and groundwater is 6.8, which, given the temporal variations that frequently occur in that parameter, is an appropriate value for most soils and groundwater and thus was used when making the health risk analyses reported herein.

3.5.2 Soil Source Zone Characteristics

Following is a discussion of the hyrdogeological and spatial characteristics of the zone of affected soil that serves as a source for COCs that might migrate into the indoor and outdoor air at the subject site.

3.5.2.1 Hydrogeology

The site-specific values for the hydrogeologic characteristics required as input for the health risk analyses are discussed below.

3.5.2.1.1 Depth to Water-bearing Unit

The depth to the water-bearing unit (*i.e.*, the depth to the phreatic surface) is an important parameter that affects the concentrations of COCs in indoor and outdoor air above a contaminated subsurface. If the groundwater is shallow, the potential concentrations of airborne COCs are higher compared to a situation where groundwater is deeper in the same formation affected by the same concentrations of COCs. At many locations, the depth to the first water-bearing unit may differ significantly from season to season. However, the modeling procedure used to compute the concentrations of COCs in indoor and outdoor air can accept only a single input parameter for the depth to groundwater. Thus, to avoid excessively conservative or unacceptably non-conservative results from a health risk assessment, it is important to use a conservative, but reasonably representative, value for depth to groundwater in the model.

In the case of the Oak Walk Site, DEC elected to use the mean depth to groundwater beneath a building as the representative value for this parameter. That choice is conservative because groundwater elevations beneath the site vary seasonally in response to rainfall in the local area and in the Berkeley and Oakland hills to the east. If precipitation occurred throughout the year, the mean depth to groundwater beneath the site would, in fact, be an accurate representation of the mean hydrogeologic condition because the model would reflect a situation in which groundwater elevation would be between the mean and the highest elevation for the driest half of the year and between the mean and the lowest elevation for the other half of the year. However, in the Oakland-Emeryville area, precipitation does not occur throughout the year. In fact, on average, more than 82% of the rainfall occurs between the months of November and March (Kozlowski 2003). Thus, groundwater elevations are usually above their mean range during that period, but significantly lower during the remaining seven months (April- October) of the reporting year. Therefore, use of the mean groundwater elevation to compute the depth to groundwater for the purpose of the health risk analyses is conservative because, in actuality, groundwater is at lower elevations than the mean for more than half of the year.

Groundwater elevation data is available for the Oak Walk Site and adjacent property from measurements made in the groundwater-quality monitoring wells installed by SJC prior to and following construction of the buildings. Those data are presented in Table 5 and the well locations are shown on Figures 4 and 5.

As was discussed in Section 2.3.1, in order to perform conservative health risk assessments for the Oak Walk Site, the risks associated with the use of Building Types 3A and 1 will be evaluated. Groundwater conditions under Building Types 3A and 1 will be represented by the conditions in Monitoring Wells MW-16A and MW-5, respectively.

Examination of Table 5 shows that the highest recorded groundwater elevation Monitoring Well MW-16A was 39.28 ft., which occurred in March 2010, and the lowest elevation was 37.50 ft., which occurred in September 2010. Thus, the mean groundwater elevation within that range in Monitoring Well MW-16A is 38.39 NAVD, which is 1.78 ft. higher than the elevation of the groundwater in MW-16A computed from the measurement made in that well in September 2009. (**Note:** Monitoring Well MW-2 is also close to Building Type 3A, but although depth to groundwater measurements in that well cover a longer period of time than those in Monitoring Well MW-16A, use of the latter data would yield a lower and therefore less conservative value for the mean groundwater elevation.)

Examination of Table 5 shows that the highest recorded groundwater elevation in Monitoring Well MW-5 was 36.81ft., which occurred on March 12, 2010, and the lowest elevation was 35.01 ft., which occurred in July 2007. Thus, the mean groundwater elevation within that range in

Monitoring Well MW-5 is 35.91 NAVD, which is 0.90 ft. higher than the elevation of the groundwater in MW-5 computed from the measurement made in that well in July 2007.

Each of the buildings constructed on the subject property has a ground floor slab, each of which is set at a known elevation. Accordingly, the depth to groundwater beneath each building can be computed by subtracting the representative mean groundwater elevation beneath that building from its ground floor slab surface elevation. The ground floor slab elevations relative to the North American Vertical Datum for Building Types 3A and 1 are shown in Table 12.

Accordingly, the following values for depth to water-bearing unit were used in this Health Risk Assessment.

Building Type	**Floor Slab Elevation** *ft. NAVD*	**Mean Groundwater Elevation** *ft. NAVD*	**Mean Depth to Water-bearing Unit** *ft. NAVD*
3A	46.83	38.39	8.44
1	42.38	35.91	6.47

3.5.2.2 Geometry of the Affected Soil Zone

The site-specific values for the affected soil zone characteristics required as input for the health risk analyses are discussed below.

3.5.2.2.1 Depths to Top and Bottom of Affected Soils

By examination of Table 2, it can be seen that the concentrations of analytes of concern in soil beneath the Oak Walk Site are generally very low at a depth of 20 ft. BGS. Accordingly, for the purpose of this Health Risk Assessment, DEC elected to assume that the depth to the bottom of affected soil at the site was 25 ft. BGS as the ground surface was at the time that the Remedial Excavations were opened.

Using the mean of the ground surface elevations at Monitoring Well MWT-2 and Boring BE-1 when those borings were drilled (see Table 1 for elevations), *i.e.*, 45.12 ft. NAVD, and subtracting 25 ft. yields an elevation of 19.84 ft. NAVD for the elevation of the bottom of contaminated soil beneath Building Type 3A, which is 26.71 ft. below the 46.83 ft. NAVD elevation of the floor slab of that building type. Using the ground surface at Monitoring Well MW-5 as a reference, similar calculations yield a depth 24.52 ft. below the floor slab of Building Type 1 for the depth to the bottom of contaminated soil under that building.

As is shown on Figure 24, the remediation program included removal of soil affected by COCs from the area beneath the Type 3A Building to a depth of 6 ft. BGS as it was before excavation of Remedial Excavation No. 2, and from beneath the Type 1 Building to a depth of 7 ft. BGS before the excavation of Remedial Excavation No. 1. The mean elevation of the bottom of Excavation

No. 2 (which is also the mean elevation to the top of the contaminated soil) beneath Building 3A can be computed from the mean elevations of sampling points M150N0 through W213N25, the locations of which are shown on Figure 24. Using the elevations recorded in Table 8, that calculation yields a mean elevation of 39.95 ft. NAVD.

In the case of Building Type 1, the mean elevation of the floor of Remedial Excavation No. 1 computed from the elevations presented in Table 8 for all of the sampling points that are located as shown on Figure 23 was 36.01 ft. NAVD.

Based on the elevational data previously discussed, the following parameters were used in the risk assessment analyses:

Building Type	**Depth to Bottom of Affected Soils** ***ft.***	**Depth to Top of Affected Soils** ***ft.***
3A	26.71	6.88
1	24.52	6.37

Note: If affected soil is located below the water table, COCs cannot be released from it by the process of vaporization. Such soil may contribute dissolved COCs to groundwater, which itself may cause those materials to migrate along available pathways and affect receptors on the ground surface, within buildings or at other locations, but that scenario does not directly affect computations of health risk due to vaporization of COCs from soil. It is, therefore, erroneous to assume that COCs vaporize from submerged soil when computing health risks at a site.

Although details of the concentrations of COCs in both soil and groundwater were included in the input to the RBCA Tool Kit for Chemical Releases software used to perform the health risk calculations, care was taken to adapt the computational models to account correctly for the lack of vaporization of those chemicals from submerged soils. For the purpose of the health risk analyses, the depth to the top of the affected soil was inputted into the analytical software, but the bottom of the affected soil zone must be assumed to be at the depth of the water table (*i.e.*, 8.44 ft. in the case of Building Type 3A and 6.47 ft. for Building Type 1). The effect of that procedure is to cause the software to compute a thickness of the zone of soil affected by the COCs to be that which is above the groundwater table, so that, in the risk computation process, no account is taken of chemical vapors that would otherwise be erroneously computed as emitting from the submerged soil.

3.5.2.2.2 Affected Soil Area

As was discussed in Section 2.3 above, because several of the key parameters, such as depth to groundwater, depth to top and bottom of affected soil, and the occupancy of the first-floor units is building-specific at the Oak Walk Site, separate health risk analyses were made for Building

Types 3A and 1, the interiors of which may potentially be exposed to higher concentrations of COC vapors than other buildings on the site. Accordingly, in making the analyses, the plan areas of the ground floor levels of Buildings 3A and 1 were used to represent the affected soil area in each case. Those building plan areas are listed in Table 12.

3.5.2.2.3 Length of Affected Soil Parallel to Assumed Wind Direction

Wind directions in the San Francisco Bay Area vary considerably, both seasonally and daily, depending upon the regional weather patterns and relative temperatures in the Central Valley of California and along the Pacific Coast. Although the prevailing wind direction, based on statistical analysis of weather records, is generally stated to be from the northwest, for the purpose of the health risk analyses and to ensure an appropriate degree of conservatism, DEC assumed that the wind would at all times blow in the direction parallel to the longest dimension of the area of the site that is affected by the chemicals of greatest concern (*i.e.*, the BTEX compounds). Further, although a separate risk analysis assessment was made for Building Types 3A and 1, for the purpose of evaluating the potential effect of the COCs on outdoor air in the vicinity of each building type, it was conservatively assumed that the whole of the area of the site where the subsurface is affected by benzene contributes to the condition of the local air. Accordingly, based on an examination of Figure 35, the longest dimension (*i.e.*, west to east) of that area was estimated to be 270 ft. and, in the other dimension (*i.e.*, south to north), was estimated to be 60 ft.

3.6 Site- and Building-specific Air Parameters

For the flow paths considered in the health risk assessment for the Oak Walk Site, the following site-specific air parameters were used.

3.6.1 Outdoor Air Pathways

For the pathways of concern to the present health risk assessment, the outdoor air pathway parameters of concern are the outdoor air mixing zone height and the ambient air velocity in the mixing zone.

3.6.1.1 Air Mixing Zone Height

The ASTM default outdoor air mixing zone height is 6.56 ft. (200 cm), which reflects the breathing area of an average person. DEC used this value in the health risk analyses reported herein.

3.6.1.2 Ambient Air Velocity in Mixing Zone

The wind speed in the outdoor air mixing zone affects the concentrations of COCs in outdoor air because it has a major influence on the dispersion of those chemicals. The ASTM default value for the wind speed (*i.e.*, the ambient air velocity) in the outdoor mixing zone is 7.38 ft/sec (225 cm/sec). Actual wind speed data is available from an anemometer located at the East Bay Municipal Utility Districts' sewage treatment plant in Oakland, approximately 0.9 miles west-southwest of the subject property. The mean annual wind speed for that site is 10.56 ft/sec (322 cm/sec) (San Francisco Bay Area Air Quality Management District 1997). SJC used that value in the health risk analyses reported herein.

3.6.2 Indoor Air Pathway: Building Parameters

The parameters related to indoor air pathways for Building Types 3A and 1 at the Oak Walk Site are discussed below.

3.6.2.1 Foundation Areas and Perimeters

The foundation areas and perimeters for each building type are shown in Table 12.

3.6.2.2 Building Volume/Area Ratio

The building volume/area ratio expresses the volume of the indoor space in a building as a ratio of the total volume indoor space to its floor area. In the case of the Oak Walk buildings, that ratio is equal to the floor-to-ceiling heights of the ground floors of the applicable commercial or residential units. The floor-to-ceiling heights and associated volume/area ratios for each building are shown in Table 12.

3.6.2.3 Building Air Exchange Rate

The building air exchange rate quantifies how much outdoor air is exchanged with indoor air in buildings. In residences not equipped with air conditioning systems, that value is affected in large measure by natural ventilation that occurs through windows and the opening and closing of exterior doors.

The ASTM default for residential units is 0.5 air changes per hour (**ACH**), which is equivalent to 0.00014 volumes per second. However, that value does not consider the local climate. In hot climates, residents will leave doors and windows open for long periods during the day, thus providing natural ventilation that is significantly above the continental mean. Conversely, in colder regions, or where winters are more inclement and extended, residences will remain relatively closed up, with associated lowering of air exchange rates for much of the year.

Emeryville, which is located on the eastern shore of San Francisco Bay, has a very temperate climate with only minor seasonal variations in average temperature. In fact, Lawrence Berkeley National Laboratory’s Environmental Energy Technologies Division considers a value of 2.0 ACH to be reasonable for residences in California generally (Spence and Gomez 1999a). DEC used that value, which is equivalent to 0.00057 volume exchanges per second, for analyses of health risks for residential units on the Oak Walk Site.

Air exchange rates in occupied commercial buildings are usually considerably higher than those in residential buildings. This is frequently due to mechanical ventilation systems and other equipment installed to control the work environment. The ASTM air exchange rate default for commercial buildings is 0.83 ACH (0.00023 exchanges per second). However, when the outside temperature is between 60° F and 70° F, Pacific Gas & Electric Company’s (**PG&E**) Energy

Center in San Francisco, California, recommends that buildings should be ventilated with 100% fresh air because that method is more efficient than use of artificially-cooled or processed air.

Given the climate on the eastern shore of San Francisco Bay and the heating, ventilating and air conditioning (**HVAC**) engineering considerations noted above, Spence and Gomez used an air exchange rate of 5.0 ACH (0.0014 exchanges per second) when analyzing health risks for a general class of commercial buildings in the region (Spence and Gomez 1999a). DEC also adopted that exchange rate for commercial space at the Oak Walk Site. Although that value is higher than the ASTM default, it is considered appropriately conservative when making health risk assessments for the commercial units. It is particularly appropriate in the case of Building Type 1, which, when fully occupied, to comply with building codes and adherence to good HVAC engineering practices, will be equipped with extensive exhaust systems that operate at capacities that must be greater than specified minimums and that exhaust large volumes of air from the interior to the exterior of the facility, thus promoting frequent exchanges of the total volume of air within the building.

3.6.2.4 Foundation Thickness and Depth to Bottom of Foundation Slab

The ground floors of the buildings on the Oak Walk Site are underlain by a 6-in. thick concrete slab reinforced with No. 4 (0.5-in. diameter) deformed bars at 18 in. on center in both directions. Even when the blocking effect of the impermeable membranes laid beneath them are discounted, in the context of making the health risk evaluation the slabs provide significant barriers to migration of vapors of COCs into the interior spaces of the buildings. Therefore, their thickness and the degree to which they may become cracked are critical parameters that must be considered when computing the concentrations of gasses or vapors of COCs that might accumulate inside the buildings.

To reflect the design of the buildings' foundation and floor slab system, a value of 6 in. (0.50 ft.) was used for both the "foundation thickness" and "depth to bottom of foundation slab" parameters that must be inputted to the risk assessment software.

3.6.2.5 Foundation Crack Fraction

The ASTM default for the areal fraction of cracks in a building foundation or floor slab is 0.01, *i.e.*, 1.0%. However, most practitioners consider this value to be unreasonably high, particularly for modern floor slab construction such as that at the Oak Walk Site where, as is noted in Section 3.6.2.4 above, the floor slabs are heavily reinforced. Other, widely misunderstood assumptions about foundation crack fractions have been made by some practitioners and by a surprisingly large number of regulatory agencies using the Johnson and Ettinger Model. For example, many conclude that crack fractions in constructed buildings range from 0.001 to 0.01. Those values have been used to set screening values for organic compounds in the subsurface and s are often used as if they represented the actual crack fractions in constructed buildings. That could not be further from the truth. As can easily be determined by reading their original paper, Johnson and Ettinger did not intend those values to reflect actual conditions in constructed buildings. They arbitrarily used that range of crack fractions to perform sensitivity studies to assess how changes in that input parameter changed the output of their model (Johnson and Ettinger 1991). In fact few direct measurements of the crack ratio for typical buildings have been made in the United States. However, the Dutch Ministry of the Environment actually measured vapor concentrations in the crawl spaces beneath and in the interior of buildings with a variety of floor constructions as part of a thoroughly engineered program to assess the validity of vapor intrusion models. Those measurements yielded a range of 0.000001 to 0.0001 for the crack fraction. The value 0.0001 was applied to foundation types classified as "bad." Those included wooden floors composed of nothing but boards over crawl spaces with damaged boards having sizeable holes in them. The foundation slabs with a crack ratio of 0.000001 were classified as "good". This group included foundations formed by concrete slabs (not necessarily with reinforcement) on grade (Waitz, M. F., J. Freijer, P. Kruele, and F. Swartjes 1996).

Because the floor slabs of the buildings at the Oak Walk Site were constructed on engineered fill and formed of heavily-reinforced concrete, all of which was inspected and tested under engineering supervision, DEC chose to use a crack value fraction of 0.000001 or 0.0001%, which is based on the actual performance of such slabs rather than some arbitrary number that was historically used to perform theoretical sensitivity analyses.

3.6.2.6 Volumetric Water and Air Content of Cracks

The more air present in foundation or basement-wall cracks, the more easily a volatilized chemical can infiltrate a building. However, it is unreasonable to assume that cracks in a floor slab would remain free of dirt or water throughout the life of the building. Even if the slab surface remained exposed, the cracks would gradually begin to fill with dirt after they formed. In reality, the slab surfaces in the Oak Walk buildings are covered with tile, carpeting and other flooring materials which themselves serve to obstruct the flow of air through the cracks regardless of when they are formed. In all cases, these floor coverings are laid on adhesives and other sealants that would fill completely any cracks that might develop

Moisture can also infiltrate cracks and be trapped there under capillary tension, particularly in fine or hairline cracks such as those that might form in the heavily-reinforced slabs of the Oak Walk buildings. The ASTM default values for the volumetric water content and the volumetric air content of cracks are 0.12 (12%) and 0.26 (26%), respectively. For the reasons stated above, those proportions reflect highly-conservative assumptions about free air in the cracks that might permit convective air flow from the subsurface into the interior of the buildings. Therefore, DEC has elected to use those values as the input required for the health risk analyses reported herein.

3.6.2.7 Indoor/Outdoor Differential Pressure and Convective Air Flow through Cracks

The assumed differential pressure between indoor air and outdoor air is an important parameter controlling convective air flow through cracks in floor slabs and through openings in a building's skin. The rate of convective air flow, in turn, influences the concentrations of vapors of COCs that may accumulate in the interior air. If there is no differential pressure between the interior of a building and the outdoors, there is no convective air flow through foundation slabs. These latter conditions are set as the ASTM defaults for health risk analyses. However, in DEC's opinion, the assumption is non-conservative, particularly with respect to commercial buildings, because those structures frequently have interior air pressures that are less than ambient outdoor pressures. Low interior air pressures are particularly common in restaurants that might occupy the first floor of Building Type 1 on the Oak Walk Site because building code requirements and good HVAC engineering practices require enhanced exhaust system flow rates in the vicinity of cooking ranges and other heat- and fume-generating equipment. For such reasons, negative pressures can occur in commercial buildings and may also be present in residential units, although conditions in restaurants usually represent the upper range of differential pressures that develop between indoor and outdoor air.

Empirical values of relative interior to exterior differential air pressures, including the maximum measured in buildings subject to low interior pressure, have been measured in the field (DiPersio and Fitzgerald 1995, Bonnefous, *et. al.* 1992). These measurements include those published by Nazaroff, who concluded that, with respect to infiltration of vapors of COCs, differential pressure can be as great as 0.01 psi (Nazaroff, *et. al*. 1987). For consistent conservatism in the health risk analyses for the potentially-affected structures on the subject property DEC used that pressure differential, which would generate significant convective upward air flow through any cracks that may develop in the floor slabs. That value was used for both commercial and residential units, even though it is recognized that it is extremely conservative when applied to the residential units.

3.7 Receptor-specific Parameters

A health risk analysis must include consideration of the characteristics of the potential "receptors" (*i.e.*, in the case of a human health risk assessment, the exposed humans) of COCs that might migrate from the affected zones of subsurface soil and groundwater. Because both carcinogenic and toxic effects of exposure to COCs are, in most cases, cumulative with time and more acutely affect persons having a low body weight, such as children, the frequency and total duration of exposure to a chemical or combination of COCs, and the weight of the person exposed must be considered carefully.

3.7.1 Exposure and Averaging Times

The ASTM guidance documents assume, as a default, that the length of time used to normalize statistically the intake of a carcinogen is 70 years for residential, commercial and construction environments. That default is also the standard upon which the USEPA's carcinogenic and toxicity data are based. DEC's model assumes the same length of time for statistical normalization.

For the purpose of making the health risk assessments, DEC assumes that the concentrations of carcinogens remain constant over the average exposure time, which is very conservatively assumed to be 30 years for persons in residential environments and 25 years for commercial workers. This is a very conservative assumption because concentrations of carcinogens in soil and groundwater will actually decrease over time under the action of natural attenuation processes.

The ASTM default for the averaging times for non-carcinogenic health effects are also 30 years for residential and 25 years for commercial or industrial environments, which are also highly conservative. DEC's model adopts those values, but sets the averaging time for non-carcinogenic effects for construction workers to be one year, which better matches actual construction working conditions that might, in the future, be encountered on the subject site than does the ASTM default value of 25 years.

3.7.2 Body Weight

Although body weight is known to be an important variable influencing the effects of carcinogens and toxic chemicals on human health, the ASTM default for body weight is set at 70 Kg (154 lbs), which is, in the United States, the approximate mean weight of individuals between the ages of 6 and 75 years (United States Environmental Protection Agency 1989a). However, the USEPA also cites the mean body weight of children between the ages of 0 and 6 years as 15 Kg (33 lbs) (United States Environmental Protection Agency 1996, 1993a, 1991b). For the purposes of evaluating health risks related to the ingestion of soil and water or when related to swimming in affected surface waters, it is DEC's practice to consider different ingestion rates during the first 6 years of a person's life as differentiated from the remainder of that life. In addition, to take advantage of available health risk data regarding dermal exposure to affected soil or surface water, it is DEC's practice to also consider the mean body weight of youths between the ages of 0 and 16 years, for which we use 35 Kg (77 lbs), which value has been statistically established by the USEPA (United States Environmental Protection Agency 1992a).

> **Note**: Although the body weights of receptors of different ages appear in the output of the health risk analyses presented in Appendices B and C (*i.e.*, they are used in relation to parameters for which "Age Adjustments" are made), they are cited there only for reasons of formality because there is no exposure to affected soil on the Oak Walk Site. Exposure to contaminated surface water, which, if present, would call for modeling of different ingestion rates and skin surface areas for persons of different ages, is not an issue that needs to be addressed for either on-site or off-site locations in a Tier 2 analysis for the subject property because no surface water is present on or in the neighborhood of the site.

3.7.3 Inhalation Rate

The RBCA Tool Kit for Chemical Releases software used to perform the health risk calculations does not contain equations that use age, body weight or inhalation rate in the context of potential exposure pathways that might lead to inhalation of COCs. This is because the calculations made in the software are based on reference *concentrations* as opposed to reference *doses* for non-carcinogens, and *unit risk* factors as opposed to *slope* factors for carcinogens (Groundwater Services, Inc. 2011).

A reference *concentration* (**R*f*C**) is an estimate of a maximum continuous inhalation exposure of a human population (including sensitive subgroups such as young children) to a toxic non-carcinogen below which there would be no significant risk of deleterious effects over the average lifetime of the population. A *unit risk* factor (**URF**) is the upper-bound excess lifetime cancer occurrence in a population of 1,000,000 due to continuous inhalation exposure to a carcinogen at a concentration of 1.0 $\mu g/m^3$ in air. Both R*f*C and URF values are independent of inhalation rate or body weight. (See Appendix D for additional discussion.)

Although the equations used in the RBCA Tool Kit for Chemical Releases software make no assumptions with regard to inhalation rate, it would be possible to scale the exposure duration or exposure frequency values (see Sections 3.7.4 and 3.7.5 below) used for the analysis of any given site model to account for varying inhalation rates. However, DEC did not do this because: a) the reference concentrations and unit risk factors that are used for each COC in our calculations are based on lifetime studies of human populations that already account for varying body weight and inhalation rates with age; and b) it would not be conservative to scale either the exposure duration or exposure frequency values. For example, if it was decided to reflect a 10 m^3/day inhalation rate, which is typical of a young child, instead of a 20 m^3/day inhalation rate that might be proposed for a physically active commercial worker (United States Environmental Protection Agency 1996, 1997), then the default exposure duration of 350 days per year would be reduced to 350 x 10/20 = 175 days/year, which would not yield such conservative results for health risks as would be the case when the unmodified ASTM default value of 350 days/year is used.

3.7.4 Exposure Duration

Exposure duration is the number of years over which an individual is assumed to be exposed to a COC. The ASTM default value for exposure durations is 30 years for residential sites and 25 years for commercial and industrial sites. DEC's model also uses those values for adults potentially exposed to COCs in commercial environments. However, when considering residents of the Oak Walk Site, depending upon the exposure pathway being evaluated, DEC divided the total 30-year exposure duration into two parts based on the age of the human receptor. Depending upon the availability of data in the published literature, that division occurred at the age of 6 years or at the age of 16 years. Where age adjustments related to young children between the ages of 0 and 6 years were applied, an exposure duration of 6 years was used for that period of a person's life. Similarly, in cases where age adjustments were made for persons between the ages of 0 and 16 years, an exposure duration of 16 years was used for that period of life. In either of those situations, the years spent as a child or young person were subtracted from the total 30-year exposure duration that would have been used if no age weighting had been applied. For the remaining 24 or 14 years of the exposure duration, as applicable, a person was assumed to be at an adult weight. To account for the total effects of a 30-year exposure duration, the time periods over which the exposed person was assumed to have different body weights due to their age were added together.

The ASTM default exposure durations are highly conservative and are the same as the values proposed by the USEPA, which values are based on analysis of 1983 United States Census Bureau data (United States Environmental Protection Agency 1989a). DEC's consideration of age weighting adds significantly to that conservatism.

The degree of conservatism applied to the health risk assessments by DEC's use of age weighting adjustments to the ASTM default values for exposure durations can be gauged by considering the following characteristics of the Census Bureau data used by the USEPA when deriving its assumptions for exposure durations. Emeryville is an urban area and the USEPA exposure durations include statistical data from rural areas where population mobility tends to be significantly lower than in the urban communities on the eastern shore of San Francisco Bay. These factors have been studied by Israeli and Nelson (1992), who report that in the United States, 95% of all urban households stay in one residence for no more than 21.7 years while, regardless of their rural or metropolitan environment, 95% of western households move from one residence to another every 17.1 years. With respect to commercial and industrial land use scenarios, the United States Bureau of Labor Statistics reports that 50% of workers move from one job to another every four years (United States Bureau of Labor Statistics 1988).

In the case of construction workers DEC modeled the exposure duration to be one year, which is again highly conservative, because over the duration of any foreseeable construction program at the Oak Walk Site individual workers will spend less than a typical maximum of three months on the site due to the changing trade skills required as work progresses.

3.7.5 Exposure Frequencies

Exposure frequency is the number of days per year that a person is assumed to be exposed to a COC. The ASTM default residential and commercial exposure frequencies, which are based on guidance from the US-EPA, are 350 days per year and 250 days per year, respectively. Because of the limited duration over which construction workers might be exposed to COCs in the subsurface, the frequency of exposure of those workers is set at 180 days per year (United States Environmental Protection Agency 1996). DEC used the same exposure frequencies when computing health risks at the Oak Walk Site. ASTM also has a separate default value for swimming-event frequency for residential land use, which is set at 12 events per year, but consideration of such events is not applicable to the Oak Walk Site where no surface waters are present.

The general residential exposure frequency of 350 days per year applies to both indoor and outdoor exposure to inhaled vapors of COCs. In both applications, that frequency is extremely conservative because, with the exception of 15 days per year when it is assumed that a resident would be on vacation, the frequency implies that a person would spend 24 hours of each day at home. In the case of indoor exposure, it takes no consideration of time spent away from home such as, in actuality, is required to meet work and school schedules, perform errands and participate in such events as weekend trips. Conversely, for the outdoor exposure scenario, the default residential exposure frequency is based on the assumption that a resident at the subject property would spend 24 hours per day on the site and that all of that time would be spent outdoors. That assumption is clearly highly conservative.

The ASTM default exposure frequency of 250 days per year for commercial workers, which was also adopted by DEC for the health risk assessments reported herein, is based on a five-day work week for 50 weeks of the year. This value is conservative because it does not provide for national holidays or additional time off work that typically amounts to 10 - 20 days per year.

3.7.6 Other Receptor-specific Parameters

For reasons of formality, the presentation of the output from the health risk analyses that are compiled in Appendices C and D include receptor-specific parameters for pathways such as those related to ingestion of surface waters and consumption of fish caught in such waters that are not present on the Oak Walk Site. The values cited in the appendices for such parameters, although they are not actually used in the computations made for the subject site, are all either ASTM default values or highly-conservative numbers derived from reliable sources.

3.8 Acceptable Health Risks

Health risks are expressed in two forms: carcinogenic risk factor and toxic hazard quotient. The carcinogenic risk is expressed as the projected increase in the number of persons that become affected by cancer due to extended exposure to the conditions on the subject site compared to the general population not exposed to the site conditions. For example, a carcinogenic risk factor of 1.0×10^{-6} expresses the risk that there would be one additional occurrence of cancer in a population of one million persons exposed to the conditions at the site compared to the number of incidents of cancer found in a reference population of one million persons not exposed to the environmental conditions at the site.

The toxic hazard quotient is a measure of the severity of exposure for a period of time to a given COC that can be tolerated by a person exposed to that chemical by any pathway (*e.g.*, inhalation of contaminated air, ingestion of contaminated soil, or dermal contact with contaminated soil) or combination of pathways without suffering any toxicological symptoms due to that exposure. It is expressed as a ratio between the level of exposure to a given COC compared to an established reference dose below which no adverse health effects are experienced even when exposure is prolonged. A closely related parameter is the “toxicity hazard index” which is the sum of the toxic hazard quotients of two or more COCs at a given site due to the exposure of a particular receptor. A toxicity hazard index of 1.0 reflects the maximum tolerable limit to which a person can be exposed without suffering negative health effects. A toxic hazard index of less than 1.0 reflects the degree to which the anticipated exposure is less than that required to induce negative health effects. As the toxic hazard index rises above 1.0, its value reflects the severity of the toxicity of the environment to which a receptor is exposed.

On a given site, persons may be exposed to risks due to the presence of more than one carcinogenic and/or toxic chemical and the exposures may be via more than one pathway. Accordingly, to assess health risk properly, it is necessary to consider the cumulative effect on health due to the presence of all of the COCs present and if multiple pathways between the source and the receptor are present their cumulative effects must also be considered. For the health risk assessments presented herein, DEC computed the cumulative risks of all COCs present due to their migration via all applicable pathways.

3.8.1 Classification of Carcinogens

Carcinogens are classified by the USEPA according to a system that is based on the weight of available evidence that they are, or are suspected to be, human carcinogens. Carcinogens are classified according to alphabetic nomenclature that is based on the weight of available evidence that a given chemical is, or is suspected to be, a human carcinogen. Chemicals known to be potent human carcinogens are classified as “A” carcinogens, while non-carcinogenic chemicals are given the classification “D.” At the Oak Walk Site, only three known human carcinogens - benzene, ethylbenzene and naphthalene - have been detected in the subsurface. Benzene is a Class A carcinogen, ethylbenzene is a Class B carcinogen and naphthalene is a Class C carcinogen. The other COCs at the Oak Walk Site (see Sections 3.1 and 3.2 above) are toxic materials, but are not known to be carcinogenic; thus, they fall into the "D" classification.

3.8.2 Health Risk Limits of Carcinogens

Although there is a general perception that a risk factor of 1.0 x 10^{-6} represents an established upper limit of acceptable carcinogenic health risk promulgated in State and Federal regulations, that is *not*, in fact, the case. The USEPA has indicated that the appropriate risk limit applicable to a specific exposure or a specific form of exposure should fall within the range 1.0 x 10^{-6} to 1.0 x 10^{-4}. The origin of the 1.0 x 10^{-6} limit appears to have been a recommended risk-based limit for residues of animal drugs found in human food-grade meat (United States Food and Drug Administration [**FDA**] 1973). That target risk level represents, essentially, a zero risk (Malander 2002).

As the inherently conservative nature of risk assessment calculations has been recognized and as risk-based evaluation of environmentally compromised sites and other potential human exposures have been more widely used in regulatory decision-making, other, less stringent, risk level guidelines have been legislated or adopted. For example, in its Hazardous Waste Management Systems Toxicity Characteristics Revisions, the USEPA selected a single level of 1.0 x 10^{-5} based on that Agency's belief that, due to the extremely conservative nature of the exposure scenarios employed in risk-based health risk assessments and the underlying health criteria used, a 1.0 x 10^{-5} risk level is realistic and appropriate as a practical target limit to protect the health of an exposed population (United States Environmental Protection Agency 1995a).

California State Proposition 65 (The Safe Drinking Water and Toxic Enforcement Act of 1986) enforcement is also based on a limiting target risk of 1.0 x 10^{-5}. Proposition 65 requires the governor of California to publish annually a list of chemicals known to the State to cause cancer or reproductive toxicity. All businesses that might expose individuals to a listed chemical must post a clear warning of such risk on the business premises, unless there is "no significant risk" posed by the chemical in question. The State of California has defined "no significant risk" as less than one excess case of cancer per one-hundred thousand individuals, which corresponds to target risk of 1.0 x 10^{-5}.

Target carcinogenic risk limits are not values that are derived from the health risk assessment calculation or from the carcinogenic or toxicological properties of any given chemical or combination of chemicals. In fact, as is evidenced by the discussion above, any selected health risk limit is, in fact, an arbitrary value that represents the perspective of a given regulatory agency, a local community, or an interest group about what constitutes an acceptable risk to human health in the context of its social, political and economic milieu. For example, the City of Oakland had preliminarily established a risk limit of 1.0 x 10^{-6} to develop Tier 1 risk-based assessment guidelines, but after extensive input from representatives of a wide range of local interests that included regulatory agencies, consulting engineers, community improvement groups, minority business associations, the Sierra Club and a wide cross-section of Oakland residents, that city set a health risk limit of 1.0 x 10^{-5} for Tier 2 health risk assessments (Spence and Gomez 1999b).

ASTM recommends a target carcinogenic health risk of 1.0 x 10^{-5} for risk-based assessments at petroleum release sites and describes that value as representative of *de minimus* risk (American Society for Testing and Materials 2002). DEC is firmly of the opinion that the 1.0 x 10^{-5} limit is applicable to the Oak Walk Site because: a) below that level there is, as had been stated by the State of California in the context of Proposition 65, as well as by other regulatory bodies, no significant risk to exposure from a known carcinogen; b) given the approximations inherent to Tier 2 health risk computations, health risk targets set lower than 1.0 x 10^{-5} have no practical mathematical significance other than as a representation of what is, in reality, a *zero* health risk; and c) the City of Oakland's election to use a health risk of 1.0 x 10^{-5} for sites in that city that include geologic, hydrogeologic, climatic and economic and socio-political environments that are essentially identical to those in the City of Emeryville, including those of the Oak Walk Site, properly reflects all of the factors that should be considered when setting a site-specific target risk level. However, the RWQCB, which has jurisdiction of the subject property in Emeryville, uses a target risk of 1.0 x 10^{-6} when preparing ESLs (California Water-quality Control Board - San Francisco Bay Region 2008). Accordingly, although for the reasons stated above DEC believes that such a target risk is unwarranted and mathematically meaningless, when evaluating the results of the risk assessment for the subject property that are reported herein DEC compared the carcinogenic risk to that 1.0 x 10^{-6} target risk level.

3.8.3 Toxic Hazard Limits

For non-carcinogenic health effects, the results of most health risk assessments are compared with a toxic hazard quotient of 1.0, which represents the threshold value below which no adverse health effects are experienced by exposed populations and is the ASTM default value for Tier 2 risk assessments. This value is based on the precedents set by the USEPA in its Risk Assessment Guidance for Superfund (**RAGS**) (United States Environmental Protection Agency 1989b). It was also adopted by the City of Oakland, but with a requirement to address cumulative risk, if necessary (*i.e.*, to consider the toxic hazard *index*), when it developed its guidelines for Tier 2 health risk assessments (Spence and Gomez 1999b). With respect to this measure of health risk, DEC concurs with both the USEPA and the City of Oakland and we normally set both the target health risk quotients and the health risk index at 1.0 when evaluating specific sites where the environment has been impaired. The RWQCB, however, in preparing its ESLs for affected soil and groundwater in the San Francisco Bay region, elected to use target quotients at the unusually conservative value of 0.2. That Agency's guidance document provides an option for site-specific adjustment of that value (California Water Quality Control Board - San Francisco Bay Region 2008); however DEC has elected to conform to the RWQCB's unmodified value and has also adopted the extremely conservative criterion that limits both the target quotients and target index to 0.2.

4.0 RESULTS OF HEALTH RISK ASSESSMENTS

As was discussed in Section 2.3.1, the potential health risks associated with Building Types 3A and 1 on the Oak Walk Site were selected for analysis due to their locations in areas of the site that are affected by relatively high concentrations of COCs in soil and groundwater because of the low elevations of their ground floor slabs. Their locations are shown on Figure 43.

4.1 Health Risk Analysis for Building Type 3A

The RBCA Tool Kit for Chemical Releases software was used to perform a health risk analysis for Building Type 3A using the conservative parameters established in Section 3.0 above. The results are presented in Table 16.

The graphic and numerical data produced as output by the health risk assessment software is presented in Appendix B. It includes complete documentation of the input parameters used to perform the assessments and the results of the interim and final calculations required to compute both the chemical-specific and pathway-specific toxicological and carcinogenic health risks associated with exposure pathways associated with both outdoor air in the area of the site surrounding Building Type 3A and the exposure to indoor air in that building type. Exposure pathways related to contact with soil, groundwater or surface water are not applicable to a risk assessment of the Oak Walk Site because residents will not be exposed to those risk pathways.

> **Note:** The exposure pathway flow chart included in the computer output presented in Appendix B represents affected surficial soils as being a source media for COCs. However, in actuality, that is not the case at the Oak Walk Site. All affected soils are buried at depth beneath the ground surface. The presence of affected surficial soils as a source medium in the diagram generated by the software is an artifact of the computer code. It appears on a flowchart whenever the user elects to use the option whereby vaporization from subsurface soil to outdoor air is computed by both the Johnson-Ettinger method and the ASTM method for surface soils, so that the results of the ASTM calculation can be set as an upper limit, which might otherwise be exceeded due to the limitations of the Johnson-Ettinger computational method (See Section 2.4.1 above). The source media and COC migration pathways actually present on the Oak Walk Project site are correctly represented on Figure 42.

The results of the health risk analysis for Building Type 3A are presented in Table 16. Examination of that Table shows that both the calculated cumulative carcinogenic risk of and the toxic hazard index for both outdoor and indoor air are below the applicable target risk and target index of 1.0×10^{-6} and 0.2, respectively. It is important to recognize that those results are based on the worst-case assumptions regarding the risk modeling parameters that were developed in Sections 2.0 and 3.0 of this document. The highest risks for the Type 3A building are associated with exposure of residents to outdoor air. The computed carcinogenic risk for that pathway is 7.0×10^{-7} with a toxic hazard index of 4.9×10^{-2}.

It may be somewhat counterintuitive to find that the computed carcinogenic risk and toxic hazard index for exposures to outdoor air are greater than those for indoor air, however, when it is recalled that the Johnson-Ettinger computations can overestimate the concentration of COCs in air above the ground surface by a factor of 10 to 100, the computed values can be seen to be plausible. This is true even though in the adopted health risk model vapor emissions were assumed to be equivalent to a condition where COCs were boiling on the ground surface.

4.2 Health Risk Analysis for Building Type 1

The results of the health risk analysis for Building Type 1 are also presented in Table 16. The graphic and numerical data produced as output by the health risk assessment software is presented in Appendix C.

Examination of that Table shows that both the calculated cumulative carcinogenic risk of and the toxic hazard index for both outdoor and indoor air for Building Type 1 are also below the applicable target risk and target index of 1.0×10^{-6} and 0.2, respectively. The highest risks for the Type 1 building are again associated with exposure of residents to outdoor air, with the computed carcinogenic risk for that pathway being 2.9×10^{-8} with a toxic hazard index of 4.6×10^{-3}.

4.3 Interpretation of Cumulative Carcinogenic Risk and Toxic Hazard Index

When considering the numerical values of the cumulative carcinogenic risks and toxic hazard indices presented in Table 16 that were computed for Building Type 3A, it is important to note that target cumulative carcinogenic risks and target toxic hazard indices are arbitrarily set. As was noted in Section 3.8.2, the USEPA (United States Environmental Protection Agency 1995a), the State of California (See The Safe Drinking Water and Toxic Enforcement Act of 1986), and the ASTM (American Society for Testing and Materials 2002) are in agreement that when cumulative carcinogenic risks and toxic hazard indices for a site fall below 1.0×10^{-5} and 1.0, respectively, there is no significant health risk present on the site. Lower values simply mean that there are, for practical purposes, zero human health risks present. Although the mathematical formulation used for the health risk analyses conducted for the Oak Walk Site produced values that are very much smaller than those established targets, it is not meaningful to try to assign a quantitative concept of risk to such low numeric values, except to the extent that they indicate that they are less than the "no significant risk" criteria. When interpreted in that light, it is clear that the risk assessment analysis results presented in Table 16 show that there is no significant health risk to the occupants of Building Type 3A on the Oak Walk Site. The same is true for occupants of Building Type 1.

4.4 Health Risk Analyses Ignore Presence of Liquid Boot® Membrane beneath Building

As is discussed in Sections 4.1 and 4.2 above, the health risk analyses demonstrated that there are no significant health risks present either indoors or outdoors at the Oak Walk Site. However, it is important to recognize that the risk analyses took no account whatsoever of the Liquid Boot® membrane placed beneath the floor slabs of all of the occupied space on the site in compliance with the directives of the ACEHD and the approved Corrective Action Plan (The San Joaquin Company Inc. 2006a and 2006b, Alameda County Environmental Health Care Services 2006a and 2006b).

The Liquid Boot® membrane would greatly inhibit, if not entirely eliminate, the migration of vapors of COCs from the subsurface into the interior space of the buildings. This is due to its action with respect to the following two factors that affect the pathways by which COC vapors might enter a building on the Oak Walk Site.

4.4.1 Blocking of Cracks in Floor Slabs

Without considering its properties as a barrier to the passage of vapors, the elastic and flexible elastomeric Liquid Boot® membrane placed beneath the floor slabs of the occupied buildings (see Figures 25 and 26) would completely block any cracks that might develop in the slabs. (**Note:** It is not possible to simulate that condition in the health risk assessment software because attempting to assign a zero value for the crack fraction produces a vacuous exception.) If it were a computational possibility, assigning a zero crack fraction to the slabs to simulate the actual conditions of the floors at the Oak Walk Site would significantly reduce the computed carcinogenic risks and toxic hazard indices.

4.4.2 Capacity of Liquid Boot® to Inhibit Passage of Vapors of COCs

As noted in Section 1.6.4 above, the Liquid Boot®, has a hydraulic conductivity of less than 1.0 x 10^{-11} cm/sec (Tofani 2009) as measured by ASTM Standard Test D4491 (American Society for Testing and Materials 2004). It does not break down in the presence of petroleum hydrocarbons when subjected to the ASTM Standard D543-06 test (American Society for Testing and Materials International 2006) and it has been shown to gain less than 1% in weight when exposed to liquid benzene at a concentration of 136,000 μg/L. At that concentration, a 60 mil thickness of the material has a mean benzene diffusion coefficient of 2.1 x 10^{-13} m^2/day (GeoKinetics, Inc. 2008, Tofani 2009).

The competency of Liquid Boot® as a vapor barrier to inhibit the passage of hydrocarbons vapors has been cited by numerous regulatory agencies in California, in the United States and in many other countries. It is particularly noteworthy that the California DTSC specifies that it should be used on sites where the subsurface contains methane that could migrate into the interiors of school buildings (California Department of Toxic Substances Control 2005). Methane (CH_4) is the smallest of the hydrocarbons; it is only one carbon chain unit in length. Benzene (C_6H_6), the smallest molecule of the suite of COCs affecting the Oak Walk Site, is much larger than methane. It is obvious, then, that if Liquid Boot® is specified by the DTSC to mitigate the passage of methane through the floors of buildings, it would be even more effective in inhibiting the migration of benzene vapors and the vapors formed of the even larger molecules of other organic compounds present in the fuel hydrocarbons and solvents affecting the Oak Walk Site.

5.0 CONCLUSIONS

In summary, the very conservative health risk assessments conducted for the Oak Walk Site have demonstrated that following the site remediation and construction of residences and commercial buildings, neither occupants of the residential units nor workers in the commercial units will be exposed to any health risk in excess of those set by the target cumulative carcinogenic risk and target toxicity index used by the ASTM, the USEPA and the State of California's Proposition 65 (*i.e.*, 1.0×10^{-5} and 1.0, respectively). In fact, the computed carcinogenic risks and target toxicity indices are all less than the unusually-conservative target values set for this project of 1.0×10^{-6} and 0.2, respectively. However, as is true for values lower than the more rational criteria set by the USEPA and Proposition 65, such low mathematical values have little quantitative meaning other than to demonstrate that there is no significant health risk to the occupants of the site.

The cumulative carcinogenic risk and toxicity indices computed for the site in no way took account of the Liquid Boot® elastomeric membrane that was placed beneath all occupied space on the property. Liquid Boot® serves not only to block any cracks that could develop in ground floor slabs, as was assumed in the risk assessment models, but, as has been recognized by the DTSC and may other State and Federal regulatory agencies, it is a highly effective vapor barrier. Because neither of those protective properties of Liquid Boot® was considered by the computations made to generate the carcinogenic risks and toxicity indices for buildings on the site (see Table 16), the extreme conservatism of the results is evident. Thus, the Oak Walk Site fully meets the “no significant health risk” standard for its occupants.

6.0 REFERENCES

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TABLES

TABLE 1

TABLE 1

OAK WALK BORING AND WELL LOCATIONS AND ELEVATIONS

Well/Boring ID	**Surface Elev.** ft. MSL	**Casing Elev.** ft. MSL	**Latitude** Degrees (N)	**Longitude** Degrees (W)
BG-1	43.33	-	37.83126586	122.27971459
BG-2	46.47	-	37.83157152	122.27901056
CPT-1	46.54	-	37.83157565	122.27899228
CPT-2	44.69	-	37.83159903	122.27956231
BE-1	44.96	-	37.83140061	122.27938970
BE-2	46.60	-	37.83141540	122.27892388
BE-3	48.48	-	37.83149306	122.27850527
BE-4	44.59	-	37.83154608	122.27931623
BE-5	43.84	-	37.83168812	122.27985103
BE-6	43.88	-	37.83163348	122.27970796
WCEW-1	42.09	41.73	37.83120830	122.27974368
MW-2	44.71	44.40	37.83131189	122.27912475
MW-3	45.95	45.49	37.83137871	122.27878729
MW-4	47.49	47.31	37.83145282	122.27838874
MW-5	42.86	42.51	37.83147167	122.27983901
MW-6	43.86	43.35	37.83183292	122.27986542
MW-6A	43.60	43.18	37.83179969	122.27992736
MW-7	45.24	44.75	37.83194879	122.27958321
MW-8	48.53	48.38	37.83210236	122.27875590
MW-9	48.00	47.85	37.83189908	122.27887514
MW-10	45.90	45.66	37.83195822	122.27924086
MW-11	45.50	45.10	37.83181178	122.27950944
MW-12	43.20	42.93	37.83164128	122.27985519
MW-13	45.90	45.56	37.83169800	122.27948931
MW-14	45.70	45.19	37.83157942	122.27941128
MW-15	43.80	43.55	37.83145978	122.27961017
MW-16A	44.80	44.50	37.83133828	122.27933383
MW-16B	44.80	44.59	37.83136053	122.27934047
MW-16C	44.80	44.48	37.83135208	122.27933761
MWT-1	43.32	42.98	37.83138990	122.27976003
MWT-2	45.70	45.28	37.83146798	122.27918964
MWT-3	47.93	47.64	37.83151042	122.27863741
MWT-4	45.15	44.74	37.83156377	122.27949460
MWT-5	47.32	47.10	37.83159767	122.27883544
MWT-6	45.41	45.16	37.83175239	122.27951885
MWT-7 [1]	45.60	45.69	37.83164424	122.27918258
MWT-8	47.43	47.23	37.83175750	122.27885735
MWT-9	46.14	45.78	37.83193666	122.27927581
MWT-10	47.38	47.22	37.83197238	122.27902606
MWT-11	45.50	46.63	37.83170803	122.27930198

Well/Boring ID	**Surface Elev.** ft. MSL	**Casing Elev.** ft. MSL	**Latitude** Degrees (N)	**Longitude** Degrees (W)
MWT-12	46.10	47.97	37.83172816	122.27914423
MWT-13	46.30	48.16	37.83173814	122.27901118
MWT-14	47.80	47.85	37.83187913	122.27889705
SG-1	44.91	-	-	-
SG-2	45.93	-	-	-
SG-3	46.86	-	-	-
SG-4	47.46	-	-	-
SG-5	43.76	-	-	-
SG-6	45.91	-	-	-
SG-7	45.84	-	-	-
SG-8	42.51	-	-	-
SG-9	45.98	-	-	-
SG-10	47.31	-	-	-

Notes:

1) MWT-7 casing truncated by vandals. Elevation resurveyed on 11/1
2) Horizontal Datum: NAD 83
3) Vertical Datum: NAVD 88

TABLE 2

DEC

TABLE 2

RESULTS OF ORGANIC CHEMICAL ANALYSES OF SOIL SAMPLES RECOVERED FROM THE OAK WALK SITE

			Petroleum Hydrocarbons			**Other Volatile Organic Compounds**																	**PNAs**		
Sample ID	**Date Sampled**	**Depth BGS** *ft.*	**Mineral Spirits** mg/Kg	**TPHd (Diesel)** mg/Kg	**TPHg (Gasoline)** mg/Kg	**Benzene** mg/Kg	**Toluene** mg/Kg	**Ethylbenzene** mg/Kg	**Total Xylenes** mg/Kg	**MTBE** mg/Kg	**Acetone** mg/Kg	**2-Butanone** mg/Kg	**n-Butylbenzene** mg/Kg	**sec-Butylbenzene** mg/Kg	**tert-Butylbenzene** mg/Kg	**Isopropylbenzene** mg/Kg	**p-Isopropylbenzene** mg/Kg	**p-Isopropyltoluene** mg/Kg	**n-Propylbenzene** mg/Kg	**1,2,4-Trimethylbenzene** mg/Kg	**1,3,5-Trimethylbenzene** mg/Kg	**52 Other VOCs by 8260B** **GC/MS**	**Napthalene** mg/Kg	**2-Methylnapthalene** mg/Kg	**15 Other PNAs by 8270C** mg/Kg
Trenches																									
T1 - 7.0	12/03/03	7.0	*na*[2]	*70*[16]	***530***[5]	ND	ND	***8.3***	*4.7*	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T1 - 8.5	12/03/03	8.5	na	90	**1,400**[5]	ND	ND	**10**	1.9	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T2 - 6.5	12/03/03	6.5	na	ND	3.8[5]	0.026	ND	0.024	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T2 - 8.5	12/03/03	8.5	na	1.5	**300**[5]	**1.1**	3.1	**6.4**	**27**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T3 - 8.0	12/03/03	8.0	na	4.3	6.4	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	ND	na	na
T3 - 9.5	12/03/03	9.5	na	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T4 - 10.5	12/03/03	10.5	na	ND	ND	ND	ND	ND	ND	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	ND
T5 - 9.0	12/03/03	9	ND	70[4]	**400**	ND	2.6	**6.1**	**36**	ND	na	na	ND	0.6	ND	0.88	ND	ND	3.9	25	7.6	ND	**4.1**	**1.8**	ND
T6 - 8.5	12/02/03	8.5	na	70	**3,000**[5]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T7 - 9.0	12/02/03	9.0	na	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T8 - 8.5	12/02/03	8.5	na	**150**	**820**[5]	ND	ND	ND	ND	ND	na	na	0.51	0.81	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	ND
T9-S10-D 5.0	10/04/07	5.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T9-S10-D 10.0	10/04/07	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T9-S10-D 14.25	10/04/07	14.3	100	67	**19,000**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T9-S30-D 5.0	10/05/07	5.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T9-S30-D 10.0	10/05/07	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T9-S30-D 14.0	10/05/07	14.0	14	8.9	**3,900**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T9-S50-D 5.0	10/05/07	5.0	ND	12	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T9-S50-D 10.0	10/05/07	10.0	99	75	**530**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T9-S50-D 13.0	10/05/07	13.0	**900**	**600**	**7,600**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T9-S50-D 15.0	10/05/07	15.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-0S-5.0	09/21/07	5.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-0S-10.0	09/21/07	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-0S-15.0	09/21/07	15.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S21.5-17.0	09/21/07	17.0	**300**	**210**	**560**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S21.5-20.5	09/21/07	20.5	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S50-D 5.0	09/24/07	5.0	ND	3.8[16]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S50-D 10.0	09/24/07	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S50-D 15.0	09/24/07	15.0	48	30	**350**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S55-D 17.0	09/24/07	17.0	ND	ND	2.2	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S75-D 5.0	09/24/07	5.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S75-D 10.0	09/24/07	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S75-D 15.0	09/24/07	15.0	**580**	**360**	**2,100**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S75-D 17.0	09/24/07	17.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S100-D 5.0	09/26/07	5.0	ND	2.3	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S100-D 10.0	09/26/07	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S100-D 15.0	09/26/07	15.0	**1,300**	**820**	**4,200**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S125-D 5.0	09/26/07	5.0	ND	2.9	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S125-D 10.0	09/26/07	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S125-D 15.0	09/26/07	15.0	ND	ND	2.1	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

			Petroleum Hydrocarbons			**Other Volatile Organic Compounds**																	**PNAs**		
Sample ID	**Date Sampled**	**Depth BGS**	**Mineral Spirits**	**TPHd (Diesel)**	**TPHg (Gasoline)**	**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**	**MTBE**	**Acetone**	**2-Butanone**	**n-Butylbenzene**	**sec-Butylbenzene**	**tert-Butylbenzene**	**Isopropylbenzene**	**p-Isopropylbenzene**	**p-Isopropyltoluene**	**n-Propylbenzene**	**1,2,4-Trimethylbenzene**	**1,3,5-Trimethylbenzene**	**52 Other VOCs by 8260B**	**Napthalene**	**2-Methylnapthalene**	**15 Other PNAs by 8270C**
		ft.	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	**GC/MS**	mg/Kg	mg/Kg	mg/Kg
T10-S150-D 5.0	09/26/07	5.0	2.2	6.2	2.6	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S150-D 10.0	09/26/07	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S150-D 15.0	09/26/07	15.0	**550**	**420**	**1,700**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T10-S150-D 19.0	09/26/07	19.0	ND	ND	6.9	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T11-5	08/08/07	5.0	ND	*9.2*	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T11-10	08/08/07	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
T11-15	08/08/07	15.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Borings and Wells																									
BE-1-5.0	04/02/04	5.0	62[3]	ND	**540**	ND	ND	**5.1**	1.6	ND	ND	ND	8.4	3.1	ND	2.7	ND	0.29	13	12	3.8	ND[6]	**18**	**3.2**	ND[9]
BE-1-10.0	04/02/04	10.0	**130**[3]	ND	**3,600**	**13**	**140**	**80**	**430**	ND	ND	ND	3.7	ND	ND	1.4	ND	ND	6.2	32	12	ND	**7.5**	ND	ND
BE-1-13.5	04/02/04	13.5	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
BE-1-15.0	04/02/04	15.0	ND	ND	7.9	0.096	0.029	0.12	0.6	0.011	ND	ND	0.014	ND	ND	ND	ND	ND	0.027	0.054	0.013	ND	0.12	ND	ND
BE-1-20.0	04/02/04	20.0	ND	ND	2.5	0.027	0.011	0.016	0.033	ND	0.031	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-1-25.0	04/02/04	25.0	ND	ND	ND	ND	0.0053	ND	0.011	0.012	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-2-5.0	04/02/04	5.0	*27*[3]	*ND*	***340***	***1.3***	*ND*	***5.7***	***26***	*ND*	*ND*	*ND*	*9.1*	*2.4*	*ND*	*2.5*	*ND*	*ND*	*12*	*37*	*14*	*ND*	***18***	***1.4***	*ND*
BE-2-10.0	04/02/04	10.0	24[3]	ND	**820**	**7.4**	**33**	**16**	**87**	ND	ND	ND	3.3	ND	ND	1.3	ND	ND	5.7	29	10	ND	**6.8**	**0.31**	ND
BE-2-15.0	04/02/04	15.0	ND	2.5[8]	5.0	0.052	ND	0.027	ND	0.075	0.14	ND	0.046	0.019	ND	0.0097	ND	ND	0.046	ND	ND	ND	ND	ND	ND
BE-2-20.0	04/02/04	20.0	ND	2.4[7]	ND	ND	ND	ND	0.0086	0.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-2-25.0	04/02/04	25.0	ND	ND	ND	0.053	0.051	0.038	0.15	0.018	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0069	ND	ND	ND	ND	ND
BE-3-5.0	04/02/04	5.0	ND	1.1[8]	ND	ND	ND	ND	ND	ND	0.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-3-10.0	04/02/04	10.0	ND	ND	ND	ND	ND	ND	ND	ND	0.025	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-3-15.0	04/02/04	15.0	ND	1.3[7]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-3-20.0	04/02/04	20.0	**190**	ND	**1,600**[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-4-5.0	04/01/04	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-4-9.5	04/01/04	9.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-4-14.5	04/01/04	14.5	ND	1.3[8]	2.8	0.006	ND	0.047	0.024	ND	0.04	ND	0.081	0.027	ND	0.017	0.0099	ND	0.081	0.12	0.005	ND	0.086	ND	ND
BE-4-19.5	04/01/04	19.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-5-5.0	04/01/04	5.0	ND	4.5[7]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-5-10.0	04/01/04	10.0	14	ND	**340**[5]	ND	ND	ND	ND	ND	ND	ND	0.092	0.046	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-5-14.5	04/01/04	14.5	ND	2.5[7]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-5-19.5	04/01/04	19.5	ND	12[7]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
BE-6-4.0	04/01/04	4.0	ND	22[7]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-6-9.5	04/01/04	9.5	ND	**1,200**[7]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0066	ND	ND
BE-6-15.0	04/01/04	15.0	ND	11[8]	130[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE-6-20.0	04/01/04	20.0	ND	4.9[8]	2.6[5]	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
BG-1-5	04/06/04	5.0	ND	ND	*1.3*	ND	ND	ND	ND	ND	*0.046*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	*0.1*	ND
BG-1-10	04/06/04	10.0	35[3]	ND	**870**	ND	9.0	**13**	**75**	ND	ND	ND	2.6	ND	ND	1.1	ND	ND	4.4	23	8.1	ND	**4.2**	**3.5**	ND
BG-1-15	04/06/04	15.0	ND	3.7[8]	**270**	1.1	0.99	**4.9**	**24**	ND	0.065	ND	0.028	ND	ND	ND	ND	ND	0.025	0.160	0.056	ND	0.055	ND	ND
BG-1-20	04/06/04	20.0	ND	ND	ND	0.0062	ND	ND	ND	0.005	0.044	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BG-1-25	04/06/04	25.0	ND	ND	ND	ND	ND	0.0051	0.023	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
BG-1-30	04/06/04	30.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BG-1-35	04/06/04	35.0	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

			Petroleum Hydrocarbons			Other Volatile Organic Compounds																	PNAs		
Sample ID	**Date Sampled**	**Depth BGS**	**Mineral Spirits**	**TPHd (Diesel)**	**TPHg (Gasoline)**	**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**	**MTBE**	**Acetone**	**2-Butanone**	**n-Butylbenzene**	**sec-Butylbenzene**	**tert-Butylbenzene**	**Isopropylbenzene**	**p-Isopropylbenzene**	**p-Isopropyltoluene**	**n-Propylbenzene**	**1,2,4-Trimethylbenzene**	**1,3,5-Trimethylbenzene**	**52 Other VOCs by 8260B**	**Napthalene**	**2-Methylnapthalene**	**15 Other PNAs by 8270C**
		ft.	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	**GC/MS**	mg/Kg	mg/Kg	mg/Kg
BG-2-5.0	04/06/04	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BG-2-10.5	04/06/04	10.5	47[3]	ND	**1,200**	ND	ND	**16**	**80**	ND	ND	ND	6.0	ND	ND	2.4	ND	ND	10	50	17	ND	**8.5**	**3.0**	ND
BG-2-15.0	04/06/04	15.0	ND	ND	ND	ND	ND	ND	ND	ND	0.028	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BG-2-18.0	04/06/04	18.0	ND	ND	ND	ND	ND	ND	ND	0.020	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BG-2-21.0	04/06/04	21.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BG-2-25.0	04/06/04	25.0	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
BG-2-30.0	04/06/04	30.0	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
BG-2-35.0	04/06/04	35.0	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-1-4.0	04/02/04	4.0	ND	ND	ND	ND	ND	ND	*0.0063*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-1-11.5	04/02/04	11.5	74	ND	**2,400 [5]**	ND	ND	ND	ND	ND	ND	ND	ND	0.023	0.022	ND	ND	ND	ND	ND	ND	ND	ND	**1.7**	ND
MWT-1-15.0	04/02/04	15.0	ND	2.8[8]	ND	ND	ND	ND	ND	ND	ND	ND	0.0051	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-1-20[11]	04/02/04	20.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-2-5.5	04/02/04	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-2-10.0	04/02/04	10.0	12[3]	ND	**440**	ND	ND	2.3	6.8	ND	ND	ND	1.8	0.44	ND	0.500	ND	ND	2.4	10	3.8	ND	1.2	**0.93**	ND
MWT-2-15.0	04/02/04	15.0	ND	8.0[8]	120	ND	ND	0.67	1.2	ND	0.099	0.027	0.035	0.0079	ND	0.0055	ND	ND	0.032	0.18	0.047	ND	0.08	0.14	ND
MWT-2-20.0	04/02/04	20.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-3-5.0	04/02/04	5.0	ND	*1.2* [7]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-3-10.0	04/02/04	10.0	ND	7.5[8]	7.0[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.026	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-3-15.0	04/02/04	15.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-3-20.0	04/02/04	20.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-4-4.0	04/01/04	4.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-4-10.0	04/01/04	10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-4-15.0	04/01/04	15.0	150	ND	120[5]	ND	ND	ND	ND	ND	ND	ND	0.026	0.015	0.0094	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-4-20.0	04/01/04	20.0	ND	2.4[8]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-5-5.0	04/02/04	5.0	ND	1.3[4]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-5-10.0	04/02/04	10.0	ND	1.1[4]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-5-15.0	04/02/04	15.0	ND	7.0[7]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-5-20.0	04/02/04	20.0	ND	7.6[7]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-6-5.0	04/01/04	5.0	ND	2.1[4]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-6-10.5	04/01/04	10.5	51	ND	**860 [5]**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-6-14.5	04/01/04	14.5	ND	1.4[8]	9.0[5]	ND	ND	ND	ND	ND	0.064	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-6-19.5	04/01/04	19.5	ND	8.5[8]	13[5]	ND	ND	ND	0.09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-7-5.0	04/01/04	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-7-10.0	04/01/04	10.0	ND	3.5[8]	4.40[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-7-15.0	04/01/04	15.0	ND	3.4[8]	7.20[5]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-7-20.0	04/01/04	20.0	ND	ND	ND	ND	ND	ND	ND	ND	0.088	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-8-5.5	04/02/04	5.5	ND	1.5[4]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-8-10.5	04/02/04	10.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-8-15.0	04/02/04	15.0	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-8-18.0	04/02/04	18.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-9-4.0	04/01/04	4.0	ND	3.3[7]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-9-9.5	04/01/04	9.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-9-14.5	04/01/04	14.5	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

			Petroleum Hydrocarbons			**Other Volatile Organic Compounds**																	**PNAs**		
Sample ID	**Date Sampled**	**Depth BGS** ft.	**Mineral Spirits** mg/Kg	**TPHd (Diesel)** mg/Kg	**TPHg (Gasoline)** mg/Kg	**Benzene** mg/Kg	**Toluene** mg/Kg	**Ethylbenzene** mg/Kg	**Total Xylenes** mg/Kg	**MTBE** mg/Kg	**Acetone** mg/Kg	**2-Butanone** mg/Kg	**n-Butylbenzene** mg/Kg	**sec-Butylbenzene** mg/Kg	**tert-Butylbenzene** mg/Kg	**Isopropylbenzene** mg/Kg	**p-Isopropylbenzene** mg/Kg	**p-Isopropyltoluene** mg/Kg	**n-Propylbenzene** mg/Kg	**1,2,4-Trimethylbenzene** mg/Kg	**1,3,5-Trimethylbenzene** mg/Kg	**52 Other VOCs by 8260B** **GC/MS**	**Napthalene** mg/Kg	**2-Methylnapthalene** mg/Kg	**15 Other PNAs by 8270C** mg/Kg
MWT-9-19.5	04/01/04	19.5	ND	14[4]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-10-5.0	04/01/04	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-10-10.0	04/01/04	10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-10-15.0	04/01/04	15.0	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-10-20	04/01/04	20.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-11-5	11/05/04	5.0	ND	1.1[12]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-11-10	11/05/04	10.0	33[13]	ND	**170**[14]	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-11-15	11/05/04	15.0	ND	1.4[12]	27[14]	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-11-19.5	11/05/04	19.5	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-12-5	11/05/04	5.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-12-10	11/05/04	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-12-15	11/05/04	15.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-12-19.5	11/05/04	19.5	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-13-5	11/05/04	5.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-13-10	11/05/04	10.0	40[13]	ND	**520**[14]	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-13-15	11/05/04	15.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-13-19	11/05/04	19.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-14-5	11/05/04	5.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-14-10	11/05/04	10.0	110[13]	ND	**360**[14]	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-14-15	11/05/04	15.0	12[13]	ND	1.2[14]	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-14-19.5	11/05/04	19.5	15[13]	ND	82[14]	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-2-5.0	04/07/04	5.0	29[3]	ND	**860**	ND	ND	**19**	**87**	ND	ND	ND	2.9	ND	ND	0.098	ND	ND	4.4	27	9.8	ND	**7.2**	**1.1**	ND
MW-2-10.0	04/07/04	10.0	16[3]	ND	**530**	ND	2.4	**9.2**	**47**	ND	ND	ND	2.1	ND	ND	0.77	ND	ND	3.4	21	7.4	ND	**5.0**	0.23	ND
MW-2-15.0	04/07/04	15.0	ND	ND	ND	0.03	ND	0.021	0.029	ND	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0085	ND	ND
MW-2-20.0	04/07/04	20.0	ND	ND	ND	ND	0.0062	ND	0.037	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-3-5.0	04/07/04	5.0	Lost	Core																					
MW-3-10.0	04/07/04	10.0	Lost	Core																					
MW-3-14.0	04/07/04	14.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-3-20.0	04/07/04	20.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-4-5.5	04/30/04	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-4-10.5	04/30/04	10.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-4-15.5	04/30/04	15.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-4-19.5	04/30/04	19.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-5-6.0	04/30/04	6.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-5-10.0	04/30/04	10.0	27	ND	**1,000**[5]	ND	ND	0.55	3.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-5-15.5	04/30/04	15.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-5-19.5	04/30/04	19.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-6-5.0	04/07/04	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-6-10.0	04/07/04	10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-6-15.0	04/07/04	15.0	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-6-20.0	04/07/04	20.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-6A-5.0[15]	09/27/08	5.0	ND[2]	11	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

			Petroleum Hydrocarbons			Other Volatile Organic Compounds																	PNAs		
Sample ID	**Date Sampled**	**Depth BGS**	**Mineral Spirits**	**TPHd (Diesel)**	**TPHg (Gasoline)**	**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**	**MTBE**	**Acetone**	**2-Butanone**	**n-Butylbenzene**	**sec-Butylbenzene**	**tert-Butylbenzene**	**Isopropylbenzene**	**p-Isopropylbenzene**	**p-Isopropyltoluene**	**n-Propylbenzene**	**1,2,4-Trimethylbenzene**	**1,3,5-Trimethylbenzene**	**52 Other VOCs by 8260B**	**Napthalene**	**2-Methylnapthalene**	**15 Other PNAs by 8270C**
		ft.	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	**GC/MS**	mg/Kg	mg/Kg	mg/Kg
MW-6A-10.0	09/27/08	10.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-6A-15.0	09/27/08	15.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-6A-20.0	09/27/08	20.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-7-5.0	04/06/04	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-7-10.0	04/06/04	10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-7-15.0	04/06/04	15.0	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-7-20.0	04/06/04	20.0	ND	7.9[4]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-8-5.0	04/07/04	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-8-10.0	04/07/04	10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-8-15.0	04/06/04	15.0	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-8-20.0	04/06/04	20.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-9-5.0	09/27/08	5.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-9-10.0	09/27/08	10.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-9-15.0	09/27/08	15.0	ND	ND	6.5	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-9-20.0	09/27/08	20.0	ND	ND	2.7	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-10-5.0	09/27/08	5.0	ND	ND	0.92	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-10-10.0	09/27/08	10.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-10-15.0	09/27/08	15.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-10-20.0	09/27/08	20.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-11-5.0	09/27/08	5.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-11-10.0	09/27/08	10.0	79	47	**540**[3]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-11-15.0	09/27/08	15.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-11-20.0	09/27/08	20.0	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-12-5.0	02/09/09	5.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-12-10.0	02/09/09	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-12-15.0	02/09/09	15.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-12-20.0	02/09/09	20.0	ND	ND	1.0	0.086	0.0075	0.036	0.046	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-13-5.0	02/09/09	5.0	ND	3.9	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-13-10.0	02/09/09	10.0	93	110	3.3	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-13-15.0	02/09/09	15.0	ND	1.3	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-13-20.0	02/09/09	20.0	2.7	2.8	2.3	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-14-5.0	02/09/09	5.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-14-10.0	02/09/09	10.0	2,400	**1,700**	**5,600**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-14-15.0	02/09/09	15.0	ND	ND	2.5	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-14-20.0	02/09/09	20.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-15-5.0	02/09/09	5.0	1.2	15	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-15-10.0	02/09/09	10.0	2.3	1.6	1.6	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-15-15.0	02/09/09	15.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-15-20.0	02/09/09	20.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16A-5.0	02/09/09	5.0	9.4	8.8	8.5	**0.22**	ND	0.21	0.17	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16A-10.0	02/09/09	10.0	13	11	**860**	**6.0**	**13**	**12**	**56**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16A-15.0	02/09/09	15.0	ND	ND	2.0	0.10	0.019	0.027	0.055	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16A-20.0	02/09/09	20.0	Lost	Core																					
MW-16B-5.0	02/10/09	5.0	Lost	Core																					

			Petroleum Hydrocarbons			Other Volatile Organic Compounds																	PNAs		
Sample ID	**Date Sampled**	**Depth BGS**	**Mineral Spirits**	**TPHd (Diesel)**	**TPHg (Gasoline)**	**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**	**MTBE**	**Acetone**	**2-Butanone**	**n-Butylbenzene**	**sec-Butylbenzene**	**tert-Butylbenzene**	**Isopropylbenzene**	**p-Isopropylbenzene**	**p-Isopropyltoluene**	**n-Propylbenzene**	**1,2,4-Trimethylbenzene**	**1,3,5-Trimethylbenzene**	**52 Other VOCs by 8260B**	**Napthalene**	**2-Methylnapthalene**	**15 Other PNAs by 8270C**
		ft.	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	**GC/MS**	mg/Kg	mg/Kg	mg/Kg
MW-16B-10.0	02/10/09	10.0	49	43	**590**	**2.9**	8.6	**8.4**	**44**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16B-15.0	02/10/09	15.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16B-20.0	02/10/09	20.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16B-25.0	02/10/09	25.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16C-5.0	02/10/09	5.0	ND	1.9	1.7	0.12	ND	0.15	0.060	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16C-10.0	02/10/09	10.0	42	29	**2,300**	**9.6**	17	**30**	**160**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16C-15.0	02/10/09	15.0	ND	ND	6.1	0.13	0.12	0.11	0.54	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16C-20.0	02/10/09	20.0	ND	ND	ND	ND	ND	ND	0.014	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16C-25.0	02/10/09	25.0	ND	ND	0.39	0.0075	0.012	0.0090	0.038	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-16C-30.0	02/10/09	30.0	ND	ND	0.40	0.0076	0.011	0.0091	0.038	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Groundwater Extraction Pit																									
GEP-1-5.0	09/26/07	5.0	ND	6.7	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
GEP-1-10.0	09/26/07	10.0	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
GEP-1-15.0	09/26/07	15.0	**310**	**220**	**3,900**	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

Concentrations in bold script exceed the 2008 San Francisco Bay Area RWQCB's Residential Environmental Screening Levels in shallow or deep soils, as appropriate, where groundwater is not a source of drinking water.

Notes:

(1) ND = Not Detected above the Method Detection Limit (MDL).
(2) na = Not analyzed
(3) The laboratory reports that the detected hydrocarbon does not match its mineral spirits standard.
(4) The laboratory reports that the detected hydrocarbon does not match its Diesel standard.
(5) The laboratory reports that the detected hydrocarbon does not match its standard for gasoline.
(6) Laboratory Method EPA 8260B analyzes for 108 Volatile Organic Compounds. Only those found are listed separately in this table.
(7) The laboratory reports that the compound reported reflects individual or discrete unidentified peaks detected in the diesel range; the pattern does not match a typical fuel standard.
(8) The laboratory reports that the hydrocarbon reported is in the early Diesel range and does not match the laboratory's Diesel standard.
(9) Laboratory Method EPA 8270C analyzes for 17 Polynuclear Aromatics. Only those found are listed separately in this table.
(10) Concentrations in **bold** script exceed the 2008 San Francisco Bay Area RWQCB's Environmental Screening Levels in shallow or deep soils, as appropriate, where groundwater is not a source of drinking water.
(11) MWT-1-20.0 was also analyzed for 65 Semi-volatile chemicals by GC/MD - EPA8270C. None were detected in the sample.
(12) Quantity of unknown hydrocarbon(s) in sample based on Diesel
(13) Quantity of unknown hydrocarbon(s) in sample based on Mineral Spirits
(14) Quantity of unknown hydrocarbon(s) in sample based on Gasoline
(15) When first drilled, MW-6A was designated MW-17.
(16) Concentrations of chemicals of concern that were detected in samples recovered from locations where soil has since been shipped off site are shown in *italic font*. At locations where the undisturbed in situ soil was excavated and the areas were restored with engineered fill derived from on-site soil, the concentrations are shown in smaller font.

TABLE 3

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TABLE 3

HEAVY METALS IN NATIVE AND IMPORTED SOIL
OAK WALK SITE

Sample No.	**Date Sampled**	**Depth BGS** ft.	**Anti-mony** mg/Kg	**Ar-senic** mg/Kg	**Bar-ium** mg/Kg	**Beryl-lium** mg/Kg	**Cad-mium** mg/Kg	**Chro-mium III** mg/Kg	**Chro-mium VI** mg/Kg	**Cobalt** mg/Kg	**Copper** mg/Kg	**Lead** mg/Kg	**Molyb-denum** mg/Kg	**Nickel** mg/Kg	**Sele-nium** mg/Kg	**Silver** mg/Kg	**Thal-lium** mg/Kg	**Vana-dium** mg/Kg	**Zinc** mg/Kg	**Mer-cury** mg/Kg
BE-4-5.5	04/01/04	5.5	ND [1]	***2.6*** [3]	*110*	ND	ND	*27*	na	*2.6*	*17*	*4.3*	ND	*24*	ND	ND	ND	***22*** [3]	*31*	ND
BE-1-13.5	04/02/04	13.5	ND	1.3	110	ND	ND	35	ND	4.9	12	4.1	ND	46	ND	ND	ND	24	28	0.053
BE-3-19.5	04/02/04	19.5	ND	2.1	150	ND	ND	30	na	6.9	19	5.4	ND	26	ND	ND	ND	25	32	ND
Los Altos	08/21/07	19.5	na	na	na	na	ND	88	na	na	na	ND	na	63	na	na	na	na	28	na

Concentrations in bold script exceed the 2008 San Francisco Bay Area RWQCB's Residential Environmental Screening Levels in shallow or deep soils, as appropriate, where groundwater is not a source of drinking water.

Notes:

(1) ND = Not Detected above the Method Detection Limit (MDL). na = not analyzed

(2) Concentrations of chemicals of concern that were detected in samples recovered from locations where soil has since been shipped off site are shown in *italic font* . At locations where the undisturbed in situ soil w excavated and the areas were restored with engineered fill derived from on-site soil, the concentrations are shown in smaller font.

(3) No heavy metals were detected at concentrations greater than those that are typical of their natural presence in the alluvial materials that originated in the Oakland Hills to the east of the subject site (Lawrence Berkeley National Laboratory 1995, Bradford, et al 1996).

TABLE 4

TABLE 4

RESULTS OF ANALYSES OF SOIL SAMPLES RECOVERED FROM OFF-SITE LOCATIONS

Sample ID	**Date Sampled**	**Sample Depth** *ft. BGS*	**TRPH** mg/Kg	**Motor Oil** mg/Kg	**Mineral Spirits** mg/Kg	**TPHd** mg/Kg	**Kero-sene** mg/Kg	**TPHg** mg/Kg	**Ben-zene** mg/Kg	**Tolu-ene** mg/Kg	**Ethyl Benzene** mg/Kg	**Total Xylenes** mg/Kg	**p-isopro-pyltoluene** mg/Kg	**Ace-tone** mg/Kg	**tert-Butyl-benzene** mg/Kg	**sec-Butyl-benzene** mg/Kg	**Naph-thalene** mg/Kg	**Other VOCs** mg/Kg	**PCBs** mg/Kg	**Lead** mg/Kg
Borings for Dunne Paint Site [3,4,5]																				
HAB-1-4	06/10/92	4.0	na [11]	ND [10]	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-1-7	06/10/92	7.0	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-2-4	06/10/92	4.0	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-2-7	06/10/92	7.0	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-3-4	06/10/92	4.0	na	ND	4.9	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-3-7	06/10/92	7.0	na	ND	1.5	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-4-4	06/10/92	4.0	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-4-7	06/10/92	7.0	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-5-4	06/10/92	4.0	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-5-7	06/10/92	7.0	na	ND	17	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-6-4	06/10/92	4.0	na	ND	3.4	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
HAB-6-7	06/10/92	7.0	na	ND	**620**	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
CDB-1@11	11/04/02	11.0	na	ND	na	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	ND
CDB-2@6	11/04/02	6.0	na	ND	na	**160** [12]	na	94 [12]	ND	ND	ND	ND	ND	ND	ND	ND	0.025	ND	na	7.3
CDB-2@16	11/04/02	16.0	na	ND	na	13 [12]	na	**210** [12]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	ND
CDB-3@3	11/04/02	3.0	na	ND	na	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	15
CDB-3@13	11/04/02	13.0	na	ND	na	37 [12]	na	**250** [12]	ND	ND	ND	ND	ND	ND	ND	0.115	0.048	1,2,4 trimethylbenzene 0.740	na	ND
CDB-4@10	11/04/02	10.0	na	ND	na	52 [12]	na	74 [12]	ND	ND	ND	ND	ND	ND	ND	ND	ND	hexachlorobutadiene 0.092	na	ND
CDB-5@3	11/04/02	3.0	na	ND	na	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	24
CDB-5@13	11/04/02	13.0	na	ND	na	21 [12]	na	**180** [12]	ND	ND	ND	ND	ND	ND	ND	ND	0.413	ND	na	ND
CDB-6@9	11/04/02	9.0	na	ND	na	38 [12]	na	**440** [12]	ND	ND	ND	ND	ND	ND	0.0063	ND	0.081	ND	na	ND
CDB-7@4	11/04/02	4.0	na	5.5	na	**120** [12]	na	**250** [12]	ND	ND	ND	ND	ND	ND	ND	0.017	ND	ND	na	24
CDB-7@12	11/04/02	12.0	na	ND	na	76 [12]	na	**130** [12]	ND	ND	ND	ND	ND	ND	ND	ND	0.060	ND	na	ND
CDB-7@23	11/04/02	23.0	na	ND	na	7.0 [12]	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	ND
CDB-8@5	11/04/02	5.0	na	ND	na	130 [12]	na	**230** [12]	ND	ND	ND	ND	ND	ND	0.027	ND	ND	ND	na	3.0
CDB-8@17	11/04/02	17.0	na	ND	na	40 [12]	na	130 [12]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	ND
CDB-9@6	11/05/02	6.0	na	ND	na	4.8 [12]	na	6.2 [12]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	6.7
CDB-9@14	11/05/02	14.0	na	ND	na	100 [12]	na	**513** [12]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	ND

Sample ID	**Date Sampled**	**Sample Depth** *ft. BGS*	**TRPH** mg/Kg	**Motor Oil** mg/Kg	**Mineral Spirits** mg/Kg	**TPHd** mg/Kg	**Kero-sene** mg/Kg	**TPHg** mg/Kg	**Ben-zene** mg/Kg	**Tolu-ene** mg/Kg	**Ethyl Benzene** mg/Kg	**Total Xylenes** mg/Kg	**p-isopro-pyltoluene** mg/Kg	**Ace-tone** mg/Kg	**tert-Butyl-benzene** mg/Kg	**sec-Butyl-benzene** mg/Kg	**Naph-thalene** mg/Kg	**Other VOCs** mg/Kg	**PCBs** mg/Kg	**Lead** mg/Kg
CDB-10@6	11/05/02	6.0	na	ND	na	**3,500**[12]	na	**3,600**[12]	ND	ND	1.0	ND	ND	ND	ND	0.550	**14**	Isopropylbenzene 710 n-Propylbenzene 1,200 1,2,4-Trimethylbenzene 1,400	na	6.1
CDB-10@9	11/05/02	9.0	na	ND	na	**220**[12]	na	**380**[12]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	ND
CDB-10@25	11/05/02	25.0	na	ND	na	1.1[12]	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	ND
CDB-11@3	11/05/02	3.0	na	ND	na	**4,300**[12]	na	**2,500**[12]	ND	ND	**3,500**	ND	ND	ND	ND	ND	**4,600**	n-Propylbenzene 2,000 1,2,4-Trimethylbenzene 8,600 1,2,5-Trimethylbenzene 4,200	na	100
CDB-11@10	11/05/02	10.0	na	ND	na	**720**[12]	na	**1,800**[12]	ND	ND	ND	ND	ND	ND	ND	ND	1.6	ND	na	ND
CDB-11@16	11/05/02	16.0	na	51	na	**510**[12]	na	**2,100**[12]	ND	ND	ND	ND	ND	ND	ND	ND	**3.2**	ND	na	ND
CDB-12@3	11/05/02	3.0	na	ND	na	1.6	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	**280**
CDB-13@14	11/05/02	14.0	na	ND	na	160[12]	na	**400**[12]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	ND
CDB-14@3	11/05/02	3.0	na	24	na	9.4	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012	ND	na	130
CDB-16@3	11/05/02	3.0	na	28	na	6.0	na	7.4[12]	ND	ND	ND	ND	ND	ND	ND	ND	0.012	ND	na	5.0
OB-2	06/30/03	10.5	na	na	**160**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
OB-10	06/30/03	10.0	na	na	**430**	na	na	na	na	na	na	na	na	ND	na	ND	ND	na	na	na
B-1-3.5	02/10/05	3.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-1-7.5	02/10/05	7.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-1-11.5	02/10/05	11.5	na	na	180	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-2-3.5	02/10/05	3.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-2-7.5	02/10/05	7.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-2-12.5	02/10/05	12.5	na	na	9.6	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-3-3.5	02/10/05	3.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-3-7.5	02/10/05	7.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-3-11.5	02/10/05	11.5	na	na	**330**	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-4-3.5	02/10/05	3.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-4-7.5	02/10/05	7.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-4-11.5	02/10/05	11.5	na	na	**1,600**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-4-13.5	02/10/05	13.5	na	na	**1,400**	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-5-3.5	02/10/05	3.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-5-7.5	02/10/05	7.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-5-11.5	02/10/05	11.5	na	na	**4,900**	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-5-13.5	02/10/05	13.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-6-3.5	02/10/05	3.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-6-7.5	02/10/05	7.5	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-6-11.5	02/10/05	11.5	na	na	**380**	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-6-13.5	02/10/05	13.5	na	na	**260**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

Sample ID	**Date Sampled**	**Sample Depth** *ft. BGS*	**TRPH** mg/Kg	**Motor Oil** mg/Kg	**Mineral Spirits** mg/Kg	**TPHd** mg/Kg	**Kero-sene** mg/Kg	**TPHg** mg/Kg	**Ben-zene** mg/Kg	**Tolu-ene** mg/Kg	**Ethyl Benzene** mg/Kg	**Total Xylenes** mg/Kg	**p-isopro-pyltoluene** mg/Kg	**Ace-tone** mg/Kg	**tert-Butyl-benzene** mg/Kg	**sec-Butyl-benzene** mg/Kg	**Naph-thalene** mg/Kg	**Other VOCs** mg/Kg	**PCBs** mg/Kg	**Lead** mg/Kg
Borings for Boysen Paint Site [3,5,9]																				
BH-A	2004	11.5	na	na	8.3	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-B	2004	11.5	na	na	**130**	na	na	na	ND	ND	ND	ND	ND	0.086	ND	ND	ND	ND	na	na
BH-C	2004	14.5	na	na	13	na	na	na	ND	ND	ND	ND	ND	0.052	ND	ND	ND	ND	na	na
BH-D	2004	15.5	na	na	5.4	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-E	2004	15.5	na	na	2.0	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-F	2004	19.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-G	2004	19.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-H	2004	7.5	na	na	14	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-I	2004	1.0	na	na	6.6	na	na	na	ND	ND	ND	ND	0.040	ND	0.015	0.040	0.040	ND	na	na
BH-J	2004	11.5	na	na	2.3	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-K	2004	15.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-L	2004	19.5	na	na	1.2	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-M	2004	11.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-N	2004	11.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-O	2004	20.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-P	2004	7.5	na	na	**140**	na	na	na	ND	ND	ND	ND	ND	0.085	0.0074	ND	ND	ND	na	na
BH-Q	2004	19.5	na	na	27	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-R	2004	11.5	na	na	14	na	na	na	ND	ND	ND	ND	ND	0.130	0.010	ND	ND	ND	na	na
BH-S	2004	11.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	0.0056	ND	ND	ND	na	na
BH-T	2004	11.5	na	na	6.6	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-U	2004	7.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-V	2004	11.5	na	na	12	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	2004	25.5	na	na	3.3	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-W	2004	7.5	na	na	24	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na

Sample ID	**Date Sampled**	**Sample Depth** *ft. BGS*	**TRPH** mg/Kg	**Motor Oil** mg/Kg	**Mineral Spirits** mg/Kg	**TPHd** mg/Kg	**Kero-sene** mg/Kg	**TPHg** mg/Kg	**Ben-zene** mg/Kg	**Tolu-ene** mg/Kg	**Ethyl Benzene** mg/Kg	**Total Xylenes** mg/Kg	**p-isopro-pyltoluene** mg/Kg	**Ace-tone** mg/Kg	**tert-Butyl-benzene** mg/Kg	**sec-Butyl-benzene** mg/Kg	**Naph-thalene** mg/Kg	**Other VOCs** mg/Kg	**PCBs** mg/Kg	**Lead** mg/Kg
BH-X	2004	11.5	na	na	5.8	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-Y	2004	8.5	na	na	44	na	na	na	ND	ND	ND	ND	0.036	0.067	ND	ND	ND	ND	na	na
BH-Z	2004	11.5	na	na	51	na	na	na	ND	ND	ND	ND	0.026	0.100	ND	ND	0.028	ND	na	na
BH-AA	2004	11.5	na	na	**1,100**	na	na	na	ND	ND	ND	ND	0.058	ND	ND	ND	ND	ND	na	na
BH-BB	2004	11.5	na	na	**320**	na	na	na	ND	ND	ND	ND	0.017	ND	ND	ND	ND	ND	na	na
BH-CC	2004	11.5	na	na	31	na	na	na	ND	ND	ND	ND	0.032	ND	ND	ND	ND	ND	na	na
	2004	19.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-DD	Aug. 2005	11.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-EE	Aug. 2005	3.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	Aug. 2005	23.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-FF	Aug. 2005	3.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	Aug. 2005	23.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-GG	Aug. 2005	5.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	Aug. 2005	19.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-HH	Aug. 2005	5.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	Aug. 2005	11.5	na	na	7.1	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-II	Aug. 2005	14.5	na	na	19	na	na	na	ND	ND	ND	ND	ND	0.056	ND	ND	ND	ND	na	na
	Aug. 2005	24.5	na	na	7.1	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	Aug. 2005	34.5	na	na	7.1	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-JJ	Aug. 2005	11.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	Aug. 2005	15.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-KK	Aug. 2005	11.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	Aug. 2005	23.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-LL	Aug. 2005	11.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	Aug. 2005	23.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-MM	Aug. 2005	11.5	na	na	56	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	Aug. 2005	15.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
BH-NN	Aug. 2005	11.5	na	na	15	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
	Aug. 2005	15.5	na	na	ND	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-1-11.5	05/30/06	11.5	ND	ND	55	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-1-14	05/30/06	14	ND	ND	**110**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-2-7	05/30/06	7.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-2-15	05/30/06	15.0	ND	ND	ND	ND	ND	0.12	ND	0.00052	ND	ND	ND	0.020	ND	ND	ND	ND	na	na

Sample ID	Date Sampled	Sample Depth *ft. BGS*	TRPH mg/Kg	Motor Oil mg/Kg	Mineral Spirits mg/Kg	TPHd mg/Kg	Kero-sene mg/Kg	TPHg mg/Kg	Ben-zene mg/Kg	Tolu-ene mg/Kg	Ethyl Benzene mg/Kg	Total Xylenes mg/Kg	p-isopro-pyltoluene mg/Kg	Ace-tone mg/Kg	tert-Butyl-benzene mg/Kg	sec-Butyl-benzene mg/Kg	Naph-thalene mg/Kg	Other VOCs mg/Kg	PCBs mg/Kg	Lead mg/Kg
B-3-7	05/30/06	7.0	ND	ND	ND	ND	ND	0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-4-7	05/30/06	7.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na
B-5-7	05/30/06	7.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na

Borings and Confirmation Sampling for Celis Site [1,2,6]

LF-LFMW-1	07/08/93	4.5	77	16	na	**220**	na	**550**	0.84	1.2	5.6	2.7	na	na	na	na	na	na	na	na
	07/08/93	9.5	ND	ND	na	18	na	**470**	0.97	ND	6.6	8.9	na	na	na	na	na	na	na	na
	07/08/93	14.5	60	ND	na	16	na	8.4	0.14	0.17	0.081	0.37	na	na	na	na	na	na	na	na
LF-LFMW-2	07/08/93	9.5	30	ND	na	14	na	ND	4.7	35	13	68	na	na	na	na	na	na	na	na
	07/08/93	14.5	ND	ND	na	ND	na	75	0.009	0.012	ND	0.015	na	na	na	na	na	na	na	na
LF-LFMW-3	07/08/93	9.5	37	ND	na	ND	na	ND	0.062	0.28	1.1	1.1	na	na	na	na	na	na	na	na
	07/08/93	14.5	ND	ND	na	ND	na	**850**	0.014	ND	0.01	0.007	na	na	na	na	na	na	na	na
LF-LFMW-4	01/28/94	5	na	ND	na	ND	na	0.8	0.083	ND	ND	0.034	na	na	na	na	na	na	na	na
	01/28/94	10	na	ND	na	19	na	**220**	1.7	6.7	4.5	24	na	na	na	na	na	na	na	na
WC N-1	8/14/1994	8.0	ND	na	na	21	na	**920**	**2.6**	**21**	**11**	**57**	na	na	na	na	na	na	na	na
WC N-2	8/14/1994	8.0	ND	na	na	10	na	**250**	0.097	0.83	**2.5**	11	na	na	na	na	na	na	na	na
WC N-3	8/14/1994	8.0	ND	na	na	96	na	**390**	**0.38**	3	**3.6**	**17**	na	na	na	na	na	na	na	na
WC N-4	Late 1994	8.0	160	na	na	**310**	na	85	**0.16**	ND	1	1.3	na	na	na	na	na	na	na	na
WC W-1	8/14/1994	8.0	ND	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
WC W-2	8/14/1994	8.0	ND	na	na	34	na	**230**	**0.34**	0.61	2.3	6.9	na	na	na	na	na	na	na	na
WC W-3	8/14/1994	8.0	ND	na	na	**180**	na	20	0.012	0.01	0.029	0.043	na	na	na	na	na	na	na	na
WC W-4	8/14/1994	8.0	150	na	na	**500**	na	80	ND	0.073	0.26	0.99	na	na	na	na	na	na	na	na
WC S-1	8/14/1994	8.0	na	na	na	na	na	**800**	**1.7**	6	**9.9**	**41**	na	na	na	na	na	na	na	na
WC S-2	8/14/1994	8.0	ND	na	na	60	na	**430**	**0.4**	0.2	**4**	**12**	na	na	na	na	na	na	na	na
WC S-3	8/14/1994	8.0	na	na	na	na	na	**730**	**1.4**	ND	**11**	1.7	na	na	na	na	na	na	na	na
WC S-4	8/14/1994	8.0	ND	na	na	25	na	**560**	ND	ND	**5.6**	**13**	na	na	na	na	na	na	na	na
WC E-1	8/14/1994	8.0	na	na	na	na	na	**240**	**0.33**	3.5	**3.4**	**16**	na	na	na	na	na	na	na	na
WC E-2	8/14/1994	8.0	ND	na	na	2	na	**170**	**0.81**	3.4	1.8	8.9	na	na	na	na	na	na	na	na
WC E-3	8/14/1994	8.0	na	na	na	na	na	**660**	**2.9**	**18**	**9.2**	**46**	na	na	na	na	na	na	na	na
WC E-4	8/14/1994	8.0	ND	na	na	5.2	na	**380**	**2.6**	**12**	**4.9**	**24**	na	na	na	na	na	na	na	na
WC B-C-1	8/14/1994	9.5	ND	na	na	68	na	**260**	0.081	0.11	2	8.4	na	na	na	na	na	na	na	na
WC B-O&G-1	8/14/1994	9.5	ND	na	na	**160**	na	**490**	**2.4**	**9.9**	**6.3**	**27**	na	na	na	na	na	na	na	na
WC B-D-1	8/14/1994	9.5	**15,000**	na	na	**18,000**	na	**650**	**3.8**	1.7	**8.1**	**17**	na	na	na	na	na	na	na	na
WC B-G-1	8/14/1994	9.5	120	na	na	ND	na	**540**	**0.64**	ND	**6.5**	**12**	na	na	na	na	na	na	na	na
WC B-C-2	8/14/1994	9.5	ND	na	na	75	na	**1,000**	**2.4**	**10**	**11**	**49**	na	na	na	na	na	na	na	na
WC B-C-3	8/14/1994	9.5	ND	na	na	29	na	**690**	**2.2**	**15**	**7.3**	**39**	na	na	na	na	na	na	na	na
URS-SB-1-6-6.5	02/06/06	6.0	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-SB-1-10-10.	02/06/06	10.0	na	na	6.2	5.1	na	ND	**6.2**	5.1	ND	ND	na	na	na	na	na	na	na	na

Sample ID	**Date Sampled**	**Sample Depth** *ft. BGS*	**TRPH** mg/Kg	**Motor Oil** mg/Kg	**Mineral Spirits** mg/Kg	**TPHd** mg/Kg	**Kero-sene** mg/Kg	**TPHg** mg/Kg	**Ben-zene** mg/Kg	**Tolu-ene** mg/Kg	**Ethyl Benzene** mg/Kg	**Total Xylenes** mg/Kg	**p-isopro-pyltoluene** mg/Kg	**Ace-tone** mg/Kg	**tert-Butyl-benzene** mg/Kg	**sec-Butyl-benzene** mg/Kg	**Naph-thalene** mg/Kg	**Other VOCs** mg/Kg	**PCBs** mg/Kg	**Lead** mg/Kg
URS-SB-1-15.5-1	02/06/06	15.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-SB-1-18.5-1	02/06/06	18.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-SB-3-6-6.5	02/07/06	6.0	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-SB-3-11-11.	02/07/06	11.0	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	MTBE: 10, TBA: 10 DIPE: 10	na	na
URS-SB-3-15.5-1	02/07/06	15.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-SB-6-5.5-6	02/07/06	5.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-SB-6-11.5-1	02/07/06	11.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-SB-6-15.5-1	02/07/06	15.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-SB-6-19.5-2	02/07/06	19.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-MW-1-6.5	07/02/07	6.0	na	na	ND	1.9	na	ND	ND	1.9	ND	ND	na	na	na	na	na	na	na	na
URS-MW-1-11.0	07/02/07	10.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-MW-1-16.0	07/02/07	15.5	na	na	ND	11	na	ND	ND	11	ND	ND	na	na	na	na	na	na	na	na
URS-MW-2-5.5	07/02/07	5.0	na	na	ND	1.3	na	ND	ND	1.3	ND	ND	na	na	na	na	na	na	na	na
URS-MW-2-11.0	07/02/07	10.5	na	na	ND	1.4	na	ND	ND	1.4	ND	ND	na	na	na	na	na	na	na	na
URS-MW-2-16.0	07/02/07	15.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-MW-3-10.0	06/29/07	9.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-MW-3-15.0	06/29/07	14.5	na	na	ND	1.8	na	ND	ND	1.8	ND	ND	na	na	na	na	na	na	na	na
URS-MW-3-20.0	06/29/07	19.5	na	na	ND	1.3	na	ND	ND	1.3	ND	ND	na	na	na	na	na	na	na	na
URS-MW-4-9.0	06/29/07	8.5	na	na	ND	8.0	na	ND	ND	8.0	ND	ND	na	na	na	na	na	na	na	na
URS-MW-4-14.5	06/29/07	14.0	na	na	ND	6.7	na	ND	ND	6.7	ND	ND	na	na	na	na	na	na	na	na
URS-MW-4-20.0	06/29/07	19.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-MW-5-6.5	06/29/07	6.0	na	na	2.2	5.1	na	3.8	**2.2**	5.1	**3.8**	ND	na	na	na	na	na	na	na	na
URS-MW-5-10.0	06/29/07	9.5	na	na	68	13	na	120	**68**	13	**120**	ND	na	na	na	na	na	na	na	na
URS-MW-5-15.0	06/29/07	14.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na

Borings and Confirmation Sampling for San Francisco Bread Site [1,6,7,8]

Sample ID	**Date Sampled**	**Sample Depth** *ft. BGS*	**TRPH** mg/Kg	**Motor Oil** mg/Kg	**Mineral Spirits** mg/Kg	**TPHd** mg/Kg	**Kero-sene** mg/Kg	**TPHg** mg/Kg	**Ben-zene** mg/Kg	**Tolu-ene** mg/Kg	**Ethyl Benzene** mg/Kg	**Total Xylenes** mg/Kg	**p-isopro-pyltoluene** mg/Kg	**Ace-tone** mg/Kg	**tert-Butyl-benzene** mg/Kg	**sec-Butyl-benzene** mg/Kg	**Naph-thalene** mg/Kg	**Other VOCs** mg/Kg	**PCBs** mg/Kg	**Lead** mg/Kg
SMW-1-6	09/04/92	18.5	na	na	na	ND	na	ND	0.0078	0.0061	ND	ND	na	na	na	na	na	na	na	4.9
LFSB17-4.5	08/09/93	4.5	70	ND	na	40	na	**260**	ND	**22**	**12**	**69**	na	na	na	na	na	na	na	na
LFSB17-6.0	08/09/93	7	50	ND	na	70	na	**440**	ND	**27**	**8**	**43**	na	na	na	na	na	na	na	na
LFSB17-12.0	08/09/93	12	47	190	na	130	na	**500**	**190**	9	4	**23**	na	na	na	na	na	na	na	na
MW-3-5.0	04/07/04	5.0	Lost Core		na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-3-10.0	04/07/04	10.0	Lost Core		na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MW-3-15.0	04/07/04	15.0	ND	ND	ND	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na
MW-3-20.0	04/07/04	120.0	ND	ND	ND	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na
URS-MW-5-6.5	06/29/07	6.0	na	na	2.2	5.1	na	3.8	ND	ND	ND	ND	na	na	na	na	na	na	na	na
URS-MW-5-10.0	06/29/07	9.5	na	na	68	13	na	**120**	ND	ND	2.3	ND	na	na	na	na	na	na	na	na
URS-MW-5-15.0	06/29/07	14.5	na	na	ND	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na

Sample ID	Date Sampled	Sample Depth *ft. BGS*	TRPH mg/Kg	Motor Oil mg/Kg	Mineral Spirits mg/Kg	TPHd mg/Kg	Kero-sene mg/Kg	TPHg mg/Kg	Ben-zene mg/Kg	Tolu-ene mg/Kg	Ethyl Benzene mg/Kg	Total Xylenes mg/Kg	p-isopro-pyltoluene mg/Kg	Ace-tone mg/Kg	tert-Butyl-benzene mg/Kg	sec-Butyl-benzene mg/Kg	Naph-thalene mg/Kg	Other VOCs mg/Kg	PCBs mg/Kg	Lead mg/Kg
Borings and Confirmation Sampling in 40th Street [1]																				
LFSB1-7.0	08/08/93	7	290	27	na	**240**	na	**850**	**5.4**	ND	**25**	**42**	na	na	na	na	na	na	na	na
LFSB1-9.5	08/08/93	9.5	130	ND	na	**220**	na	**180**	**0.89**	1.1	**4.3**	**18**	na	na	na	na	na	na	na	na
LFSB1-14.5	08/08/93	14.5	60	ND	na	ND	na	7.4	0.44	0.44	0.14	0.61	na	na	na	na	na	na	na	na
LFSB2-7.0	08/08/93	7	160	57	na	**790**	na	**780**	**8**	ND	**31**	**140**	na	na	na	na	na	na	ND	na
LFSB2-9.5	08/08/93	9.5	210	ND	na	**200**	na	**720**	**2.4**	5.2	**15**	**59**	na	na	na	na	na	na	na	na
LFSB2-14.5	08/08/93	14.5	43	12	na	ND	na	1.0	0.2	0.21	0.021	0.12	na	na	na	na	na	na	ND	na
LFSB3-9.5	08/07/93	9.5	37	ND	na	11	na	**580**	**9.7**	**50**	**15**	**90**	na	na	na	na	na	na	ND	na
LFSB3-14.5	08/07/93	14.5	37	ND	na	ND	na	0.9	0.092	0.16	0.031	0.17	na	na	na	na	na	na	ND	na
LFSB4-7.0	08/08/93	7	70	ND	na	13	na	**380**	**3**	5.2	**8.2**	**18**	na	na	na	na	na	na	na	na
LFSB4-14.5	08/08/93	14.5	210	ND	na	ND	na	ND	0.026	0.005	0.019	0.023	na	na	na	na	na	na	na	na
LFSB5-7.0	08/08/93	7	37	ND	na	15	na	**410**	**2.4**	0.6	**16**	6.3	na	na	na	na	na	na	na	na
LFSB5-14.5	08/08/93	14.5	93	ND	na	ND	na	ND	0.011	ND	0.008	0.008	na	na	na	na	na	na	na	na
LFSB6-9.5	08/08/93	9.5	67	ND	na	51	na	**490**	**2.7**	ND	**15**	**15**	na	na	na	na	na	na	na	na
LFSB6-14.5	08/08/93	14.5	ND	ND	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LFSB7-9.5	08/07/93	9.5	170	66	na	52	na	**750**	**2.5**	8.5	**22**	**93**	na	na	na	na	na	na	na	na
LFSB7-14.5	08/07/93	14.5	ND	ND	na	ND	na	2.8	ND	ND	0.029	0.03	na	na	na	na	na	na	na	na
LFSB8-9.5	08/08/93	9.5	130	ND	na	**110**	na	**2,800**	**22**	**9.5**	**82**	**290**	na	na	na	na	na	na	na	na
LFSB8-14.5	08/08/93	14.5	37	11	na	ND	na	ND	0.009	ND	ND	ND	na	na	na	na	na	na	na	na
LFSB9-7.0	08/07/93	7	ND	ND	na	14	na	**210**	**2.8**	**13**	**5.1**	**29**	na	na	na	na	na	na	na	na
LFSB9-9.5	08/07/93	9.5	na	na	na	na	na	**1,200**	**14**	**81**	**26**	**140**	na	na	na	na	na	na	na	na
LFSB9-14.5	08/07/93	14.5	77	ND	na	ND	na	ND	0.079	0.059	0.011	0.041	na	na	na	na	na	na	na	na
LFSB10-7.0	08/07/93	7	na	na	na	na	na	73	**2.6**	4.7	1.6	7.7	na	na	na	na	na	na	na	na
LFSB10-9.5	08/07/93	9.5	40	ND	na	ND	na	**1,100**	ND	7.8	ND	**22**	na	na	na	na	na	na	na	na
LFSB10-14.5	08/07/93	14.5	ND	ND	na	ND	na	8.6	0.48	0.29	0.1	0.48	na	na	na	na	na	na	na	na
LFSB11-14.5	08/09/93	14.5	40	11	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LFSB12-1.0	08/09/93	1	**4,600**	**400**	na	ND	na	ND	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB12-3.0	08/09/93	3	**420**	64	na	**560**	na	**6,500**	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB13-5.0	08/09/93	5	63	ND	na	ND	na	23	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB13-6.5	08/09/93	6.5	37	ND	na	ND	na	13	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB14-2.0	08/09/93	2	**2,200**	**480**	na	ND	na	42	na	na	na	na	na	na	na	na	na	na	0.22	na
LFSB14-4.5	08/09/93	4.5	47	ND	na	ND	na	ND	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB15-4.5	08/09/93	4.5	**480**	12	na	**140**	na	**4,700**	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB15-6.0	08/09/93	6	120	14	na	59	na	**3,700**	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB16-4.5	08/09/93	4.5	60	ND	na	ND	na	9	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB16-6.0	08/09/93	6	53	ND	na	ND	na	8	na	na	na	na	na	na	na	na	na	na	ND	na

Sample ID	**Date Sampled**	**Sample Depth**	**TRPH**	**Motor Oil**	**Mineral Spirits**	**TPHd**	**Kero-sene**	**TPHg**	**Ben-zene**	**Tolu-ene**	**Ethyl Benzene**	**Total Xylenes**	**p-isopro-pyltoluene**	**Ace-tone**	**tert-Butyl-benzene**	**sec-Butyl-benzene**	**Naph-thalene**	**Other VOCs**	**PCBs**	**Lead**
		ft. BGS	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
LFSB18-1.0	08/09/93	1	**2,200**	320	na	ND	na	1	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB18-3.0	08/09/93	3	**1,100**	**390**	na	ND	na	ND	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB19-1.5	08/09/93	1.5	**2,200**	**530**	na	ND	na	ND	na	na	na	na	na	na	na	na	na	na	ND	na
LFSB19-3.0	08/09/93	3	**3,600**	**740**	na	ND	na	1	na	na	na	na	na	na	na	na	na	na	ND	na
LF-1-4.5	08/07/93	4.5	77	16	na	**220**	na	**550**	**0.84**	1.2	**5.6**	2.7	na	na	na	na	na	na	na	na
LF-1-9.5	08/07/93	9.5	ND	ND	na	18	na	**470**	**0.97**	ND	**6.6**	8.9	na	na	na	na	na	na	na	na
LF-1-14.5	08/07/93	14.5	60	ND	na	16	na	8.4	0.14	0.17	0.081	0.37	na	na	na	na	na	na	na	na
LF-2-9.5	08/07/93	9.5	30	ND	na	14	na	**740**	**4.70**	**35**	**13**	**68**	na	na	na	na	na	na	na	na
LF-2-14.5	08/07/93	14.5	ND	ND	na	ND	na	ND	0.009	0.012	ND	0.015	na	na	na	na	na	na	na	na
LF-3-9.5	08/07/93	9.5	37	ND	na	ND	na	75	0.062	0.28	1.1	1.1	na	na	na	na	na	na	na	na
LF-3-14.5	08/07/93	14.5	ND	ND	na	ND	na	ND	0.014	ND	0.01	0.007	na	na	na	na	na	na	na	na
LF-B1-2	08/30/94	2	ND	na	na	ND	na	0.8	0.008	ND	0.016	0.085	na	na	na	na	na	na	na	na
LF-B1-5	08/30/94	5	30	na	na	ND	na	**110**	**0.840**	0.520	**3.2**	12	na	na	na	na	na	na	na	na
LF-B1-10	08/30/94	10	30	na	na	ND	na	**690**	**12**	**50**	**18**	**99**	na	na	na	na	na	na	na	na
LF-B2-2	08/30/94	2	10	na	na	ND	na	**110**	**0.6**	2.9	**3.3**	**16**	na	na	na	na	na	na	na	na
LF-B2-5	08/30/94	5	10	na	na	1.0	na	66	**0.37**	0.8	0.79	3.5	na	na	na	na	na	na	na	na
LF-B2-10	08/30/94	10	30	na	na	ND	na	**830**	**13**	**52**	**21**	**110**	na	na	na	na	na	na	na	na
LF-B3-2	08/30/94	2	80	na	na	ND	na	**440**	**8.5**	36	**12**	**58**	na	na	na	na	na	na	na	na
LF-B3-5	08/30/94	5	200	na	na	8.0	na	**810**	**14**	**62**	**22**	**100**	na	na	na	na	na	na	na	na
LF-B3-10	08/30/94	10	50	na	na	ND	na	**390**	**7.1**	**22**	**7.2**	**38**	na	na	na	na	na	na	na	na
LF-B4-2	08/30/94	2	40	na	na	ND	na	49	**0.14**	0.12	2.3	11	na	na	na	na	na	na	na	na
LF-B4-5	08/30/94	5	**1,300**	na	na	28	na	**8,800**	**6.8**	7.3	**190**	**870**	na	na	na	na	na	na	na	na
LF-B4-10	08/30/94	10	110	na	na	3.0	na	**510**	**1.1**	0.96	**3.4**	**13**	na	na	na	na	na	na	na	na
LF-B5-2	08/30/94	2	10	na	na	ND	na	0.4	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B5-5	08/30/94	5	**2,400**	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B5-10	08/30/94	10	ND	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B6-2	08/30/94	2	20	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B6-5	08/30/94	5	10	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B6-10	08/30/94	10	ND	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B7-2	08/30/94	2	10	na	na	ND	na	27	**0.42**	ND	0.75	0.05	na	na	na	na	na	na	na	na
LF-B7-5	08/30/94	5	ND	na	na	ND	na	16	**0.67**	ND	ND	0.025	na	na	na	na	na	na	na	na
LF-B7-10	08/30/94	10	20	na	na	ND	na	**520**	**7.4**	**30**	14	**78**	na	na	na	na	na	na	na	na
LF-B8-2	08/30/94	2	50	na	na	5.0	na	3.4	**0.2**	ND	0.56	0.02	na	na	na	na	na	na	na	na
LF-B8-5	08/30/94	5	ND	na	na	ND	na	14	**0.3**	0.01	0.26	ND	na	na	na	na	na	na	na	na
LF-B8-10	08/30/94	10	20	na	na	ND	na	**140**	**2.1**	5.8	4	**21**	na	na	na	na	na	na	na	na
LF-B9-2	08/30/94	2	20	na	na	ND	na	2.8	**0.33**	0.005	0.41	0.07	na	na	na	na	na	na	na	na
LF-B9-5	08/30/94	5	ND	na	na	ND	na	40	**1.2**	0.013	2.6	0.15	na	na	na	na	na	na	na	na
LF-B9-10	08/30/94	10	20	na	na	ND	na	**190**	**4.3**	**11**	5.5	**28**	na	na	na	na	na	na	na	na
LF-B10-2	08/30/94	2	150	na	na	ND	na	29	0.038	0.048	0.18	**1.2**	na	na	na	na	na	na	na	na
LF-B10-5	08/30/94	5	30	na	na	ND	na	13	ND	0.02	0.05	ND	na	na	na	na	na	na	na	na

Table 4

Sample ID	Date Sampled	Sample Depth *ft. BGS*	TRPH mg/Kg	Motor Oil mg/Kg	Mineral Spirits mg/Kg	TPHd mg/Kg	Kero-sene mg/Kg	TPHg mg/Kg	Ben-zene mg/Kg	Tolu-ene mg/Kg	Ethyl Benzene mg/Kg	Total Xylenes mg/Kg	p-isopro-pyltoluene mg/Kg	Ace-tone mg/Kg	tert-Butyl-benzene mg/Kg	sec-Butyl-benzene mg/Kg	Naph-thalene mg/Kg	Other VOCs mg/Kg	PCBs mg/Kg	Lead mg/Kg
LF-B10-10	08/30/94	10	ND	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B11-2	08/30/94	2	20	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B11-5	08/30/94	5	ND	na	na	ND	na	1	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B11-10	08/30/94	10	40	na	na	ND	na	**250**	**1.1**	0.35	**4.4**	**21**	na	na	na	na	na	na	na	na
LF-B12-2	08/30/94	2	30	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B12-5	08/30/94	5	ND	na	na	ND	na	0.9	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B12-10	08/30/94	10	30	na	na	ND	na	**160**	**0.97**	0.19	**4.1**	**20**	na	na	na	na	na	na	na	na
LF-B13-2	08/30/94	2	**600**	na	na	**220**	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B13-5	08/30/94	5	40	na	na	10	na	4.2	ND	ND	0.02	ND	na	na	na	na	na	na	na	na
LF-B13-10	08/30/94	10	20	na	na	3.0	na	6.9	**0.36**	ND	0.45	0.13	na	na	na	na	na	na	na	na
LF-B14-2	08/30/94	2	**410**	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B14-5	08/30/94	5	ND	na	na	ND	na	1.6	0.01	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B14-10	08/30/94	10	ND	na	na	ND	na	2.9	0.006	ND	0.01	ND	na	na	na	na	na	na	na	na
LF-B15-2	08/30/94	2	**420**	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B15-5	08/30/94	5	ND	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B15-10	08/30/94	10	20	na	na	ND	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B16-2	08/30/94	2	50	na	na	10	na	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na
LF-B16-5	08/30/94	5	ND	na	na	ND	na	28	**0.16**	ND	0.96	0.037	na	na	na	na	na	na	na	na
LF-B16-10	08/30/94	10	20	na	na	ND	na	**130**	**2.5**	5.4	**2.6**	**15**	na	na	na	na	na	na	na	na

Concentrations in bold script exceed the 2008 San Francisco Bay Area RWQCB's Residential Environmental Screening Levels in shallow or deep soils, as appropriate, where groundwater is not a source of drinking water.

NOTES:

(1) Data Source: Levine-Fricke 1994, 1993
(2) Data Source: Woodward-Clyde International-Americas 1997, 1998
(3) Data Source: Aqua Science Engineers, Inc. 2005a,b
(4) Data Source: Clayton Group Services 2007, 2004a,b, 2003, 2002
(5) Data Source: Hageman-Aquiar, Inc. 1992
(6) Data Source: URS 2006, 2007a
(7) Data Source: The San Joaquin Company 2005
(8) Data Source: SEACOR Science and Engineering Analysis Corporation 1992
(9) Data Source: Environmental Resource Management 2006
(10) ND = Not Detected above the Method Detection Limit (MDL).
(11) na = not analyzed
(12) Laboratory reports pattern is closer to mineral spirits or Stoddard solvent.

TABLE 5

DEC

TABLE 5

DEPTHS TO GROUNDWATER

Well No.	Date Measured	Casing Elevation ft. MSL	Groundwater Depth ft.	Groundwater Elevation ft. MSL
WCEW-1		41.73		
	05/19/04		7.88	33.85
	11/08/04		7.13	34.60
	04/15/07		7.39	34.34
	06/21/07		7.74	33.99
	08/09/07		8.00	33.73
	09/21/09		7.64	34.09
	03/12/10		5.40	36.33
	09/21/10		7.10	34.63
MW-2		44.40		
	05/19/04		5.98	38.42
	11/08/04		4.94	39.46
	04/15/07		4.86	39.54
	06/21/07		5.62	38.78
	08/09/07		5.42	38.98
	09/21/09		6.35	38.05
	03/12/10		5.40	39.00
	09/21/10		6.72	37.68
MW-3		45.49		
	05/19/04		5.66	39.83
	11/08/04		5.89	39.60
	04/15/07		5.25	40.24
	06/21/07		5.95	39.54
	08/09/07		6.57	38.92
	09/21/09		5.42	40.07
	03/12/10		2.96	42.53
	09/21/10		6.31	39.18
MW-4		47.31		
	05/19/04		6.19	41.12
	11/08/04		5.81	41.50
	09/21/09		7.42	39.89
	03/12/10		4.23	43.08
	09/21/10		7.85	39.46
MW-5		42.51		
	05/19/04		7.39	35.12
	11/08/04		7.09	35.42
	04/15/07		6.92	35.59
	06/21/07		7.50	35.01
MW-5	08/09/07		7.42	35.09
cont.	09/21/09		6.01	36.50
	03/12/10		5.70	36.81
	09/21/10		6.65	35.86

Well No.	**Date Measured**	**Casing Elevation ft. MSL**	**Groundwater Depth ft.**	**Groundwater Elevation ft. MSL**
MW-6 [2]		43.35		
	05/19/04		7.16	36.19
	11/08/04		6.93	36.42
MW-6A		43.18		
	09/21/09		6.16	37.02
	03/12/10		6.08	37.10
	09/21/10		6.66	36.52
MW-7		44.75		
	05/19/04		8.40	36.35
	11/08/04		8.10	36.65
	09/21/09		6.01	38.74
	03/12/10		6.26	38.49
	09/21/10		7.00	37.75
MW-8		48.38		
	05/19/04		9.65	38.73
	11/08/04		9.05	39.33
	09/21/09		7.58	40.80
	03/12/10		6.70	41.68
	09/21/10		8.12	40.26
MW-9		47.85		
	09/21/09		7.91	39.94
	03/12/10		7.07	40.78
	09/21/10		9.28	38.57
MW-10		45.66		
	09/21/09		5.72	39.94
	03/12/10		5.84	39.82
	09/21/10		7.17	38.49
MW-11		45.10		
	09/21/09		7.43	37.67
	03/12/10		6.78	38.32
	09/21/10		7.98	37.12
MW-12		42.93		
	09/21/09		5.72	37.21
	03/12/10		5.60	37.33
	09/21/10		6.42	36.51
MW-13		45.56		
	09/21/09		7.61	37.95
	03/12/10		7.27	38.29
	09/21/10		8.52	37.04
MW-14		45.19		
	09/21/09		7.38	37.81
	03/12/10		6.56	38.63
	09/21/10		8.12	37.07

Well No.	Date Measured	Casing Elevation ft. MSL	Groundwater Depth ft.	Groundwater Elevation ft. MSL
MW-15		43.55		
	09/21/09		6.55	37.00
	03/12/10		6.88	36.67
	09/21/10		7.24	36.31
MW-16A		44.50		
	09/21/09		7.00	37.50
	03/12/10		5.22	39.28
	09/21/10		7.14	37.36
MW-16B		44.59		
	09/21/09		7.24	37.35
	03/12/10		5.42	39.17
	09/21/10		7.26	37.33
MW-16C		44.48		
	09/21/09		7.24	37.24
	03/12/10		12.84	31.64
	09/21/10		6.62	37.86
URS Off-site Wells				
URS MW-1		42.21		
	09/21/09		8.15	34.06
	03/12/10		7.51	34.70
URS MW-2		40.83		
	09/21/09		8.63	32.20
	03/12/10		7.41	33.42
URS MW-3		40.54		
	09/21/09		9.89	30.65
	03/12/10		8.47	32.07
URS MW-4		41.41		
	09/21/09		9.81	31.60
	03/12/10		8.55	32.86
URS MW-5		43.93		
	09/21/09		5.84	38.09
	03/12/10		4.31	39.62
LFMW-LF-4		40.76		
	09/21/09		7.71	33.05
	03/12/10		6.98	33.78
Temporary Wells 2004				
MWT-1	05/19/04	42.98	8.43	34.55
	11/08/04		6.82	36.16
MWT-2	05/19/04	45.28	7.69	37.59

Well No.	Date Measured	Casing Elevation ft. MSL	Groundwater Depth ft.	Groundwater Elevation ft. MSL
	11/08/04		7.17	38.11
MWT-3	05/19/04	47.64	7.64	40.00
	11/08/04		7.66	39.98
MWT-4	05/19/04	44.74	8.43	36.31
	11/08/04		7.99	36.75
MWT-5	05/19/04	47.10	9.07	38.03
	11/08/04		8.84	38.26
MWT-6	05/19/04	45.21	9.05	36.16
	11/08/04		8.73	36.48
MWT-7 [1]	05/19/04	46.61	9.90	36.71
	11/08/04	45.69	8.60	37.09
MWT-8	05/19/04	47.23	9.65	37.58
	11/08/04		9.31	37.92
MWT-9	05/19/04	45.78	8.70	37.08
	11/08/04		8.23	37.55
MWT-10	05/19/04	47.22	9.53	37.69
	11/08/04		9.03	38.19
MWT-11	11/08/04	46.63	9.71	36.92
MWT-12	11/08/04	47.97	10.79	37.18
MWT-13	11/08/04	48.16	10.65	37.51
MWT-14	11/08/04	47.85	9.63	38.22

Notes:

1) MWT-7 casing truncated by vandals. Elevation resurveyed on 11/10/04
2) MW-6 damaged during construction. Replaced by MW-6A on 09/27/08

TABLE 6

DEC

TABLE 6

RESULTS OF ANALYSES OF GROUNDWATER SAMPLES RECOVERED FROM TRENCHES, PITS AND WELLS ON THE OAK WALK SITE

		Petroleum Hydrocarbons			BTEX Compounds				Fuel Oxygenates					Other Volatile Organic Compounds										PNAs	
Sample ID	**Date Sampled**	**TPHd (diesel)** µg/L	**Mineral Spirits** µg/L	**TPHg (gasoline)** µg/L	**Benzene** µg/L	**Toluene** µg/L	**Ethylbenzene** µg/L	**Total Xylenes** µg/L	**MTBE** µg/L	**TAME** µg/L	**ETBE** µg/L	**DIPE** µg/L	**TBA** µg/L	**n-Butylbenzene** µg/L	**sec-Butylbenzene** µg/L	**tert-Butylbenzene** µg/L	**isoproplylbenzene** µg/L	**p-Isopropylbenzene** µg/L	**p-Isopropyltoluene** µg/L	**n-propylbenzene** µg/L	**1,2,4-trimethylbenzene** µg/L	**1,3,5-tri methylbenzene** µg/L	**52 Other VOCs by 8260B** µg/L	**Naphthalene** µg/L	**15 Other PNAs by 8270C** µg/L
Trenches																									
T3-W	12/03/03	**2,300** [3]	na	**6,300** [5]	ND	ND	31	30	ND	na	na	na	na	100	47	ND	ND	23	ND	230	320	110	ND	12	ND
T7-W	12/02/03	ND	na	ND	ND	ND	ND	ND	ND	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
T-10W	09/24/07	**6,100**	**9,100**	**70,000**	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
W11	08/08/07	**4,500**	**5,800**	**1,800**	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Groundwater Extraction Pit																									
GEP-1A	09/26/07	**54,000**	**81,000**	**8,200**	1.4	3.6	ND	2.2	1.9	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GEP-1B	10/04/07	**530**	**810**	**1,100**	ND	ND	ND	ND	ND	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Monitoring Wells																									
WCEW-1	05/19/04	ND	**600** [6]	**3,700**	**90**	0.66	**48**	56	170	na	na	na	na	ND	8.7	ND	12	1.8	ND	31	14	5.6	ND	8.3	ND
	09/24/09	**1,600**	**390**	**1,400**	1.5	ND	1.2	ND	150	ND	ND	ND	21	na	na	na	na	na	na	na	na	na	na	na	na
	03/14/10	**1,600**	**460**	**1,200**	3.5	ND	4.3	1.3	31	ND	ND	ND	5.4	na	na	na	na	na	na	na	na	na	na	na	na
	09/23/10	**1,000**	**220**	**990**	ND	ND	ND	ND	1.3	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-2	05/19/04	ND	**2,100** [6]	**49,000**	**7,900**	**2,100**	**980**	**8,300**	770	na	na	na	na	100	ND	ND	ND	ND	ND	ND	1,600	460	ND	**490**	ND
	09/18/07	**1,400**	**1,500**	**8,300**	**1,500**	ND	**340**	21	84	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	09/24/09	**400**	**350**	**4,000**	**1,500**	ND	**520**	ND	47	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/14/10	**780**	**870**	**8,300**	**1,500**	47	**790**	**740**	74	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/23/10	**570**	**460**	**8,800**	**1,800**	12	**710**	90	61	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-3	05/19/04	ND	**420** [6]	**1,300**	ND	ND	ND	1.1	5.8	na	na	na	na	14	ND	ND	ND	ND	ND	ND	ND	12	ND	ND	ND
	09/24/09	110	ND	ND	ND	ND	ND	ND	2.4	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/14/10	130	ND	58	4.6	ND	7.2	5.6	1.9	ND	ND	ND	4.1	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	67	ND	ND	ND	ND	ND	ND	3.0	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-4	05/19/04	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/22/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-5	05/19/04	ND	**330** [6]	**2,600** [5]	ND	ND	ND	ND	17	na	na	na	na	ND	ND	2.5	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/24/09	**220**	**250**	**430**	ND	ND	ND	ND	0.77	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/14/10	190	**230**	**300**	ND	ND	ND	ND	0.51	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/23/10	**250**	120	**380**	ND	ND	ND	ND	0.56	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-6*	05/19/04	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-6A	09/22/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na

Sample ID	Date Sampled	TPHd (diesel) µg/L	Mineral Spirits µg/L	TPHg (gasoline) µg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Total Xylenes µg/L	MTBE µg/L	TAME µg/L	ETBE µg/L	DIPE µg/L	TBA µg/L	n-Butylbenzene µg/L	sec-Butylbenzene µg/L	tert-Butylbenzene µg/L	isopropylbenzene µg/L	p-Isopropylbenzene µg/L	p-Isopropyltoluene µg/L	n-pro-pylbenzene µg/L	1,2,4-trimethylbenzene µg/L	1,3,5-tri methylbenzene µg/L	52 Other VOCs by 8260B µg/L	Naphthalene µg/L	15 Other PNAs by 8270C µg/L
MW-7	05/19/04	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/22/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-8	05/19/04	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/22/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-9	09/24/09	78	ND	190	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/14/10	150	89	140	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/23/10	200	99	**350**	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-10	09/22/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-11	09/24/09	ND	ND	70	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	ND	ND	81	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	ND	ND	63	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-12	09/22/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-13	09/22/09	66	ND	130	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	130	100	140	0.67	ND	0.76	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	120	130	**400**	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-14	09/22/09	72	ND	68	ND	ND	ND	ND	13	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	ND	ND	ND	ND	ND	ND	ND	11	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	ND	ND	87	ND	ND	ND	ND	11	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-15	09/22/09	ND	ND	51	ND	ND	ND	ND	2.6	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	ND	ND	ND	ND	ND	ND	ND	6.0	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/22/10	ND	ND	ND	ND	ND	ND	ND	7.1	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-16A	09/22/09	**2,400**	**4,100**	**64,000**	**18,000**	**2,500**	**3,000**	**11,000**	830	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/14/10	**2,000**	**4,000**	**38,000**	**11,000**	**780**	**2,400**	**7,500**	840	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/23/10	**1,800**	**3,400**	**49,000**	**14,000**	**570**	**3,200**	**9,800**	800	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
MW-16B	09/22/09	**410**	**480**	**4,000**	**1,600**	18	**150**	**170**	500	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/14/10	**930**	**1,600**	**9,800**	**5,200**	**220**	**650**	**1,800**	520	ND	ND	ND	100	na	na	na	na	na	na	na	na	na	na	na	na
	09/23/10	**250**	**280**	**3,600**	**1,800**	**61**	**190**	**310**	560	ND	ND	ND	87	na	na	na	na	na	na	na	na	na	na	na	na
MW-16C	09/22/09	ND	ND	**270**	ND	ND	ND	ND	230	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/14/10	ND	ND	**270**	4.9	ND	1.6	1.3	370	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	09/23/10	ND	ND	ND	ND	ND	ND	ND	400	ND	ND	ND	40	na	na	na	na	na	na	na	na	na	na	na	na
URS Wells [10]																									
URS-MW-1	09/21/09	90	83	120	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	110	ND	53	ND	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
URS-MW-2	09/21/09	**210**	ND	ND	ND	ND	ND	ND	49	ND	ND	ND	40	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	**320**	ND	ND	ND	ND	ND	ND	18	ND	ND	ND	37	na	na	na	na	na	na	na	na	na	na	na	na
URS-MW-3	09/21/09	ND	ND	ND	ND	ND	ND	ND	1.9	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	ND	ND	ND	ND	ND	ND	ND	1.7	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na

Sample ID	Date Sampled	TPHd (diesel) µg/L	Mineral Spirits µg/L	TPHg (gasoline) µg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Total Xylenes µg/L	MTBE µg/L	TAME µg/L	ETBE µg/L	DIPE µg/L	TBA µg/L	n-Butylbenzene µg/L	sec-Butylbenzene µg/L	tert-Butylbenzene µg/L	isopropylbenzene µg/L	p-Isopropylbenzene µg/L	p-Isopropyltoluene µg/L	n-pro--pylbenzene µg/L	1,2,4-tri-methylbenzene µg/L	1,3,5-tri methylbenzene µg/L	52 Other VOCs by 8260B µg/L	Naphthalene µg/L	15 Other PNAs by 8270C µg/L
URS-MW-4	09/21/09	110	ND	ND	ND	ND	ND	ND	56	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	**210**	ND	ND	ND	ND	ND	ND	20	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
URS-MW-5	09/21/09	**1,100**	99	150	ND	ND	ND	ND	63	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	**1,100**	160	170	ND	ND	1.0	ND	49	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
LF-MW-LF-4	09/21/09	**1,600**	**320**	**490**	ND	ND	7.9	ND	2.0	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
	03/13/10	**820**	**1,100**	**1,200**	0.5	ND	7.2	ND	1.1	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na
Temporary Wells																									
MWT-1	5/19/04	ND	74[6]	**350**	ND	ND	ND	ND	ND	na	na	na	na	8.0	ND	ND	1.0	ND	ND	1.0	ND	ND	ND	ND	ND
MWT-2	5/19/04	ND	**3,200**[6]	**28,000**	**460**	ND	**1,200**	**2,700**	66	na	na	na	na	100	ND	ND	ND	ND	ND	310	1,600	490	ND	**340**	ND
MWT-3	5/19/04	ND	**450**	**1,000**[5]	ND	ND	ND	ND	ND	na	na	na	na	ND	ND	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-4	5/19/04	ND	88[6]	**540**[5]	ND	ND	ND	ND	ND	na	na	na	na	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-5	5/19/04	ND	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-6[9]	5/19/04	ND	**980**	**4,200**[5]	ND	ND	ND	ND	ND	na	na	na	na	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-7	5/19/04	ND	**3,200**	**56,000**[5]	0.78	ND	ND	ND	ND	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-8	5/19/04	ND	**370**	**800**[5]	ND	ND	ND	ND	ND	na	na	na	na	ND	ND	1.6	ND	ND	ND	ND	0.70	ND	ND	ND	ND
MWT-9	5/19/04	ND	ND	ND	ND	ND	ND	ND	0.79	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MWT-10	5/19/04	ND	ND	59[5]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-11	11/6/04	ND	**3,500**[7]	**930**[8]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-12	11/6/04	ND	**830**[7]	**1,400**[8]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-13	11/6/04	ND	**440**[7]	**1,100**[5]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
MWT-14	11/6/04	ND	**1,200**[7]	**4,600**[5]	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na

Concentrations in bold script exceed the 2008 San Francisco Bay Area RWQCB's Residential Environmental Screening Levels in shallow soils where groundwater is not a source of drinking water.

Notes:

(1) ND = Not Detected above the Method Detection Limit (MDL).
(2) na = Not Analyzed.
(3) The laboratory reports that the detected hydrocarbon does not match its diesel standard.
(4) Laboratory Method 8260B tests for 66 Volatile Organic Comppunds. Only those detected are presented on this table.
(5) The laboratory reports that the detected hydrocarbon does not match its gasoline standard.
(6) The laboratory reports that the detected hydrocarbon does not match its mineral spirits standard.
(7) Quantity of unknown hydrocarbons in sample based on Mineral Spirits
(8) Quantity of unknown hydrocarbons in sample based on gasoline
(9) Monitoring Well MW-6 was destroyed on November 11, 2007 and replaced with Monitoring Well MW-6A on September 27, 2008
(10) Data from URS

TABLE 7

TABLE 7

RESULTS OF ANALYSES OF GROUNDWATER SAMPLES RECOVERED FROM OFF-SITE LOCATIONS

		Petroleum Hydrocarbons							**Volatile Organic Compounds**														
Sample ID	**Date Sampled**	**TRPH**	**Motor Oil**	**TEPH**	**TPHd**	**Mineral Spirits**	**TPPH**	**TPHg**	**Ben-zene**	**Tolu-ene**	**Ethyl Benzene**	**Total Xylenes**	**MTBE**	**Naph-thalene**	**tert-Butyl Benzene**	**sec-Butyl Benzene**	**n-Butyl Benzene**	**1,2,4-Trimethyl benzene**	**Isopropyl benzene**	**Vinyl Chloride**	**1,1-Dichloro ethene**	**cis-1,2 Di-chloroethene**	**Other VOCs**
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Dunne Paint Site [3,4,5]																							
B-12	11/04/02	na [11]	**260** [12]	na	**17,000**	na	na	**9,200**	63	13	ND [10]	26	ND	38	ND	52	47	6.5	120	ND	ND	ND	n-Propylbenzene 47
B-14	11/04/02	na	ND	na	**220,000**	na	na	**170,000**	ND	2.0	ND	ND	ND	30	ND	ND	ND	ND	ND	ND	ND	ND	DIPE 2.4 Carbon Disulfide 2.4
B-15	11/04/02	na	ND	na	**16,000**	na	na	**4,000**	ND	ND	ND	ND	ND	ND	5.3	ND	ND	ND	ND	ND	ND	ND	ND
B-16	11/04/02	na	ND	na	**1,200,000**	na	na	**150,000**	ND	ND	ND	ND	ND	ND	6.4	ND	ND	ND	ND	ND	ND	ND	ND
OB-1	06/27/03	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OB-2	06/30/03	na	na	na	na	**12,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OB-3	06/27/03	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OB-4	06/27/03	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OB-5	06/27/03	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OB-6	06/27/03	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Trichloroethene 15; Tetrachloroethene 11
OB-7	06/27/03	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OB-8	06/27/03	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OB-9	06/27/03	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OB-10	06/30/03	na	na	na	na	**5,800**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CW-1	11/12/03	na	na	na	na	85	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	03/12/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	06/15/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/14/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CW-2	11/12/03	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	03/12/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	06/15/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/14/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CW-3	11/12/03	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	TCE 5.1
	03/12/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	06/15/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/14/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-D1	08/26/88	na	na	na	na	**1,000**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	01/18/89	na	na	na	na	ND	na	na	na	2.0	ND	1.1	na	na	na	na	na	na	na	na	na	na	na
	04/24/89	na	na	na	na	ND	na	na	na	ND	ND	1.8	na	na	na	na	na	na	na	na	na	na	na
	02/21/90	na	na	na	ND	ND	ND	na	ND	ND	0.4	1.3	na	na	na	na	na	na	na	na	na	na	na
	06/10/92	na	na	na	ND	ND	ND	na	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
	06/10/93	na	na	**220**	na	na	**230**	na	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
	09/24/93	na	na	na	na	ND	na	ND	na	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
	09/29/93	na	na	na	na	110	na	na	na	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
	12/14/99	na	na	na	na	ND	na	na	na	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
	11/12/03	na	na	na	na	85	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	03/12/04	na	na	na	na	**260**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	06/15/04	na	na	na	na	100	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/14/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-D2	08/26/88	na	na	na	na	**1,600**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	01/18/89	na	na	na	na	ND	na	na	na	6.3	ND	12	na	na	na	na	na	na	na	na	na	na	na
	04/24/89	na	na	na	na	ND	na	na	na	ND	ND	7.7	na	na	na	na	na	na	na	na	na	na	na
	02/21/90	na	na	na	na	**300**	na	na	na	ND	0.3	1.5	na	na	na	na	na	na	na	na	na	na	na
	06/10/92	na	na	ND	na	76	ND	na	na	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
	06/10/93	na	na	**9,100**	ND	na	**6,200**	na	na	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
	09/24/93	na	na	ND	ND	ND	ND	na	na	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
	09/29/93	na	na	na	na	**220**	na	na	na	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na

		Petroleum Hydrocarbons							Volatile Organic Compounds														
Sample ID	**Date Sampled**	**TRPH**	**Motor Oil**	**TEPH**	**TPHd**	**Mineral Spirits**	**TPPH**	**TPHg**	**Ben-zene**	**Tolu-ene**	**Ethyl Benzene**	**Total Xylenes**	**MTBE**	**Naph-thalene**	**tert-Butyl Benzene**	**sec-Butyl Benzene**	**n-Butyl Benzene**	**1,2,4-Trimethyl benzene**	**Isopropyl benzene**	**Vinyl Chloride**	**1,1-Dichloro ethene**	**cis-1,2 Di-chloroethene**	**Other VOCs**
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-D2	12/10/98	na	na	na	ND	180	95	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
continued	12/14/99	na	na	na	na	100	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	11/12/03	na	na	na	na	**1,400**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	03/12/04	na	na	na	na	**330**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	06/15/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/14/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B-1-W	02/10/05	na	na	na	na	**330**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B-2-W	02/10/05	na	na	na	na	**220**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B-4-W	02/10/05	na	na	na	na	**1,600**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B-5-W	02/10/05	na	na	na	na	**7,200**	na	na	ND	ND	ND	ND	ND	ND	5.3	ND	ND	ND	ND	ND	ND	ND	ND
B-6-W	02/10/05	na	na	na	na	**47,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Boysen Paint Site [3,5,9]																							
MW-B1	09/30/91	na	na	**18,000**	ND	na	**29,000**	na	5	**6**	**250**	**980**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	06/10/93	na	na	**27,000**	na	na	**57,000**	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/29/93	na	na	na	na	**43,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	05/28/03	na	na	**1,100,000**	na	**26,000**	**37,000**	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	06/15/04	na	na	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL			LNAPL	LNAPL	LNAPL	LNAPL
	09/14/04	na	na	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	ND	ND	LNAPL	LNAPL	LNAPL	LNAPL
	12/16/04	na	na	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	ND	ND	LNAPL	LNAPL	LNAPL	LNAPL
	03/30/04	na	na	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	ND	ND	LNAPL	LNAPL	LNAPL	LNAPL
																		ND	ND				
MW-B2	06/10/93	na	na	**3,800**	na	na	510	na	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND	ND	ND	ND
	09/29/93	na	na	na	na	**290,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/10/98	na	na	ND	ND	**150,000**	**2,400**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/14/99	na	na	na	na	**630**	na	na	na	na	na	na	na	na	na	na	na	ND	ND	na	na	na	na
	05/28/03	na	na	**22,000**	na	**26,000**	**1,600**	na	ND	ND	ND	ND	ND	ND	3.2	3.2	ND	ND	ND	ND	ND	ND	ND
	06/15/04	na	na	na	na	**3,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	33	ND	ND	ND	ND	ND	ND
	09/14/05	na	na	na	na	**410**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/16/04	na	na	na	na	**480**	na	na	ND	ND	ND	ND	ND	ND	1.8	1.4	ND	ND	ND	ND	ND	ND	ND
	03/30/05	na	na	na	na	**14,000**	na	na	ND	ND	ND	ND	ND	ND	5.8	4.1	ND	ND	ND	2.2	ND	0.57	ND
	06/27/05	na	na	na	na	**4,300**	na	na	ND	ND	ND	ND	ND	ND	5.9	4.7	ND	ND	ND	2.2	ND	ND	ND
MW-B3	06/10/93	na	na	**1,700**	na	na	**1,400**	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/29/93	na	na	na	na	**2,400**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/10/98	na	na	ND	ND	120	830	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/14/99	na	na	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	ND	ND	na	na	na	na
	05/28/03	na	na	ND	na	ND	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	06/15/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/14/05	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/16/04	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	03/30/05	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	06/27/05	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	TCE 3.4; 1,1,1-Trichloroethene 0.5
MW-B4	06/10/93	na	na	**36,000**	na	na	**36,000**	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	09/29/93	na	na	na	na	**1,400**	na	na	ND	ND	ND	ND	na	na	ND	ND	ND	na	na	ND	ND	ND	ND
	12/10/98	na	na	na	**1,000**	**7,500**	**2,700**	ND	ND	ND	ND	ND	na	na	ND	ND	ND	na	na	ND	ND	ND	ND
	12/14/99	na	na	na	na	**5,100**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	ND	na	na
	05/28/03	na	na	**7,000**	na	**990**	**14,000**	na	ND	ND	ND	ND	na	na	2.8	ND	ND	na	na	1.8	ND	ND	ND
MW-B4	06/15/04	na	na	na	na	**1,300**	na	na	ND	ND	ND	ND	na	na	ND	ND	ND	na	na	ND	ND	ND	ND
cont.	09/14/05	na	na	na	na	**400**	na	na	ND	ND	ND	ND	na	na	ND	ND	ND	na	na	ND	ND	ND	ND
	12/16/04	na	na	na	na	**450**	na	na	ND	ND	ND	ND	na	na	4.6	ND	ND	na	na	ND	ND	ND	ND
	03/30/05	na	na	na	na	**3,000**	na	na	ND	ND	ND	ND	na	na	6.5	2.0	ND	na	na	1.3	ND	ND	ND
	06/27/05	na	na	na	na	**2,800**	na	na	ND	ND	ND	ND	na	na	7.1	3.0	ND	na	na	1.9	ND	ND	TCE 3.4 1,1,1-Trichloroethene 0.5
BES-1	04/21/94	na	na	**18,000**	na	**12,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/10/98	na	na	ND	na	**78,000**	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/14/99	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	ND	na	na
	05/28/03	na	na	**19,000**	na	na	**84,000**	na	ND	ND	ND	ND	ND	ND	4	ND	ND	ND	ND	20	1.5	17	trans-1,2 Dichlorothene 2.1
	06/18/03	na	na	na	na	**120,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	18	ND	14	ND
	06/15/04	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	09/14/05	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	12/16/04	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	03/30/05	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL
	06/27/05	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL	LNAPL

		Petroleum Hydrocarbons							Volatile Organic Compounds														
Sample ID	Date Sampled	TRPH µg/L	Motor Oil µg/L	TEPH µg/L	TPHd µg/L	Mineral Spirits µg/L	TPPH µg/L	TPHg µg/L	Ben-zene µg/L	Tolu-ene µg/L	Ethyl Benzene µg/L	Total Xylenes µg/L	MTBE µg/L	Naph-thalene µg/L	tert-Butyl Benzene µg/L	sec-Butyl Benzene µg/L	n-Butyl Benzene µg/L	1,2,4-Trimethyl benzene µg/L	Isopropyl benzene µg/L	Vinyl Chloride µg/L	1,1-Dichloro ethene µg/L	cis-1,2 Di-chloroethene µg/L	Other VOCs µg/L
MW-LD4	09/30/91	na	na	na	na	na	na	na	2.0	3.1	9.0	2.4	na	na	na	na	na	na	na	na	na	na	na
	04/06/93	na	na	**21,000**	na	na	**1,100**	na	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
	09/29/93	na	na	na	na	**700**	na	na	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na
	12/10/98	na	na	na	170	130	83	ND	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na
	12/14/99	na	na	na	na	**440,000**	na	na	na	na	na	na	ND	ND	na	na	na	na	na	na	na	na	na
	01/13/00	na	na	na	na	**630,000**	na	na	na	na	na	na	ND	ND	na	na	na	na	na	na	na	na	na
BH-A	2004	na	na	na	na	54	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-B	2004	na	na	na	na	**1,700,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	9.0	ND	ND	ND	ND	ND	ND
BH-C	2004	na	na	na	na	**230**	na	na	ND	ND	ND	ND	ND	ND	ND	2.2	ND	ND	ND	0.51	ND	4.7	ND
BH-E	2004	na	na	na	na	**3,600**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-F	2004	na	na	na	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-G	2004	na	na	na	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	TCE 0.57
BH-H	2004	na	na	na	na	**1,200,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-I	2004	na	na	na	na	**57,000**	na	na	ND	ND	ND	ND	ND	ND	ND	35	ND	ND	ND	ND	ND	ND	n-Propylbenzene 20
BH-J	2004	na	na	na	na	**1,600,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-K	2004	na	na	na	na	**1,300**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-L	2004	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-M	2004	na	na	na	na	72	na	na	ND	0.64	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-N	2004	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-O	2004	na	na	na	na	ND	na	na	1.6	26	2.4	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-P	2004	na	na	na	na	**680**	na	na	ND	0.57	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-Q	2004	na	na	na	na	**110,000**	na	na	ND	ND	ND	ND	ND	ND	6.1	ND	ND	ND	ND	ND	ND	ND	ND
BH-R	2004	na	na	na	na	**880,000**	na	na	ND	ND	ND	ND	ND	ND	4.9	ND	ND	ND	ND	ND	ND	ND	ND
BH-S	2004	na	na	na	na	**520**	na	na	ND	0.64	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-T	2004	na	na	na	na	**11,000**	na	na	0.7	12	1.2	6.8	ND	ND	2.0	ND	ND	0.93	ND	ND	ND	ND	ND
BH-U	2004	na	na	na	na	**1,600**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-W	2004	na	na	na	na	**870,000**	na	na	ND	ND	ND	ND	ND	2.6	1.0	ND	ND	4.0	ND	ND	ND	ND	ND
BH-X	2004	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-Y	2004	na	na	na	na	**1,400,000**	na	na	ND	12	ND	12	ND	41	46	ND	ND	ND	ND	ND	ND	ND	ND
BH-Z	2004	na	na	na	na	**59,000**	na	na	ND	11	ND	7.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-AA	2004	na	na	na	na	**2,000,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-BB	2004	na	na	na	na	**1,100,000**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-DD	Aug. 2005	na	na	na	na	**970**	na	na	ND	2.9	0.58	3.8	ND	ND	ND	ND	ND	0.78	ND	ND	ND	ND	ND
BH-EE	Aug. 2005	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-FF	Aug. 2005	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-II-16-20'	Aug. 2005	na	na	na	na	160	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-II-23-27'	Aug. 2005	na	na	na	na	56	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-II-45-50'	Aug. 2005	na	na	na	na	68	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-JJ	Aug. 2005	na	na	na	na	**520**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

		Petroleum Hydrocarbons							Volatile Organic Compounds														
Sample ID	**Date Sampled**	**TRPH** µg/L	**Motor Oil** µg/L	**TEPH** µg/L	**TPHd** µg/L	**Mineral Spirits** µg/L	**TPPH** µg/L	**TPHg** µg/L	**Ben-zene** µg/L	**Tolu-ene** µg/L	**Ethyl Benzene** µg/L	**Total Xylenes** µg/L	**MTBE** µg/L	**Naph-thalene** µg/L	**tert-Butyl Benzene** µg/L	**sec-Butyl Benzene** µg/L	**n-Butyl Benzene** µg/L	**1,2,4-Trimethyl benzene** µg/L	**Isopropyl benzene** µg/L	**Vinyl Chloride** µg/L	**1,1-Dichloro ethene** µg/L	**cis-1,2 Di-chloroethene** µg/L	**Other VOCs** µg/L
BH-KK	Aug. 2005	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-LL	Aug. 2005	na	na	na	na	ND	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-MM	Aug. 2005	na	na	na	na	**3,500**	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BH-NN	Aug. 2005	na	na	na	na	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B-1	05/31/06	na	na	na	ND	ND	na	**460**	ND	0.65	ND	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Acetone 47
B-2	05/30/06	na	na	na	ND	ND	na	120	ND	0.52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Acetone 20
B-4	06/07/06	na	na	na	na	na	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Celis Site [1,2,6]																							
LF-LFMW-1	08/07/93	11	ND	na	**41,000**	na	na	**100,000**	**13,000**	**9,400**	**3,100**	**14,000**	na	na	na	na	na	na	na	na	na	na	na
LF-LFMW-2	08/07/93	ND	ND	na	95	na	na	**13,000**	**2,400**	**2,900**	**500**	**2,000**	na	na	na	na	na	na	na	na	na	na	na
LF-LFMW-3	08/07/93	ND	ND	na	**780**	na	na	**11,000**	**1,500**	**5,100**	**2,900**	**5,000**	na	na	na	na	na	na	na	na	na	na	na
LF-LFMW-4	01/28/94	na	160	na	**1,400**	na	na	**18,000**	**1,000**	**1,900**	**880**	**4,700.0**	na	na	na	na	na	na	na	na	na	na	na
	09/26/97	na	ND	na	**480**	na	na	**3,200**	44	**6.6**	**49**	**180**	ND	17	na	na	na	na	na	na	na	na	na
	07/10/07	na	na	na	**620**	**260**	na	**450**	3.5	ND	11	1.8	6.2	na	na	na	na	na	na	na	na	na	na
	10/31/07	na	na	na	**3,400**	**450**	na	**780**	1.3	ND	15	1.1	5.7	na	na	na	na	na	na	na	na	na	na
	01/18/08	na	na	na	**1,000**	**500**	na	**970**	4.1	ND	17	0.8	5.0	na	na	na	na	na	na	na	na	na	na
	09/21/09	na	na	na	**1,600**	**320**	na	**490**	ND	ND	7.9	ND	2.0	na	na	na	na	na	na	na	na	na	na
	03/12/10	na	na	na	**1,200**	**1,100**	na	**1,200**	0.5	ND	7.2	ND	1.1	na	na	na	na	na	na	na	na	na	na
WCEW-1	09/26/97	na	ND	na	**180,000**	na	na	**110,000**	**2,800**	**4,900**	**3,100**	**12,000**	ND	**120**	na	na	na	na	na	na	na	na	ND
	12/05/97	na	ND	na	95	na	na	**4,700**	**2,100**	**1,800**	**2,500**	**10,000**	340	**170**	na	na	na	na	na	na	na	na	ND
	03/13/98	na	ND	na	**780**	na	na	**7,700**	**2,500**	**1,300**	**1,000**	**3,400**	570	**421**	na	na	na	na	na	na	na	na	ND
	06/02/98	na	**550**	na	**780**	na	na	**3,400**	**2,100**	**460**	**910**	**2,990**	350	**1,000**	na	na	na	na	na	na	na	na	ND
	5/19/2004[5]	na	na	na	ND	**600**	na	**3,700**	**90**	0.66	**48**	56	170	8.3	ND	8.7	ND	14	12	ND	ND	ND	1,3,5 Trimethylbenzene 5.6;
	09/24/09	na	na	na	**1,600**	**390**	na	**1,400**	1.5	ND	1.2	ND	150	na	na	na	na	na	na	na	na	na	TBA 21
	03/14/10	na	na	na	**1,600**	**460**	na	**1,200**	3.5	ND	4.3	1.3	131	na	na	na	na	na	na	na	na	na	TBA 5.4
SB-1-15-20	02/06/06	na	na	na	**310**	110	na	**220**	ND	ND	ND	ND	5.2	ND	ND	8.7	ND	ND	ND	ND	ND	ND	ND
URS-MW-1	07/10/07	na	na	na	**580**	**550**	na	**960**	ND	ND	ND	ND	1.7	na	na	na	na	na	na	na	na	na	na
	10/31/07	na	na	na	**670**	150	na	**270**	ND	ND	ND	ND	1.3	na	na	na	na	na	na	na	na	na	na
	01/18/08	na	na	na	**220**	79	na	150	ND	ND	ND	ND	1.1	na	na	na	na	na	na	na	na	na	na
	09/21/09	na	na	na	90	83	na	120	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na
	03/21/10	na	na	na	110	63	na	53	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na
URS-MW-2	07/10/07	na	na	na	**240**	ND	na	ND	ND	ND	ND	ND	140	ND	ND	ND	ND	ND	ND	ND	ND	ND	TBA 18
	10/31/07	na	na	na	180	ND	na	ND	ND	4.4	ND	5.1	160	na	na	na	na	na	na	na	na	na	na
	01/18/08	na	na	na	170	ND	na	ND	ND	ND	ND	ND	160	na	na	na	na	na	na	na	na	na	na
	09/21/09	na	na	na	**210**	ND	na	ND	ND	ND	ND	ND	49	na	na	na	na	na	na	na	na	na	TBA 40
	03/21/10	na	na	na	**320**	63	na	53	ND	ND	ND	ND	18	na	na	na	na	na	na	na	na	na	TBA 37
URS-MW-3	07/10/07	na	na	na	ND	ND	na	ND	ND	ND	ND	ND	1.3	na	na	na	na	na	na	na	na	na	na
	10/31/07	na	na	na	50	ND	na	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na
	01/18/08	na	na	na	ND	ND	na	ND	ND	ND	ND	ND	ND	na	na	na	na	na	na	na	na	na	na
	09/21/09	na	na	na	ND	ND	na	ND	ND	ND	ND	ND	1.9	na	na	na	na	na	na	na	na	na	na
	03/21/10	na	na	na	ND	ND	na	ND	ND	ND	ND	ND	1.7	na	na	na	na	na	na	na	na	na	na
URS-MW-4	07/10/07	na	na	na	110	ND	na	ND	ND	ND	ND	ND	82	na	na	na	na	na	na	na	na	na	na
	10/31/07	na	na	na	170	ND	na	ND	ND	ND	ND	ND	7.2	na	na	na	na	na	na	na	na	na	na
	01/18/08	na	na	na	110	ND	na	ND	ND	ND	ND	ND	3.9	na	na	na	na	na	na	na	na	na	na
	09/21/09	na	na	na	110	ND	na	ND	ND	ND	ND	ND	56	na	na	na	na	na	na	na	na	na	na
	03/21/10	na	na	na	210	ND	na	ND	ND	ND	ND	ND	20	na	na	na	na	na	na	na	na	na	na
URS-MW-5	07/10/07	na	na	na	**820**	160	na	**270**	ND	ND	**22**	ND	99	na	na	na	na	na	na	na	na	na	TBA 11
	10/31/07	na	na	na	**1,400**	**1,400**	na	**2,500**	ND	ND	**270**	ND	47	na	na	na	na	na	na	na	na	na	na
	01/18/09	na	na	na	**2,000**	**540**	na	**1,000**	ND	ND	**110**	ND	49	na	na	na	na	na	na	na	na	na	na
	09/21/09	na	na	na	**1,100**	99	na	150	ND	ND	ND	ND	63	na	na	na	na	na	na	na	na	na	na
	03/12/10	na	na	na	**1,100**	160	na	170	ND	ND	1.0	ND	49	na	na	na	na	na	na	na	na	na	na

		Petroleum Hydrocarbons							Volatile Organic Compounds														
Sample ID	**Date Sampled**	**TRPH** µg/L	**Motor Oil** µg/L	**TEPH** µg/L	**TPHd** µg/L	**Mineral Spirits** µg/L	**TPPH** µg/L	**TPHg** µg/L	**Ben-zene** µg/L	**Tolu-ene** µg/L	**Ethyl Benzene** µg/L	**Total Xylenes** µg/L	**MTBE** µg/L	**Naph-thalene** µg/L	**tert-Butyl Benzene** µg/L	**sec-Butyl Benzene** µg/L	**n-Butyl Benzene** µg/L	**1,2,4-Trimethyl benzene** µg/L	**Isopropyl benzene** µg/L	**Vinyl Chloride** µg/L	**1,1-Dichloro ethene** µg/L	**cis-1,2 Di-chloroethene** µg/L	**Other VOCs** µg/L
San Francisco Bread Site [1,6,7,8]																							
SMW-1	09/11/92	na	na	na	200	na	na	**1,400**	**470**	45	43	100	na	na	na	na	na	na	na	na	na	na	na
	12/03/92	na	na	na	na	na	na	ND	ND	ND	1.6	ND	na	na	na	na	na	na	na	na	na	na	na
	03/04/93	na	na	na	na	na	na	**700**	1.1	ND	ND	1.1	na	na	na	na	na	na	na	na	na	na	na
	06/04/93	na	na	na	na	na	na	**2,900**	**340**	58	**50**	**140**	na	na	na	na	na	na	na	na	na	na	na
	09/02/93	na	na	na	na	na	na	**1,500**	**340**	ND	ND	**140**	na	na	na	na	na	na	na	na	na	na	na
	12/01/93	na	na	na	na	na	na	**810**	**170**	23	22	39	na	na	na	na	na	na	na	na	na	na	na
	03/08/94	na	na	na	na	na	na	**5,800**	**1,700**	**430**	**230**	**490**	na	na	na	na	na	na	na	na	na	na	na
MW-3	05/19/04	na	na	na	ND	**420**	na	**1,300**	ND	ND	ND	1.1	5.8	ND	ND	ND	14	ND	ND	ND	ND	ND	1,3,5 Trimethylbenzene 12
	09/24/09	na	na	na	110	ND	ND	ND	ND	ND	ND	ND	2.4	na	na	na	na	na	na	na	na	na	na
	03/14/10	na	na	na	130	ND	7.2	58	4.6	ND	7.2	5.6	1.9	na	na	na	na	na	na	na	na	na	TBA 4.1
URS-MW-5	07/10/07	na	na	na	**820**	160	na	**270**	0.6	ND	22	ND	99	na	na	na	na	na	na	na	na	na	na
	10/31/07	na	na	na	**1,400**	**1,400**	na	**2,500**	3.9	ND	**270**	ND	47	na	na	na	na	na	na	na	na	na	na
	01/18/08	na	na	na	**2,000**	**540**	na	**1,000**	3.3	ND	**110**	ND	49	na	na	na	na	na	na	na	na	na	na
	09/21/09	na	na	na	**1,100**	99	na	150	ND	ND	ND	ND	63	na	na	na	na	na	na	na	na	na	na
	03/12/10	na	na	na	**1,100**	160	na	170	ND	ND	1.0	ND	49	na	na	na	na	na	na	na	na	na	na

Concentrations in bold script exceed the 2008 San Francisco Bay Area RWQCB's Residential Environmental Screening Levels in shallow soils where groundwater is not a source of drinking water.

Notes:

(1) Data Source: Levine-Fricke 1994, 1993
(2) Data Source: Woodward-Clyde International-Americas 1997, 1998
(3) Data Source: Aqua Science Engineers, Inc. 2005a,b
(4) Data Source: Clayton Group Services 2007, 2004a,b, 2003, 2002
(5) Data Source: Hageman-Aquiar, Inc. 1992
(6) Data Source: URS 2006, 2007a, 2009
(7) Data Source: The San Joaquin Company 2005
(8) Data Source: SEACOR Science and Engineering Analysis Corporation 1992
(9) Data Source: Environmental Resource Management 2006
(10) ND = Not Detected above the Method Detection Limit (MDL).
(11) na = Not Analyzed.

TABLE 8

Table 8

RESULTS OF ANALYSES OF SOIL SAMPLES RECOVERED FROM FLOORS OF REMEDIAL EXCAVATIONS
August 10 - 30, 2007

Sample ID	**Date Sampled**	**Elevation** NAVD *ft.*	**TPHd (diesel)** mg/Kg	**Mineral Spirits** mg/Kg	**TPHg (gasoline)** mg/Kg	**Benzene** mg/Kg	**Toluene** mg/Kg	**Ethylbenzene** mg/Kg	**Total Xylenes** mg/Kg
Remedial Excavation No. 1									
W275N08	08/28/07	36.62	3.0	1.7	9.7	ND	ND	ND	ND
W275N30	08/28/07	36.73	29	40	**510**	**0.97**	2.8	**8.5**	**51**
W275N55	08/30/07	36.06	32	26	**140**	ND	ND	ND	ND
W275N80	08/30/07	36.73	18	19	85	ND	ND	ND	ND
W275N105	08/28/07	36.74	54	ND	1.7	0.014	0.048	0.087	0.57
W305N08	08/28/07	36.13	ND	ND	1.9	ND	ND	ND	ND
W305N30	08/28/07	36.04	3.1	4.1	**130**	ND	2.0	1.8	9.3
W305N55	08/28/07	36.10	4.1	5.7	59	ND	ND	ND	2.6
W305N80	08/28/07	35.29	8.2	10	0.32	ND	ND	ND	ND
W305N115	08/28/07	36.47	ND	ND	ND	ND	ND	ND	ND
W335N08	08/28/07	35.69	ND	ND	ND	ND	ND	ND	ND
W335N30	08/28/07	35.66	42	57	**140**	ND	ND	ND	4.1
W335N55	08/28/07	34.96	6.5	8.4	7.7	ND	ND	ND	ND
W335N80	08/28/07	35.50	ND	ND	ND	ND	ND	ND	ND
W335N105	08/28/07	35.40	100	**140**	**120**	ND	ND	ND	ND
Remedial Excavation No. 2									
W0N0	08/14/07	40.81	28	6.3	3.2	ND	ND	ND	ND
W0N25	08/14/07	40.54	ND	ND	ND	ND	ND	ND	ND
W0N35	08/14/07	40.42	ND	ND	ND	ND	ND	ND	ND
W0N50	08/14/07	40.25	ND	ND	ND	ND	ND	ND	ND
W0N65	08/14/07	40.81	ND	ND	ND	ND	ND	ND	ND
W15N61	08/10/07	40.57	ND	ND	ND	ND	ND	ND	ND
W25N0	08/14/07	39.47	ND	ND	ND	ND	ND	ND	ND
W25N25	08/14/07	39.94	ND	ND	ND	ND	ND	ND	ND
W25N50	08/17/07	40.71	ND	ND	ND	ND	ND	ND	ND
W25N75	08/17/07	41.05	ND	ND	ND	ND	ND	ND	ND
W50N0	08/22/07	39.95	3.0	ND	ND	ND	ND	ND	ND
W50N50	08/17/07	40.41	ND	ND	ND	ND	ND	ND	ND
W50N75	08/17/07	40.44	ND	ND	ND	ND	ND	ND	ND
W75N0	08/22/07	40.61	19	24	**350**	ND	3.9	**8.1**	**21**
W75N25	08/22/07	40.22	26	29	**280**	ND	3.9	**2.9**	9.2
W75N50	08/17/07	40.19	ND	ND	0.90	0.0077	ND	ND	ND
W75N75	08/17/07	40.92	ND	ND	ND	ND	ND	ND	ND
W100N0	08/23/07	40.38	13	14	**180**	ND	1.6	**2.9**	**16**
W100N25	08/23/07	40.72	18	15	**150**	ND	ND	2.3	ND

Sample ID	Date Sampled	Elevation NAVD *ft.*	TPHd (diesel) mg/Kg	Mineral Spirits mg/Kg	TPHg (gasoline) mg/Kg	Benzene mg/Kg	Toluene mg/Kg	Ethylbenzene mg/Kg	Total Xylenes mg/Kg
W100N50	08/17/07	40.23	ND	ND	0.70	0.0094	ND	0.0051	ND
W100N75	08/17/07	40.21	ND	ND	ND	ND	ND	ND	ND
W125N0	08/23/07	40.54	7.1	9.2	72	ND	ND	1.2	3.9
W125N25	08/27/07	40.36	32	31	100	ND	ND	ND	ND
W125N50	08/27/07	39.72	9.3	7.6	**150**	ND	ND	ND	ND
W125N75	08/17/07	40.53	ND	ND	ND	ND	ND	ND	ND
W150N0	08/23/07	39.65	10	9.9	96	ND	ND	1.1	3.2
W150N25	08/23/07	40.09	18	21	**290**	ND	ND	**6.0**	8.2
W150N50	08/17/07	39.32	ND	ND	ND	ND	ND	ND	ND
W175N0	08/23/07	39.93	2.6	1.6	2.9	ND	ND	ND	ND
W175N25	08/23/07	40.39	2.8	2.4	9.0	0.020	ND	0.11	0.0099
W175N50	08/27/07	39.89	ND	ND	ND	ND	ND	ND	2.4
W175N75	08/27/07	39.13	ND	ND	ND	ND	ND	ND	ND
W200N0	08/27/07	40.30	ND	ND	0.47	ND	ND	ND	ND
W200N50	08/27/07	40.06	5.6	5.2	93	ND	ND	1.6	ND
W200N75	08/27/07	39.92	**940**	**1300**	**5100**	ND	ND	**50**	**270**
W213N25	08/27/07	40.76	6.8	5.4	6.5	ND	ND	0.055	ND

Notes:

(1) Concentrations in **bold** script exceed the 2008 San Francisco Bay Area RWQCB's Environmental Screening Levels for residential property in shallow soils where groundwater is not a source of drinking water.

(2) ND = Not Detected above the Method Detection Limit (MDL).

TABLE 9

TABLE 9

RWQCB TIER 1 CONCENTRATION LIMITS (ESLs)
FOR CHEMICALS OF CONCERN IN SHALLOW SOIL, GROUNDWATER AND SOIL GAS
AT SITES WHERE SGROUNDWATER IS NOT A SOURCE OF DRINKING WATER

Shallow = <3m BGS for soil; <1.5m BGS for soil gas

	Limiting Concentrations to Protect Human Healtl				
	Soil		***Groundwater***	***Soil Gas for Vapor Intrusion***	
Chemical of Concerr	Residential mg/Kg	Commercial mg/Kg	Resid. or Comm. µg/L	Residential *$\mu g/m^3$*	Commercial *$\mu g/m^3$*
Acetone	0.50	0.50	1,500	666,000	1,800,000
Aroclor® 1260 (PCBs)	0.22	0.74	0.014	n/a	n/a
Antimony	6.3	40	30	n/a	n/a
Arsenic	0.39	1.6	36	n/a	n/a
Barium	750	1,500	1,000	n/a	n/a
Benzene	0.12	0.27	46	84	280
Beryllium	4.0	8.0	0.53	n/a	n/a
2-Butatone (Metyl Ethyl Ketone)	13	13	14,000	1,000,000	2,900,000
n-Butylbenzene (1-Phenylbutane)	ne	ne	ne	ne	ne
sec-Butylbenzene (Butyl Benzene)	ne	ne	ne	ne	ne
tert-Butylbenzene	ne	ne	ne	ne	ne
Cadmium	1.7	7.4	0.25	n/a	n/a
Chromium III	750	750	180	n/a	n/a
Chromium VI	8.0	8.0	11	n/a	n/a
Cobalt	40	80	3.0	n/a	n/a
Copper	230	230	3.1	n/a	n/a
Dibromoethane (EDB)	ne	ne	ne	ne	ne
Ethyl benzene	2.3	4.7	43	980	3,300
Lead	200	750	2.5	n/a	n/a
Mercury	1.3	10	0.025	n/a	n/a
2-Methylnaphthalene	0.25	0.25	2.1	ne	ne
4-Methylphenol	ne	ne	ne	ne	ne
Methyl Teritary Butyl Ether	8.4	8.4	1,800	9,400	31,000
Methylene Chloride	7.2	17	2,200	5,200	17,000

	Limiting Concentrations to Protect Human Health				
	Soil		***Groundwater***	***Soil Gas for Vapor Intrusion***	
Chemical of Concern	Residential mg/Kg	Commercial mg/Kg	Resid. or Comm. µg/L	Residential *µg/m³*	Commercial *µg/m³*
Molybdenum	40	40	240	n/a	n/a
Naphthalene	1.3	2.8	24	72	240
Nickel	150	150	8.2	n/a	n/a
Isopropylbenzene (Cumene)	ne	ne	ne	ne	ne
p-Isopropylbenzene	ne	ne	ne	ne	ne
p-Isopropyltoluene (p-Cymene)	ne	ne	ne	ne	ne
n-Propylbenzene (Isocumene)	ne	ne	ne	ne	ne
Selinium	10	10	5.0	n/a	n/a
Silver	20	40	0.19	n/a	n/a
Tetrachlorethene	0.47	0.90	120	410	4100
Thallium	1.3	16	4.0	n/a	n/a
Toluene	9.3	9.3	130	63,000	180,000
TPHd, TPHms (Diesel and Mineral Spirits)	100	180	210	10,000	29,000
TPHg (Gasoline)	100	180	210	10,000	29,000
Trichloroethene	1.9	4.1	360	1,200	4,100
1,2,4 Trimethylbenzene	ne	ne	ne	ne	ne
1,3,5 Trimethylbenzene	ne	ne	ne	ne	ne
Vanadium	16	200	19	n/a	n/a
Xylene Isomers (Total)	11.0	11.0	100	21,000	58,000
Zinc	600	600	81	n/a	n/a

Notes:

n/a = not applicable to soil gas

ne = not established in the RWQCB ESL guidance document (California Regional Water Quality Control Board San Francisco Bay Region (2008), *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater.* California Regional Water Quality Control Board San Francisco Bay Region INTERIM FINAL. November 2007 (Revised May 2008).

TABLE 10

TABLE 10

RWQCB TIER 1 CONCENTRATION LIMITS (ESLs)
FOR CHEMICALS OF CONCERN IN DEEP SOIL, GROUNDWATER AND SOIL GAS
AT SITES WHERE SGROUNDWATER IS NOT A SOURCE OF DRINKING WATER

Deep = >3m BGS for soil; >1.5m BGS for soil gas

	Limiting Concentrations to Protect Human Healtl				
	Soil		***Groundwater***	***Soil Gas for Vapor Intrusion***	
Chemical of Concern	Residential mg/Kg	Commercial mg/Kg	Resid. or Comm. µg/L	Residential *$\mu g/m^3$*	Commercial *$\mu g/m^3$*
Acetone	0.50	0.50	1,500	666,000	1,800,000
Aroclor® 1260 (PCBs)	6.3	6.3	0.014	n/a	n/a
Antimony	310	310	30	n/a	n/a
Arsenic	15	15	36	n/a	n/a
Barium	2,500	2,600	1,000	n/a	n/a
Benzene	2.0	2.0	46	84	280
Beryllium	98	98	0.53	n/a	n/a
2-Butatone (Metyl Ethyl Ketone)	13	13	14,000	1,000,000	2,900,000
n-Butylbenzene (1-Phenylbutane)	ne	ne	ne	ne	ne
sec-Butylbenzene (Butyl Benzene)	ne	ne	ne	ne	ne
tert-Butylbenzene	ne	ne	ne	ne	ne
Cadmium	39	39	0.25	n/a	n/a
Chromium III	2,500	5,000	180	n/a	n/a
Chromium VI	0.53	0.53	11	n/a	n/a
Cobalt	94	94	3.0	n/a	n/a
Copper	2,500	5,000	3.1	n/a	n/a
Dibromoethane (EDB)	ne	ne	ne	ne	ne
Ethyl benzene	4.7	4.7	43	980	3,300
Lead	750	750	2.5	n/a	n/a
Mercury	58	58	0.025	n/a	n/a
2-Methylnaphthalene	0.25	0.25	2.1	ne	ne
4-Methylphenol	ne	ne	ne	ne	ne
Methyl Teritary Butyl Ether	8.4	8.4	1,800	9,400	31,000
Methylene Chloride	34	34	2,200	5,200	17,000

Chemical of Concern	**Limiting Concentrations to Protect Human Healtl** ***Soil*** Residential mg/Kg	 Commercial mg/Kg	 ***Groundwater*** Resid. or Comm. µg/L	 ***Soil Gas for Vapor Intrusion*** Residential *µ g/m³*	 Commercial *µ g/m³*
Molybdenum	2,500	3,900	240	n/a	n/a
Naphthalene	4.8	4.8	24	72	240
Nickel	260	260	8.2	n/a	n/a
Isopropylbenzene (Cumene)	ne	ne	ne	ne	ne
p-Isopropylbenzene	ne	ne	ne	ne	ne
p-Isopropyltoluene (p-Cymene)	ne	ne	ne	ne	ne
n-Propylbenzene (Isocumene)	ne	ne	ne	ne	ne
Selinium	2,500	3,900	5.0	n/a	n/a
Silver	2,500	3,900	0.19	n/a	n/a
Tetrachlorethene	17	17	120	410	4100
Thallium	62	62	4.0	n/a	n/a
Toluene	9.3	9.3	130	63,000	180,000
TPHd, TPHms (Diesel and Mineral Spirits)	180	180	210	10,000	29,000
TPHg (Gasoline)	180	180	210	10,000	29,000
Trichloroethene	33	33	360	1,200	4,100
1,2,4 Trimethylbenzene	ne	ne	ne	ne	ne
1,3,5 Trimethylbenzene	ne	ne	ne	ne	ne
Vanadium	770	770	19	n/a	n/a
Xylene Isomers (Total)	11	11	100	21,000	58,000
Zinc	2,500	5,000	81	n/a	n/a

Notes:

n/a = not applicable to soil gas
ne = not established in the RWQCB ESL guidance document (California Regional Water Quality Control Board San Francisco Bay Region (2008), *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater.* California Regional Water Quality Control Board San Francisco Bay Region INTERIM FINAL. November 2007 (Revised May 2008).

TABLE 11

TABLE 11

RESULTS OF SOIL GAS SURVEY

Soil in Bottom of Test Boring

Sample ID	Date Sampled	Depth BGS ft.	Mineral Spirits mg/Kg	TPHd (diesel) mg/Kg	TPHg (gasoline) mg/Kg	Benzene mg/Kg	Toluene mg/Kg	Ethylbenzene mg/Kg	Total Xylenes mg/Kg	MTBE mg/Kg	Acetone mg/Kg	2-Butanone mg/Kg	n-Butylbenzene mg/Kg	sec-Butylbenzene mg/Kg	tert-Butylbenzene mg/Kg	Isopropylbenzene mg/Kg	p-Isopropyltoluene mg/Kg	n-Propylbenzene mg/Kg	1,2,4-Trimethylbenzene mg/Kg	1,3,5-Trimethylbenzene mg/Kg	Napthalene mg/Kg	Other VOCs by 8260B GC/MS
SG-1-5.0	10/29/07	5.0	ND	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG-2-5.0	10/29/07	5.0	ND	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG-3-5.0	10/29/07	5.0	ND	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG-4-5.0	10/29/07	5.0	ND	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG-5-5.0	10/29/07	5.0	ND	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG-6-5.0	10/29/07	5.0	ND	ND	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG-7-5.0	09/24/07	5.0	ND	9.1	na	ND	ND	0.0065	0.019	ND	ND	ND	ND	ND	ND	0.005	ND	0.016	0.019	0.0049	ND	ND
SG-8-5.0	09/24/07	5.0	ND	10.0	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG-9-5.0	09/24/07	5.0	ND	6.0	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG-10-5.0	09/24/07	5.0	4.8	33.0	na	0.021	ND	0.041	0.096	ND	0.082	ND	0.018	0.019	ND	0.049	ND	0.190	0.099	0.022	0.014	ND

Soil Gas

Sample ID	Date Sampled	Depth BGS ft.	Benzene $\mu g/m^3$	Toluene $\mu g/m^3$	Ethylbenzene $\mu g/m^3$	Total Xylenes $\mu g/m^3$	MTBE $\mu g/m^3$	Acetone $\mu g/m^3$	2-Butanone $\mu g/m^3$	trichlorofluoromethane $\mu g/m^3$	1,2,4-Trimethylbenzene $\mu g/m^3$	1,3,5-Trimethylbenzene $\mu g/m^3$	Carbon disulfide $\mu g/m^3$	Methylene Chloride $\mu g/m^3$	4-ethyltoluene $\mu g/m^3$	Other VOCs by 8260B GC/MS
SG-1	10/29/07	5.0	ND	ND	ND	ND	ND	47	ND	ND	ND	ND	ND	ND	ND	ND
SG-2	10/29/07	5.0	14	57	21	70	ND	120	ND	26	ND	ND	32	ND	ND	ND
SG-3	10/29/07	5.0	ND	ND	ND	ND	ND	94	ND	20	ND	ND	ND	ND	ND	ND
SG-4	10/29/07	5.0	ND	8.8	ND	ND	ND	130	ND	ND	ND	ND	ND	ND	ND	ND
SG-5	10/29/07	5.0	13	75	35	140	ND	77	ND	ND	ND	ND	ND	ND	15	ND
SG-6	10/29/07	5.0	ND	ND	ND	ND	ND	93	ND	ND	ND	ND	ND	ND	ND	ND
SG-7	09/24/07	5.0	35	9.6	ND	ND	ND	220	58	ND	ND	ND	47	9.3	ND	ND
SG-8	09/24/07	5.0	29	9.0	ND	ND	ND	220	77	ND	ND	ND	ND	7.5	ND	ND
SG-9	09/24/07	5.0	72	16	29	48	ND	370	39	ND	ND	ND	ND	ND	ND	ND
SG-10	09/24/07	5.0	**840**	33	370	620	ND	430	90	ND	ND	ND	ND	ND	25	ND

Concentrations in bold script exceed the 2008 San Francisco Bay Area RWQCB's Residential Environmental Screening Levels in shallow soils where groundwater is not a source of drinking water.

Note: ND = Not Detected above the Method Detection Limit (MDL).

TABLE 12

TABLE 12

KEY GROUND FLOOR BUILDING DIMENSIONS

Building Type	**Ground Floor Occupancy**	**Slab** Emeryville Datum *ft.*	**Elevation** NAVD *ft.*	**Length East to West** *ft.*	**Length North to South** *ft.*	**Plan Area** *ft.*^{2}	**Foundation Perimeter** *ft.*	**Gr. Floor Floor to Ceiling** *ft.*	**Gr. Floor Interior Volume** *ft.*^{3}	**Ground Floor Volume/Area Ratio**	**Gr. Floor Slab Thickness** *in.*	**Vapor meable Barrier**
1	Commercial	36.70	42.38	55.0	91.0	4,260	331.0	18	76,680	18.0	6	Liquid Boot®
2A	Commercial	37.90	43.58	30.5	34.0	1,022	129.0	18	18,396	18.0	6	Liquid Boot®
2B	Residential	39.75	45.43	23.0	32.5	722	118.3	9	6,498	9.0	6	Liquid Boot®
2C	Residential	40.50	46.18	31.3	30.0	932	126.6	9	8,388	9.0	6	Liquid Boot®
3A	Residential	41.15	46.83	32.5	23.0	722	118.3	11	7,942	11.0	6	Liquid Boot®
3B	Residential	41.60	47.28	32.5	23.0	722	118.3	11	7,942	11.0	6	Liquid Boot®
3C	Residential	40.50	46.18	32.5	23.0	722	118.3	11	7,942	11.0	6	Liquid Boot®
4	Residential	40.35	46.03	26.0	42.8	990	146.3	9	8,910	9.0	6	Liquid Boot®
5	Residential	40.95	46.63	24.5	49.0	923	139.0	9	8,307	9.0	6	Liquid Boot®
6	Residential	41.75	47.43	24.0	48.0	1,132	146.0	9	10,188	9.0	6	Liquid Boot®
7	Residential	41.95	47.63	24.5	49.0	923	139.0	9	8,307	9.0	6	Liquid Boot®
8	Residential	42.25	47.93	24.0	46.0	1,095	140.0	9	9,855	9.0	6	Liquid Boot®
9	Garage	42.09	47.77	62.5	25.0	1,543	175.0	8	12,344	8.0	6	Liquid Boot®

Notes:

(1) For Building Types 4 through 8 slab elevations cited are for basement concrete laid over impermeable membrane.
(2) In Byuilding Types 4 through 8 first floors will be suspended at approximately 2.25 ft higher elevations.

TABLE 13

TABLE 13

KEY GROUNDWATER DEPTH SOIL COLUMN PARAMETERS

Building Type	Use of Building	Indoor Exposure Classification	Outdoor Exposure Classification	Depth to Bottom of Contaminated Soil *ft.*	Depth to Top of Contaminated Soil *ft.*	Depth to Groundwater *ft.*
3A	Residential	Residential	Residential	26.71	6.88	8.44
1	Commercial	Commercial	Residential	24.52	6.37	6.47

TABLE 14

TABLE 14

REPRESENTATIVE CONCENTRATIONS OF CHEMICALS OF CONCERN IN SOIL BENEATH VULNERABLE BUILDINGS

	Building Type 3A *mg/Kg*	**Building Type 1** *mg/Kg*
Benzene	0.002	0.066
Toluene	ND	0.323
Ethylbenzene	5.315	0.692
Xylene (mixed isomers)	25.801	4.509
Methyl tertiary-butyl ether	ND	ND
Teriary Butyl Alchohol	ND	2.600
n-Butylbenzene	2.750	ND
sec-Butylbenzene	0.220	0.008
Isopropylbenzene	0.250	0.367
p-isopropylbenzene	ND	1.467
n-propylbenzene	4.300	ND
p-isopropyltolune	0.250	ND
1,2,4-trimethylbenzene	21.000	7.667
1,3,5-trimethylbenzene	7.900	2.700
Naphthalene	9.600	1.400
2-Methyl naphthalene	0.465	1.733

Note: ND = Not detected above the Method Detection Limit (MDL) of the analytical method employed.

TABLE 15

TABLE 15

REPRESENTATIVE CONCENTRATIONS OF CHEMICALS OF CONCERN IN GROUNDWATER BENEATH VULNERABLE BUILDINGS

	Building Type 3A *µg/Kg*	**Building Type 1** *µg/Kg*
Benzene	14,000	ND
Toluene	570	ND
Ethylbenzene	3,200	ND
Xylene (mixed isomers)	9,800	ND
Methyl tertiary-butyl ether	800	0.6
Teriary Butyl Alchohol	40	ND
n-Butylbenzene	ND	8.0
sec-Butylbenzene	ND	8.7
Isopropylbenzene	ND	12.0
p-isopropylbenzene	ND	1.8
n-propylbenzene	310	31.0
p-isopropytolune	ND	ND
1,2,4-trimethylbenzene	1,600	14.0
1,3,5-trimethylbenzene	490	5.6
Naphthalene	340	8.3
2-Methyl naphthalene	ND	ND

Note: ND = Not detected above the Method Detection Limit (MDL)

TABLE 16

TABLE I6

HEALTH RISK ANALYSIS RESULTS FOR BUILDINGS

BUILDING TYPE 3A

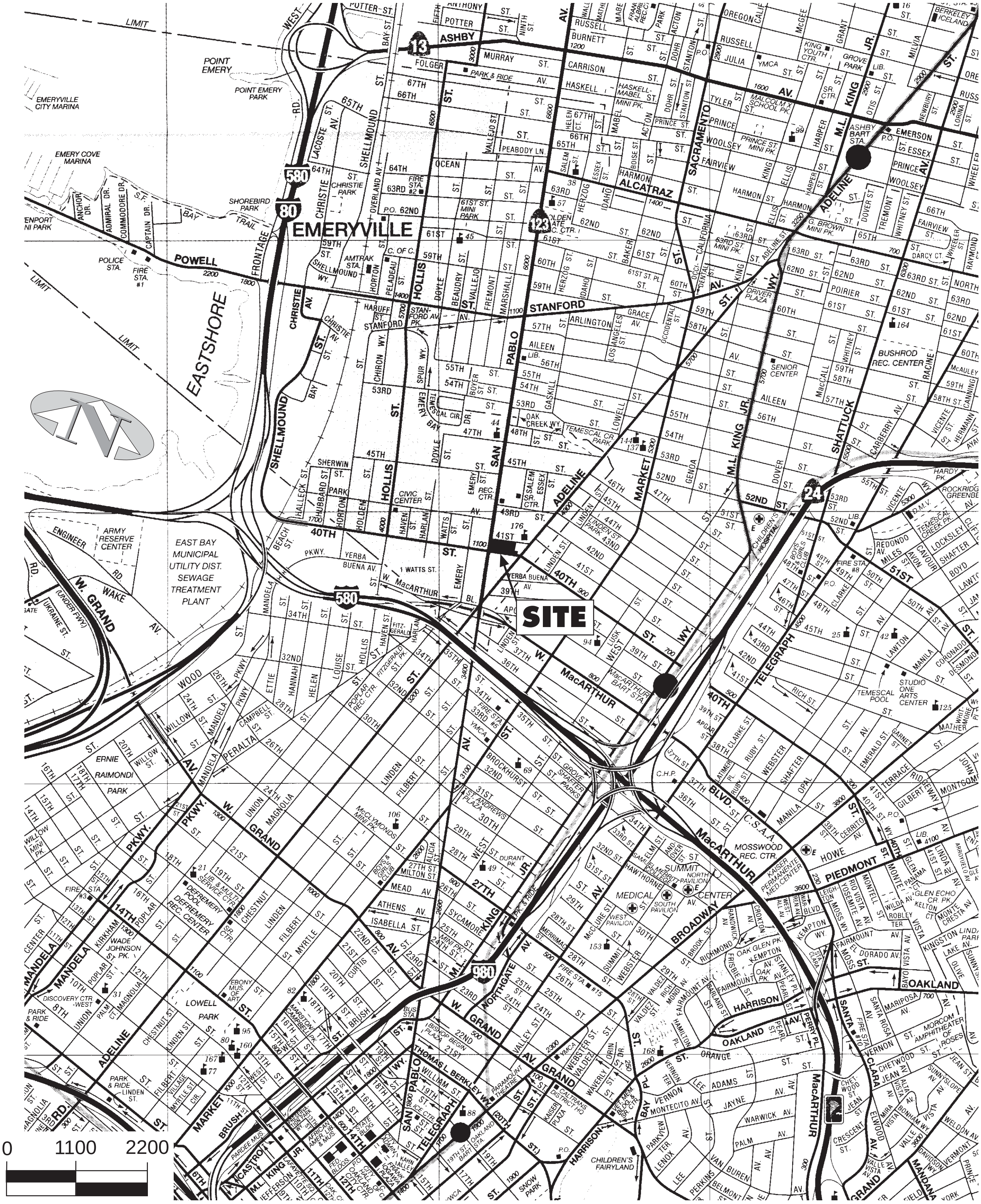
Outdoor Exposure Environment Classification	**Indoor Exposure Environment Classification**	**Cumulative COC Carcinogenic Risk**			**Toxic Hazard Index**		
		Outdoor Air	Indoor Air	Target Risk	Outdoor Air	Indoor Air	Target Index
Residential	Commercial	**7.0×10^{-7}**	1.0×10^{-7}	1.0×10^{-6}	**4.9×10^{-2}**	2.1×10^{-2}	0.200

BUILDING TYPE 1

Outdoor Exposure Environment Classification	**Indoor Exposure Environment Classification**	**Cumulative COC Carcinogenic Risk**			**Toxic Hazard Index**		
		Outdoor Air	**Indoor Air**	**Target Risk**	**Outdoor Air**	**Indoor Air**	**Target Index**
Residential	Commercial	**2.9×10^{-8}**	1.5×10^{-9}	1.0×10^{-6}	**4.6×10^{-3}**	3.6×10^{-5}	0.200

Note: Critical Exposure Pathways are in **bold** font.

FIGURES



Basemap: AAA; Oakland-Berkeley-Alameda (12/02)

SITE LOCATION

Oak Walk Site
Emeryville, California

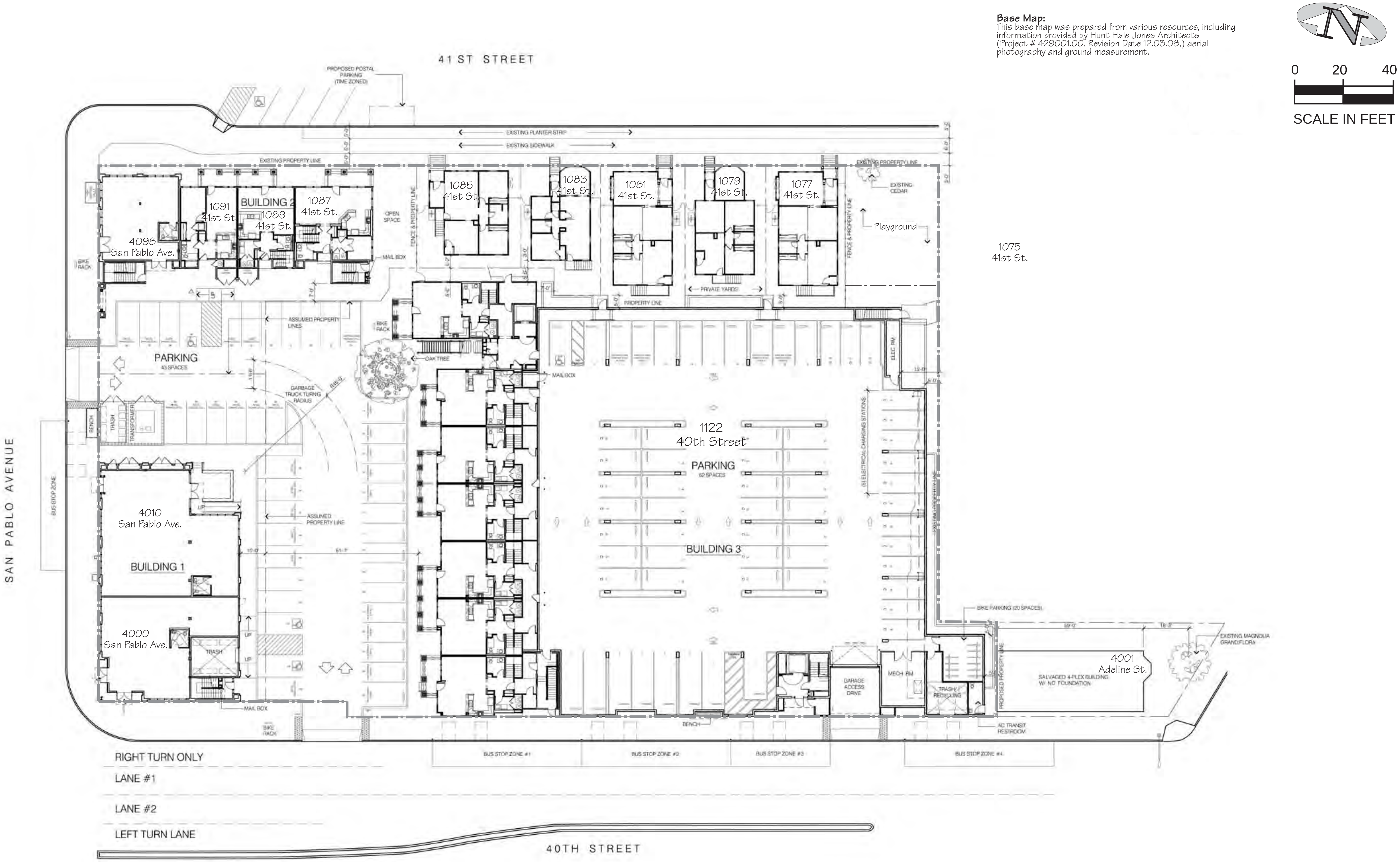
FIG 1

Dietz Engineering and Construction, Inc.

Project Number: 0707.1001

Drawn by: GNM

Date: 02/17/12



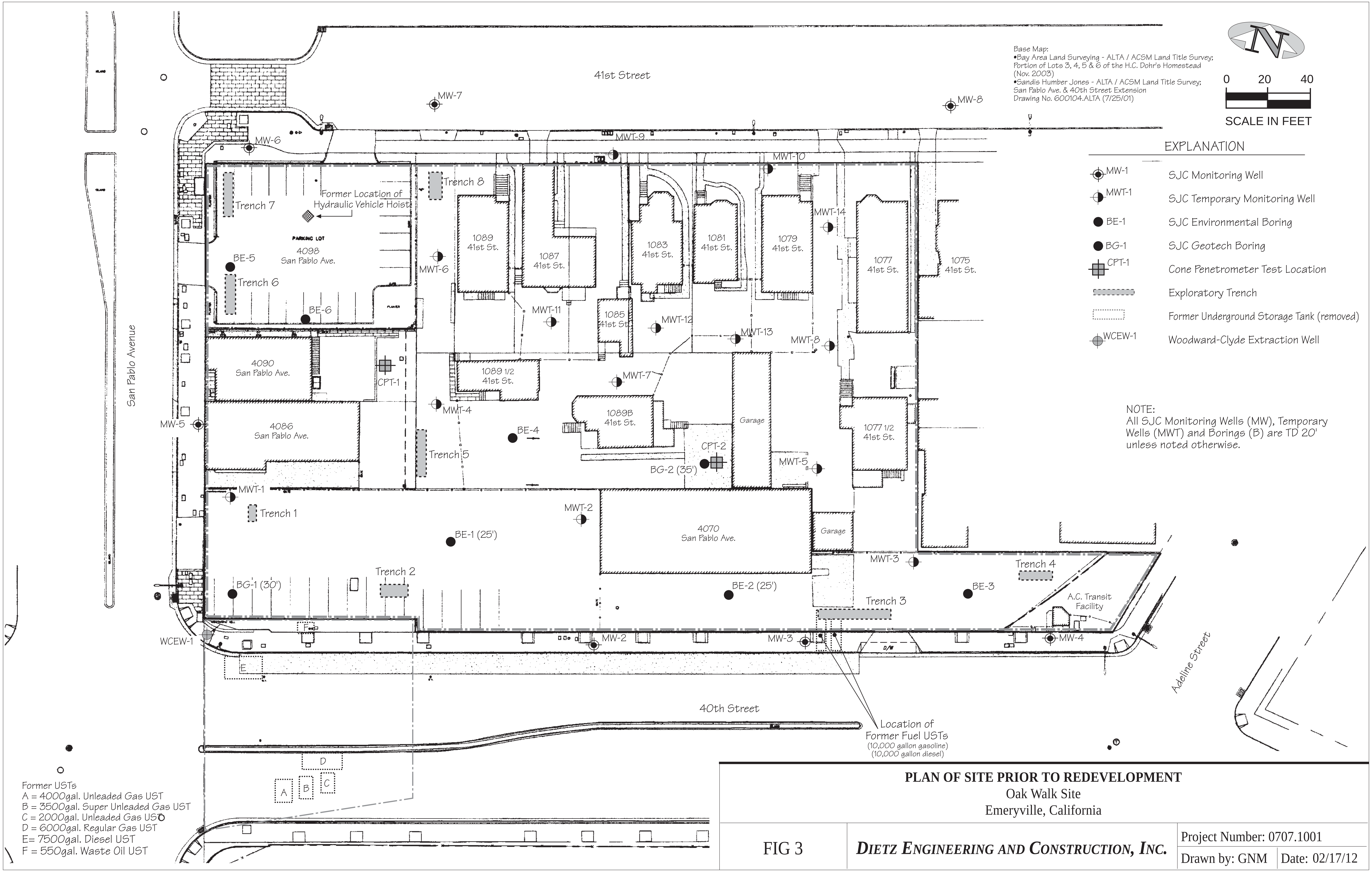
Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

SITE PLAN
Oak Walk Site
Emeryville, California

FIG 2

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/17/12



Base Map:
•Bay Area Land Surveying - ALTA / ACSM Land Title Survey; Portion of Lots 3, 4, 5 & 6 of the H.C. Dohr's Homestead (Nov. 2003)
•Sandis Humber Jones - ALTA / ACSM Land Title Survey; San Pablo Ave. & 40th Street Extension Drawing No. 600104.ALTA (7/25/01)

EXPLANATION

MW-1	SJC Monitoring Well
MWT-1	SJC Temporary Monitoring Well
BE-1	SJC Environmental Boring
BG-1	SJC Geotech Boring
CPT-1	Cone Penetrometer Test Location
▨	Exploratory Trench
☐	Former Underground Storage Tank (removed)
WCEW-1	Woodward-Clyde Extraction Well

NOTE:
All SJC Monitoring Wells (MW), Temporary Wells (MWT) and Borings (B) are TD 20' unless noted otherwise.

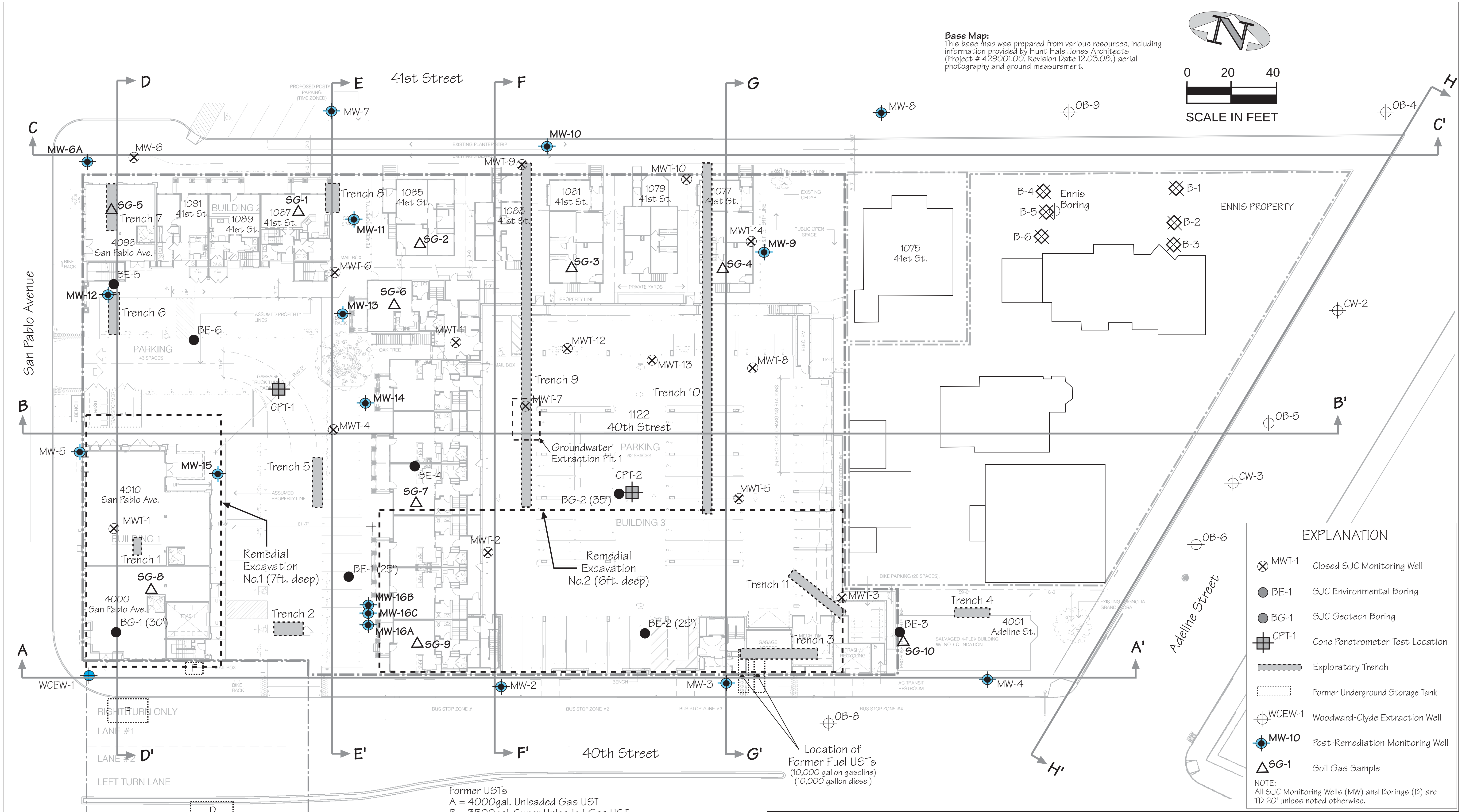
Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

PLAN OF SITE PRIOR TO REDEVELOPMENT
Oak Walk Site
Emeryville, California

FIG 3

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/17/12



Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

NOTE:
All SJC Monitoring Wells (MW) and Borings (B) are TD 20' unless noted otherwise.

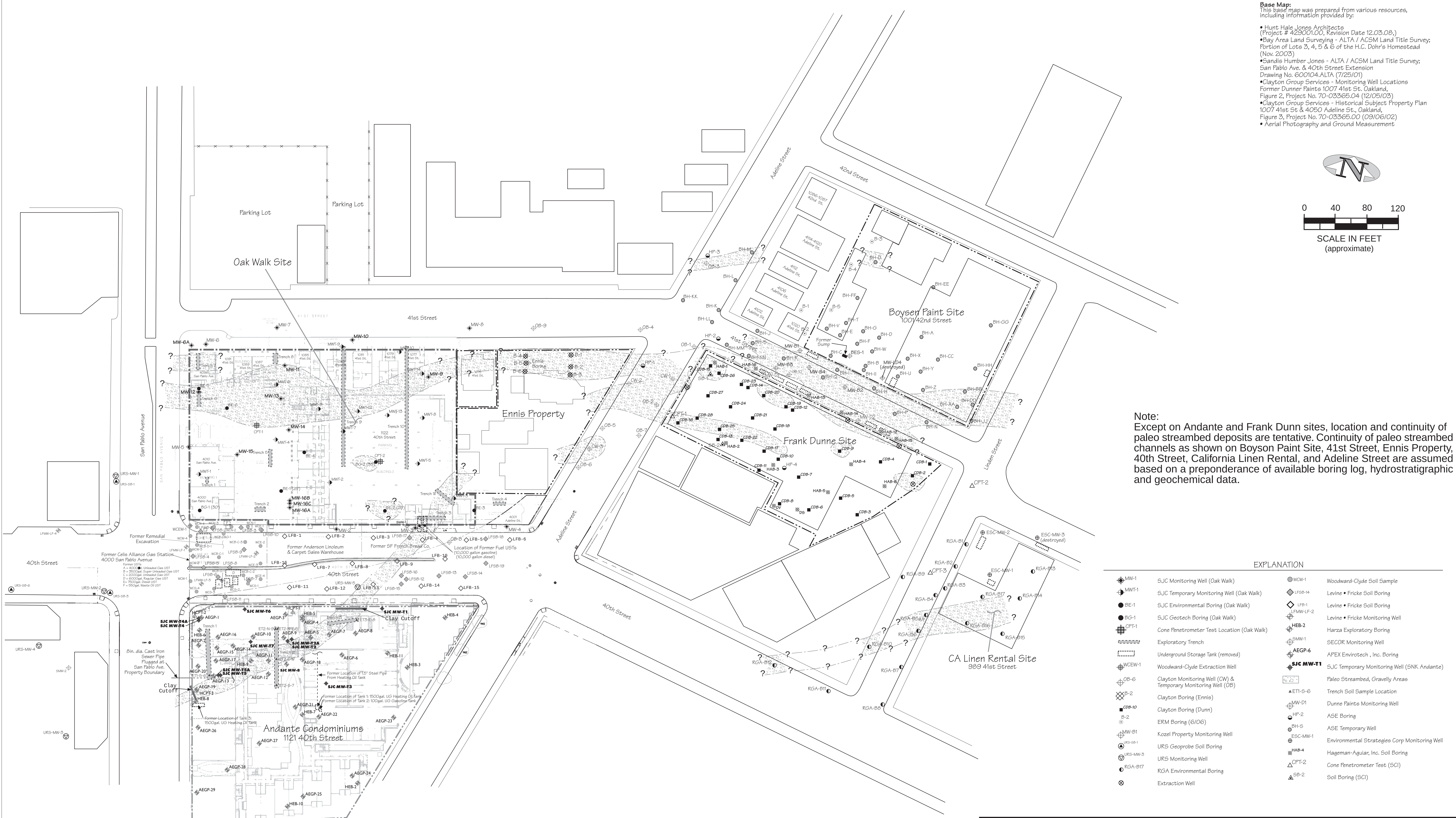
Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

BORINGS, WELL, EXPLORATORY TRENCH & SOIL-GAS TESTING LOCATIONS
Oak Walk Site
Emeryville, California

FIG 4

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/17/12



Base Map:
This base map was prepared from various resources,
including information provided by:

- Hunt Hale Jones Architects
(Project # 429001.00, Revision Date 12.03.08,)
- Bay Area Land Surveying - ALTA / ACSM Land Title Survey;
Portion of Lots 3, 4, 5 & 6 of the H.C. Dohr's Homestead
(Nov. 2003)
- Sandis Humber Jones - ALTA / ACSM Land Title Survey;
San Pablo Ave. & 40th Street Extension
Drawing No. 600104.ALTA (7/25/01)
- Clayton Group Services - Monitoring Well Locations
Former Dunner Paints 1007 41st St. Oakland,
Figure 2, Project No. 70-03365.04 (12/05/03)
- Clayton Group Services - Historical Subject Property Plan
1007 41st St & 4050 Adeline St., Oakland,
Figure 3, Project No. 70-03365.00 (09/06/02)
- Aerial Photography and Ground Measurement

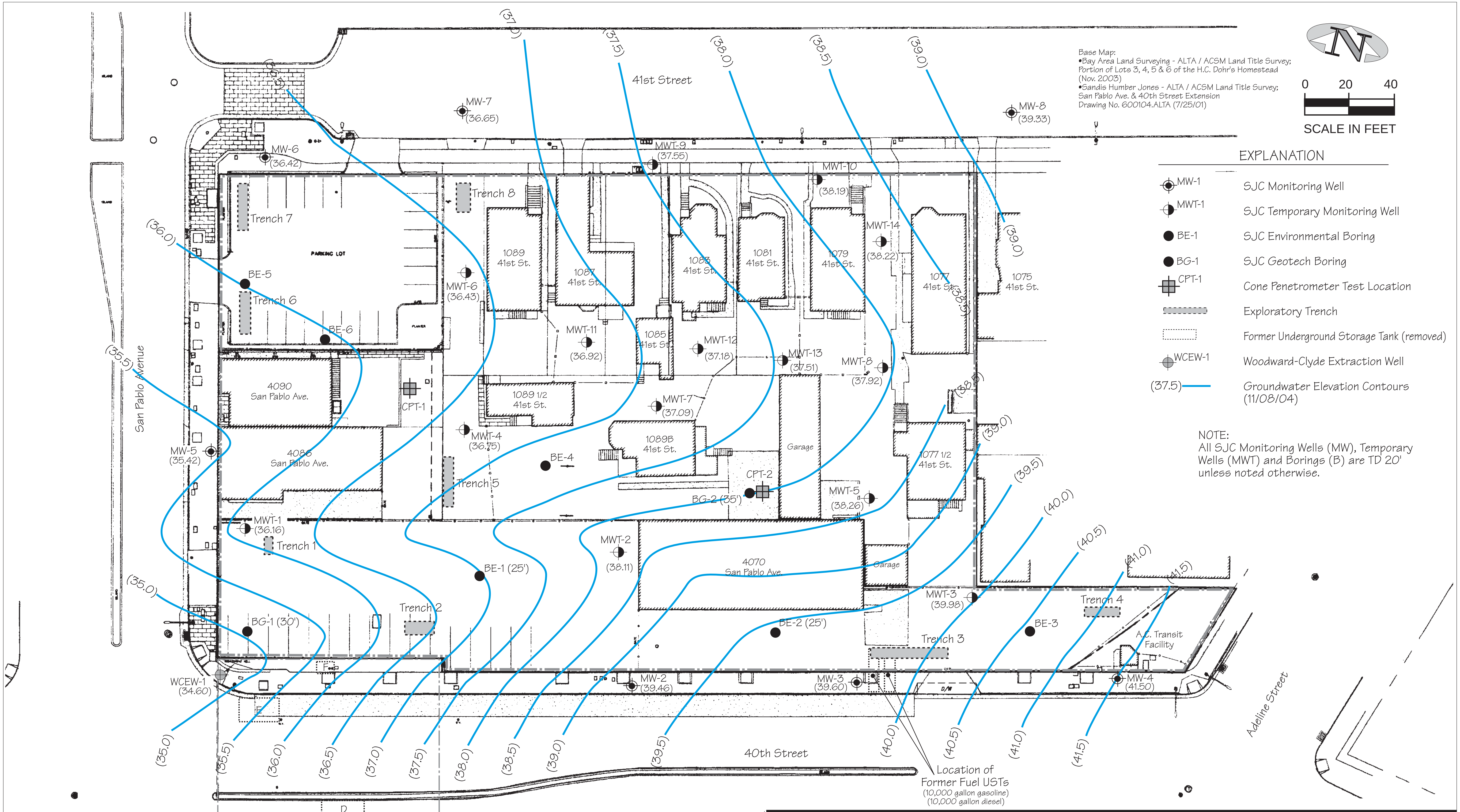
Note:
Except on Andante and Frank Dunn sites, location and continuity of paleo streambed deposits are tentative. Continuity of paleo streambed channels as shown on Boyson Paint Site, 41st Street, Ennis Property, 40th Street, California Linen Rental, and Adeline Street are assumed based on a preponderance of available boring log, hydrostratigraphic and geochemical data.

UNAUTHORIZED RELEASE SITES IN NEIGHBORHOOD OF OAK WALK SITE
Oak Walk Site
Emeryville, California

FIG 5

Dietz Engineering and Construction, Inc.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/17/12



Base Map:
•Bay Area Land Surveying - ALTA / ACSM Land Title Survey;
Portion of Lots 3, 4, 5 & 6 of the H.C. Dohr's Homestead
(Nov. 2003)
•Sandis Humber Jones - ALTA / ACSM Land Title Survey;
San Pablo Ave. & 40th Street Extension
Drawing No. 600104.ALTA (7/25/01)

NOTE:
All SJC Monitoring Wells (MW), Temporary Wells (MWT) and Borings (B) are TD 20' unless noted otherwise.

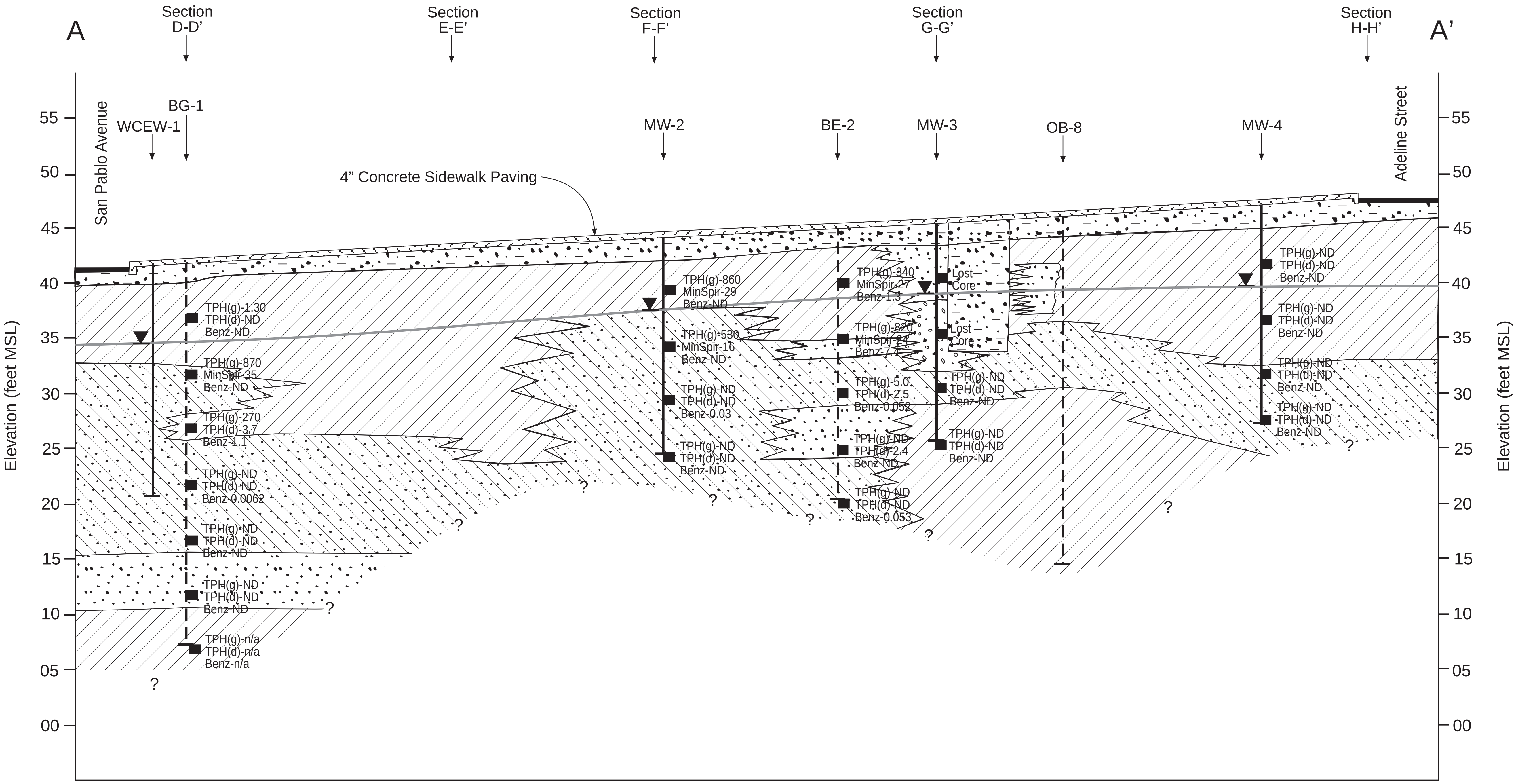
Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

GROUNDWATER CONTOURS ON NOVEMBER 8, 2004
Oak Walk Site
Emeryville, California

FIG 6

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/19/12



EXPLANATION

▨ Clays and Silty Clays

▨ Sandy Clay and Clays with some Silt, Sand or Gravel

▨ Silts, Clayey Gravel and Sands

▨ Gravel

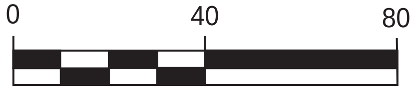
▨ Gravelly Fill

▨ Engineered Fill

▨ A/B/ Gravel Fill

▼ Water Table (09/21/10)

Gasoline-340
MineralSpirits/TPH(d)-27
Benzene-ND
Soil Sample Analysis Results (mg/kg)



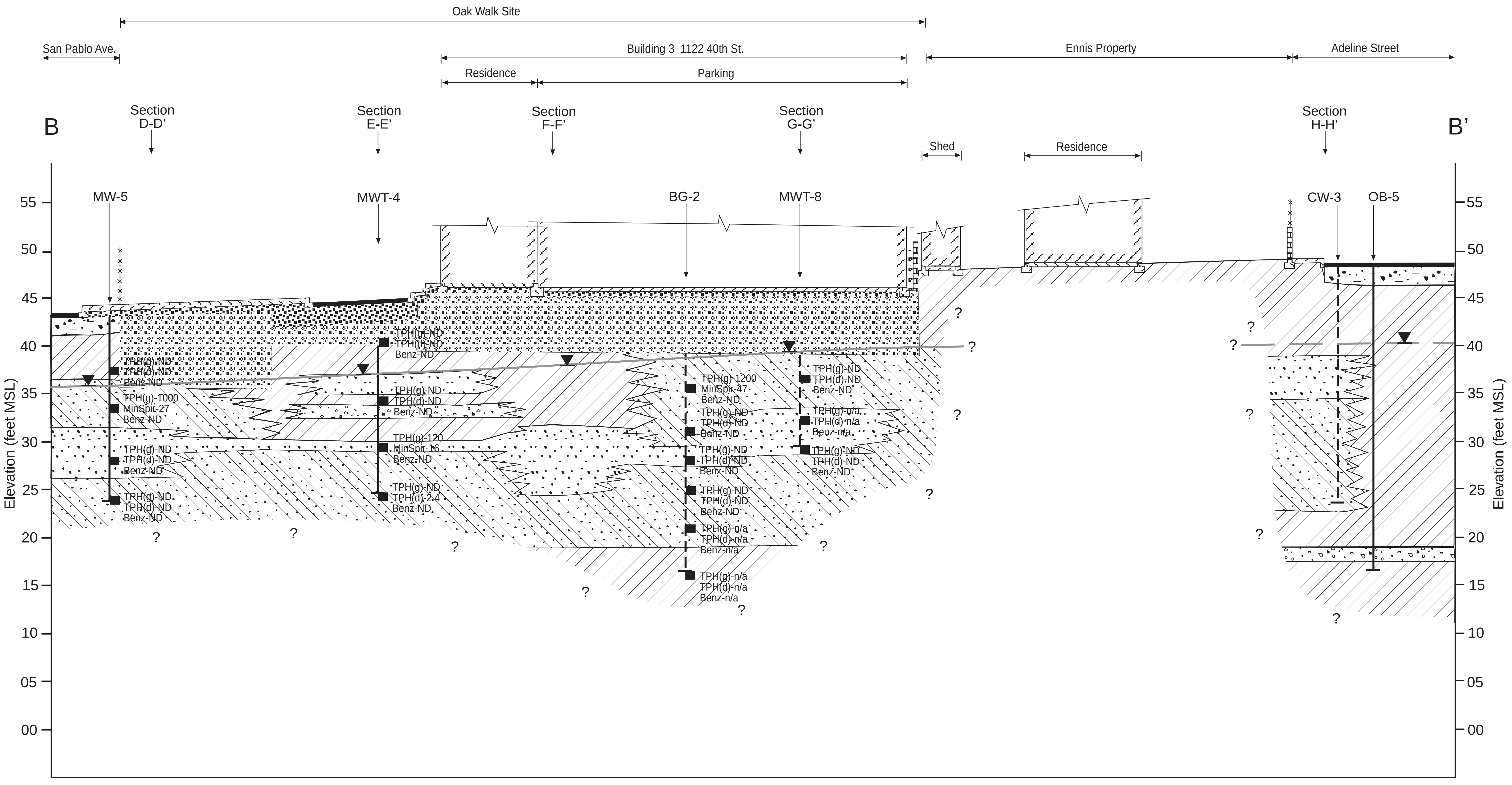
HORIZONTAL SCALE IN FEET

HYDROSTRATIGRAPHIC SECTION A-A'
Oak Walk Site
Emeryville, California

FIG 7

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/19/12



EXPLANATION

▨ Clays and Silty Clays

▨ Sandy Clay and Clays with some Silt, Sand or Gravel

▨ Silts, Clayey Gravel and Sands

▨ Gravel

▨ Gravelly Fill

▼ Water Table (09/21/10)

Gasoline-340
MineralSpirits/TPH(d)-27
Benzene-ND
Soil Sample Analysis Results (mg/kg)

▨ Engineered Fill

▨ A/B/ Gravel Fill

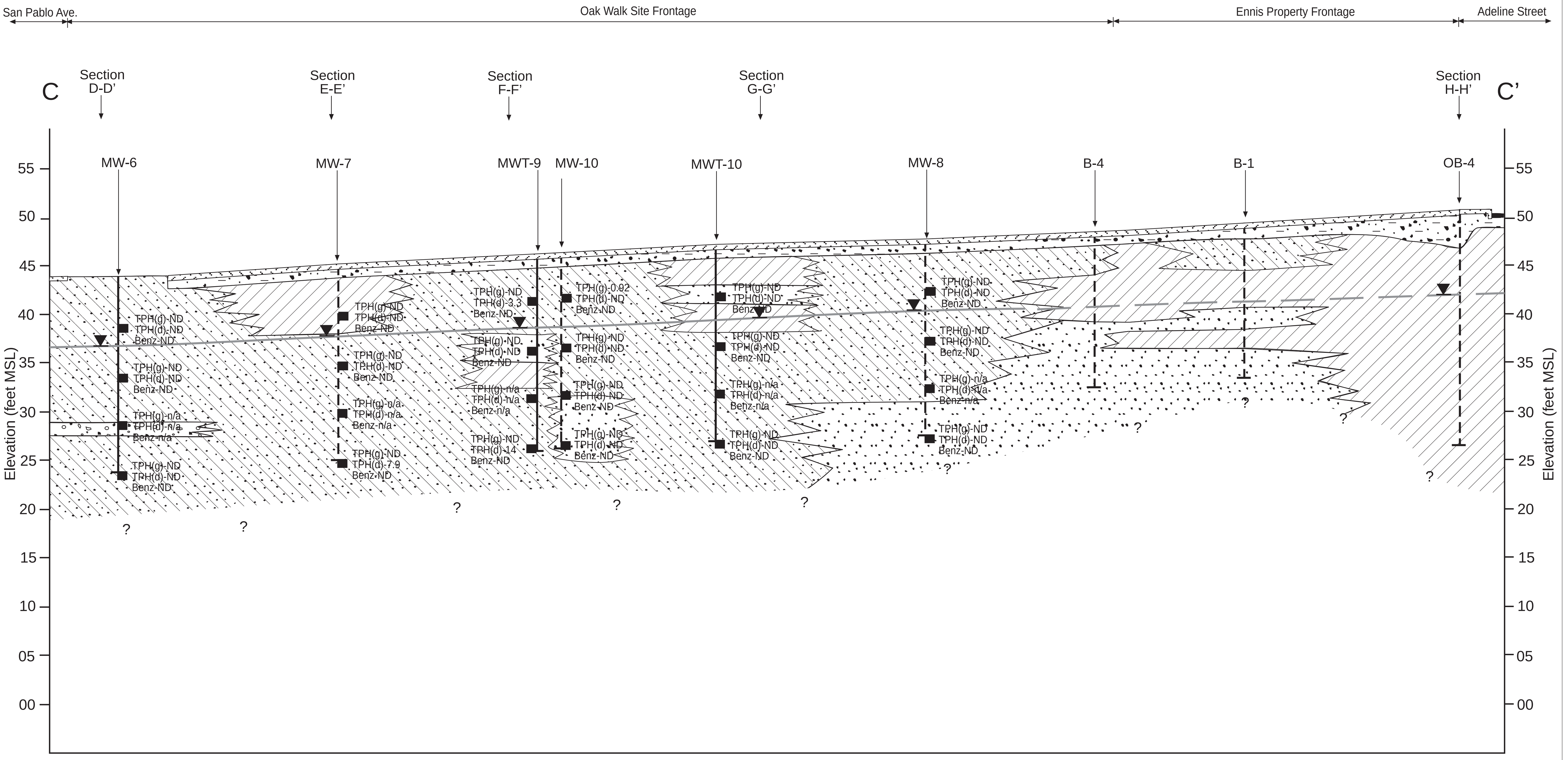
0 40 80
HORIZONTAL SCALE IN FEET

HYDROSTRATIGRAPHIC SECTION B-B'
Oak Walk Site
Emeryville, California

FIG 8

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/19/12



EXPLANATION

▨ Clays and Silty Clays

▨ Sandy Clay and Clays with some Silt, Sand or Gravel

▨ Silts, Clayey Gravel and Sands

▨ Gravel

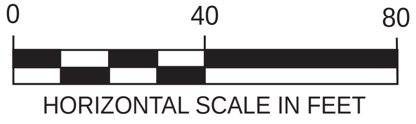
▨ Gravelly Fill

▼ Water Table (09/21/10)

Gasoline-340
MineralSpirits/TPH(d)-27
Benzene-ND
Soil Sample Analysis Results (mg/kg)

▨ Engineered Fill

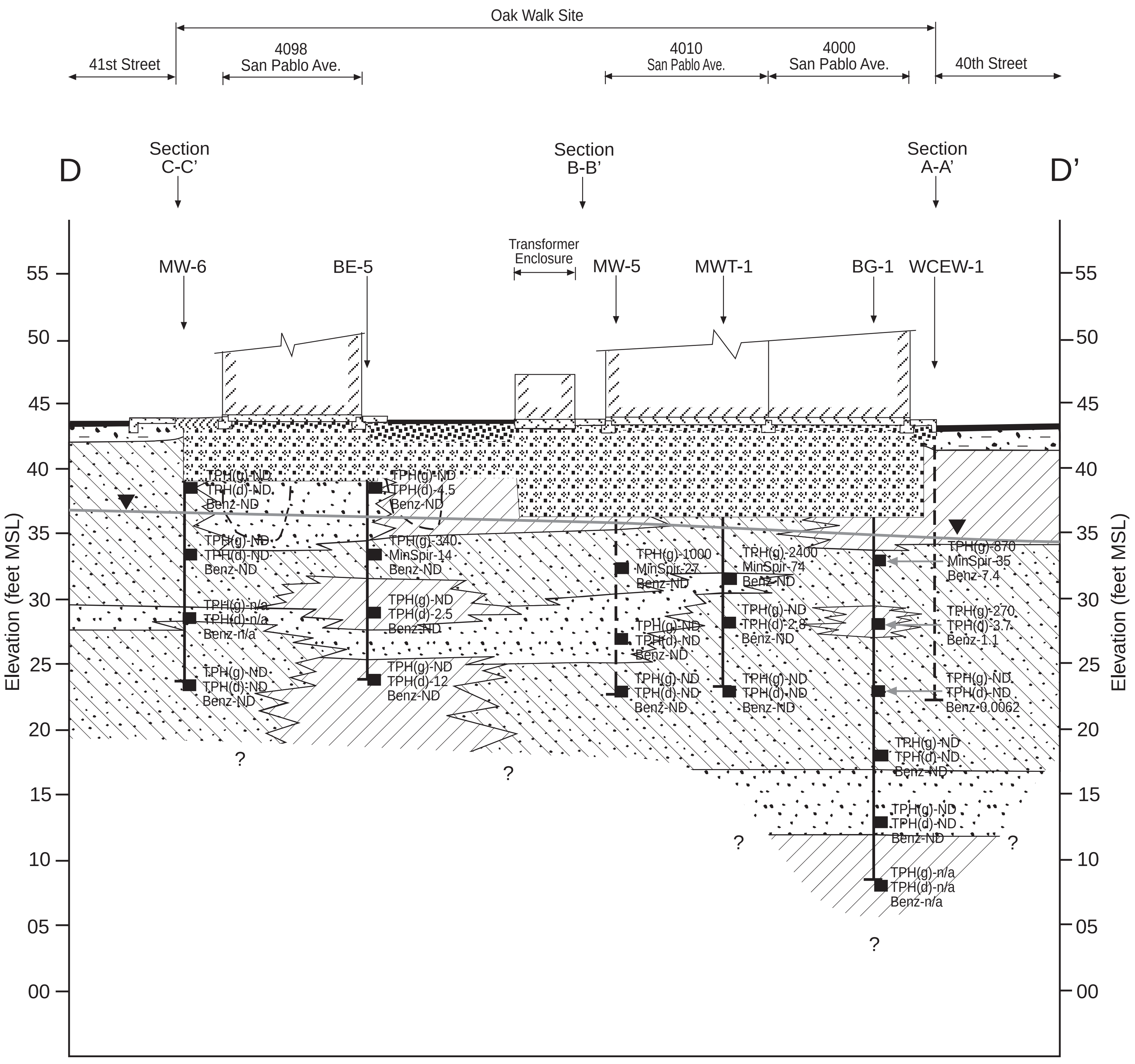
▨ A/B/ Gravel Fill



HORIZONTAL SCALE IN FEET

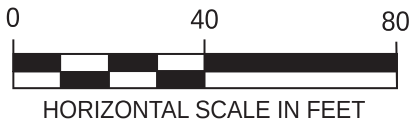
HYDROSTRATIGRAPHIC SECTION C-C'
Oak Walk Site
Emeryville, California

FIG 9	DIETZ ENGINEERING AND CONSTRUCTION, INC.	Project Number: 0707.1001	
		Drawn by: GNM	Date: 02/19/12



EXPLANATION

- ▨ Clays and Silty Clays
- ▨ Sandy Clay and Clays with some Silt, Sand or Gravel
- ░ Silts, Clayey Gravel and Sands
- ░ Gravel
- ░ Gravelly Fill
- ▼ Water Table (09/21/10)
- Gasoline-340 MineralSpirits/TPH(d)-27 Benzene-ND Soil Sample Analysis Results (mg/kg)
- ░ Engineered Fill
- ▓ A/B/ Gravel Fill

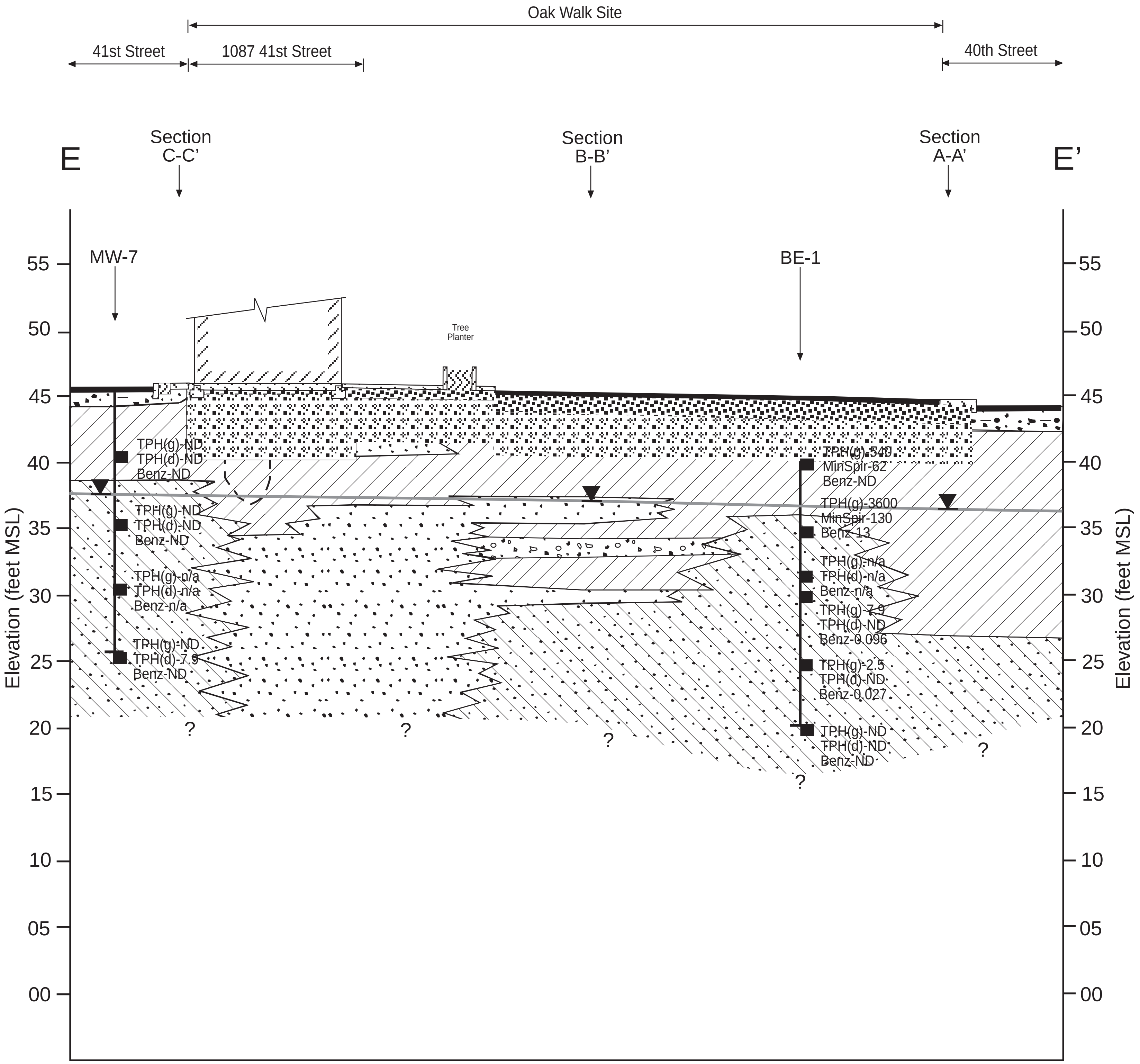


HYDROSTRATIGRAPHIC SECTION D-D'
Oak Walk Site
Emeryville, California

FIG 10

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/19/12



EXPLANATION

▨ Clays and Silty Clays

▨ Sandy Clay and Clays with some Silt, Sand or Gravel

▨ Silts, Clayey Gravel and Sands

▨ Gravel

▨ Gravelly Fill

▼ Water Table (09/21/10)

Gasoline-340
MineralSpirits/TPH(d)-27
Benzene-ND
Soil Sample Analysis Results (mg/kg)

▨ Engineered Fill

▨ A/B/ Gravel Fill

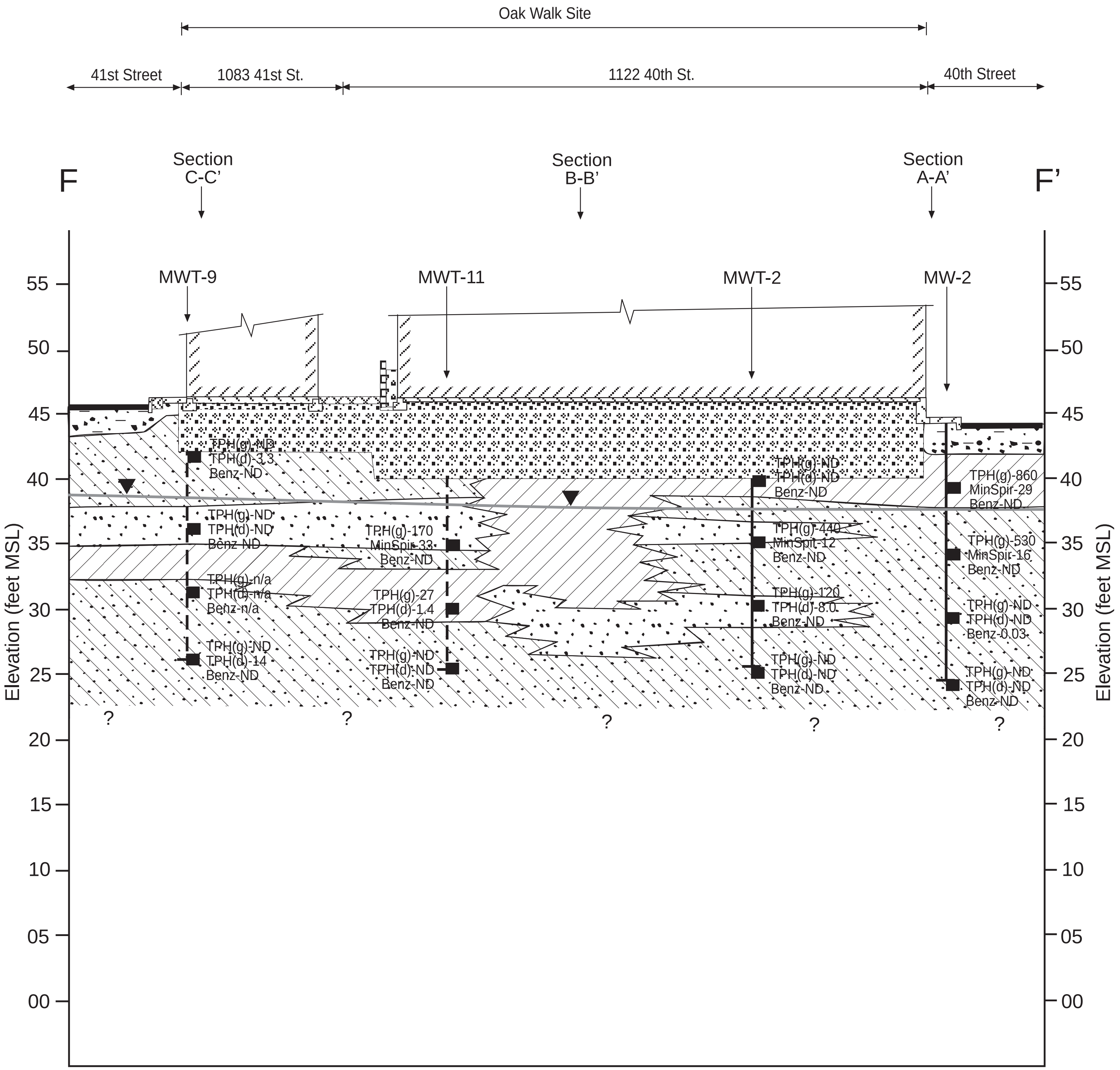
0 40 80
HORIZONTAL SCALE IN FEET

HYDROSTRATIGRAPHIC SECTION E-E'
Oak Walk Site
Emeryville, California

FIG 11

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/19/12



EXPLANATION

▨ Clays and Silty Clays

▨ Sandy Clay and Clays with some Silt, Sand or Gravel

▨ Silts, Clayey Gravel and Sands

▨ Gravel

▨ Gravelly Fill

▼ Water Table (09/21/10)

Gasoline-340
MineralSpirits/TPH(d)-27
Benzene-ND
Soil Sample Analysis Results (mg/kg)

▨ Engineered Fill

▨ A/B/ Gravel Fill

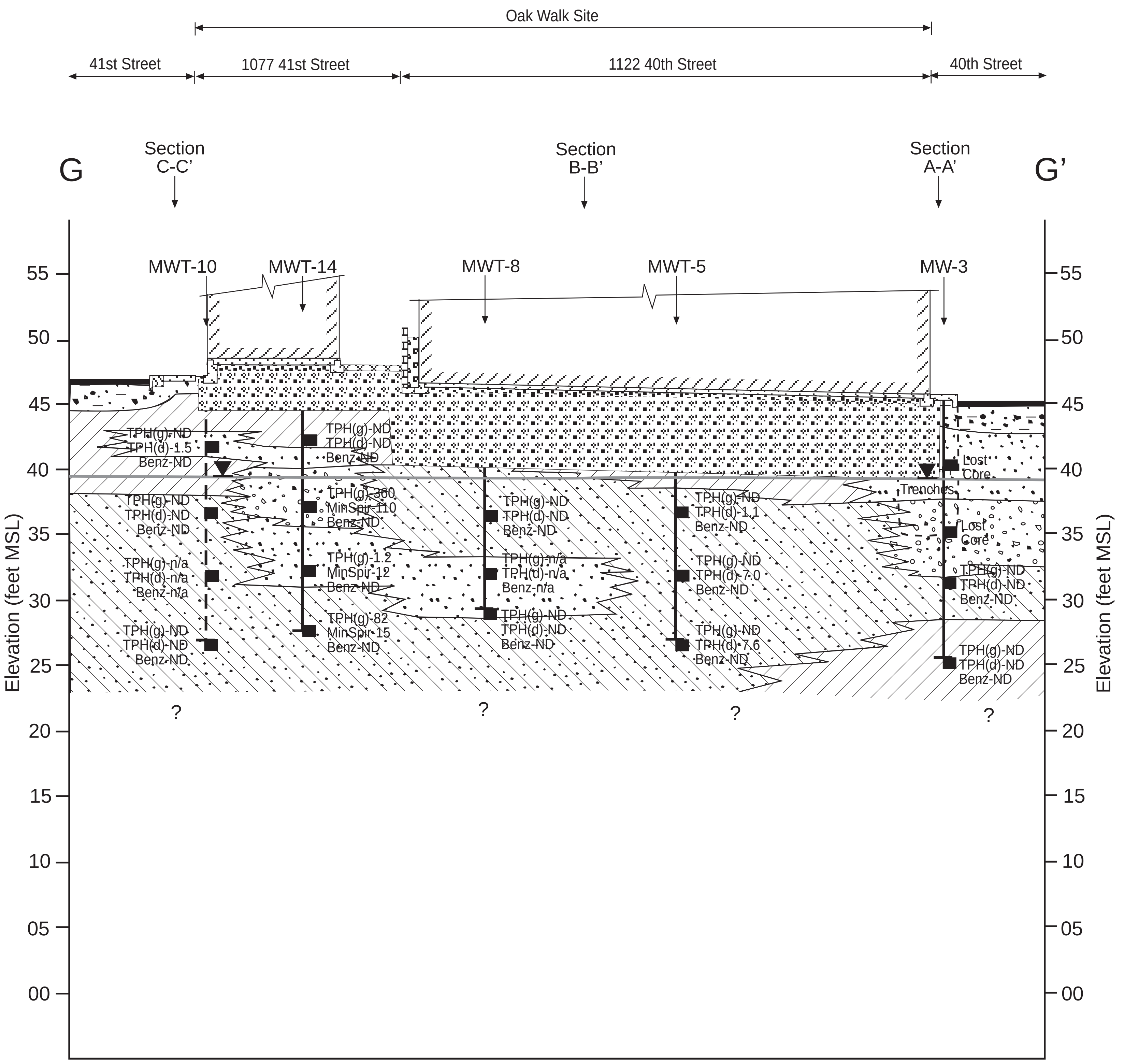
0 40 80
HORIZONTAL SCALE IN FEET

HYDROSTRATIGRAPHIC SECTION F-F'
Oak Walk Site
Emeryville, California

FIG 12

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/19/12



EXPLANATION

▨ Clays and Silty Clays

▧ Sandy Clay and Clays with some Silt, Sand or Gravel

░ Silts, Clayey Gravel and Sands

░ Gravel

░ Gravelly Fill

▼ Water Table (09/21/10)

Gasoline-340
MineralSpirits/TPH(d)-27
Benzene-ND
Soil Sample Analysis Results (mg/kg)

░ Engineered Fill

▓ A/B/ Gravel Fill

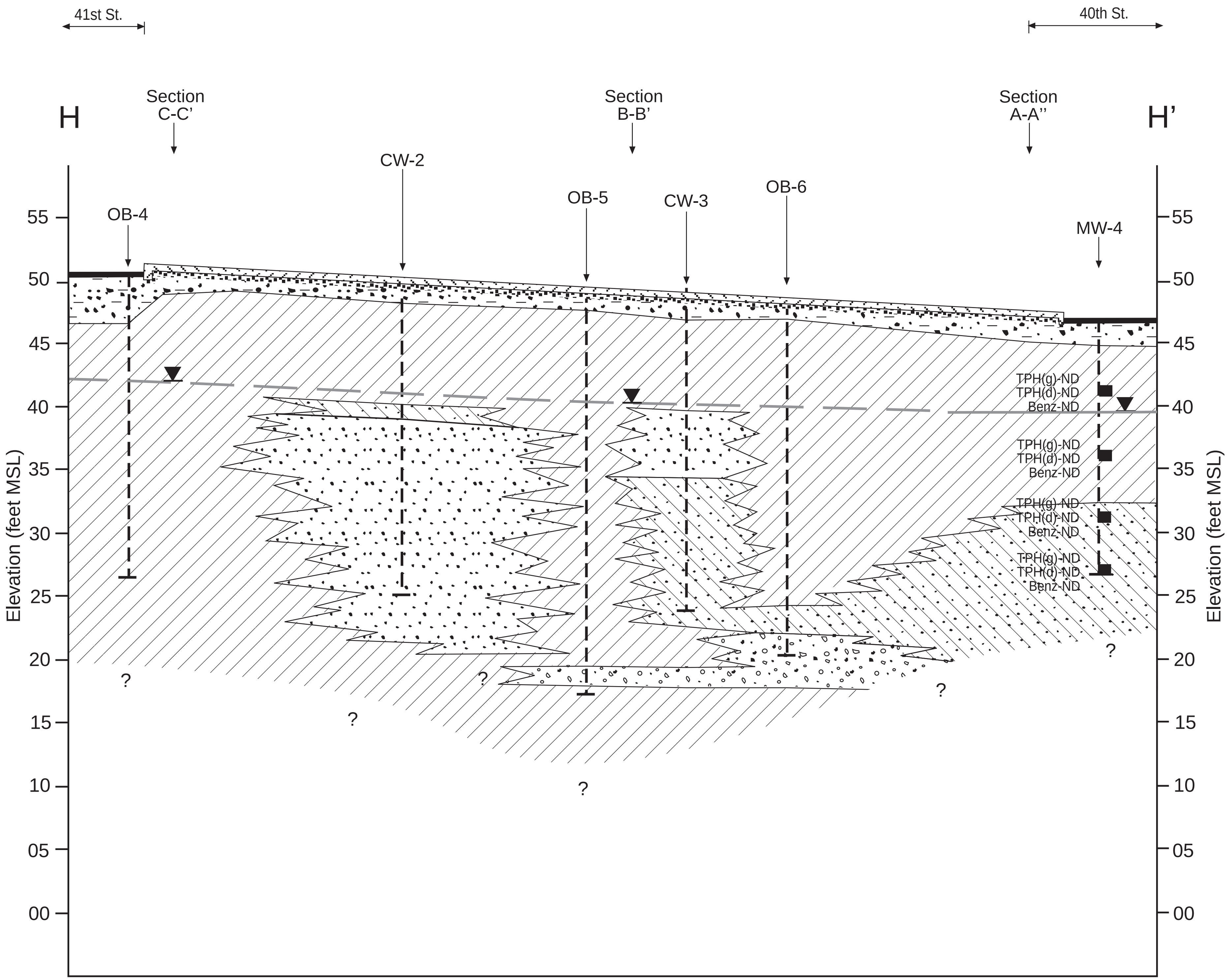
0 40 80
HORIZONTAL SCALE IN FEET

HYDROSTRATIGRAPHIC SECTION G-G'
Oak Walk Site
Emeryville, California

FIG 13

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/19/12



EXPLANATION

▨ Clays and Silty Clays

▨ Sandy Clay and Clays with some Silt, Sand or Gravel

▨ Silts, Clayey Gravel and Sands

▨ Gravel

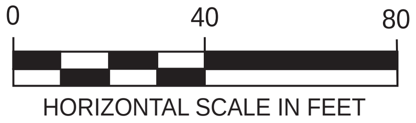
▨ Gravelly Fill

▼ Water Table (09/21/10)

Gasoline-340
MineralSpirits/TPH(d)-27
Benzene-ND
Soil Sample Analysis Results (mg/kg)

▨ Engineered Fill

▨ A/B/ Gravel Fill

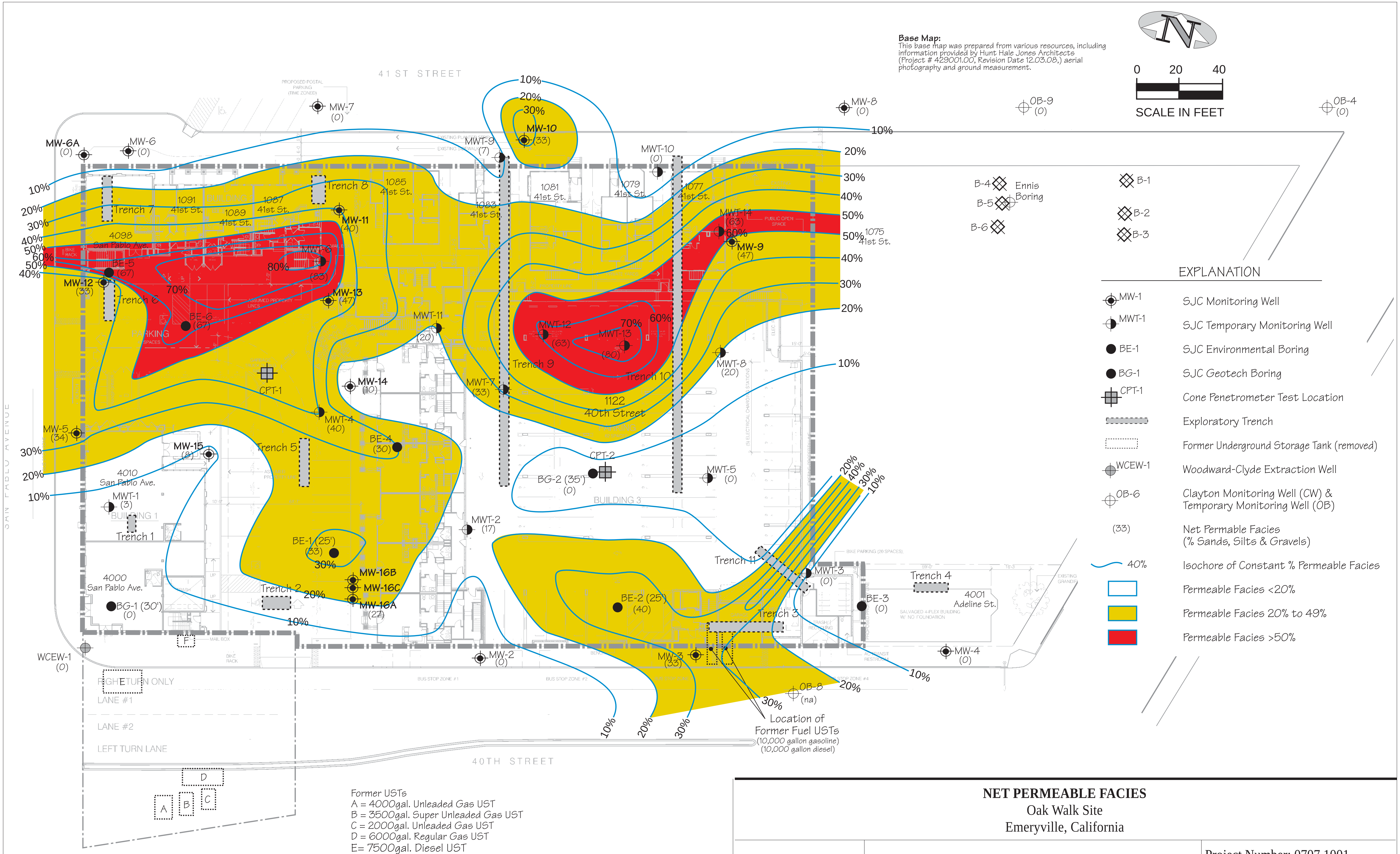


HYDROSTRATIGRAPHIC SECTION H-H’
Oak Walk Site
Emeryville, California

FIG 14

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/19/12



Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

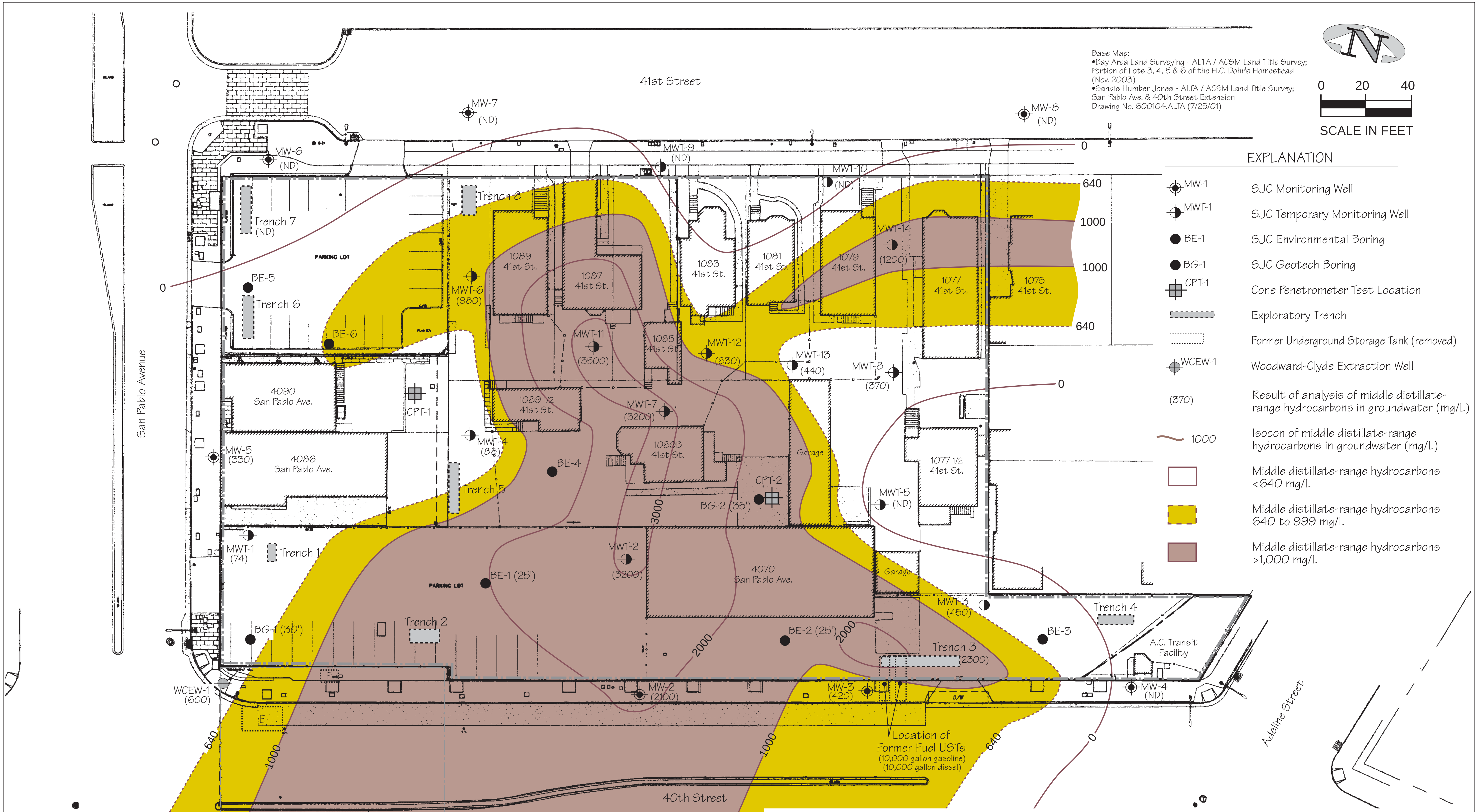
Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

NET PERMEABLE FACIES
Oak Walk Site
Emeryville, California

FIG 15

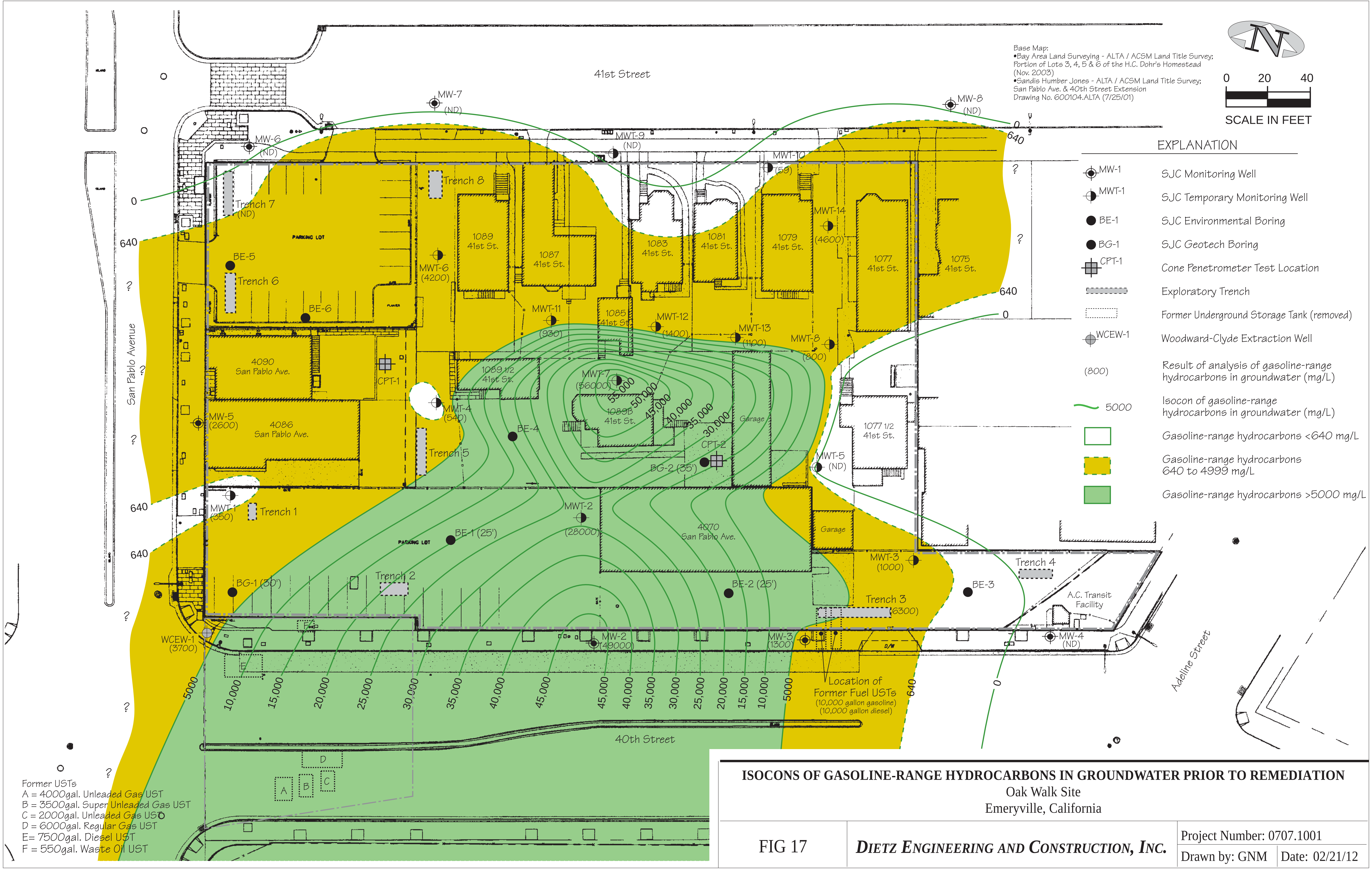
DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/21/12



ISOCONS OF MIDDLE DISTILLATE-RANGE HYDROCARBONS IN GROUNDWATER PRIOR TO REMEDIATION
Oak Walk Site
Emeryville, California

FIG 16	*DIETZ ENGINEERING AND CONSTRUCTION, INC.*	Project Number: 0707.1001
		Drawn by: GNM · Date: 02/21/12

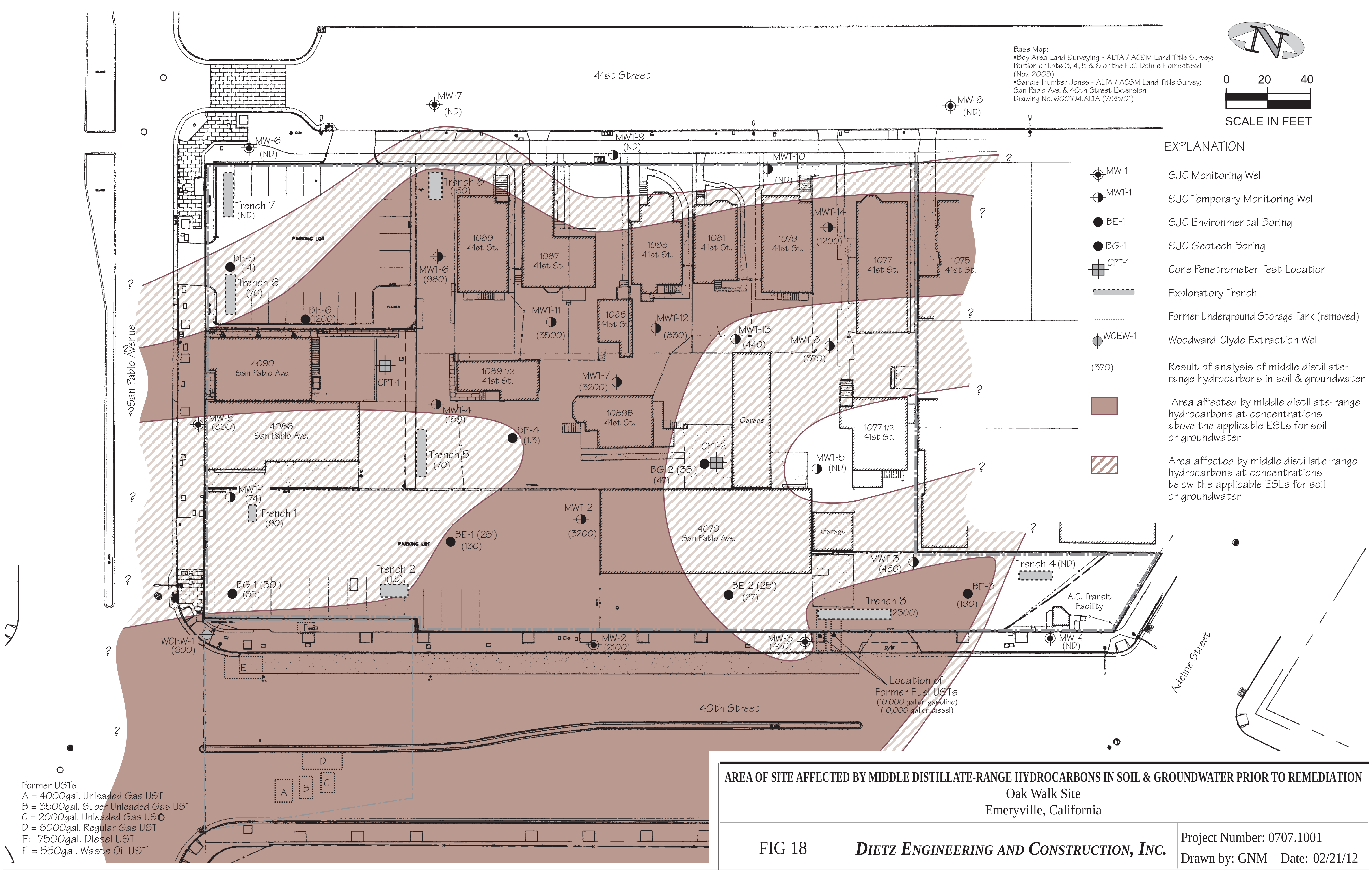


ISOCONS OF GASOLINE-RANGE HYDROCARBONS IN GROUNDWATER PRIOR TO REMEDIATION
Oak Walk Site
Emeryville, California

FIG 17

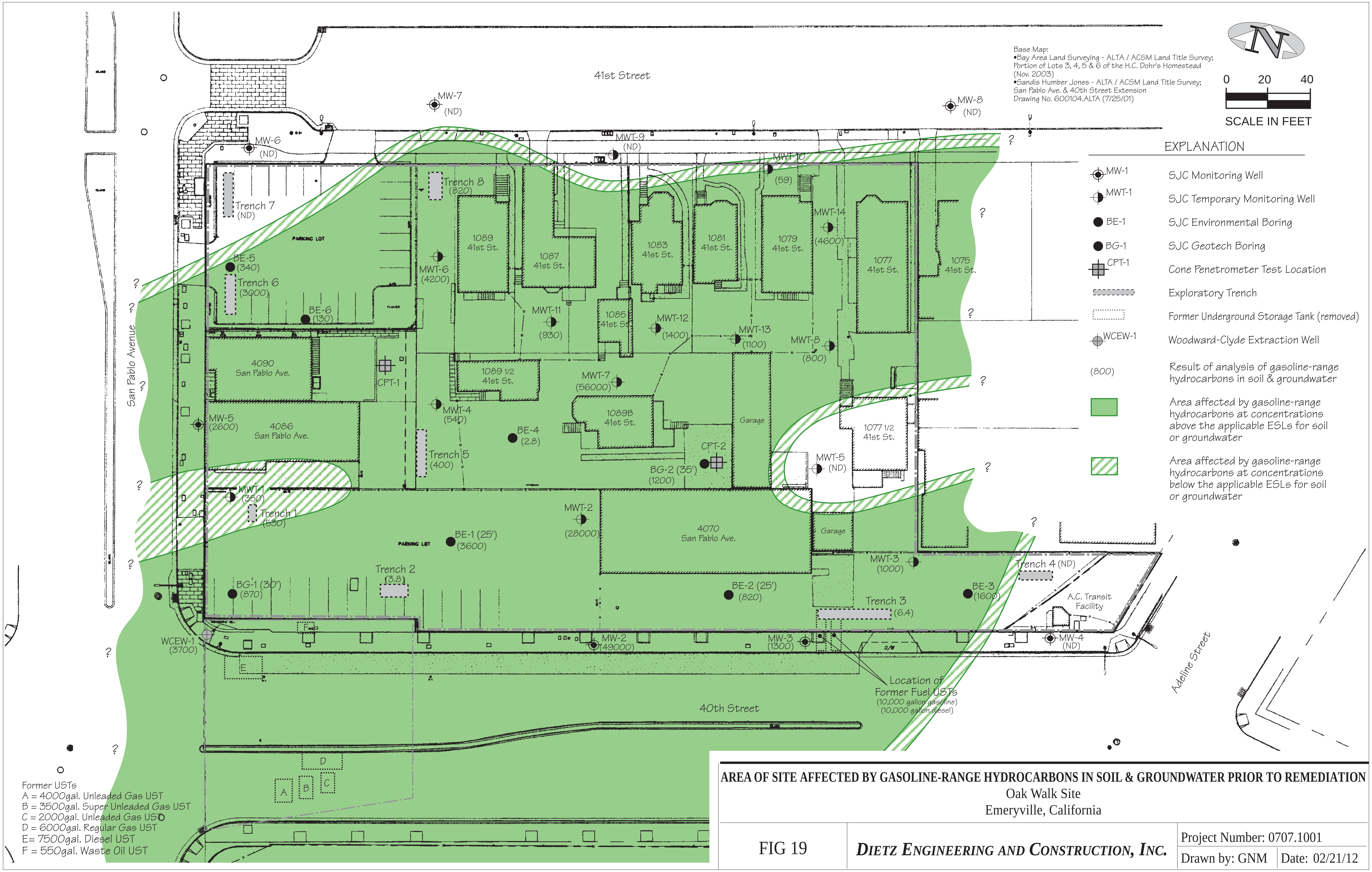
Dietz Engineering and Construction, Inc.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/21/12



AREA OF SITE AFFECTED BY MIDDLE DISTILLATE-RANGE HYDROCARBONS IN SOIL & GROUNDWATER PRIOR TO REMEDIATION
Oak Walk Site
Emeryville, California

FIG 18	*DIETZ ENGINEERING AND CONSTRUCTION, INC.*	Project Number: 0707.1001
		Drawn by: GNM Date: 02/21/12

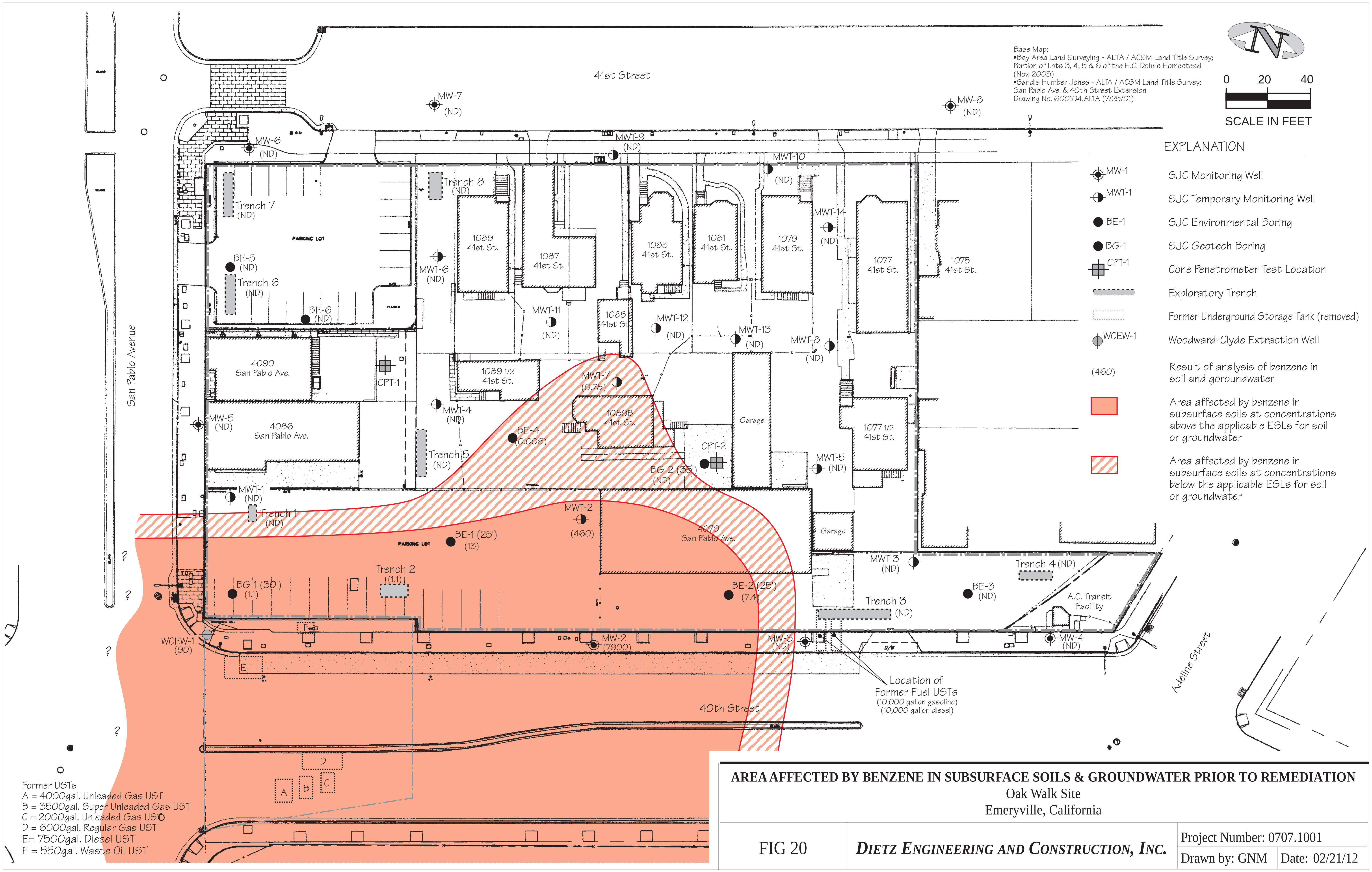


AREA OF SITE AFFECTED BY GASOLINE-RANGE HYDROCARBONS IN SOIL & GROUNDWATER PRIOR TO REMEDIATION
Oak Walk Site
Emeryville, California

FIG 19

Dietz Engineering and Construction, Inc.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/21/12

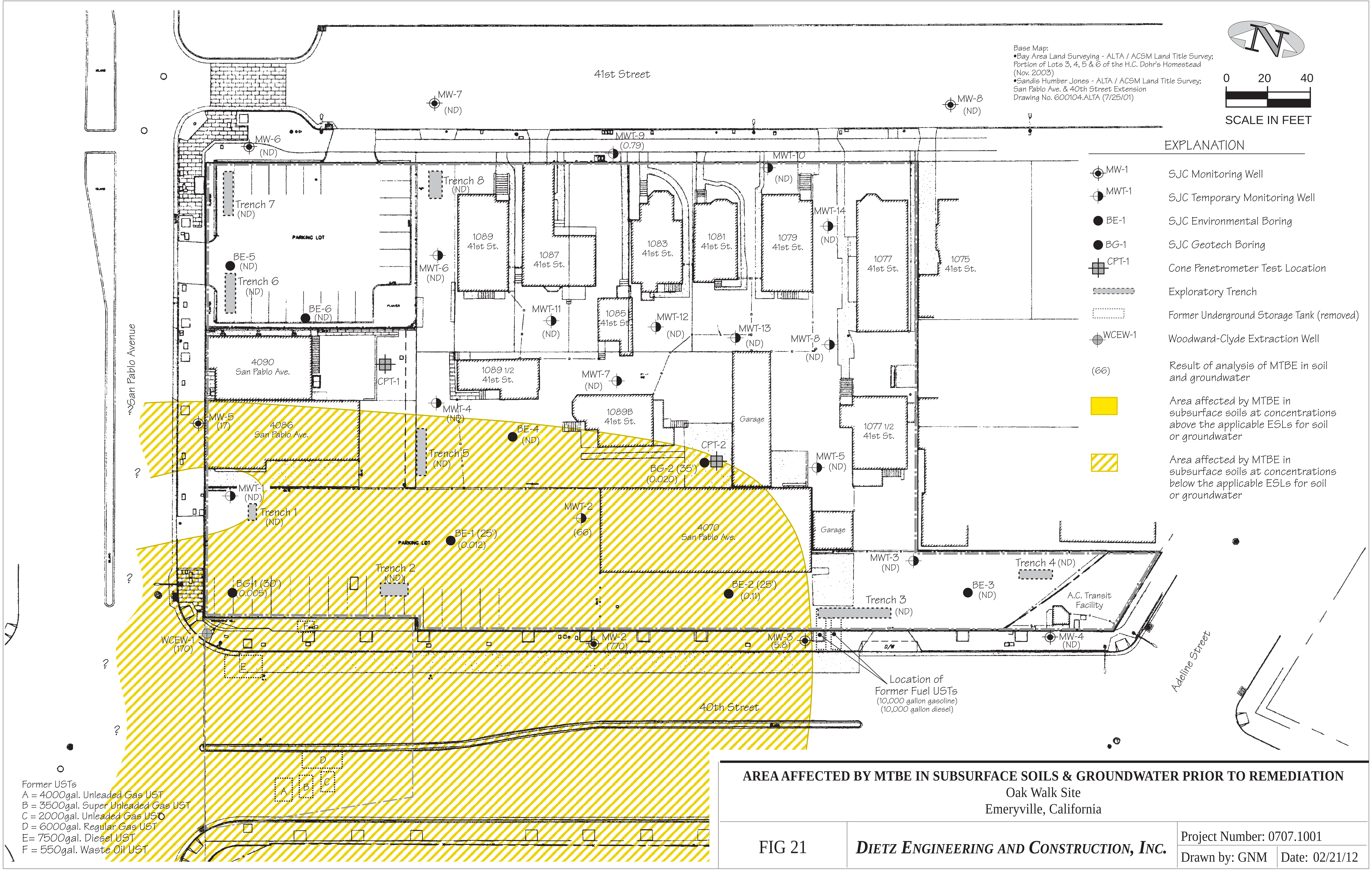


AREA AFFECTED BY BENZENE IN SUBSURFACE SOILS & GROUNDWATER PRIOR TO REMEDIATION
Oak Walk Site
Emeryville, California

FIG 20

Dietz Engineering and Construction, Inc.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/21/12

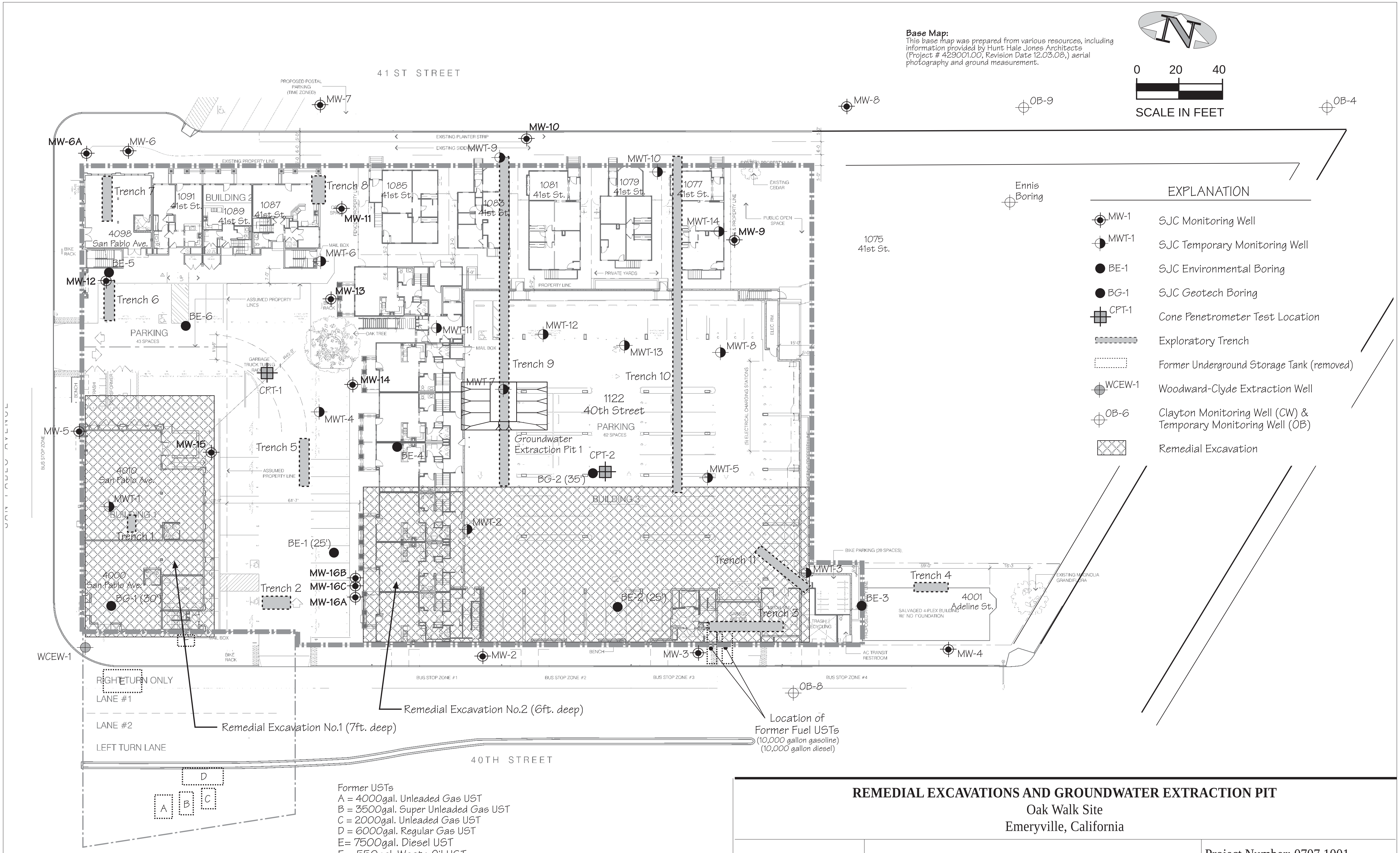


AREA AFFECTED BY MTBE IN SUBSURFACE SOILS & GROUNDWATER PRIOR TO REMEDIATION
Oak Walk Site
Emeryville, California

FIG 21

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/21/12



Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

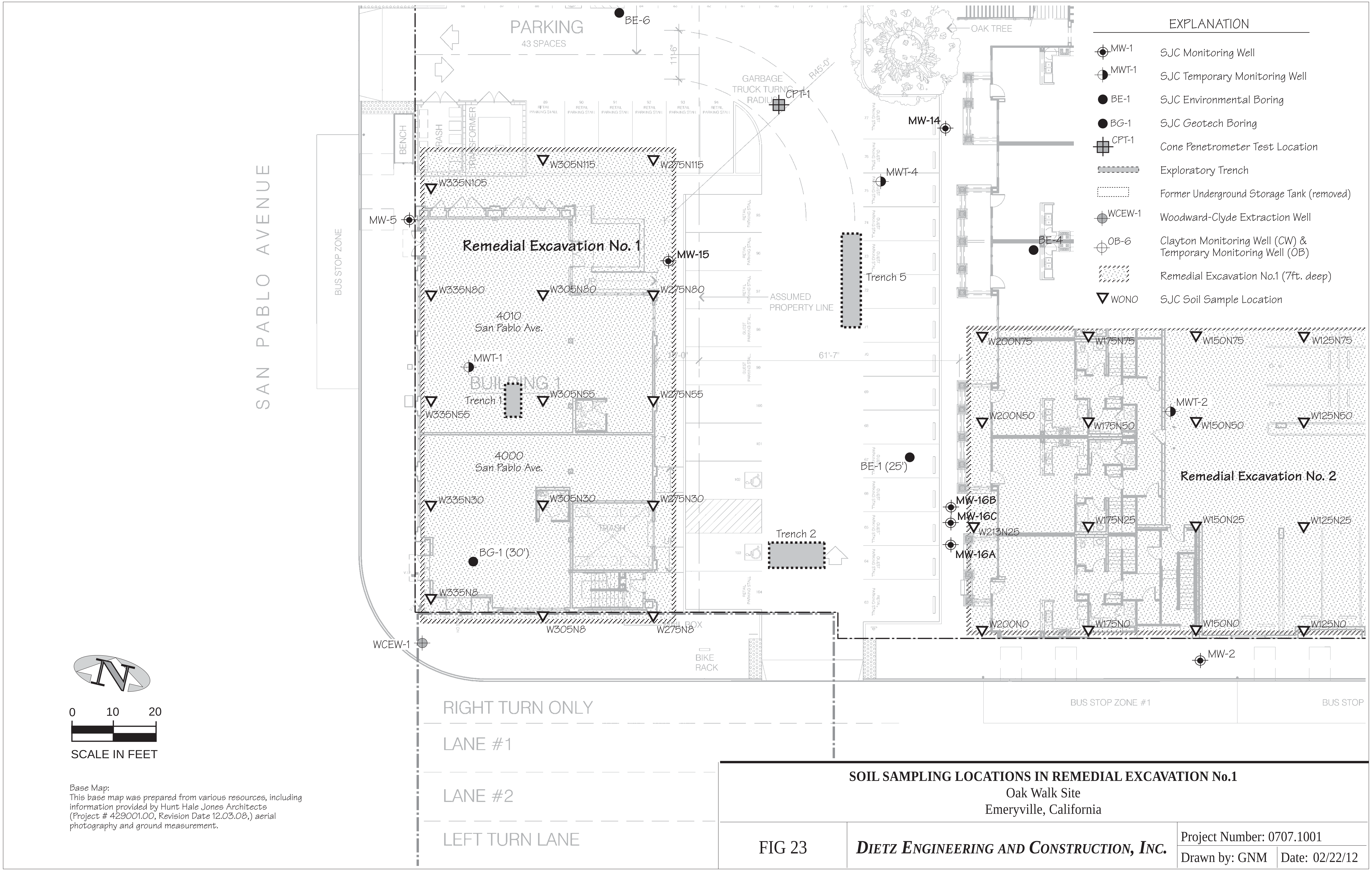
Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

REMEDIAL EXCAVATIONS AND GROUNDWATER EXTRACTION PIT
Oak Walk Site
Emeryville, California

FIG 22

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/22/12



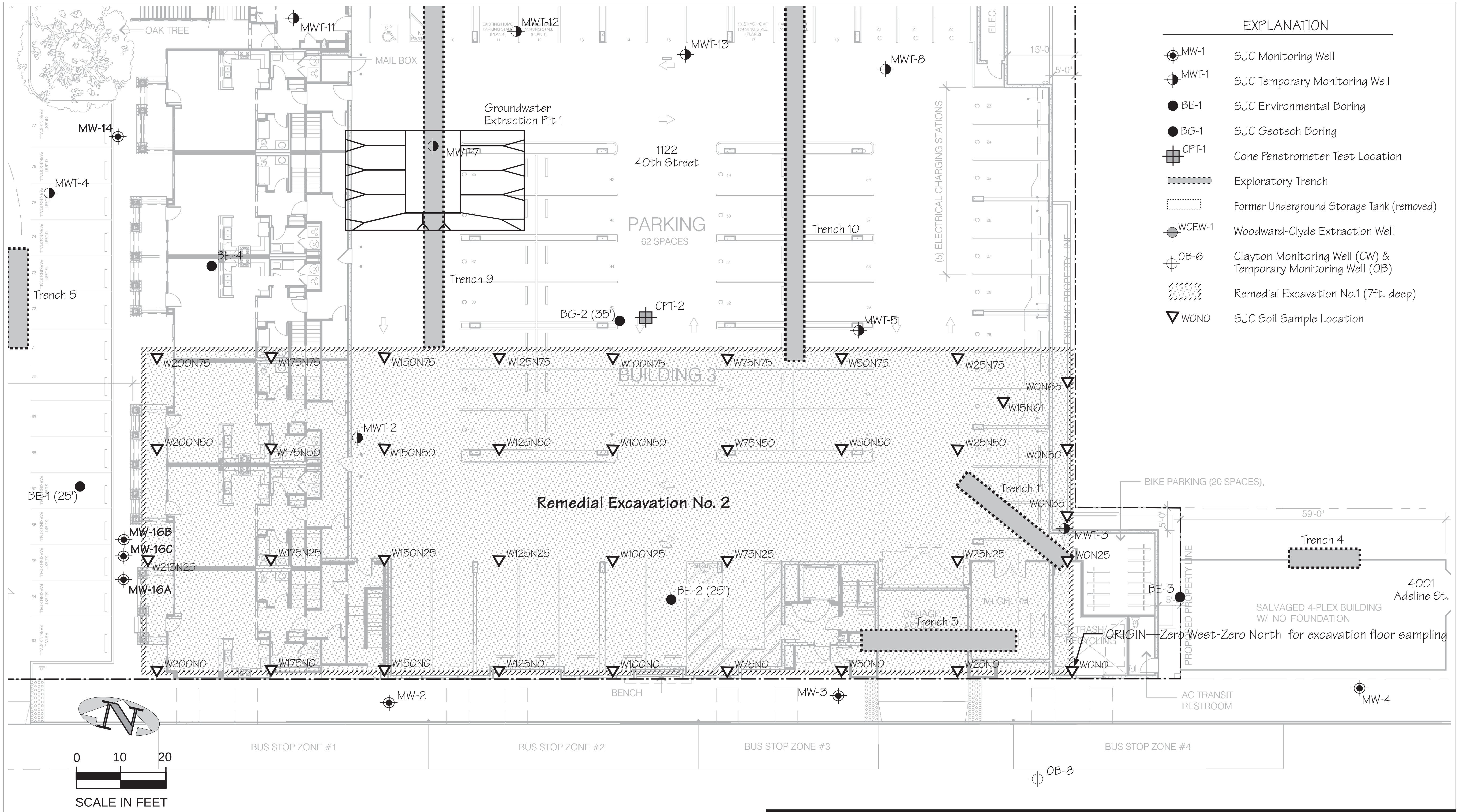
Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

SOIL SAMPLING LOCATIONS IN REMEDIAL EXCAVATION No.1
Oak Walk Site
Emeryville, California

FIG 23

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/22/12



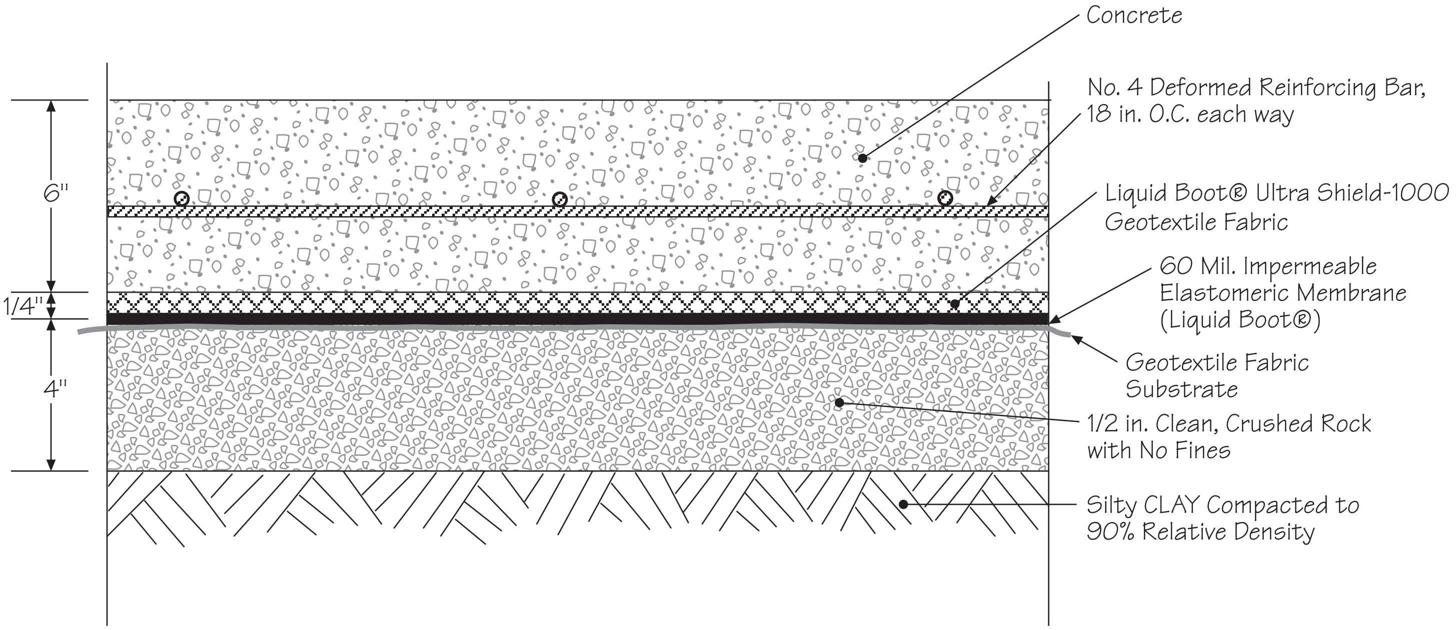
Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

SOIL SAMPLING LOCATIONS IN REMEDIAL EXCAVATION No.2
Oak Walk Site
Emeryville, California

FIG 24

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/22/12

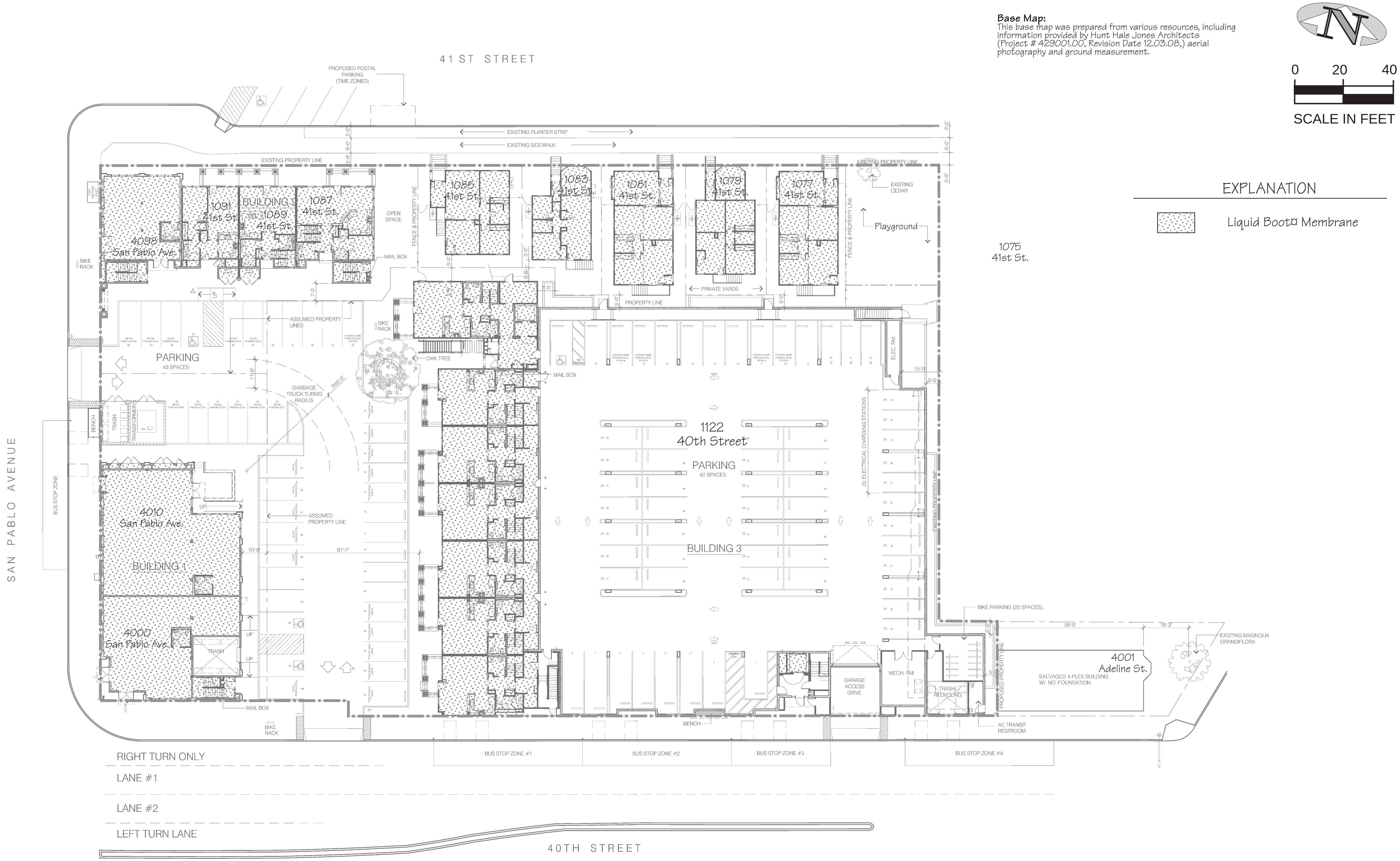


FLOOR SLAB WITH LIQUID BOOT¤ MEMBRANE

Oak Walk Site

Emeryville, California

FIG 25	***DIETZ ENGINEERING AND CONSTRUCTION, INC.***	Project Number: 0707.1001
		Drawn by: GNM Date: 02/22/12



Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

EXPLANATION

▨	Liquid Boot¤ Membrane

GROUND FLOOR SLABS UNDERLAIN BY LIQUID BOOT® MEMBRANE

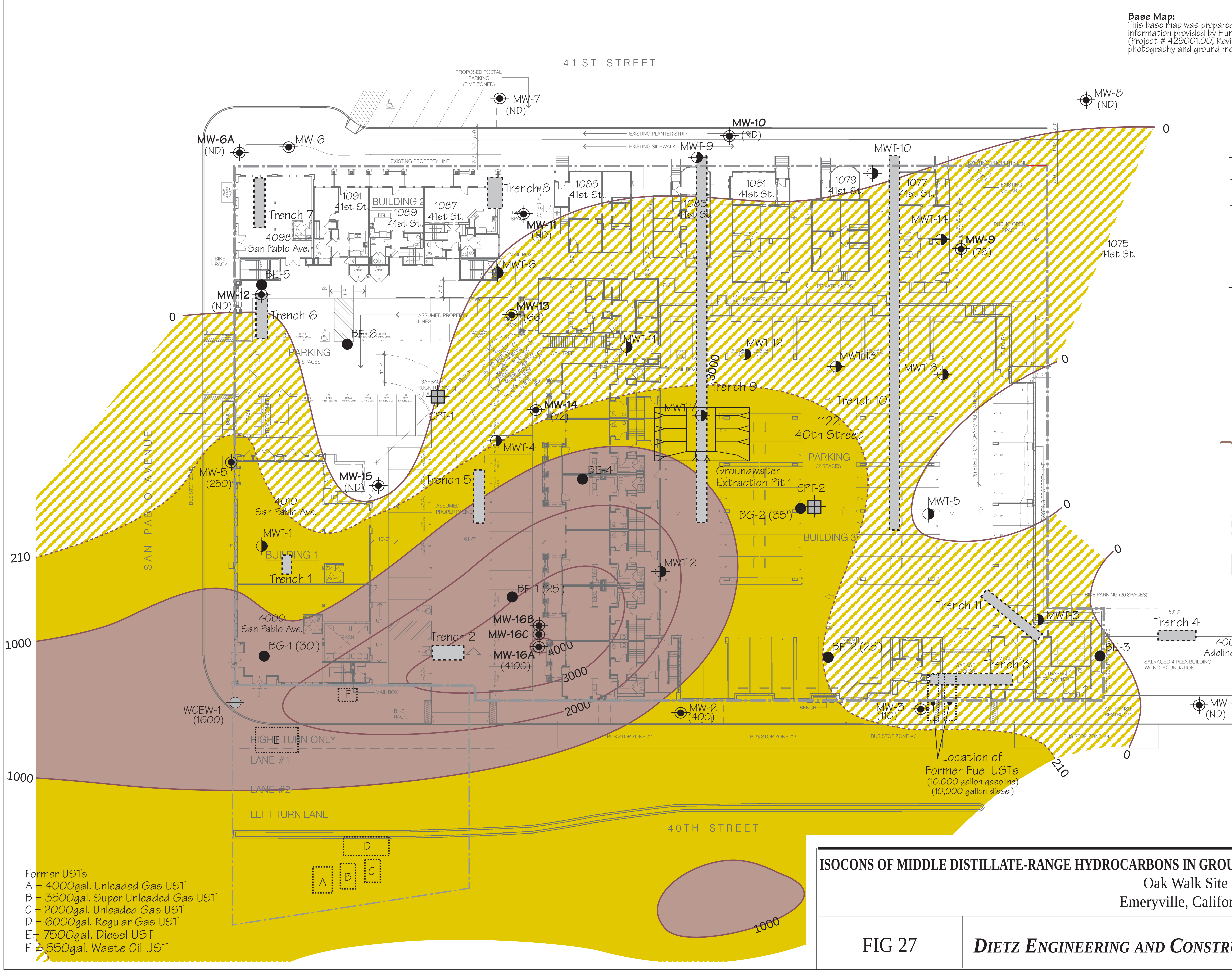
Oak Walk Site
Emeryville, California

FIG 26

Dietz Engineering and Construction, Inc.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/27/12

Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.



EXPLANATION

⊕	MW-1	SJC Monitoring Well
◐	MWT-1	SJC Temporary Monitoring Well
●	BE-1	SJC Environmental Boring
●	BG-1	SJC Geotech Boring
⊞	CPT-1	Cone Penetrometer Test Location
▬		Exploratory Trench
⬚		Former Underground Storage Tank (removed)
⊕	WCEW-1	Woodward-Clyde Extraction Well
	(370)	Result of analysis of middle distillate-range hydrocarbons in groundwater (µg/L)
∼	1000	Isocon of middle distillate-range hydrocarbons in groundwater (µg/L)
▨		Middle distillate-range hydrocarbons 0 to 210 µg/L
■		Middle distillate-range hydrocarbons 210 to 999 µg/L
■		Middle distillate-range hydrocarbons >1,000 µg/L

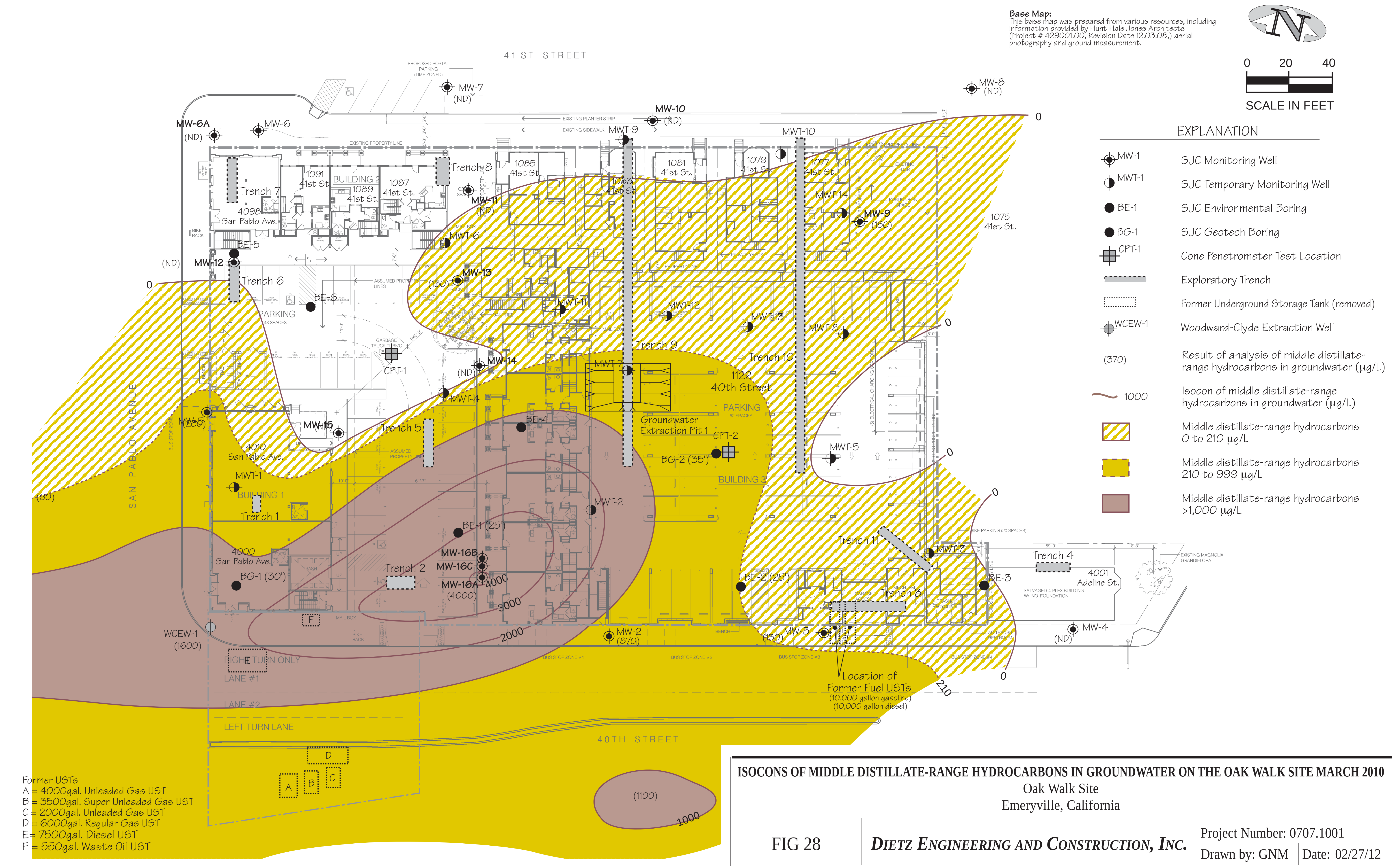
Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

ISOCONS OF MIDDLE DISTILLATE-RANGE HYDROCARBONS IN GROUNDWATER ON THE OAK WALK SITE SEPTEMBER 2009
Oak Walk Site
Emeryville, California

FIG 27

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/27/12



Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

EXPLANATION

MW-1	SJC Monitoring Well
MWT-1	SJC Temporary Monitoring Well
BE-1	SJC Environmental Boring
BG-1	SJC Geotech Boring
CPT-1	Cone Penetrometer Test Location
▨	Exploratory Trench
☐	Former Underground Storage Tank (removed)
WCEW-1	Woodward-Clyde Extraction Well
(370)	Result of analysis of middle distillate-range hydrocarbons in groundwater (µg/L)
1000	Isocon of middle distillate-range hydrocarbons in groundwater (µg/L)
▨	Middle distillate-range hydrocarbons 0 to 210 µg/L
🟨	Middle distillate-range hydrocarbons 210 to 999 µg/L
🟫	Middle distillate-range hydrocarbons >1,000 µg/L

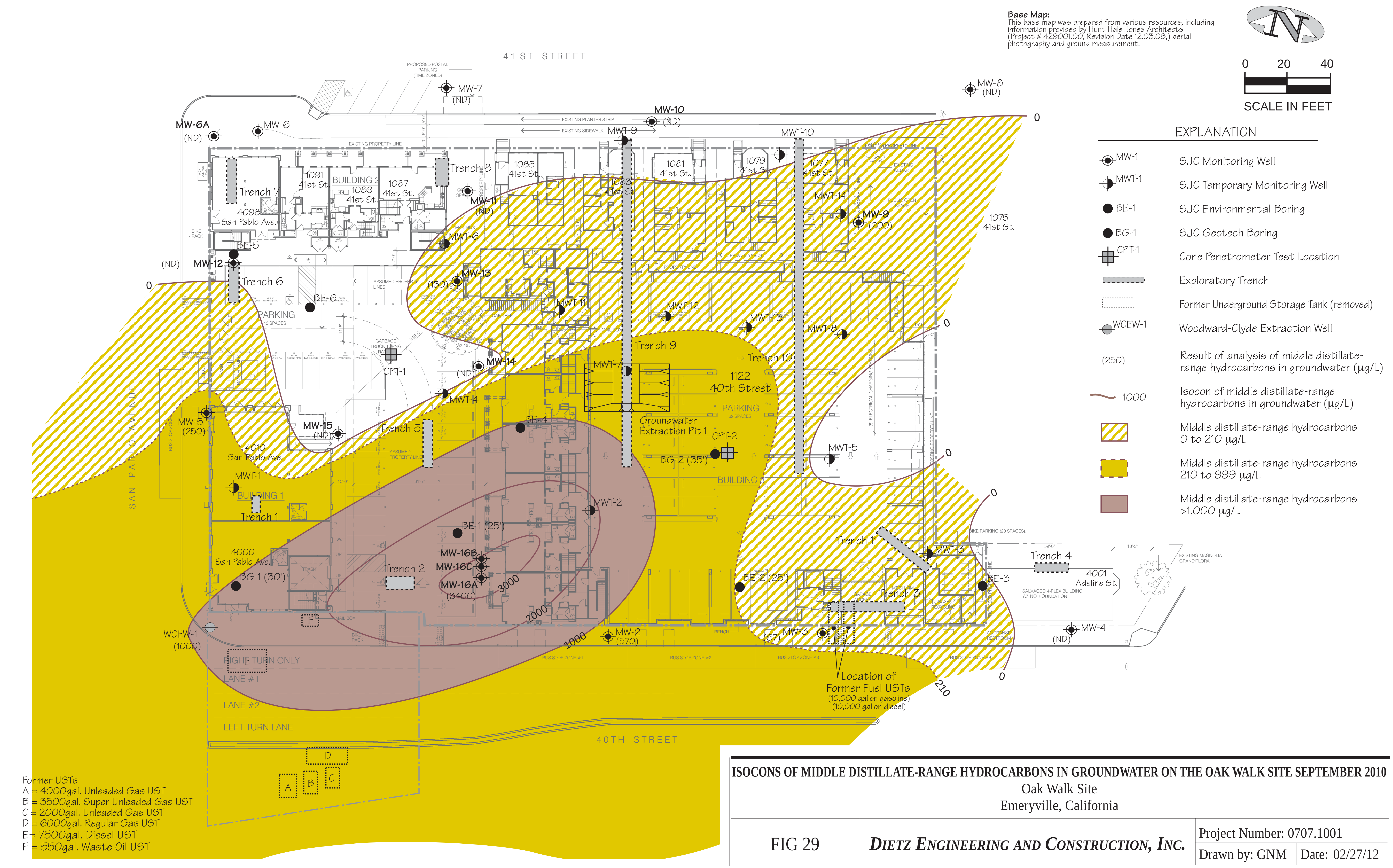
Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

ISOCONS OF MIDDLE DISTILLATE-RANGE HYDROCARBONS IN GROUNDWATER ON THE OAK WALK SITE MARCH 2010
Oak Walk Site
Emeryville, California

FIG 28

Dietz Engineering and Construction, Inc.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/27/12



Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

ISOCONS OF MIDDLE DISTILLATE-RANGE HYDROCARBONS IN GROUNDWATER ON THE OAK WALK SITE SEPTEMBER 2010

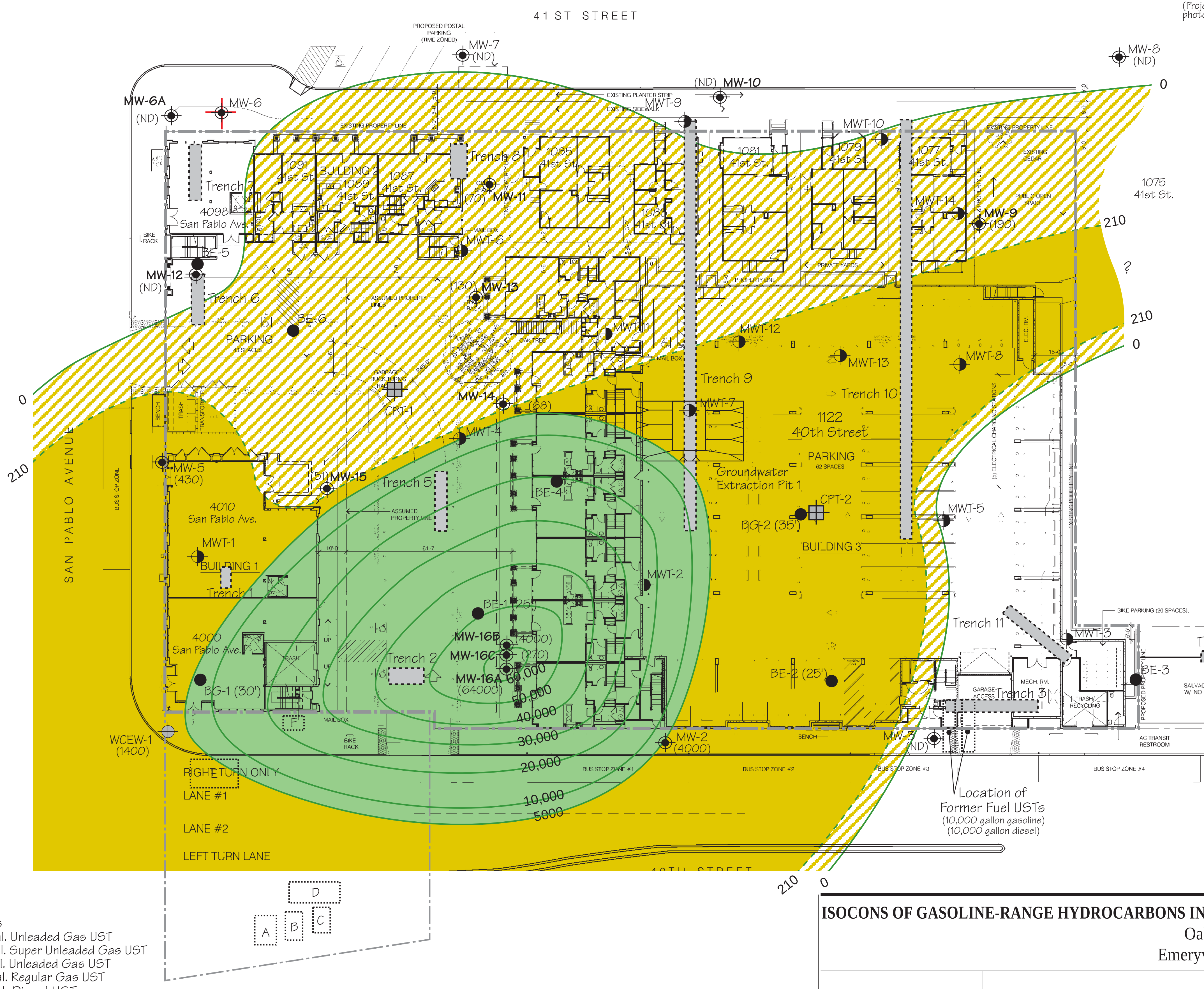
Oak Walk Site
Emeryville, California

FIG 29

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/27/12

Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.



0 20 40
SCALE IN FEET

EXPLANATION

MW-1	SJC Monitoring Well
MWT-1	SJC Temporary Monitoring Well
● BE-1	SJC Environmental Boring
● BG-1	SJC Geotech Boring
CPT-1	Cone Penetrometer Test Location
▬	Exploratory Trench
⬚	Former Underground Storage Tank (removed)
WCEW-1	Woodward-Clyde Extraction Well
(800)	Result of analysis of gasoline-range hydrocarbons in groundwater (µg/L)
~ 5000	Isocon of gasoline-range hydrocarbons in groundwater (µg/L)
▨	Gasoline-range hydrocarbons 0-210 µg/L
🟨	Gasoline-range hydrocarbons 210 to 4999 µg/L
🟩	Gasoline-range hydrocarbons >5000 µg/L

Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

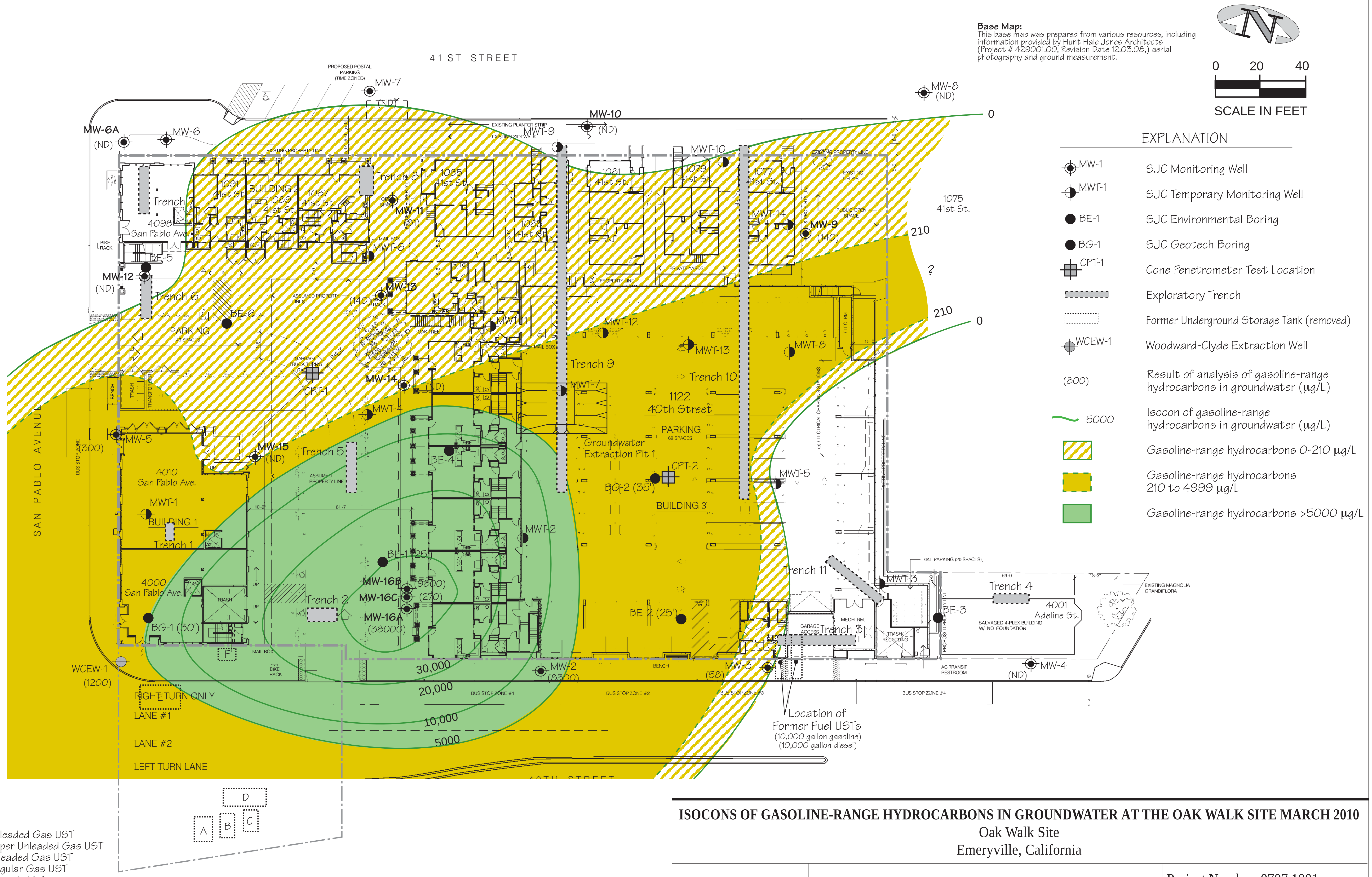
ISOCONS OF GASOLINE-RANGE HYDROCARBONS IN GROUNDWATER AT THE OAK WALK SITE SEPTEMBER 2009

Oak Walk Site
Emeryville, California

FIG 30

Dietz Engineering and Construction, Inc.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/27/12



Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

Location of Former Fuel USTs
(10,000 gallon gasoline)
(10,000 gallon diesel)

Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

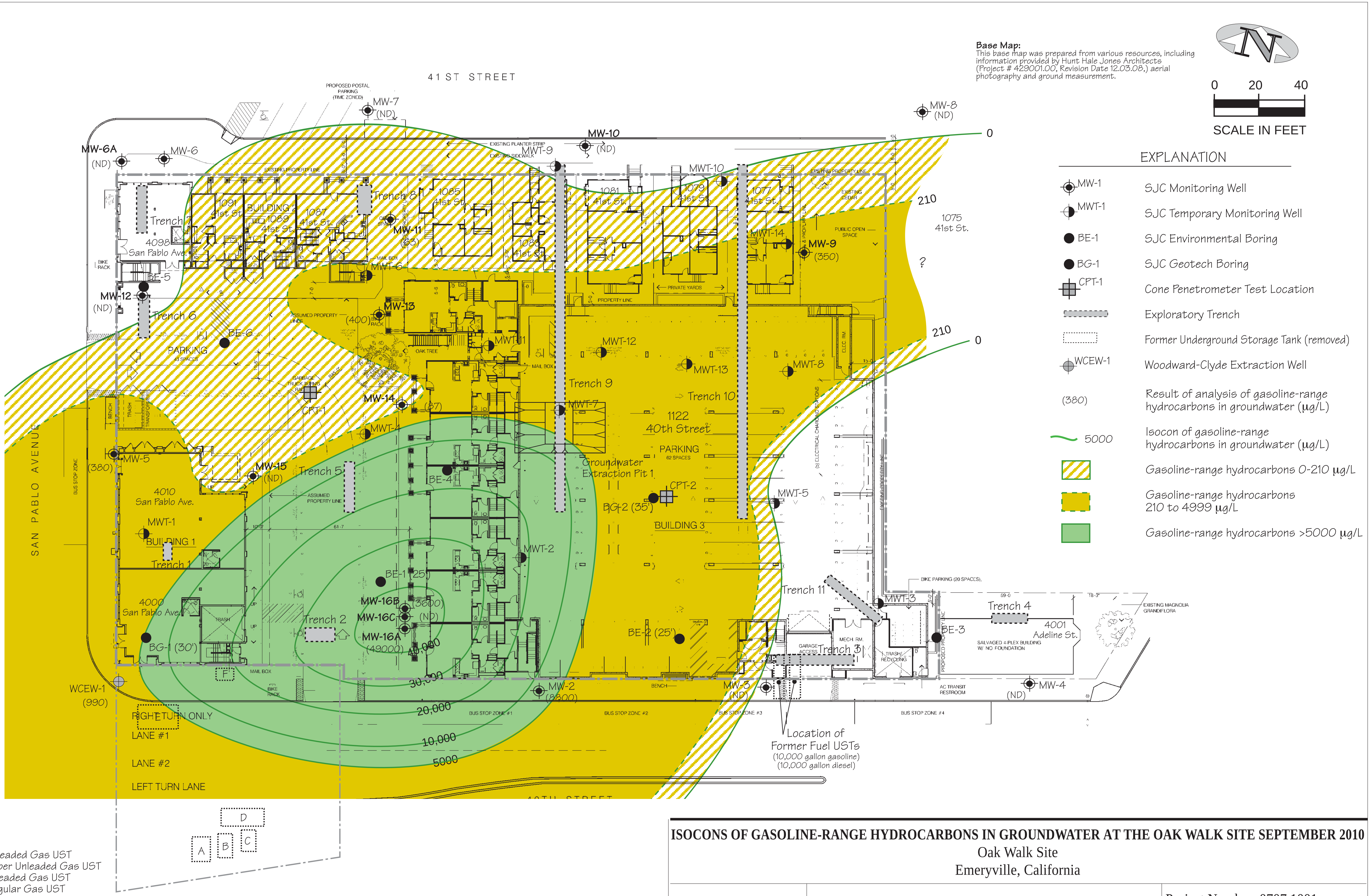
ISOCONS OF GASOLINE-RANGE HYDROCARBONS IN GROUNDWATER AT THE OAK WALK SITE MARCH 2010

Oak Walk Site
Emeryville, California

FIG 31

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/27/12



Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

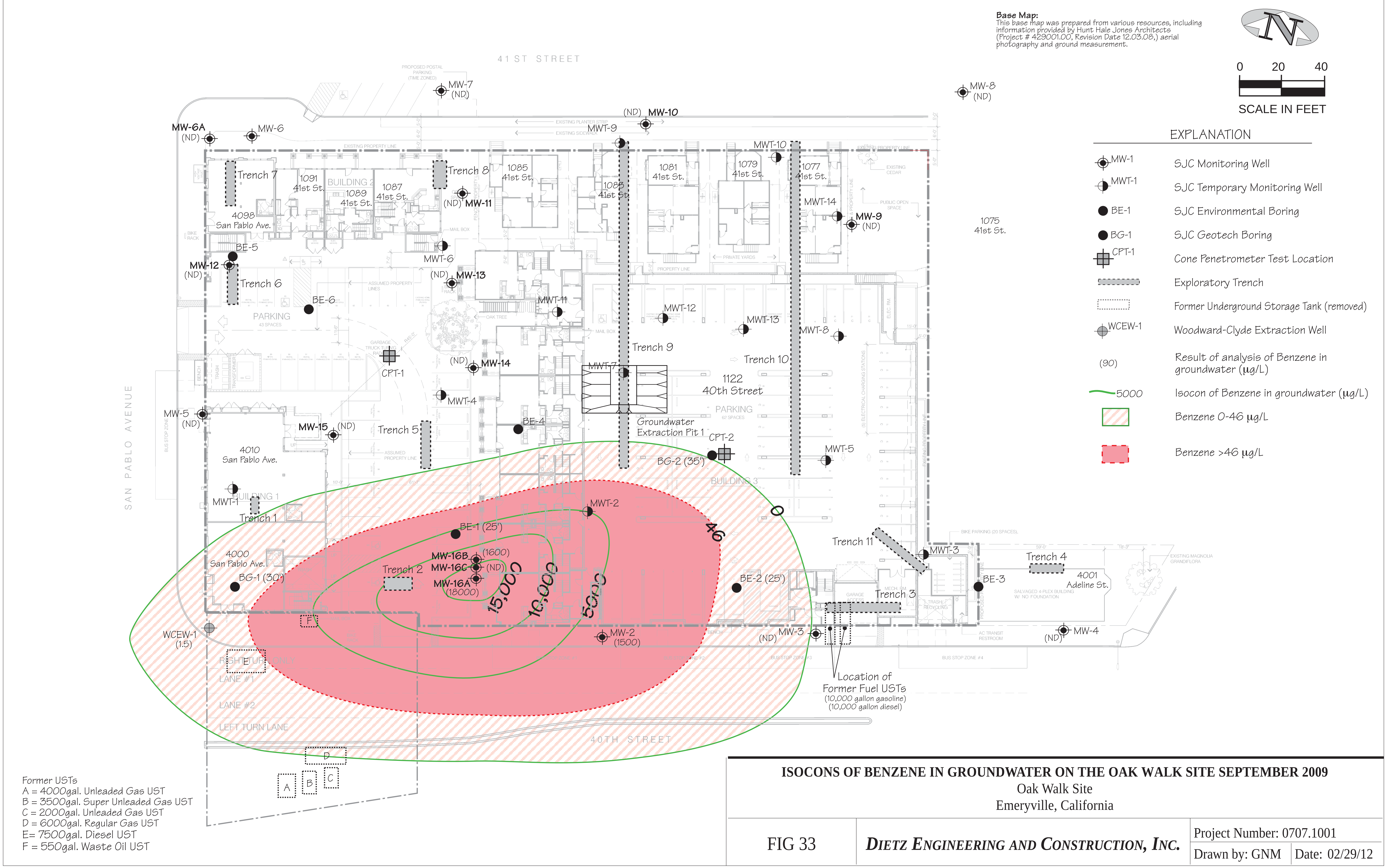
ISOCONS OF GASOLINE-RANGE HYDROCARBONS IN GROUNDWATER AT THE OAK WALK SITE SEPTEMBER 2010

Oak Walk Site
Emeryville, California

FIG 32

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/27/12



ISOCONS OF BENZENE IN GROUNDWATER ON THE OAK WALK SITE SEPTEMBER 2009

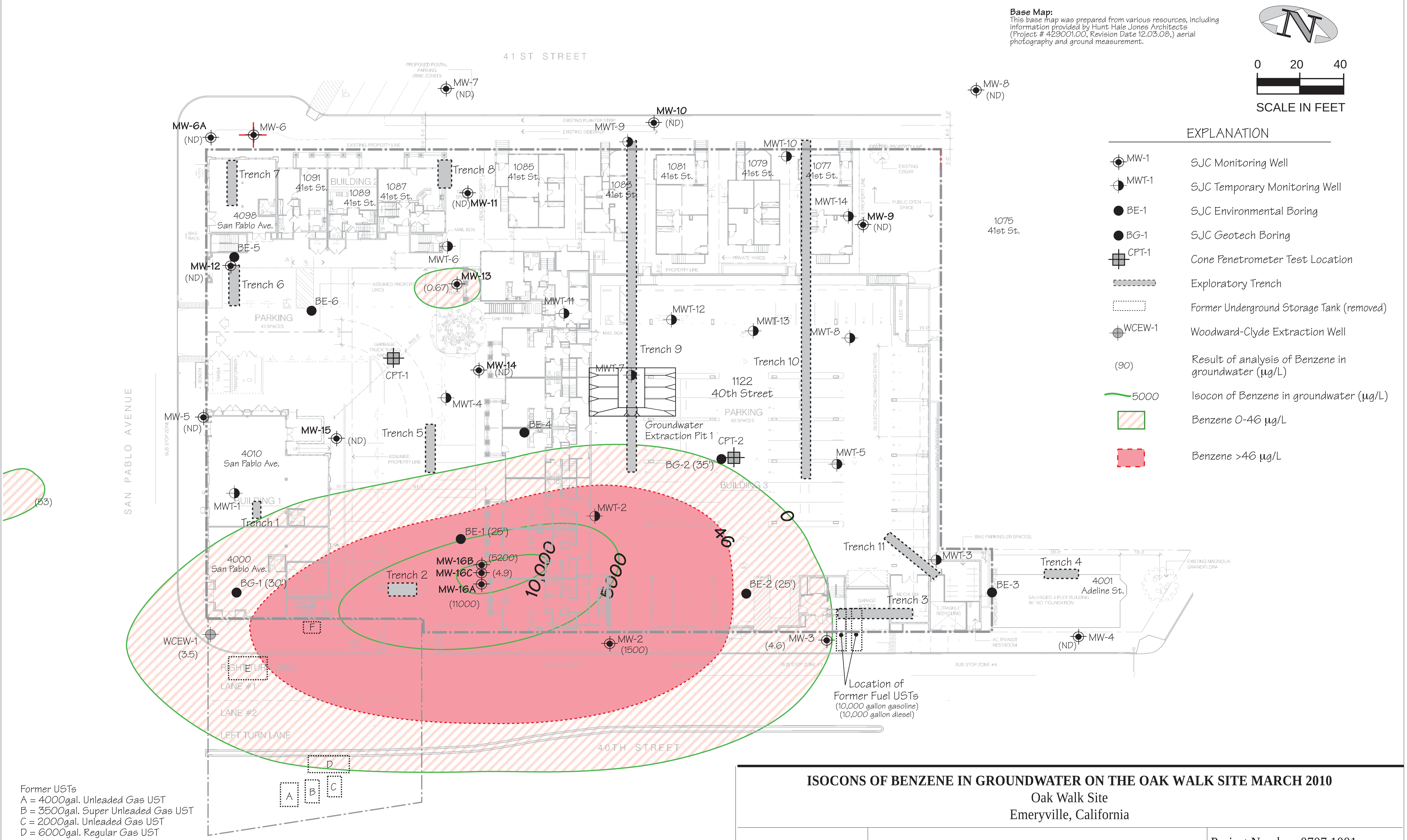
Oak Walk Site
Emeryville, California

FIG 33

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12

Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.



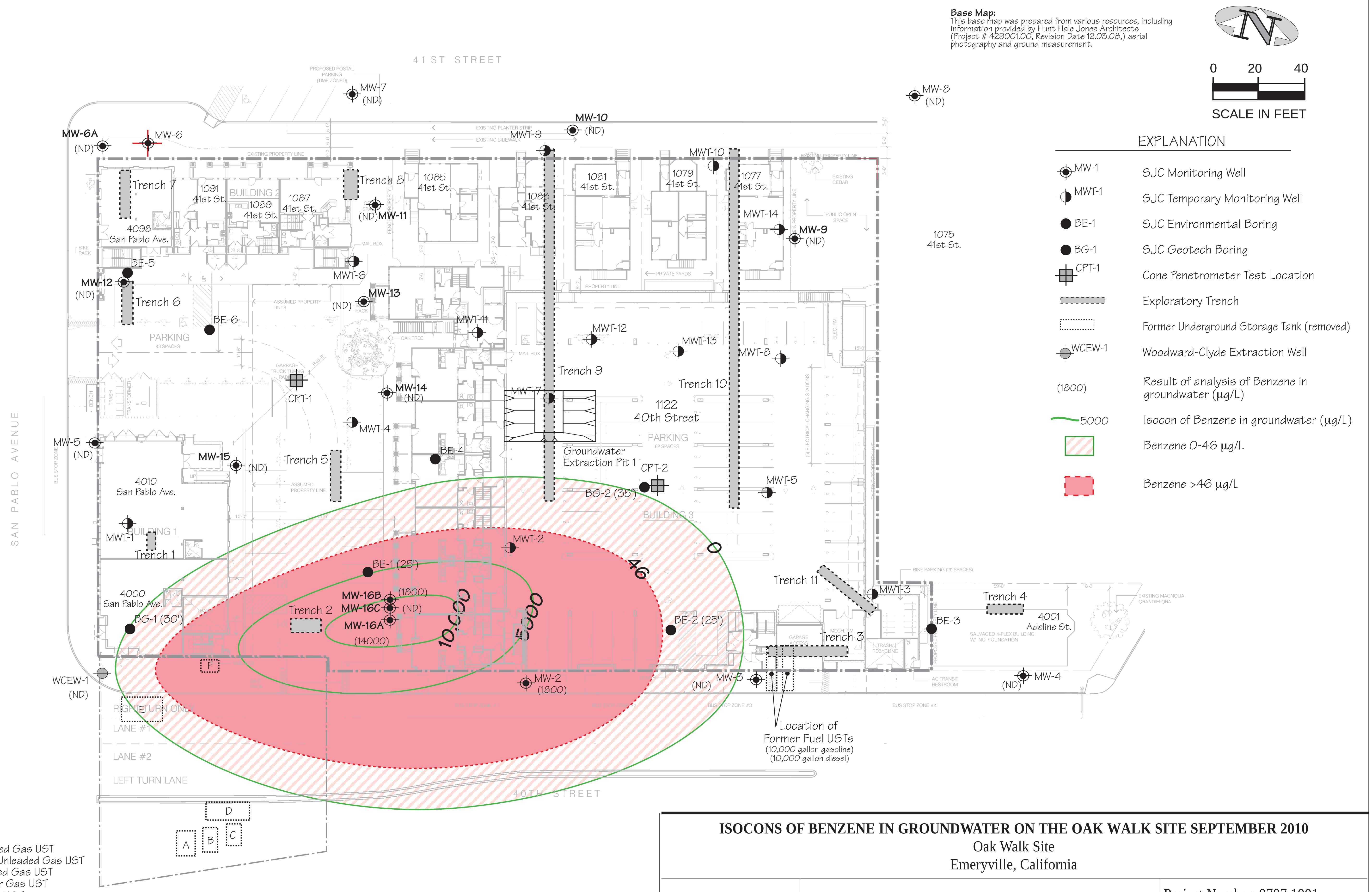
Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

ISOCONS OF BENZENE IN GROUNDWATER ON THE OAK WALK SITE MARCH 2010
Oak Walk Site
Emeryville, California

FIG 34

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12



Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08.) aerial photography and ground measurement.

EXPLANATION

MW-1	SJC Monitoring Well
MWT-1	SJC Temporary Monitoring Well
● BE-1	SJC Environmental Boring
● BG-1	SJC Geotech Boring
CPT-1	Cone Penetrometer Test Location
▨	Exploratory Trench
☐	Former Underground Storage Tank (removed)
WCEW-1	Woodward-Clyde Extraction Well
(1800)	Result of analysis of Benzene in groundwater (μg/L)
5000	Isocon of Benzene in groundwater (μg/L)
▨	Benzene 0-46 μg/L
🟥	Benzene >46 μg/L

Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

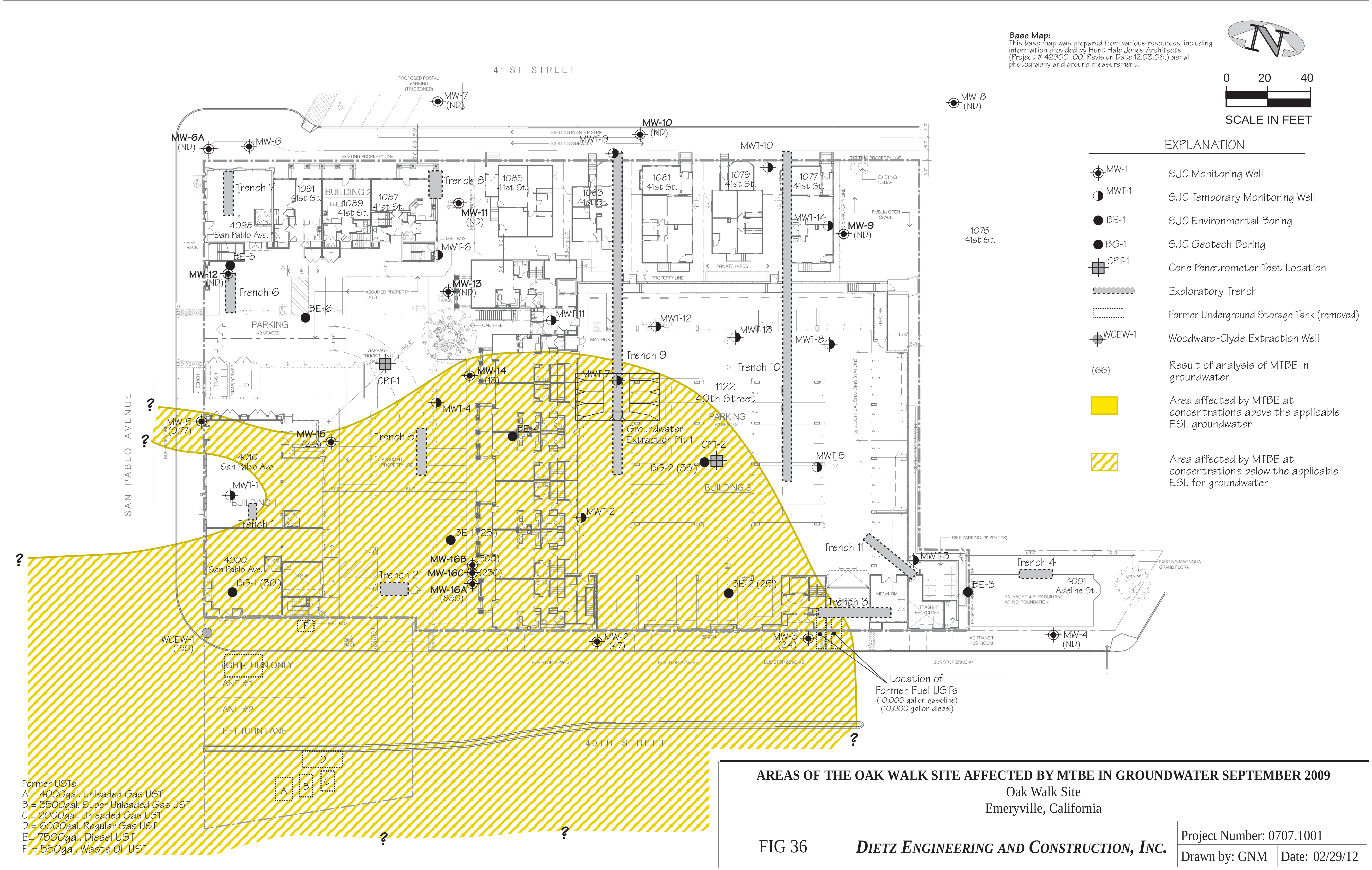
ISOCONS OF BENZENE IN GROUNDWATER ON THE OAK WALK SITE SEPTEMBER 2010

Oak Walk Site
Emeryville, California

FIG 35

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12

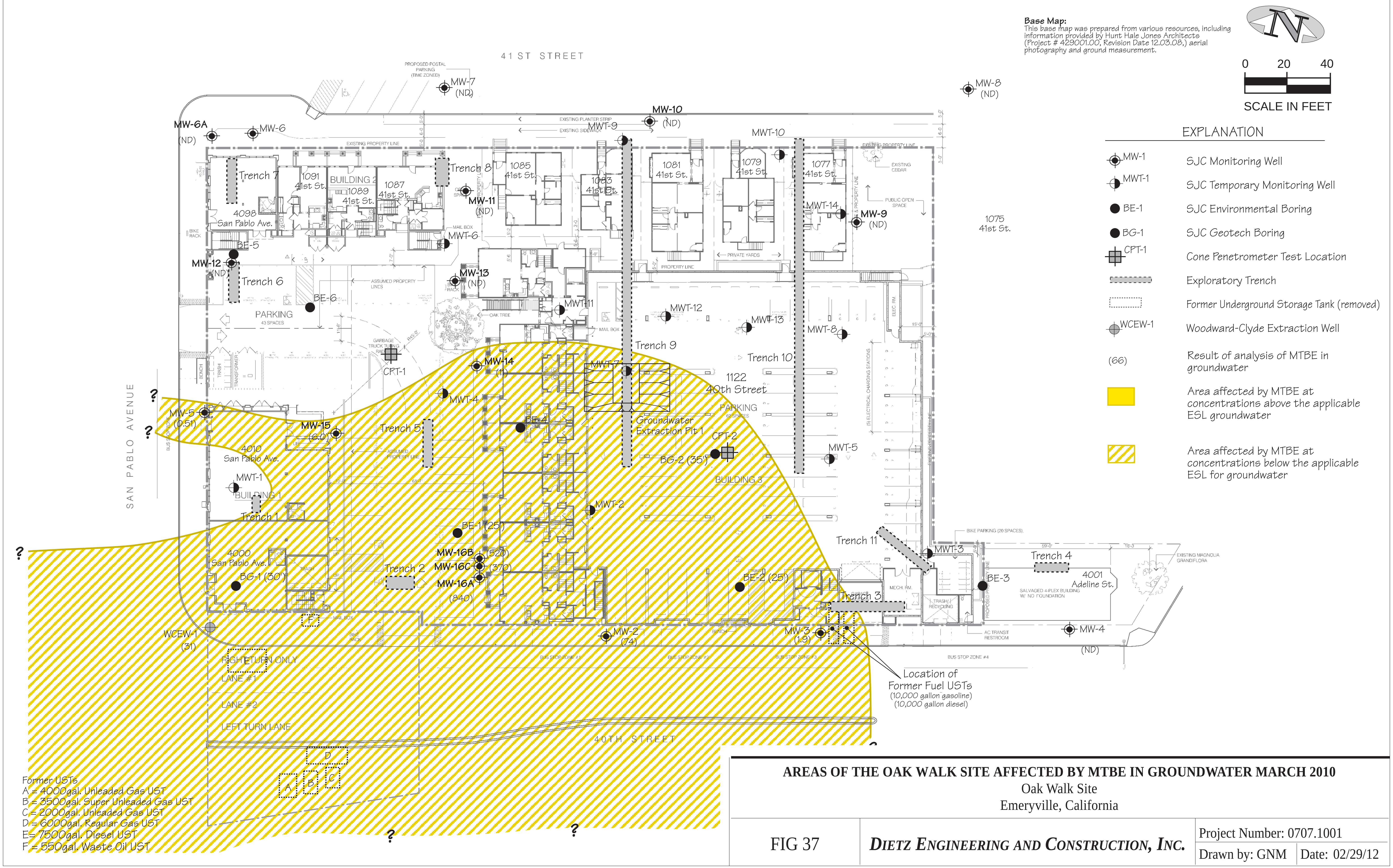


AREAS OF THE OAK WALK SITE AFFECTED BY MTBE IN GROUNDWATER SEPTEMBER 2009
Oak Walk Site
Emeryville, California

FIG 36

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12



Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

AREAS OF THE OAK WALK SITE AFFECTED BY MTBE IN GROUNDWATER MARCH 2010

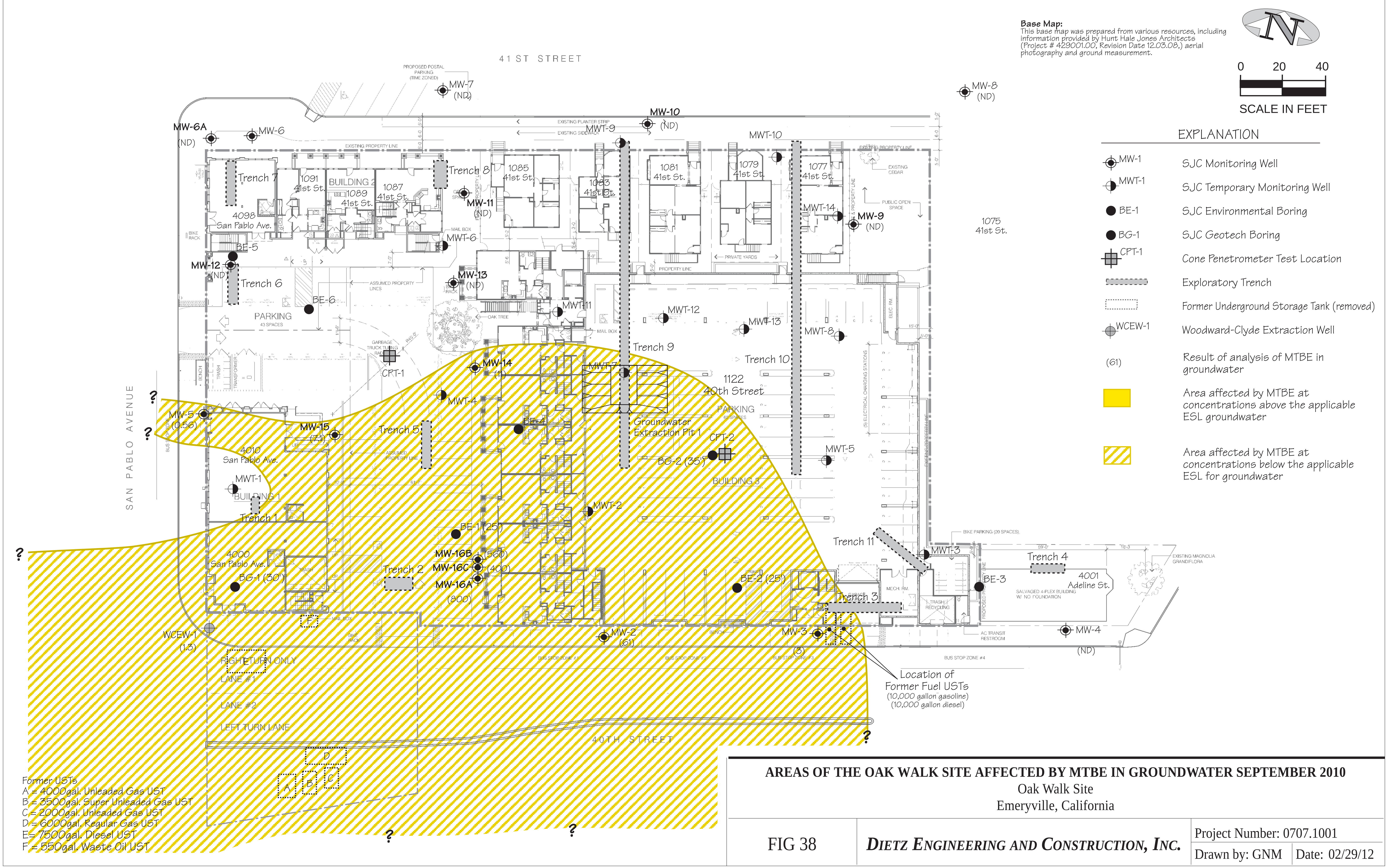
Oak Walk Site
Emeryville, California

FIG 37

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12

Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.



Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

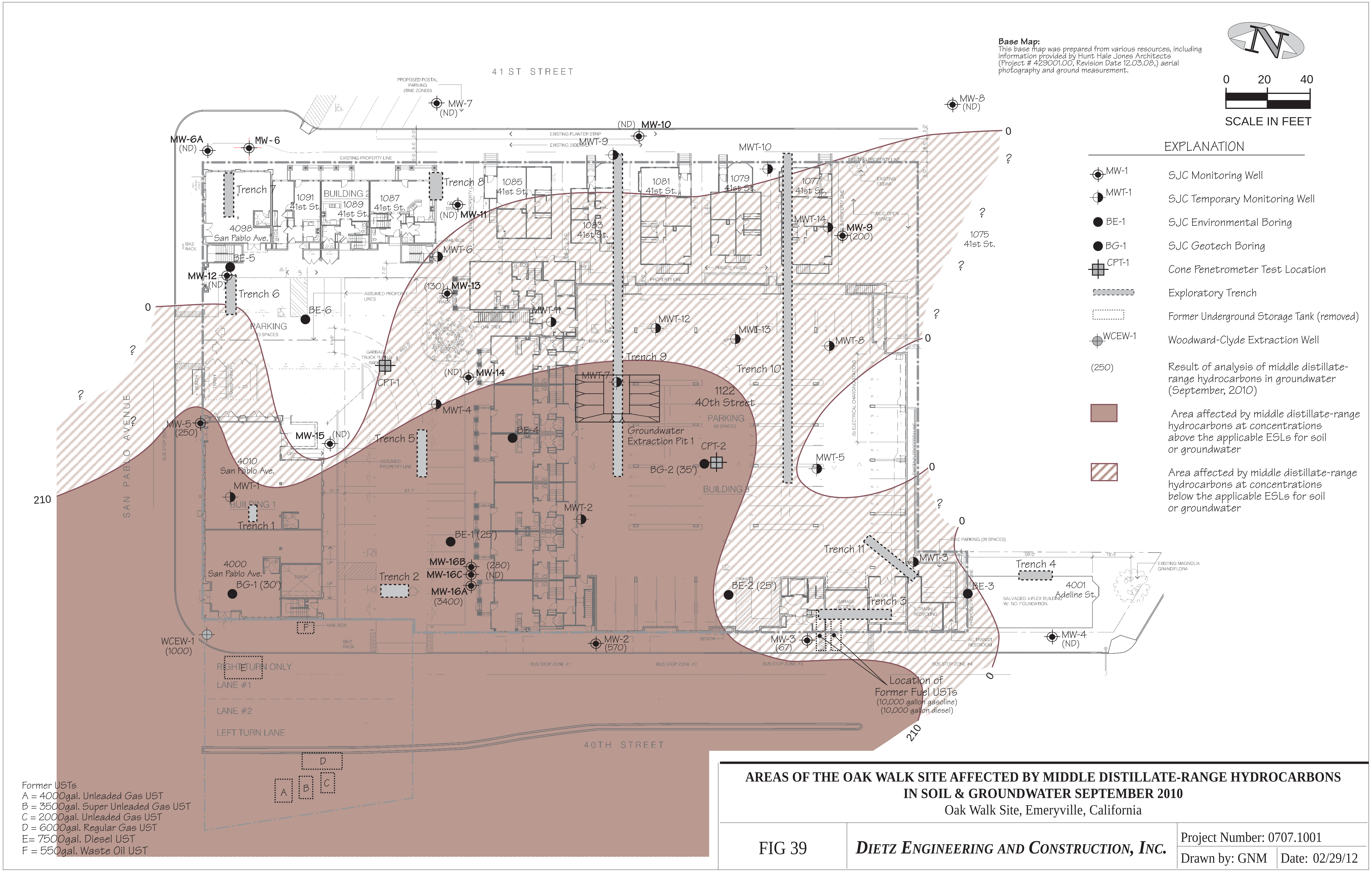
AREAS OF THE OAK WALK SITE AFFECTED BY MTBE IN GROUNDWATER SEPTEMBER 2010

Oak Walk Site
Emeryville, California

FIG 38

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12



Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

EXPLANATION

MW-1	SJC Monitoring Well
MWT-1	SJC Temporary Monitoring Well
● BE-1	SJC Environmental Boring
● BG-1	SJC Geotech Boring
CPT-1	Cone Penetrometer Test Location
▬	Exploratory Trench
⬚	Former Underground Storage Tank (removed)
WCEW-1	Woodward-Clyde Extraction Well
(250)	Result of analysis of middle distillate-range hydrocarbons in groundwater (September, 2010)
■	Area affected by middle distillate-range hydrocarbons at concentrations above the applicable ESLs for soil or groundwater
▨	Area affected by middle distillate-range hydrocarbons at concentrations below the applicable ESLs for soil or groundwater

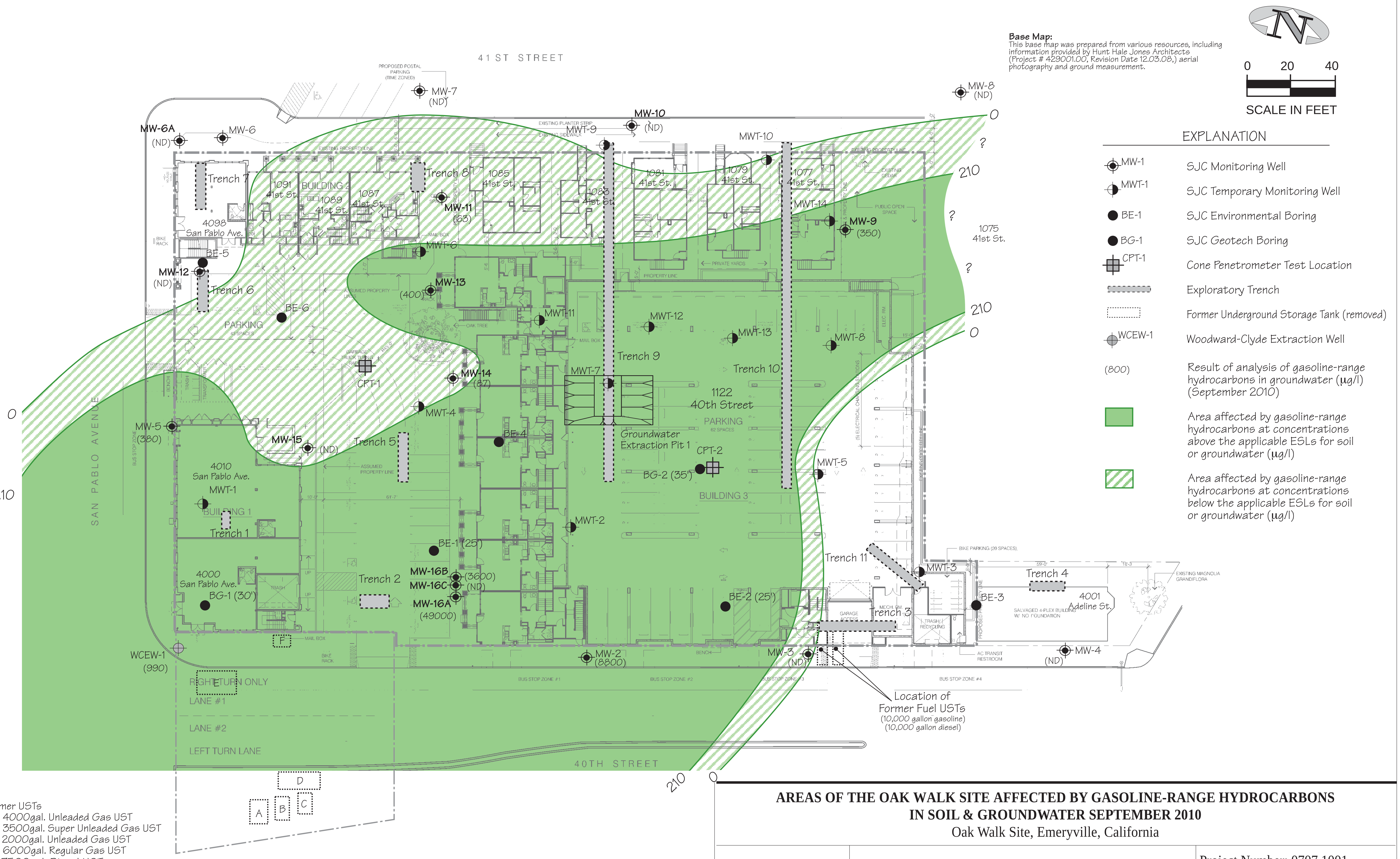
Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

AREAS OF THE OAK WALK SITE AFFECTED BY MIDDLE DISTILLATE-RANGE HYDROCARBONS IN SOIL & GROUNDWATER SEPTEMBER 2010
Oak Walk Site, Emeryville, California

FIG 39

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12



Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

EXPLANATION

MW-1	SJC Monitoring Well
MWT-1	SJC Temporary Monitoring Well
BE-1	SJC Environmental Boring
BG-1	SJC Geotech Boring
CPT-1	Cone Penetrometer Test Location
	Exploratory Trench
	Former Underground Storage Tank (removed)
WCEW-1	Woodward-Clyde Extraction Well
(800)	Result of analysis of gasoline-range hydrocarbons in groundwater (μg/l) (September 2010)
🟩	Area affected by gasoline-range hydrocarbons at concentrations above the applicable ESLs for soil or groundwater (μg/l)
▨	Area affected by gasoline-range hydrocarbons at concentrations below the applicable ESLs for soil or groundwater (μg/l)

Former USTs
A = 4000gal. Unleaded Gas UST
B = 3500gal. Super Unleaded Gas UST
C = 2000gal. Unleaded Gas UST
D = 6000gal. Regular Gas UST
E= 7500gal. Diesel UST
F = 550gal. Waste Oil UST

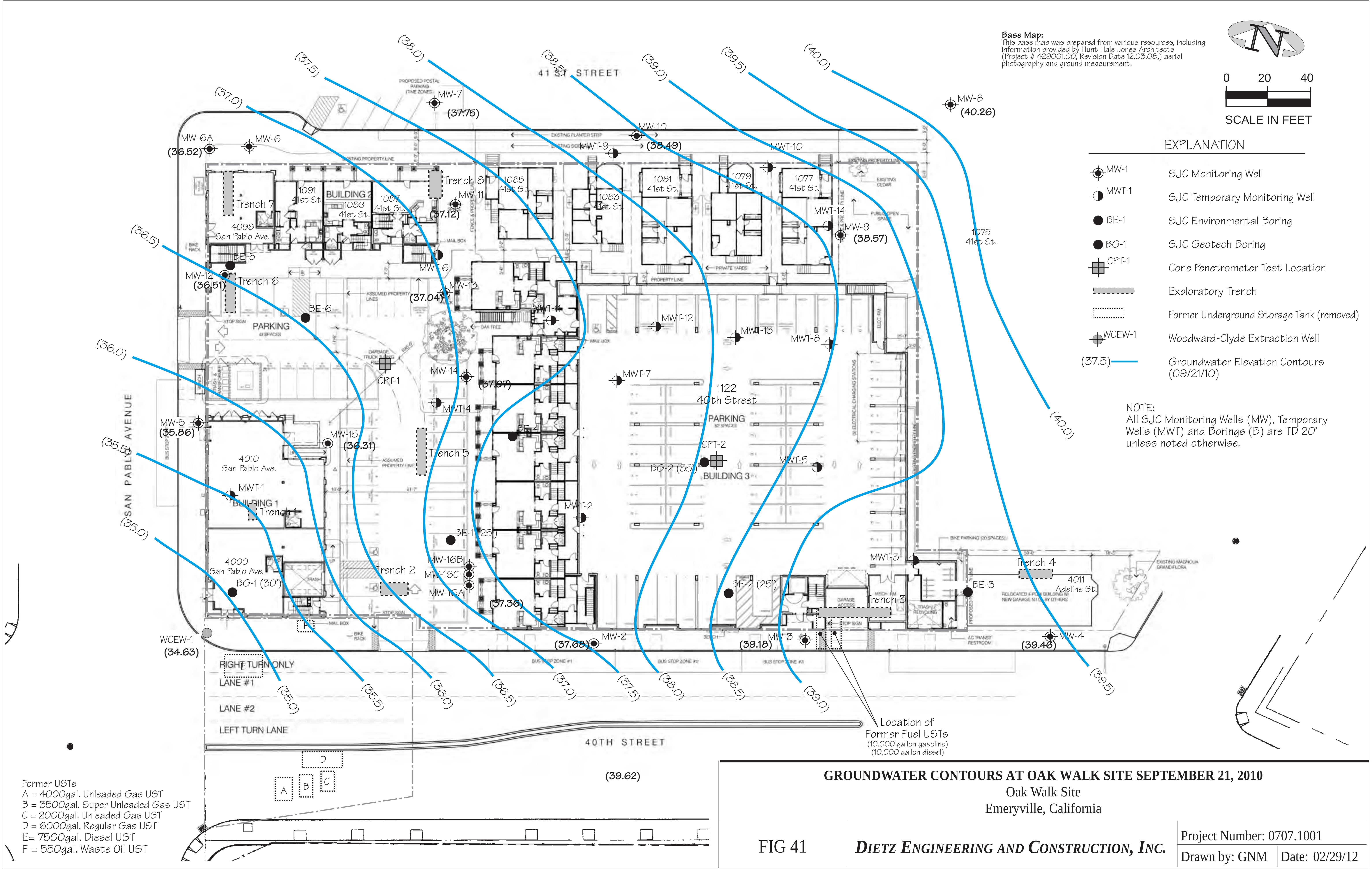
AREAS OF THE OAK WALK SITE AFFECTED BY GASOLINE-RANGE HYDROCARBONS IN SOIL & GROUNDWATER SEPTEMBER 2010

Oak Walk Site, Emeryville, California

FIG 40

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12



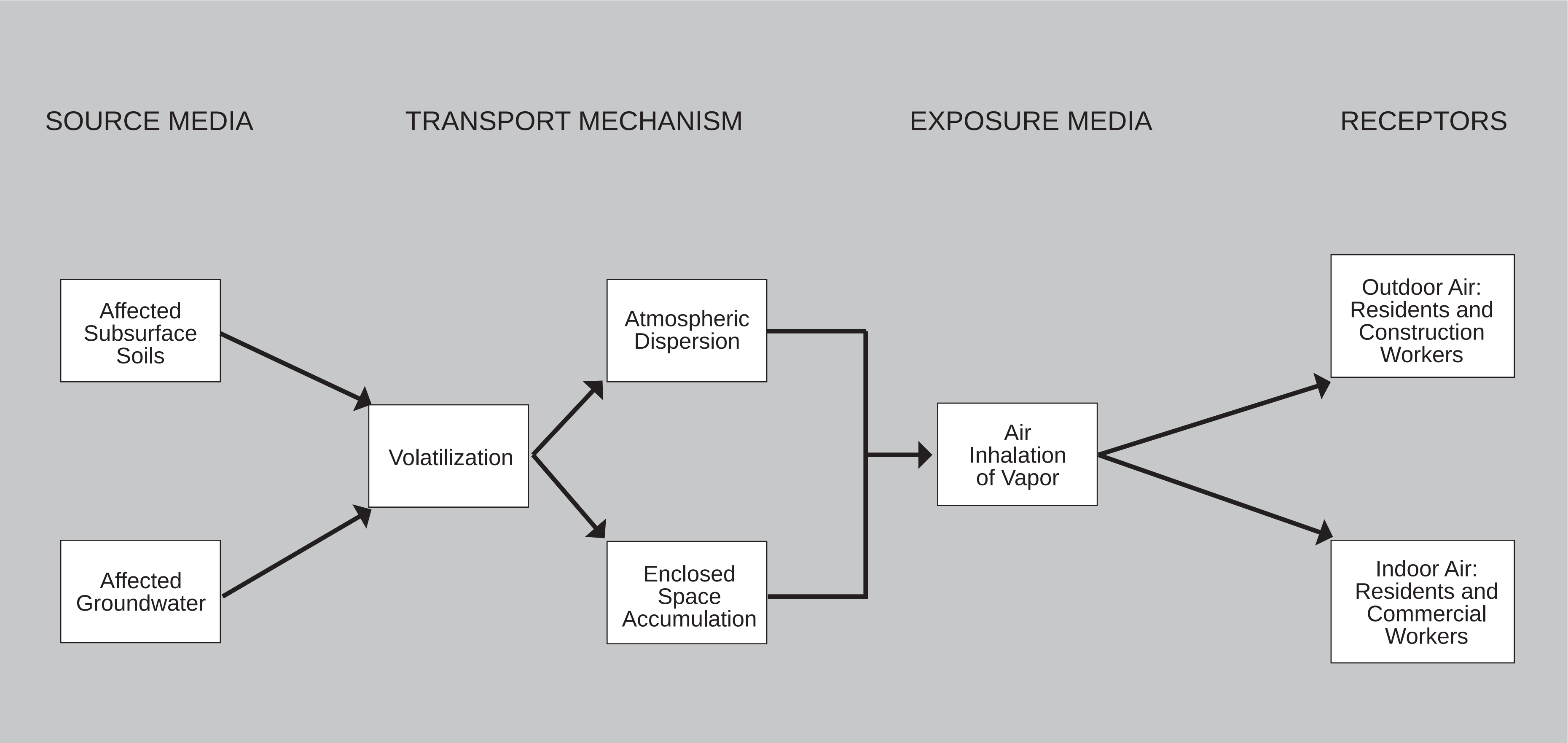
GROUNDWATER CONTOURS AT OAK WALK SITE SEPTEMBER 21, 2010

Oak Walk Site
Emeryville, California

FIG 41

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12

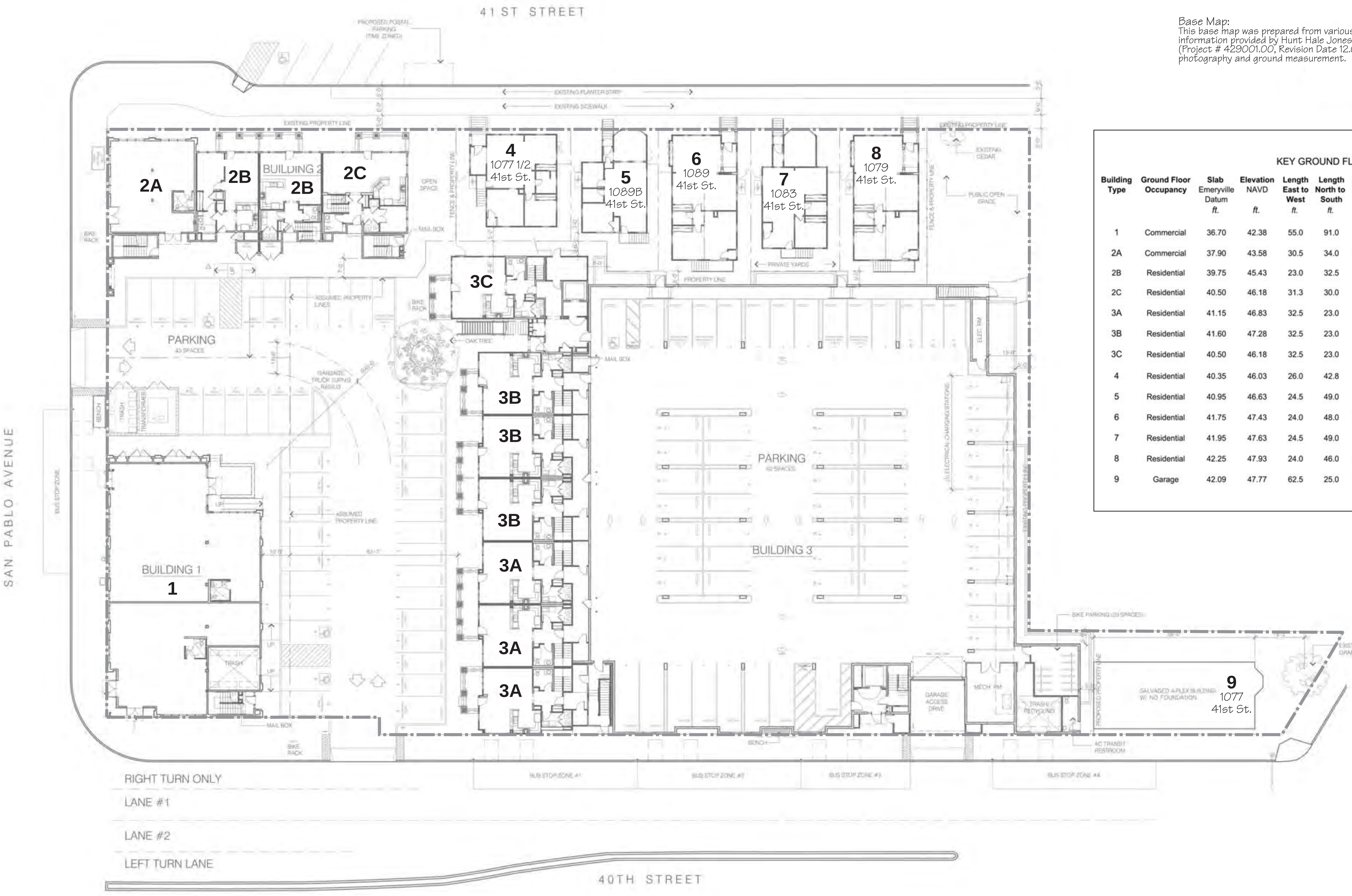


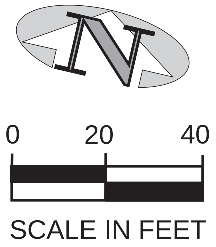
EXPOSURE PATHWAYS FOR HUMAN HEALTH RISK ASSESSMENTS
Oak Walk Site
Emeryville, California

FIG 42

DIETZ ENGINEERING AND CONSTRUCTION, INC.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12





Base Map:
This base map was prepared from various resources, including information provided by Hunt Hale Jones Architects (Project # 429001.00, Revision Date 12.03.08,) aerial photography and ground measurement.

KEY GROUND FLOOR BUILDING DIMENSIONS

Building Type	Ground Floor Occupancy	Slab Emeryville Datum ft.	Elevation NAVD ft.	Length East to West ft.	Length North to South ft.	Plan Area ft. ²	Foundation Perimeter ft.	Gr. Floor Floor to Ceiling ft.	Gr. Floor Interior Volume ft. ³	Ground Floor Volume/Area Ratio	Gr. Floor Slab Thickness in.	Imper-meable Barrier
1	Commercial	36.70	42.38	55.0	91.0	4,260	331.0	18	76,680	18.0	6	Liquid Boot®
2A	Commercial	37.90	43.58	30.5	34.0	1,022	129.0	18	18,396	18.0	6	Liquid Boot®
2B	Residential	39.75	45.43	23.0	32.5	722	118.3	9	6,498	9.0	6	Liquid Boot®
2C	Residential	40.50	46.18	31.3	30.0	932	126.6	9	8,388	9.0	6	Liquid Boot®
3A	Residential	41.15	46.83	32.5	23.0	722	118.3	11	7,942	11.0	6	Liquid Boot®
3B	Residential	41.60	47.28	32.5	23.0	722	118.3	11	7,942	11.0	6	Liquid Boot®
3C	Residential	40.50	46.18	32.5	23.0	722	118.3	11	7,942	11.0	6	Liquid Boot®
4	Residential	40.35	46.03	26.0	42.8	990	146.3	9	8,910	9.0	6	Liquid Boot®
5	Residential	40.95	46.63	24.5	49.0	923	139.0	9	8,307	9.0	6	Liquid Boot®
6	Residential	41.75	47.43	24.0	48.0	1,132	146.0	9	10,188	9.0	6	Liquid Boot®
7	Residential	41.95	47.63	24.5	49.0	923	139.0	9	8,307	9.0	6	Liquid Boot®
8	Residential	42.25	47.93	24.0	46.0	1,095	140.0	9	9,855	9.0	6	Liquid Boot®
9	Garage	42.09	47.77	62.5	25.0	1,543	175.0	8	12,344	8.0	6	Liquid Boot®

GROUND FLOOR RESIDENTIAL AND COMMERCIAL UNIT TYPES
Oak Walk Site
Emeryville, California

FIG 43

Dietz Engineering and Construction, Inc.

Project Number: 0707.1001
Drawn by: GNM
Date: 02/29/12

PLATES

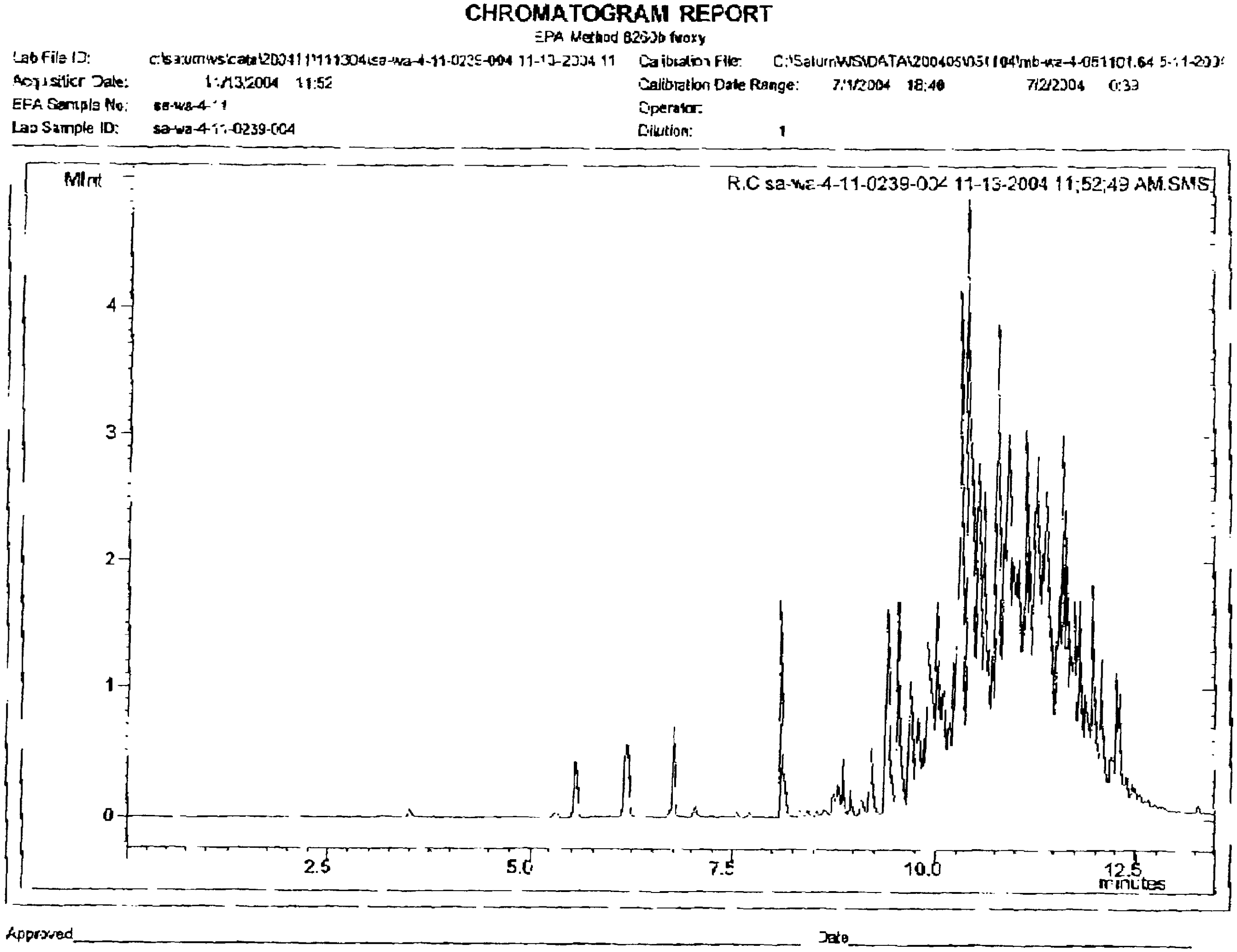
DEC

Oak Walk Redevelopment Site Emeryville, California, CA

Plate 1 Areal Photograph No. AV-8401-3-4-74, flown on 4/19/03: Note: The Oak Walk Redevelopment Site is outlined.

Oak Walk Redevelopment Site Emeryville, California, CA

Plate 2 Areal Photograph No. Gy-30-74, flown in 1930: Note: The area of the Oak Walk Redevelopment Site is outlined.



CHROMATOGRAM REPORT

EPA Method 8260b fuoxy

Lab File ID: c:\saturnws\data\20041111\111304\sa-wa-4-11-0239-004 11-13-2004 11

Acquisition Date: 11/13/2004 11:52

EPA Sample No: sa-wa-4-11

Lab Sample ID: sa-wa-4-11-0239-004

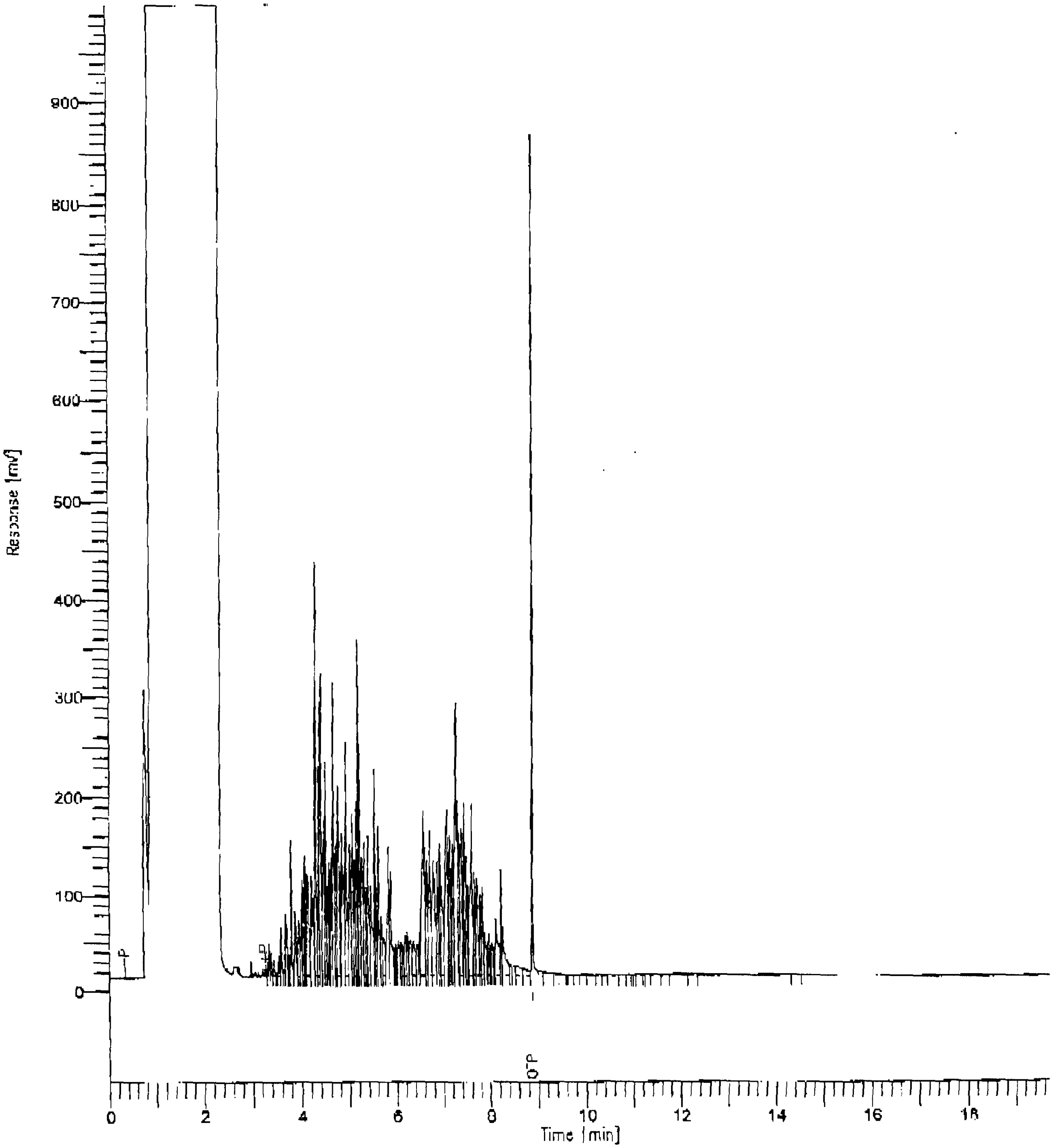
Calibration File: C:\SaturnWS\DATA\200405\051104\mb-wa-4-051101.64 5-11-200

Calibration Date Range: 7/1/2004 18:40 7/2/2004 0:33

Operator:

Dilution: 1

Approved____________________ Date____________________


Response [mV]
900
800
700
600
500
400
300
200
100
0
P
P
OTP
0
2
4
6
8
10
12
14
16
18
Time [min]

CHROMATOGRAM REPORT

EPA Method 8260B 03/12/04 3900 E

Lab File ID: c:\varianws\data\200404\040504\sa-so-4-04-0056-008 4-6-2004 1;04;

Acquisition Date: 4/6/2004 1:04

EPA Sample No: sa-so-4-04

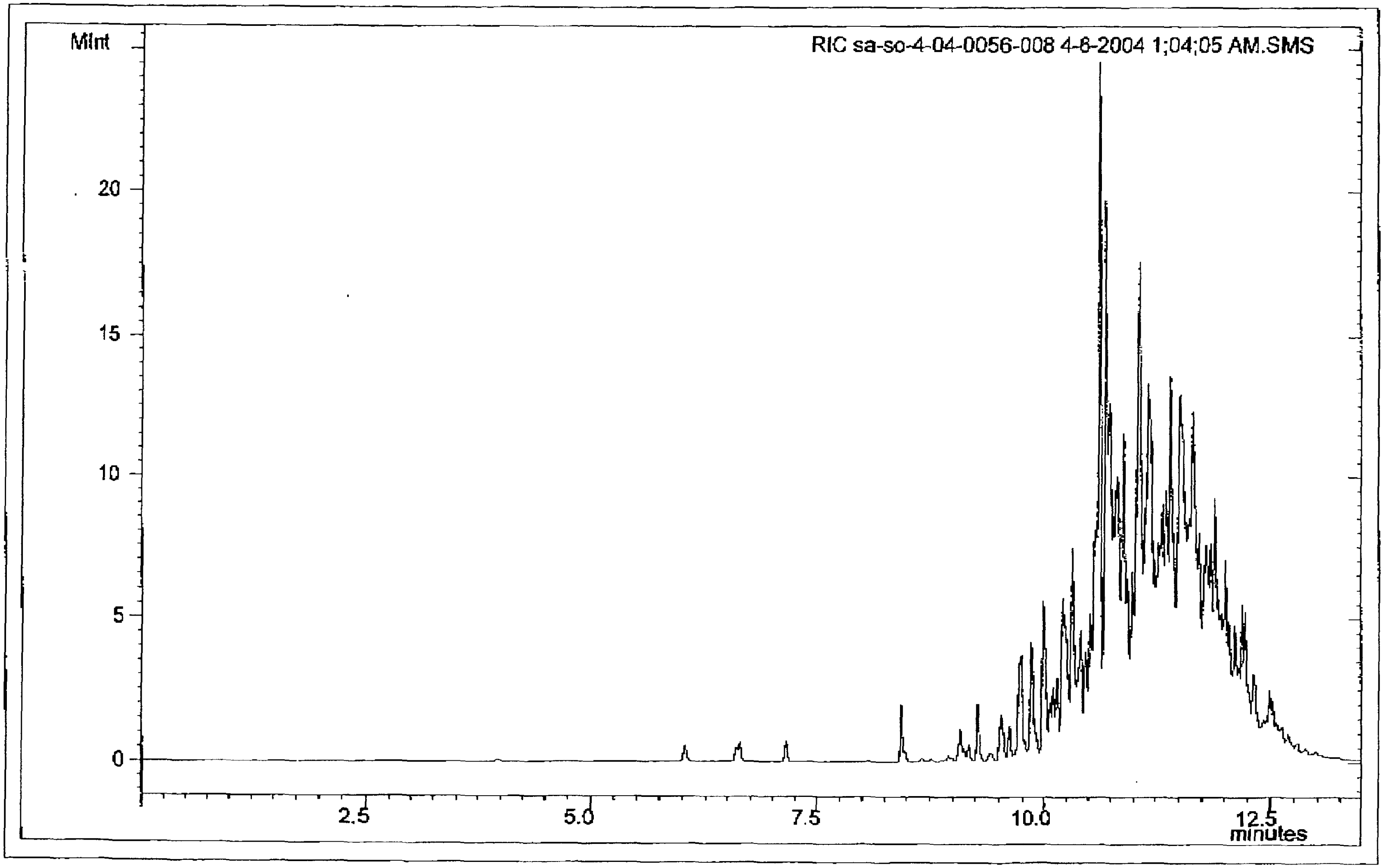
Lab Sample ID: sa-so-4-04-0056-008

Calibration File: C:\VarianWS\data\200401\012804\100ng surr 1-28-2004 2;45;58 PI

Calibration Date Range: 1/28/200 14:45 3/12/2004 12:27

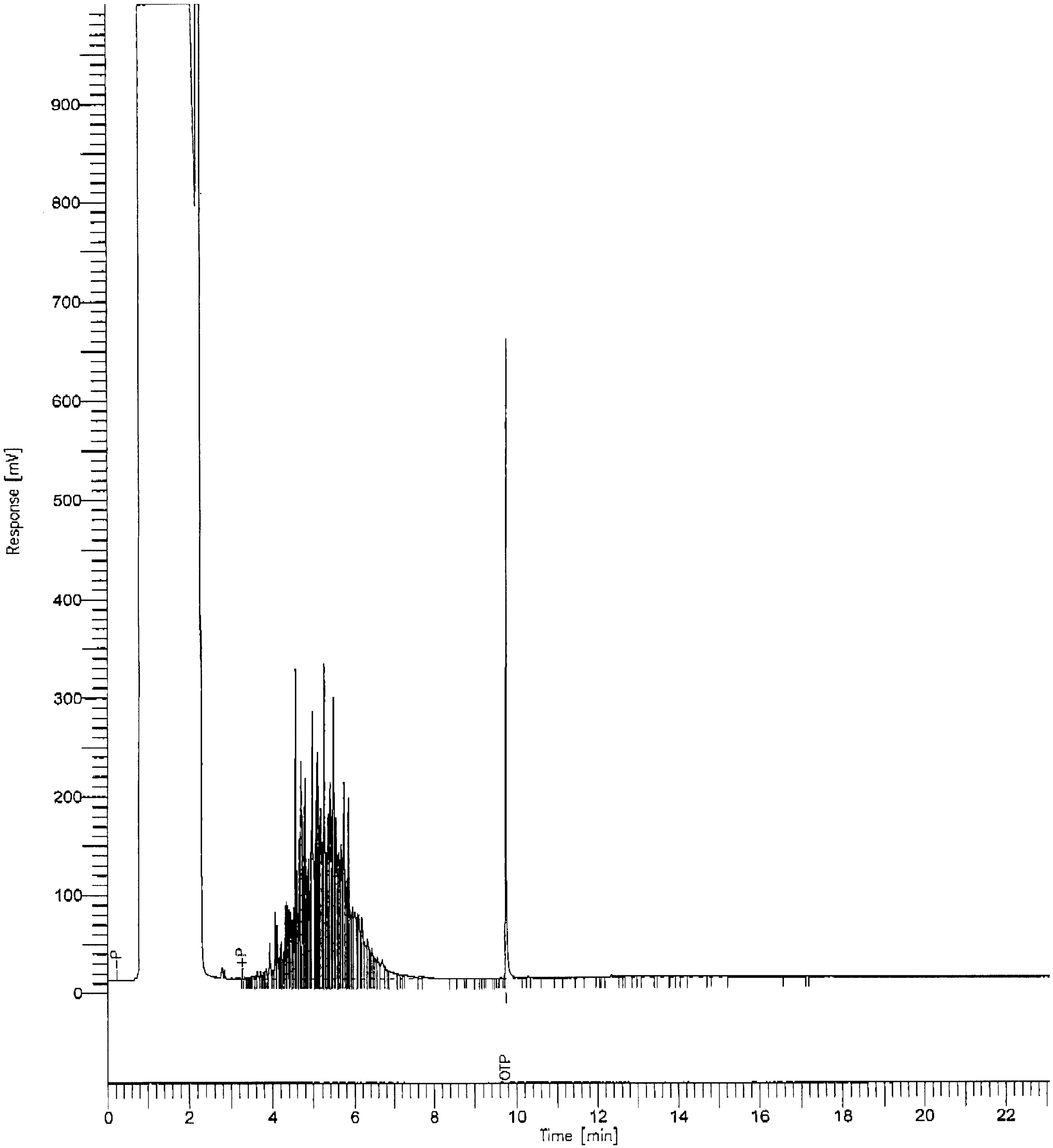
Operator: tl-sf

Dilution: 1



Approved______________________________ Date____________________

Oak Walk Site, Emeryville, CA

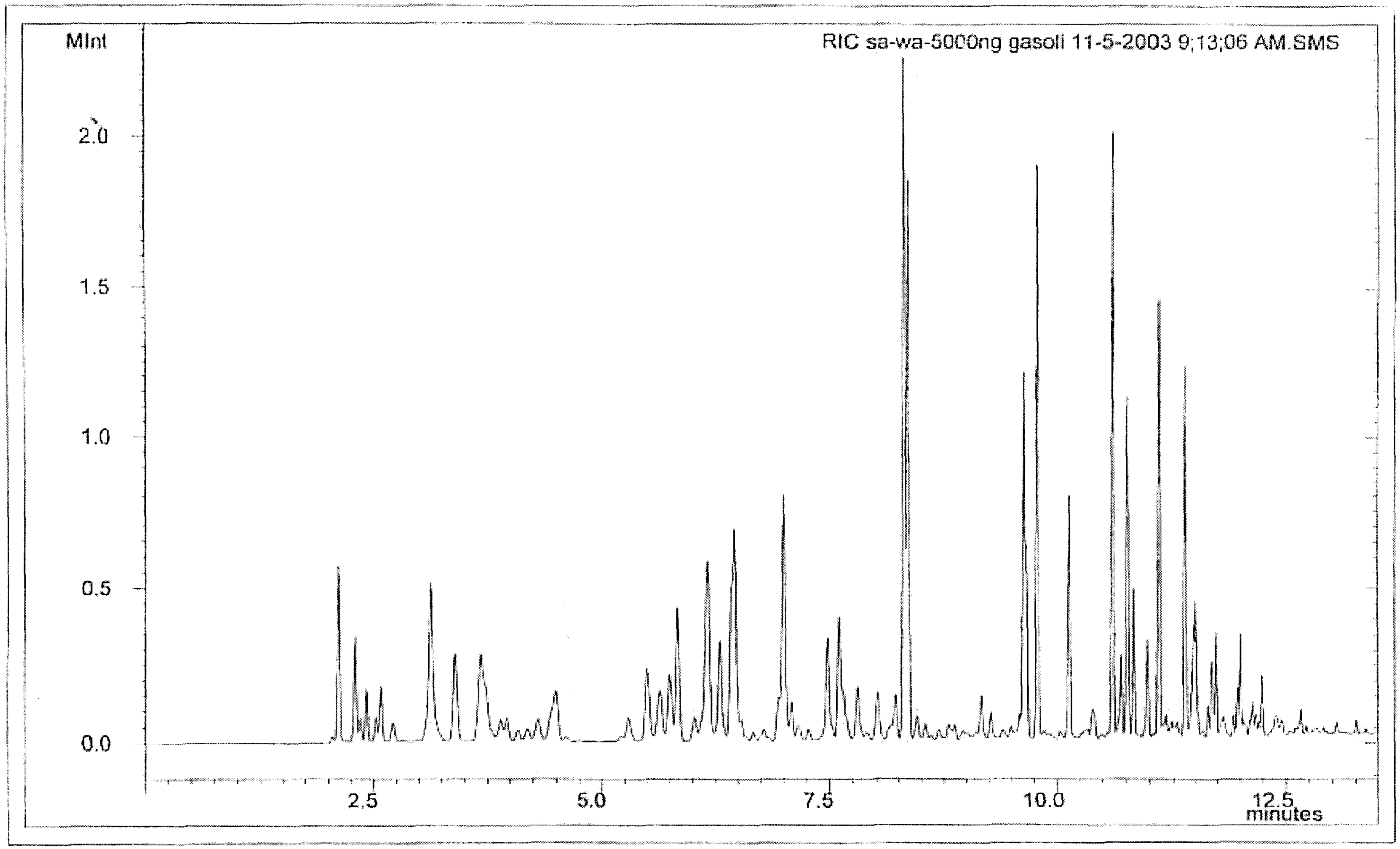


DEC

CHROMATOGRAM REPORT

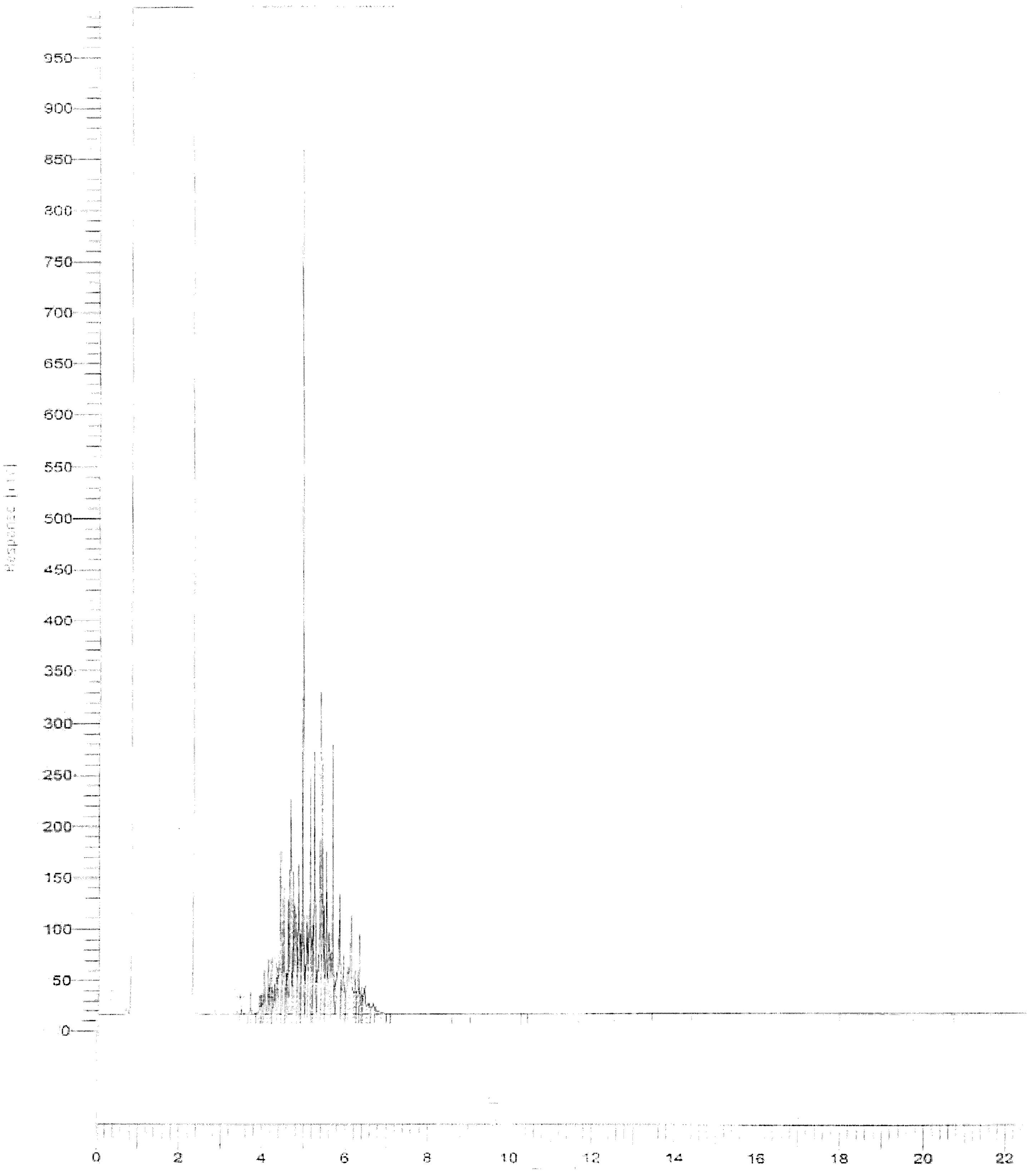
EPA Method 8260B FUOXY 041703

Lab File ID: c:\saturnws\data\200311\110503\sa-wa-5000ng gasoli 11-5-2003 9;13
Calibration File: C:\SaturnWS\data\200304\041703\5_25NG FUOXY 4-17-2003 2;1
Acquisition Date: 11/5/2003 9:13
Calibration Date Range: 4/17/200 14:13 4/17/2003 16:47
EPA Sample No: sa-wa-5000
Operator:
Lab Sample ID: sa-wa-5000ng gasoli
Dilution: 1



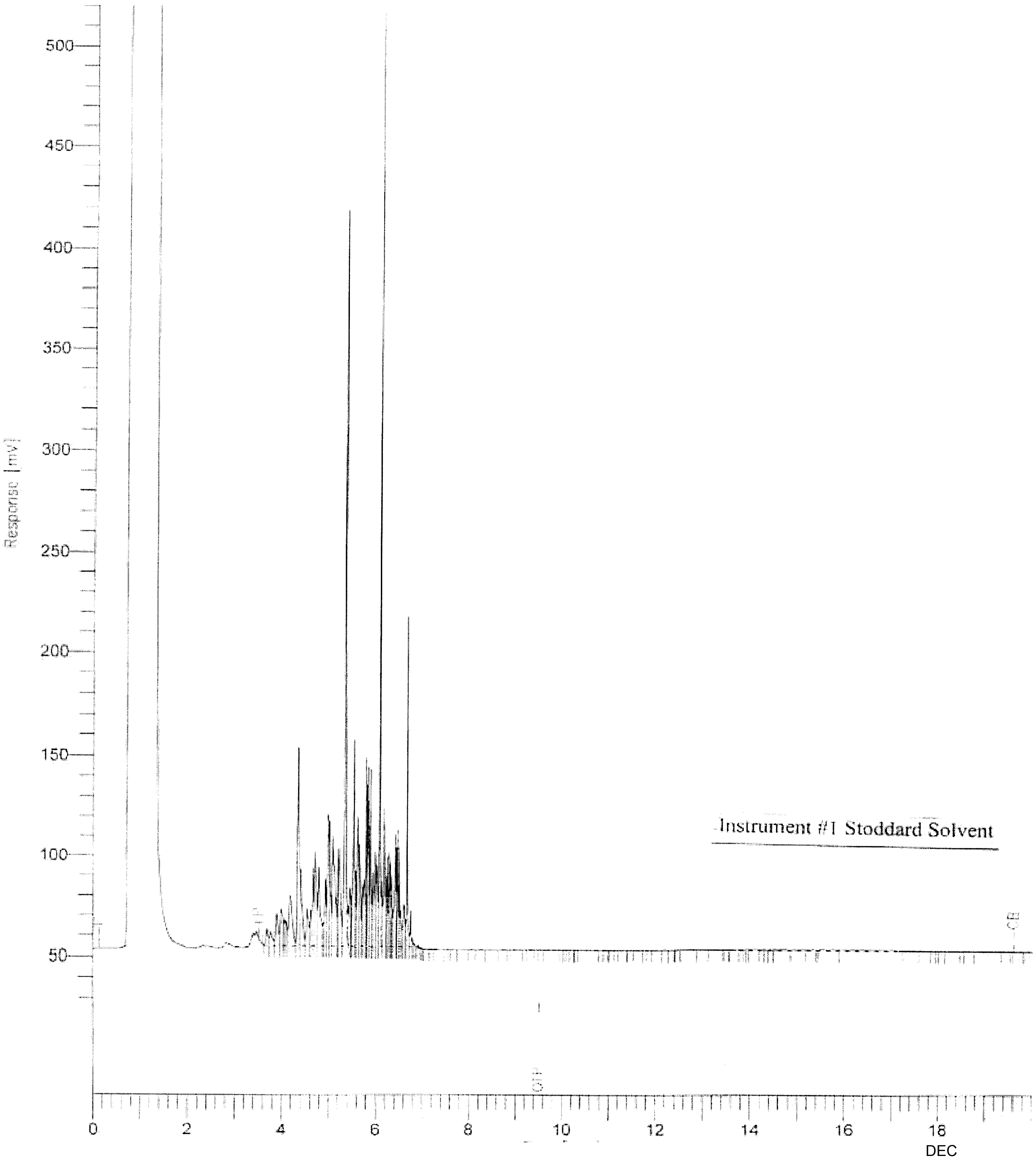
Approved________________ Date________________

Oak Walk Site, Emeryville, CA

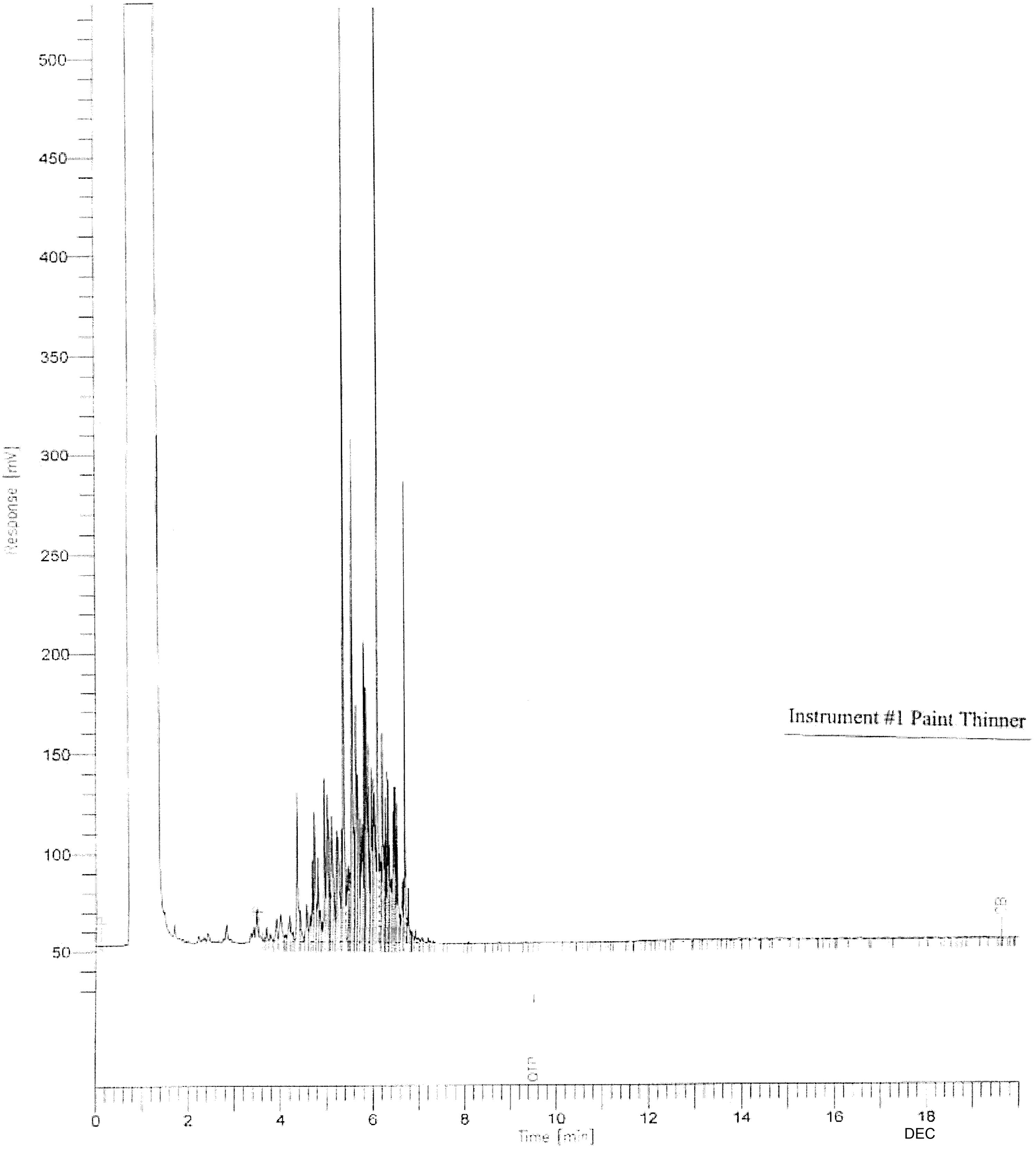


DEC

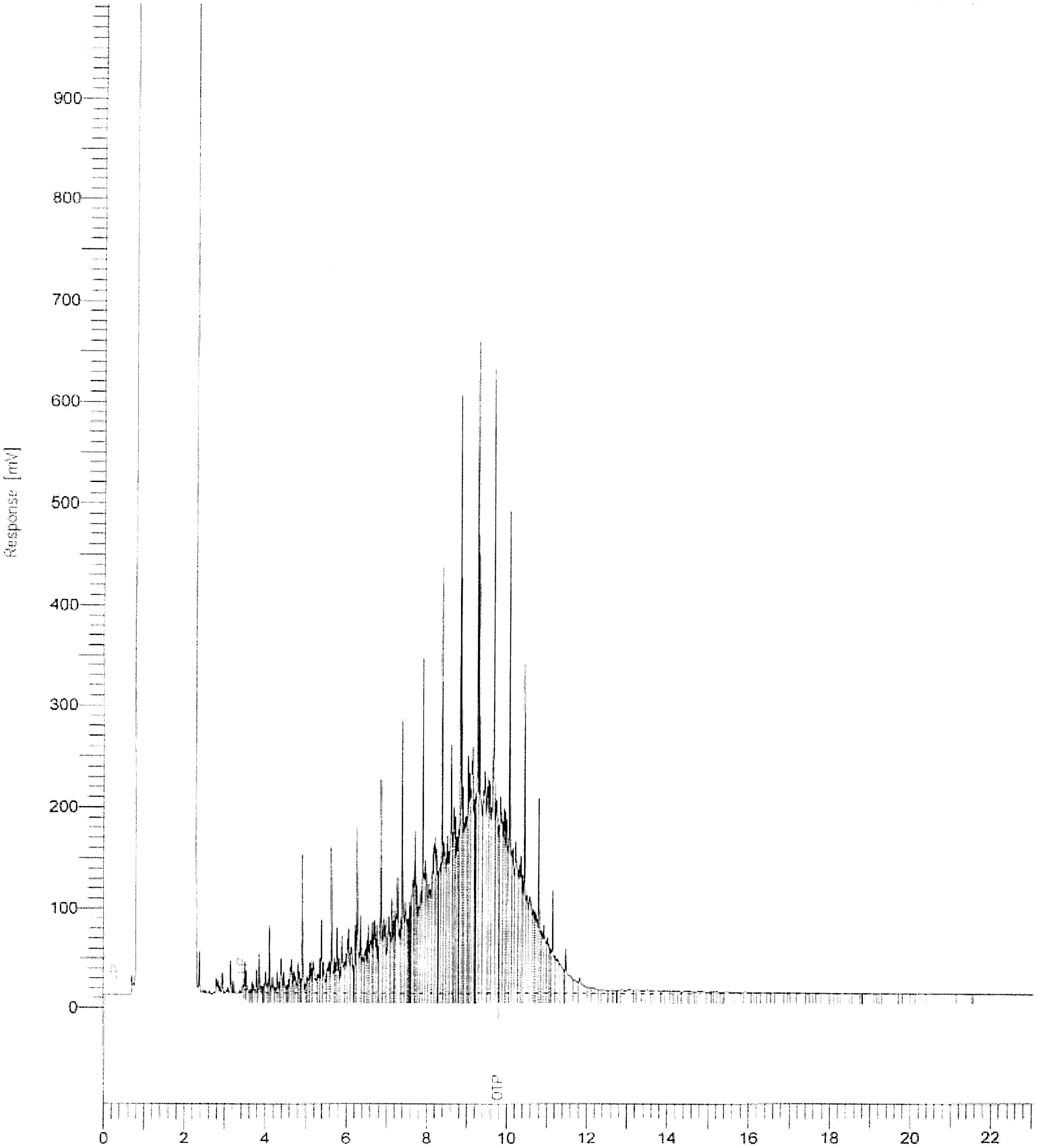
Oak Walk Site, Emeryville, CA



Oak Walk Site, Emeryville, CA



Oak Walk Site, Emeryville, CA



DEC

APPENDICES

DEC

APPENDIX A

Sanborn® Maps

EDR™ Environmental Data Resources Inc

"Linking Technology with Tradition"®

Sanborn® Map Report

Ship To: Dai Watkins
The San Joaquin Company
1120 Hollywood Avenue
Oakland, CA 94602

Order Date: 9/23/2004 **Completion Date:** 9/24/2004
Inquiry #: 1274549.1s
P.O. #: NA
Site Name: Bay Rock Oak Walk
Address: 4070 San Pablo Avenue
City/State: Emeryville, CA 94608
Cross Streets:

Customer Project: 0004.081
2013847SHA 510-336-9118

Based on client-supplied information, fire insurance maps for the following years were identified

1903 - 1 Map
1911 - 1 Map
1951 - 1 Map
1952 - 1 Map
1967 - 1 Map
1969 - 1 Map

Limited Permission to Photocopy Total Maps: 6

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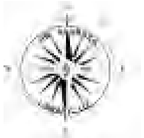
Sanborn Map Abbreviations

"Linking technology with tradition"®



Abbreviation	Meaning
A	Automobile (usually designates the location of a garage)
A in B	Automobile located in basement
A S	Automatic sprinkler
Abv	Above
ACS	Automatic chemical sprinkler
AFA	Automatic fire alarm
Agr	Agricultural
Appts	Apparatus
Apts	Apartments
Asb Cl	Asbestos clad
Att'd	Attended
Aud'it'm	Auditorium
Auto Ho	Automobile house, or garage
B	Basement, boiler or occasionally brick
B& S	Boots and shoes
BPOE	Benevolent & Protective Order of Elks
B Sm	Blacksmith
B'ld'g	Building
B'lr.	Boiler
B's't	Basement
Bak'y	Bakery
Balc	Balcony
Bap	Baptist
Bbl	Barrel
Bbls	Barrels
BE	Brick enclosed elevator
Bill'ds	Billiards
Bl Sm	Blacksmith
Blk Sm	Blacksmith
Bst	Basement
C B	Cement brick or concrete block construction
C Br	Concrete brick or cement block construction
Cap'cy	Capacity
Carptr	Carpenter
CBET	Concrete enclosed elevator with traps
Chem	Chemical
Chinaw	Chinaware or porcelain
Chine	Chinese
Cl	Clad
Clo	Clothing
Co	Company
Comp	Composition construction (i.e. stucco) or compressor
Conc	Concrete
Conf'y	Confectionary (candy store)
Confec'y	Confectionary (candy store)
Constr'n	Construction
Corp'n	Corporation
D	Dwelling
DH	Double (fire) hydrant
DG	Dry goods
Drs	Doctor's office
Dwg	Dwelling
E	Open elevator
E Fl	Each Floor
El	Electric
Elec	Electrician
Eng	Engine
Ent	Entertainment
Episc'l	Episcopal
ESC	Elevator with self-closing traps
ET	Elevator with traps
Exch	Telephone exchange
Expr	Express (as used to designate a delivery service)
F	Flat (as used to designate a delivery service)
FA	Fire alarm
FE	Fire escape
F Pump	Fire pump
Fill'g Sta	Filling station, or gas station
Fl	Floor
Fr Attic	Frame constructed attic
Frat	Fraternity
Fur	Furnishings
Furn'g	Furnishings
Furne	Furniture
GAR	Grand Army of the Republic
GT	Gasoline tank
Gal	Gallery
Gall	Gallery
Gall'y	Gallery
Gen'l	General (as used to designate a general store)
Gents	Gentlemen's
Greas'g	Greasing
Gro	Grocery or groceries

Abbreviation	Meaning
HPFS	High pressure fire service
H'dw	Hardware
Hack	Hackney or delivery service
Hardw	Hardware
Ho	Hotel or house (as used to designate a warehouse)
Htr	Heater
Hyd	Hydrant
ICRR	Illinois Central Railroad
Imp	Implements
Ins	Insurance
Insts	Instruments
Ir Cl	Iron clad
K of C	Knights of Columbus
Lab	Laboratory
Lodg'g	Lodging
Luth	Lutheran
Luth'n	Lutheran
ME	Methodist Episcopal
Mach'y	Machinery
Mak'r	Maker
Manf'y	Manufactory or factory
Mdse	Merchandise
Mfy	Manufactory or factory
Mill'y	Millinery
Mkg	Making
Mo	Motor
NS	Not sprinklered
OU	Open under
Off	Office
PO	Post office
Paint'g	Painting
Pat Med	Patent medicines
Plumb'g	Plumbing
Print'g	Printing
QH	Quadruple (fire) hydrant
RC	Roman Catholic
R'f	Roof
R'm	Room
Rep	Repair
Rep'g	Repairing
Repos'ry	Repository
Restr't	Restaurant
Rf	Roof
Rm	Room
S	Store
SA	Spark arrestor
S Vac	Store portion of building is vacant
Sal	Saloon
Sky'ts	Skylights
Sm	Smith, as in gunsmith or blacksmith
Sm Ho	Smokehouse
Sp'k'l'rs	Sprinklers
St'ge	Storage
St'y	Story
Sta	Station
Stat'y	Stationery
TH	Triple (fire) hydrant
Tel	Telephone
Tenem'ts	Tenements
TESC	Tile enclosed elevator with self-closing traps
Tinw	Tinware
Trimm'g	Trimming
U	Upright
Up	Upright
VP	Vertical pipe
Vac	Vacant
Ven'd	Veneered
Ven'r'd	Veneered
W	Ware, as in warehouse or wareroom
WC	Water closet or toilet
WG	Wire glass skylights
W Ho	Warehouse
WPA	Works Progress Administration
W'ks	Works
Whol	Wholesale
Wkg	Working
Woodwkg	Woodworking

Environmental Data Resources, Inc.

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Sanborn Map Legend

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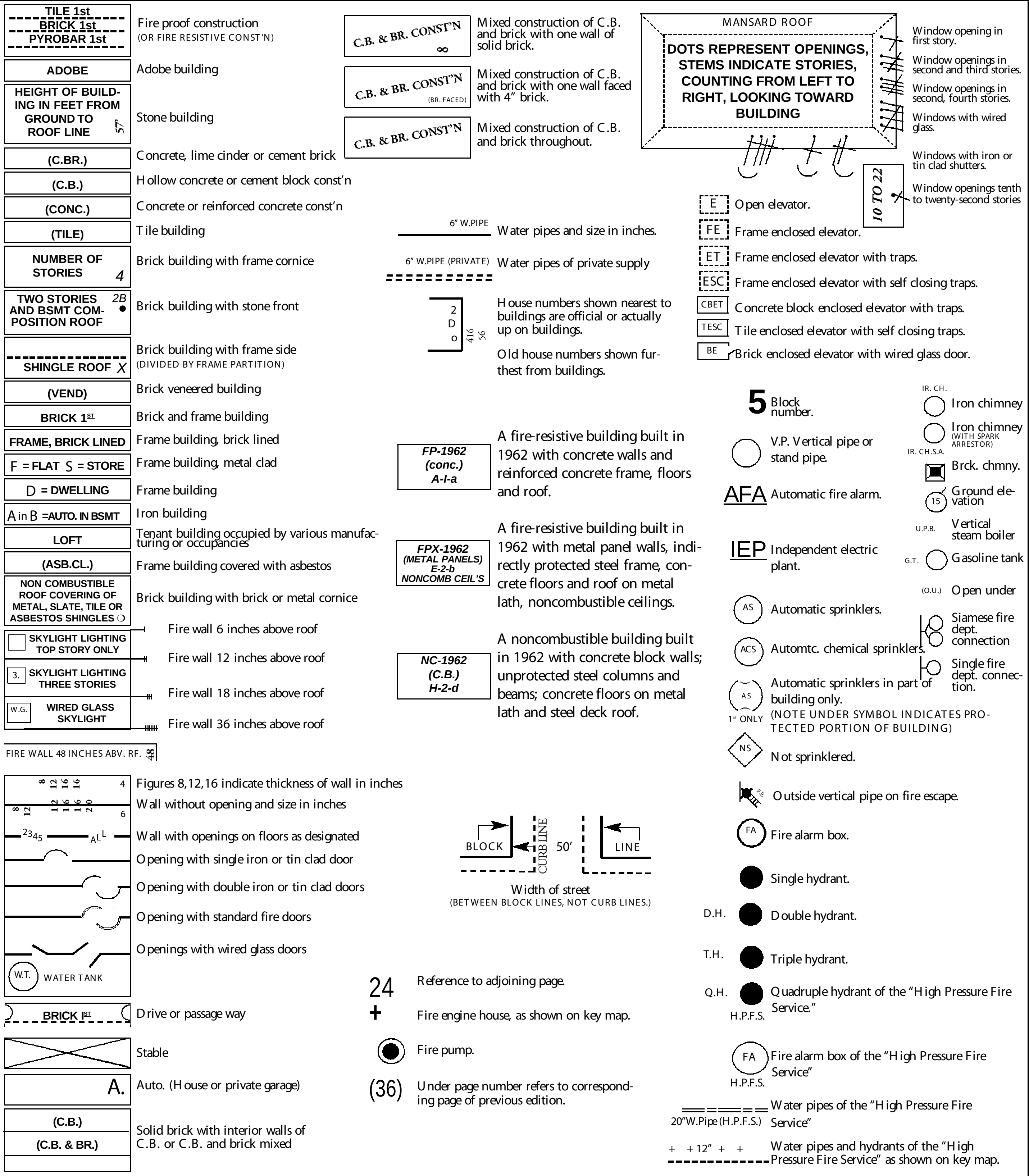

TILE 1st BRICK 1st PYROBAR 1st	Fire proof construction (OR FIRE RESISTIVE CONST'N)
ADOBE	Adobe building
HEIGHT OF BUILDING IN FEET FROM GROUND TO ROOF LINE 57'	Stone building
(C.BR.)	Concrete, lime cinder or cement brick
(C.B.)	Hollow concrete or cement block const'n
(CONC.)	Concrete or reinforced concrete const'n
(TILE)	Tile building
NUMBER OF STORIES 4	Brick building with frame cornice
TWO STORIES AND BSMT COMPOSITION ROOF 2B	Brick building with stone front
SHINGLE ROOF X	Brick building with frame side (DIVIDED BY FRAME PARTITION)
(VEND)	Brick veneered building
BRICK 1ST	Brick and frame building
FRAME, BRICK LINED	Frame building, brick lined
F = FLAT S = STORE	Frame building, metal clad
D = DWELLING	Frame building
A in B =AUTO. IN BSMT	Iron building
LOFT	Tenant building occupied by various manufacturing or occupancies
(ASB.CL.)	Frame building covered with asbestos
NON COMBUSTIBLE ROOF COVERING OF METAL, SLATE, TILE OR ASBESTOS SHINGLES	Brick building with brick or metal cornice
	Fire wall 6 inches above roof
SKYLIGHT LIGHTING TOP STORY ONLY	Fire wall 12 inches above roof
3. SKYLIGHT LIGHTING THREE STORIES	Fire wall 18 inches above roof
W.G. WIRED GLASS SKYLIGHT	Fire wall 36 inches above roof
FIRE WALL 48 INCHES ABV. RF. 48	
8 12 16 16 4	Figures 8,12,16 indicate thickness of wall in inches
8 12 16 16 20 6	Wall without opening and size in inches
2345 AL L	Wall with openings on floors as designated
	Opening with single iron or tin clad door
	Opening with double iron or tin clad doors
	Opening with standard fire doors
	Openings with wired glass doors
W.T. WATER TANK	
BRICK 1ST	Drive or passage way
	Stable
A.	Auto. (House or private garage)
(C.B.) (C.B. & BR.)	Solid brick with interior walls of C.B. or C.B. and brick mixed

C.B. & BR. CONST'N ∞	Mixed construction of C.B. and brick with one wall of solid brick.
C.B. & BR. CONST'N (BR. FACED)	Mixed construction of C.B. and brick with one wall faced with 4" brick.
C.B. & BR. CONST'N	Mixed construction of C.B. and brick throughout.
6" W.PIPE	Water pipes and size in inches.
6" W.PIPE (PRIVATE)	Water pipes of private supply
2 D o 416 56	House numbers shown nearest to buildings are official or actually up on buildings. Old house numbers shown furthest from buildings.
FP-1962 (conc.) A-I-a	A fire-resistive building built in 1962 with concrete walls and reinforced concrete frame, floors and roof.
FPX-1962 (METAL PANELS) E-2-b NONCOMB CEIL'S	A fire-resistive building built in 1962 with metal panel walls, indirectly protected steel frame, concrete floors and roof on metal lath, noncombustible ceilings.
NC-1962 (C.B.) H-2-d	A noncombustible building built in 1962 with concrete block walls; unprotected steel columns and beams; concrete floors on metal lath and steel deck roof.
BLOCK 50' LINE CURB LINE	Width of street (BETWEEN BLOCK LINES, NOT CURB LINES.)
24	Reference to adjoining page.
+	Fire engine house, as shown on key map.
	Fire pump.
(36)	Under page number refers to corresponding page of previous edition.

MANSARD ROOF

DOTS REPRESENT OPENINGS, STEMS INDICATE STORIES, COUNTING FROM LEFT TO RIGHT, LOOKING TOWARD BUILDING

	Window opening in first story.
	Window openings in second and third stories.
	Window openings in second, fourth stories.
	Windows with wired glass.
	Windows with iron or tin clad shutters.
10 TO 22	Window openings tenth to twenty-second stories
E	Open elevator.
FE	Frame enclosed elevator.
ET	Frame enclosed elevator with traps.
ESC	Frame enclosed elevator with self closing traps.
CBET	Concrete block enclosed elevator with traps.
TESC	Tile enclosed elevator with self closing traps.
BE	Brick enclosed elevator with wired glass door.
5	Block number.
	V.P. Vertical pipe or stand pipe.
AFA	Automatic fire alarm.
IEP	Independent electric plant.
AS	Automatic sprinklers.
ACS	Automtc. chemical sprinklers.
AS 1ST ONLY	Automatic sprinklers in part of building only. (NOTE UNDER SYMBOL INDICATES PROTECTED PORTION OF BUILDING)
NS	Not sprinklered.
F.E.	Outside vertical pipe on fire escape.
FA	Fire alarm box.
●	Single hydrant.
D.H. ●	Double hydrant.
T.H. ●	Triple hydrant.
Q.H. ● H.P.F.S.	Quadruple hydrant of the "High Pressure Fire Service."
FA H.P.F.S.	Fire alarm box of the "High Pressure Fire Service"
20"W.Pipe (H.P.F.S.)	Water pipes of the "High Pressure Fire Service"
+ +12" + +	Water pipes and hydrants of the "High Pressure Fire Service" as shown on key map.
IR. CH.	Iron chimney
	Iron chimney (WITH SPARK ARRESTOR)
IR. CH.S.A.	Brck. chmny.
15	Ground elevation
U.P.B.	Vertical steam boiler
G.T.	Gasoline tank
(O.U.)	Open under
	Siamese fire dept. connection
	Single fire dept. connection.

CODING OF STRUCTURAL UNITS FOR FIREPROOF AND NON-COMBUSTIBLE BUILDINGS

FRAMING

CODE	STRUCTURAL UNIT
A.	Reinforced Concrete Frame.
B.	Reinforced Concrete Joists, Columns, Beams, Trusses, Arches, Masonry Piers.
C.	Protected Steel Frame.
D.	Individually Protected Steel Joists, Columns, Beams, Trusses, Arches.
E.	Indirectly Protected Steel Frame.
F.	Indirectly Protected Steel Joists, Columns, Beams, Trusses, Arches.
G.	Unprotected Steel Frame.
H.	Unprotected Steel Joists, Columns, Beams, Trusses, Arches.
O.	Masonry Bearing Walls.

The coding for framing, floor and roof structural units as shown above is used in describing the construction of fire-resistive buildings. In addition, reports for fire-resistive buildings will show the date built and wall construction when other than brick.

FP buildings have masonry floors and roof; concrete and/or directly or indirectly protected steel framing; and clay brick, stone or poured concrete walls.

FPX buildings are FP buildings with inferior walls such as concrete block, cement brick, metal or glass panels, etc.

NC buildings have unprotected steel framing and fire-resistive but non-masonry floors and roof.

FLOORS

CODE	STRUCTURAL UNIT
1.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Pre-cast Concrete or Gypsum Slabs or Planks.
2.	Concrete on Metal Lath, Incombustible Form Boards, Paper-backed Wire Fabric, Steel Deck, and Cellular, Ribbed or Corrugated Steel Units.
3.	Open Steel Deck or Grating.

LAND USE CODE APPLICABLE TO CHANGES DIAGRAMMED AFTER 5/69

R	RESIDENTIAL	M	MANUFACTURING
RT	RESIDENTIAL-TRANSIENT	P	PUBLIC OR INSTITUTIONAL
C	COMMERCIAL	U	UTILITY
W	WAREHOUSE	T	TRANSPORTATION

NUMERICAL PREFIX INDICATES THE NUMBER OF ESTABLISHMENTS IN EACH CATEGORY

ROOF

CODE	STRUCTURAL UNIT
a.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Reinforced Gypsum Concrete. Pre-cast Concrete or Gypsum Slabs or Planks.
b.	Concrete or Gypsum on Metal Lath, Incombustible Form Boards, Paper-backed Wire Fabric, Steel Deck, and Cellular, Ribbed or Corrugated Steel Units.
c.	Incombustible Composition Boards with or without Insulation. Masonry or Metal Tiles.
d.	Steel Deck, Corrugated Metal or Asbestos Protected Metal with or without Insulation.

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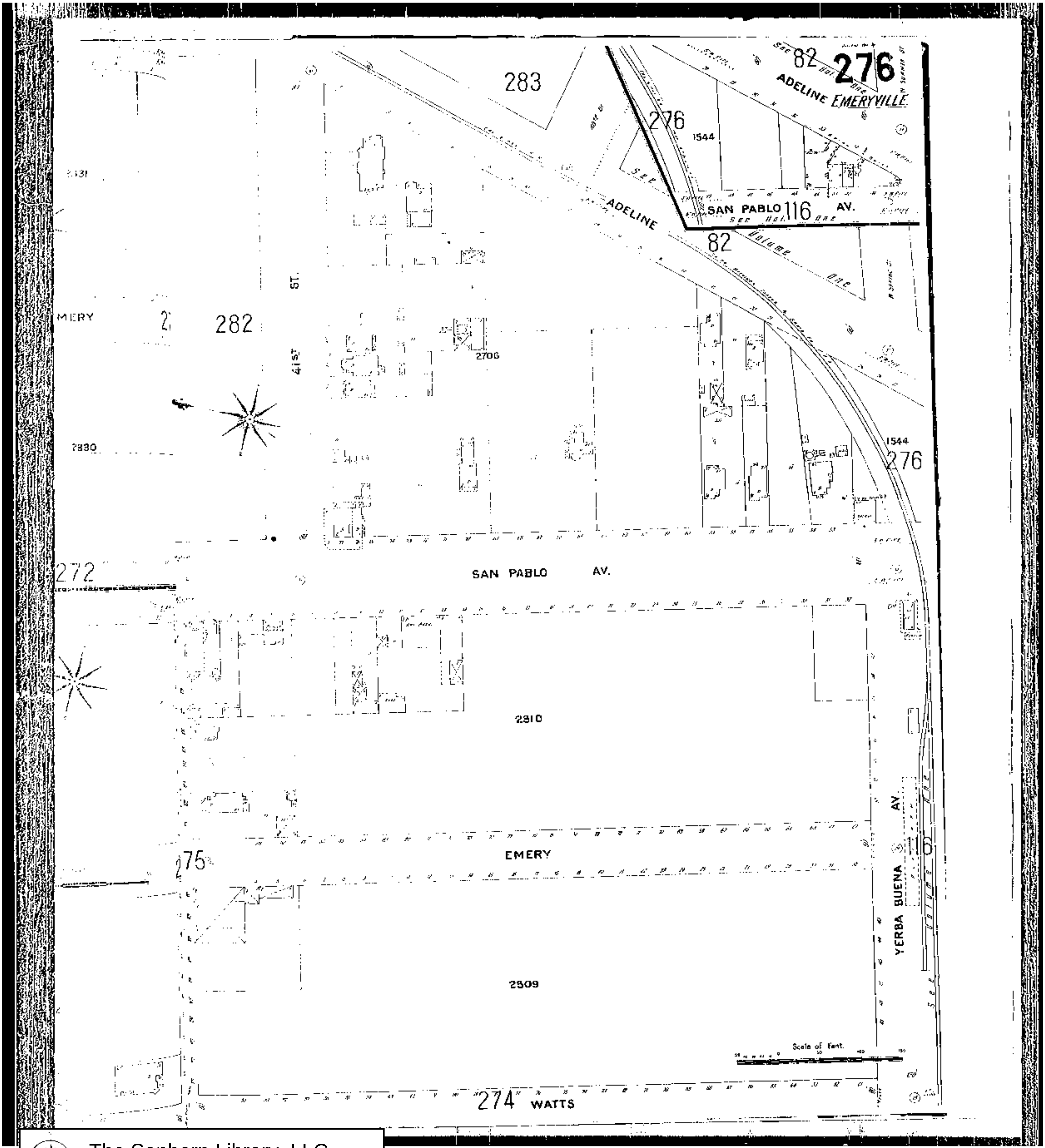

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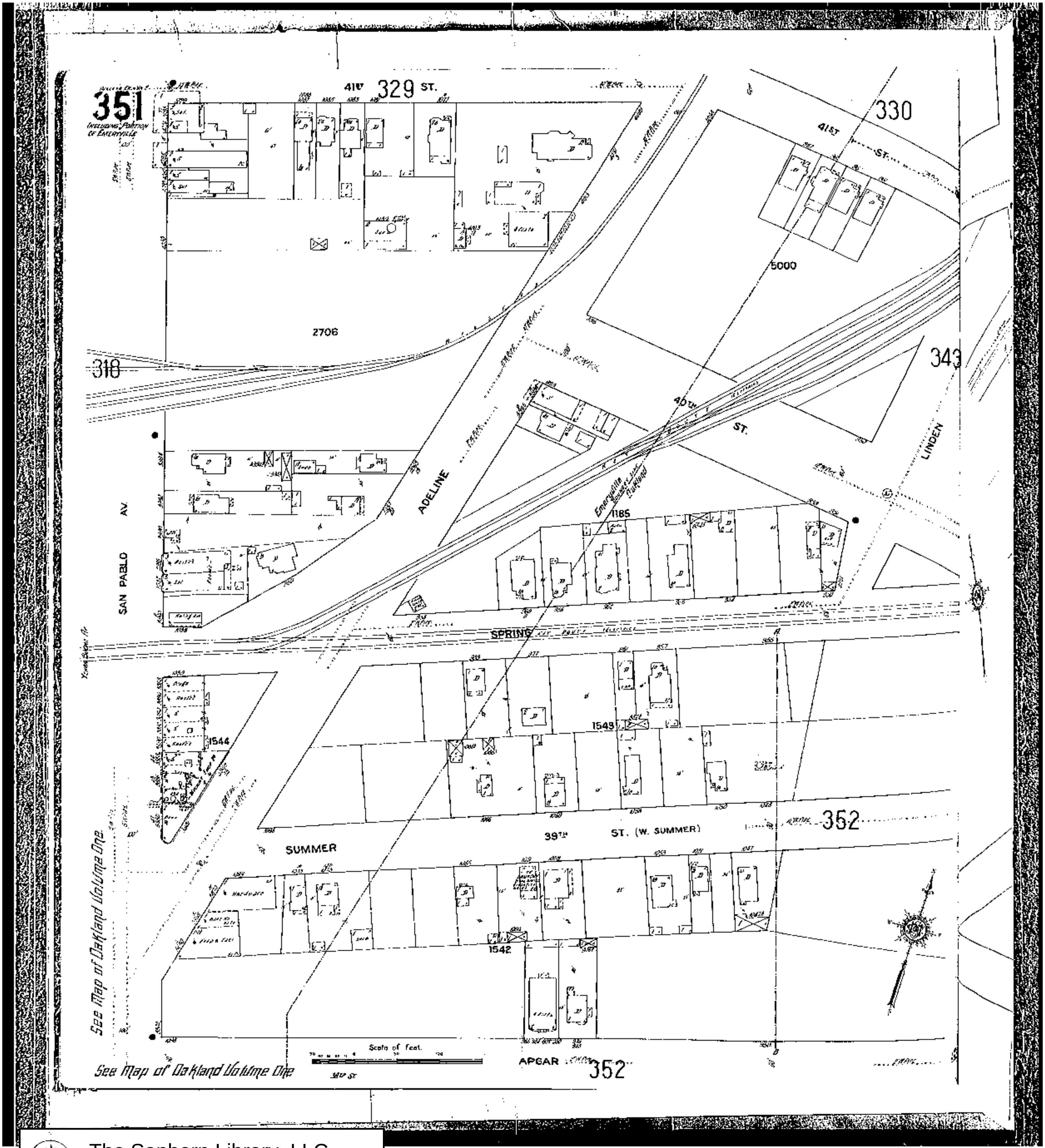

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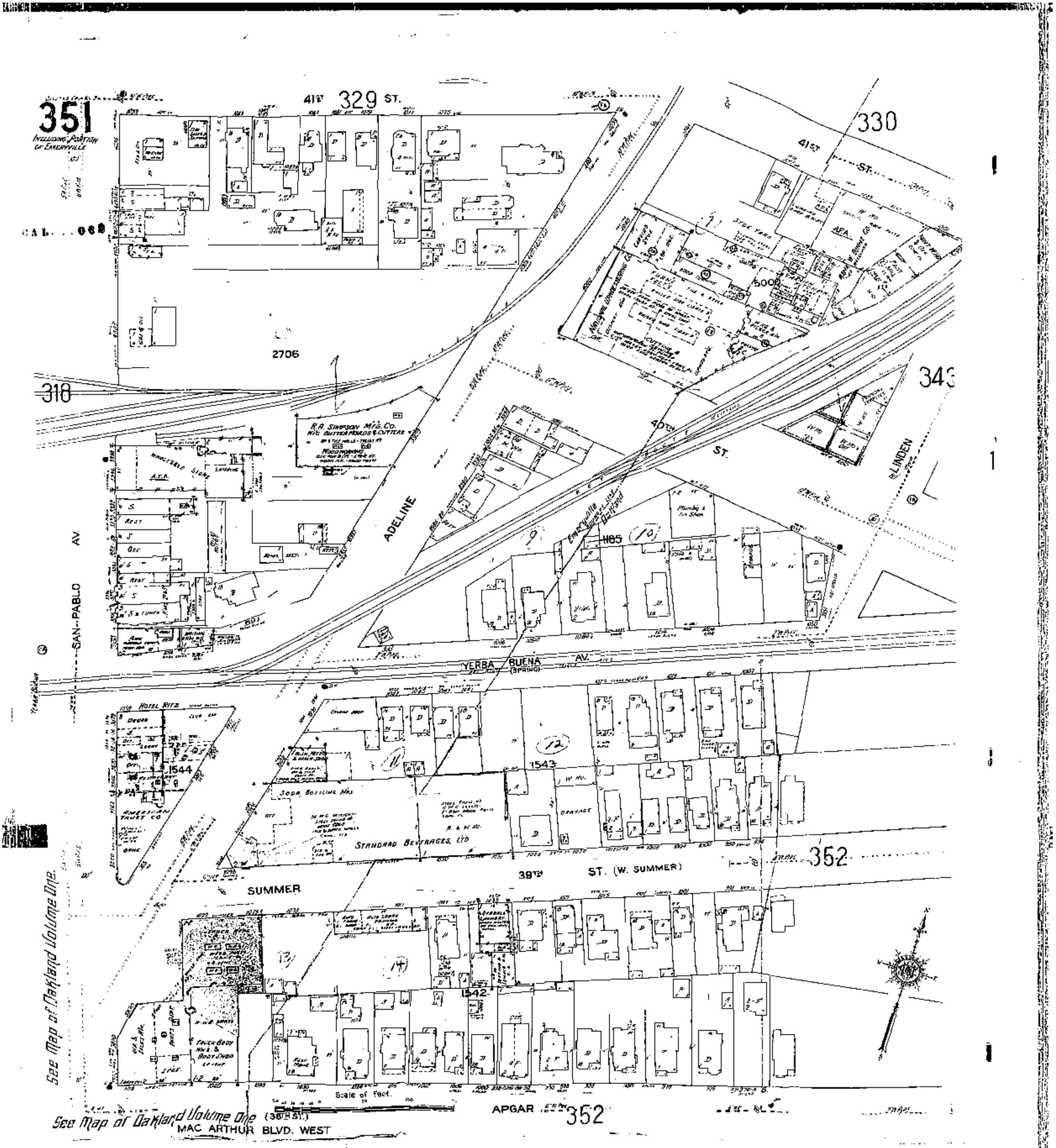

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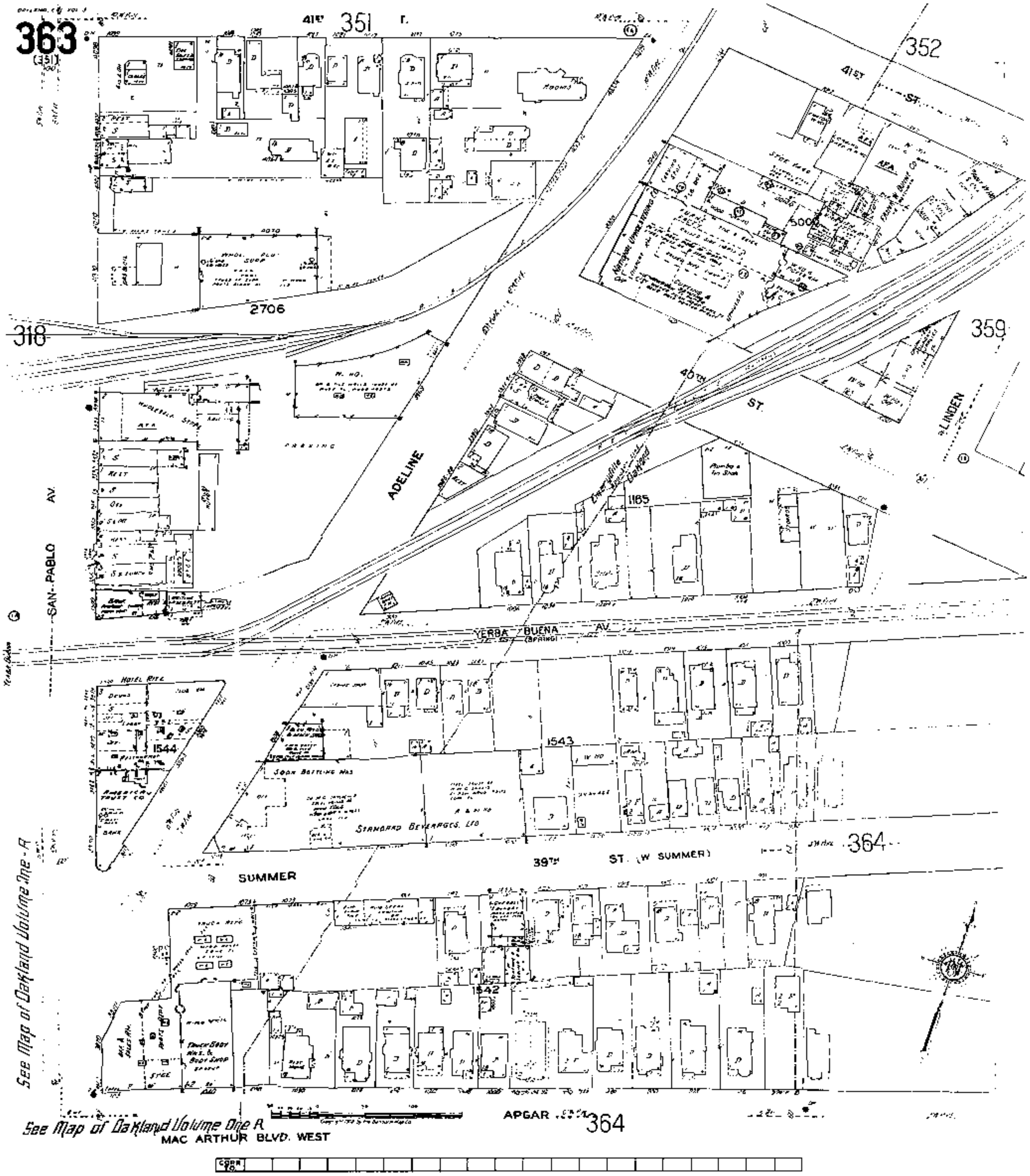
Year

EDR Research Associate



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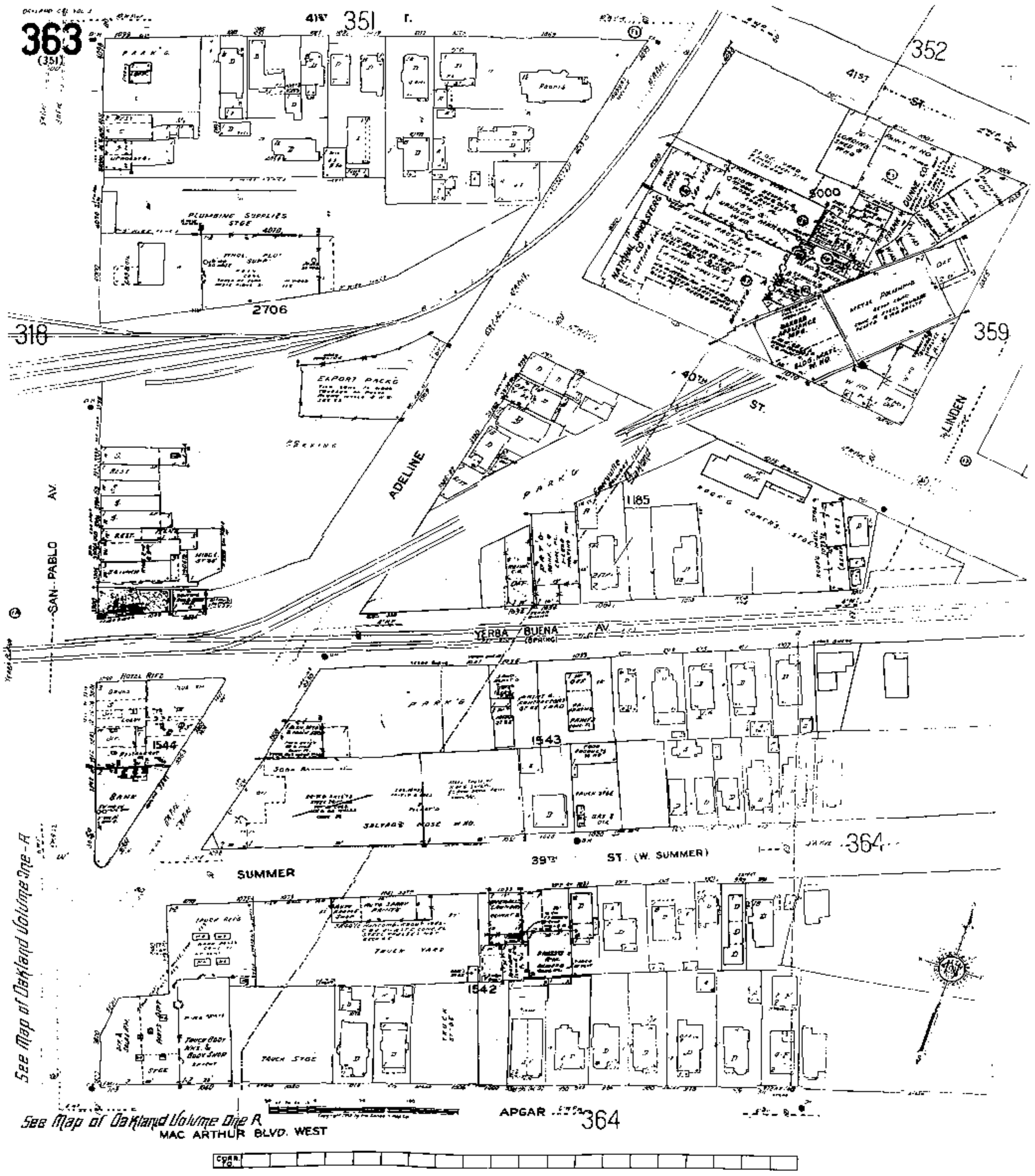
Year EDR Research Associate



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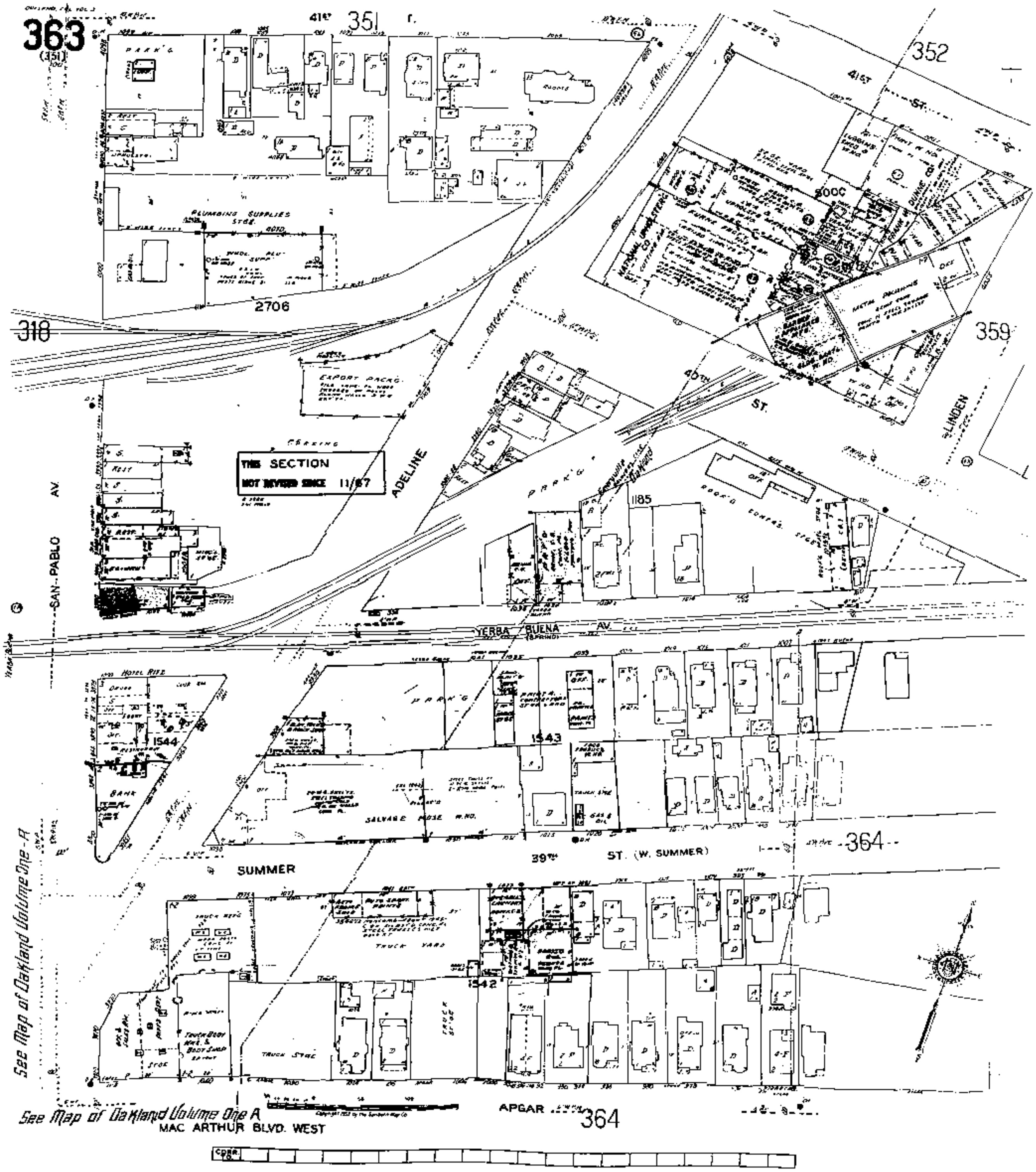

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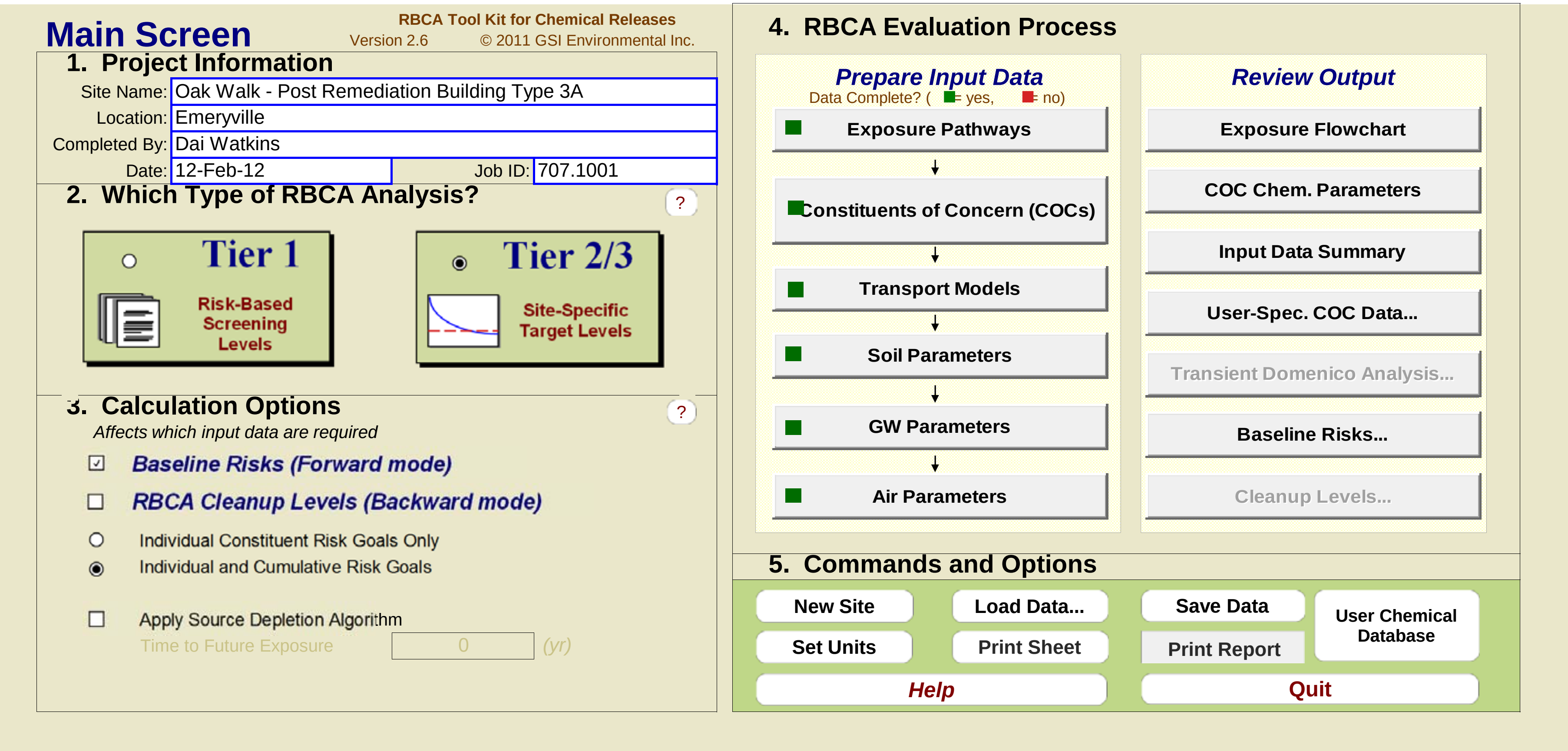
Year EDR Research Associate

APPENDIX B

Health Risk Assessment for Building Type 3A

RBCA Tool Kit for Chemical Releases, Version 2.6



Site Name: Oak Walk - Post Remediation Building Type 3A

Location: Emeryville

Completed By: Dai Watkins

Date: 12-Feb-12 Job ID: 707.1001

○ Tier 1

● Tier 2/3

☑ Baseline Risks (Forward mode)

☐ RBCA Cleanup Levels (Backward mode)

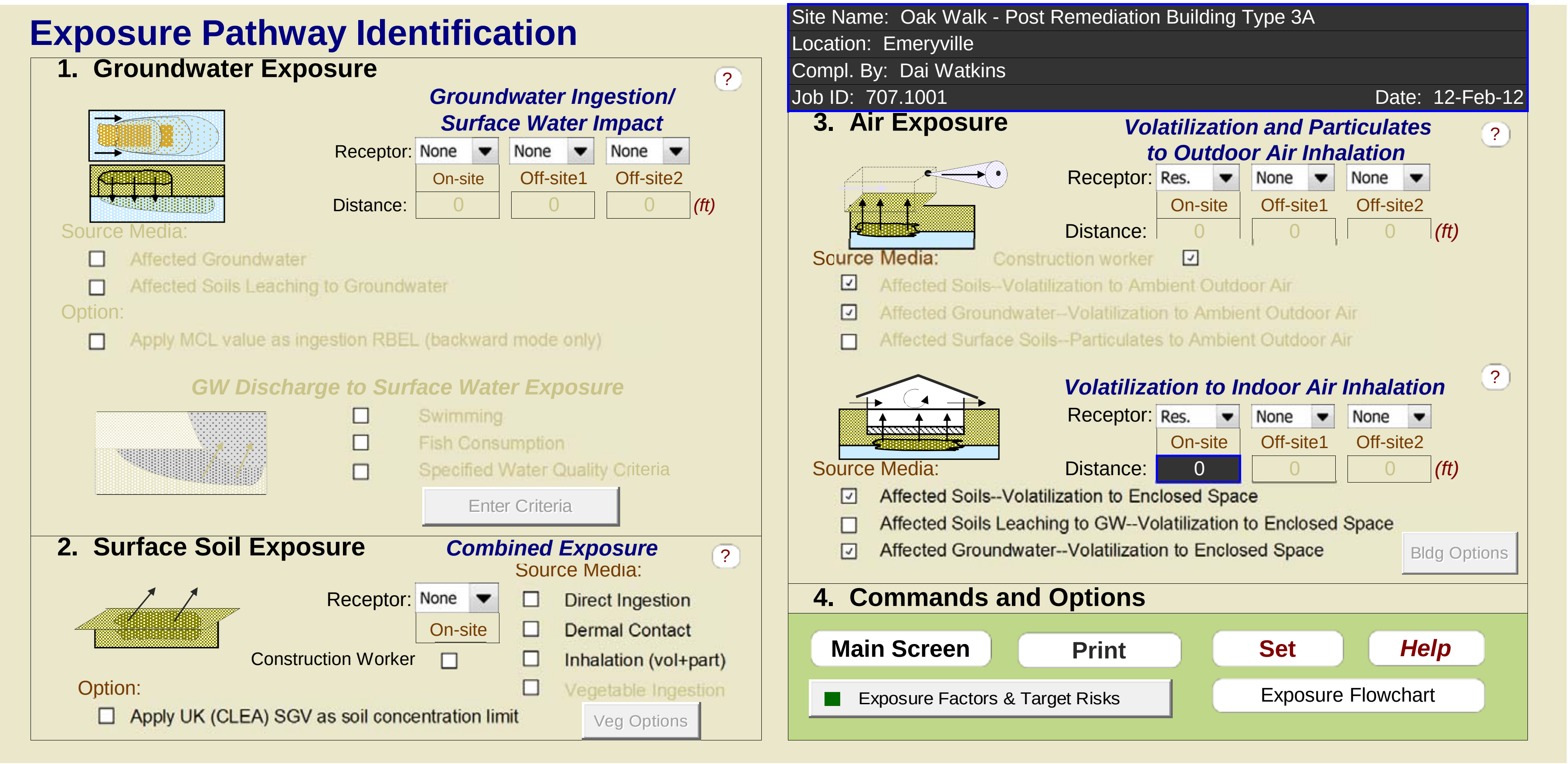
○ Individual Constituent Risk Goals Only

● Individual and Cumulative Risk Goals

☐ Apply Source Depletion Algorithm

Time to Future Exposure 0 (yr)

RBCA Tool Kit for Chemical Releases, Version 2.6



Exposure Pathway Identification

Site Name: Oak Walk - Post Remediation Building Type 3A
Location: Emeryville
Compl. By: Dai Watkins
Job ID: 707.1001
Date: 12-Feb-12

1. Groundwater Exposure

Groundwater Ingestion/ Surface Water Impact

	On-site	Off-site1	Off-site2	
Receptor:	None	None	None	
Distance:	0	0	0	(ft)

Source Media:
- ☐ Affected Groundwater
- ☐ Affected Soils Leaching to Groundwater

Option:
- ☐ Apply MCL value as ingestion RBEL (backward mode only)

GW Discharge to Surface Water Exposure

- ☐ Swimming
- ☐ Fish Consumption
- ☐ Specified Water Quality Criteria

2. Surface Soil Exposure

Combined Exposure

	On-site
Receptor:	None

Construction Worker ☐

Source Media:
- ☐ Direct Ingestion
- ☐ Dermal Contact
- ☐ Inhalation (vol+part)
- ☐ Vegetable Ingestion

Option:
- ☐ Apply UK (CLEA) SGV as soil concentration limit

3. Air Exposure

Volatilization and Particulates to Outdoor Air Inhalation

	On-site	Off-site1	Off-site2	
Receptor:	Res.	None	None	
Distance:	0	0	0	(ft)

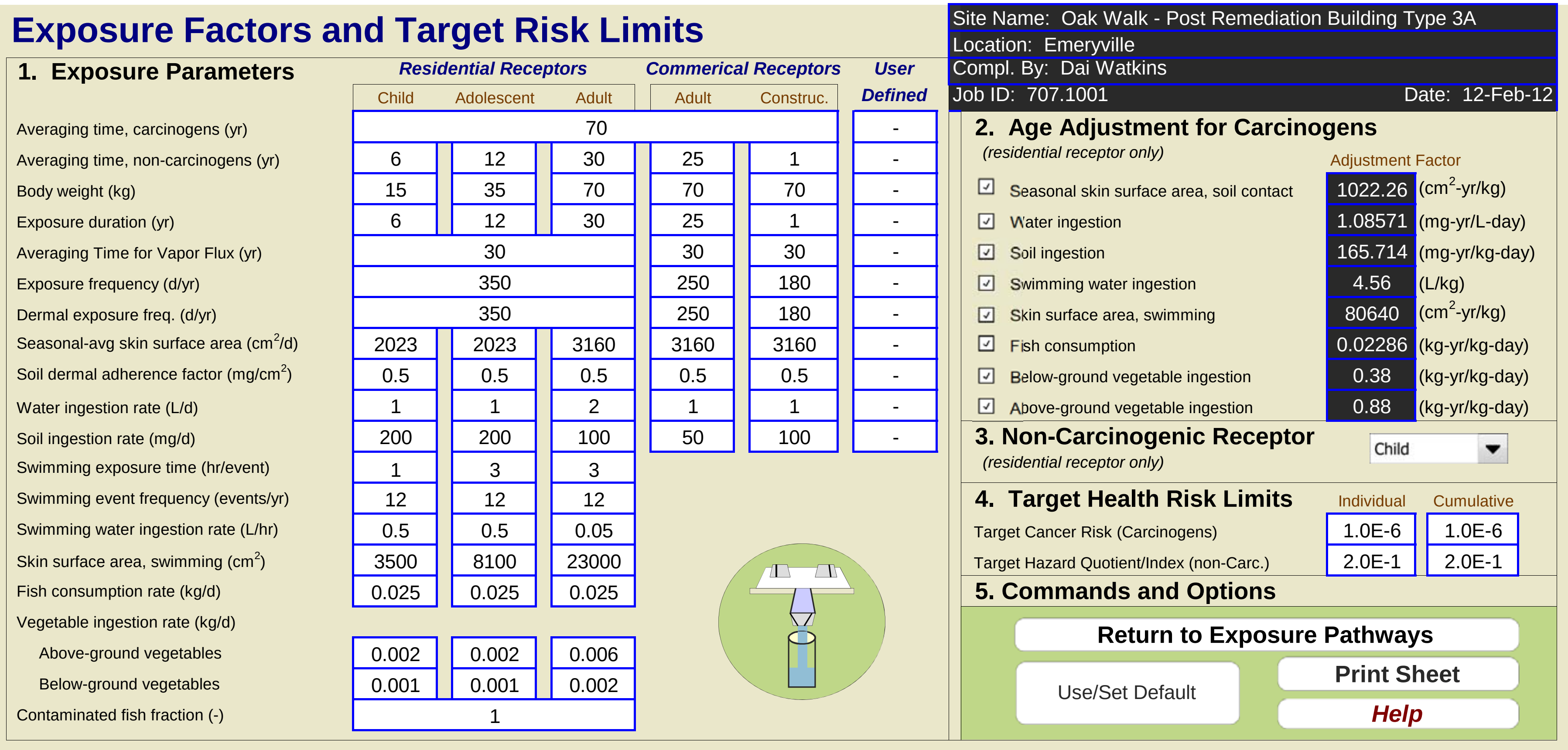
Source Media: Construction worker ☑
- ☑ Affected Soils--Volatilization to Ambient Outdoor Air
- ☑ Affected Groundwater--Volatilization to Ambient Outdoor Air
- ☐ Affected Surface Soils--Particulates to Ambient Outdoor Air

Volatilization to Indoor Air Inhalation

	On-site	Off-site1	Off-site2	
Receptor:	Res.	None	None	
Distance:	0	0	0	(ft)

Source Media:
- ☑ Affected Soils--Volatilization to Enclosed Space
- ☐ Affected Soils Leaching to GW--Volatilization to Enclosed Space
- ☑ Affected Groundwater--Volatilization to Enclosed Space

4. Commands and Options



Exposure Factors and Target Risk Limits

Site Name: Oak Walk - Post Remediation Building Type 3A
Location: Emeryville
Compl. By: Dai Watkins
Job ID: 707.1001
Date: 12-Feb-12

1. Exposure Parameters

	Residential Receptors			*Commerical Receptors*		*User Defined*
	Child	Adolescent	Adult	Adult	Construc.	
Averaging time, carcinogens (yr)	70					-
Averaging time, non-carcinogens (yr)	6	12	30	25	1	-
Body weight (kg)	15	35	70	70	70	-
Exposure duration (yr)	6	12	30	25	1	-
Averaging Time for Vapor Flux (yr)	30			30	30	-
Exposure frequency (d/yr)	350			250	180	-
Dermal exposure freq. (d/yr)	350			250	180	-
Seasonal-avg skin surface area (cm^2/d)	2023	2023	3160	3160	3160	-
Soil dermal adherence factor (mg/cm^2)	0.5	0.5	0.5	0.5	0.5	-
Water ingestion rate (L/d)	1	1	2	1	1	-
Soil ingestion rate (mg/d)	200	200	100	50	100	-
Swimming exposure time (hr/event)	1	3	3			
Swimming event frequency (events/yr)	12	12	12			
Swimming water ingestion rate (L/hr)	0.5	0.5	0.05			
Skin surface area, swimming (cm^2)	3500	8100	23000			
Fish consumption rate (kg/d)	0.025	0.025	0.025			
Vegetable ingestion rate (kg/d)						
Above-ground vegetables	0.002	0.002	0.006			
Below-ground vegetables	0.001	0.001	0.002			
Contaminated fish fraction (-)	1					

2. Age Adjustment for Carcinogens

(residential receptor only)

	Adjustment Factor	
☑ Seasonal skin surface area, soil contact	1022.26	(cm^2-yr/kg)
☑ Water ingestion	1.08571	(mg-yr/L-day)
☑ Soil ingestion	165.714	(mg-yr/kg-day)
☑ Swimming water ingestion	4.56	(L/kg)
☑ Skin surface area, swimming	80640	(cm^2-yr/kg)
☑ Fish consumption	0.02286	(kg-yr/kg-day)
☑ Below-ground vegetable ingestion	0.38	(kg-yr/kg-day)
☑ Above-ground vegetable ingestion	0.88	(kg-yr/kg-day)

3. Non-Carcinogenic Receptor

(residential receptor only)

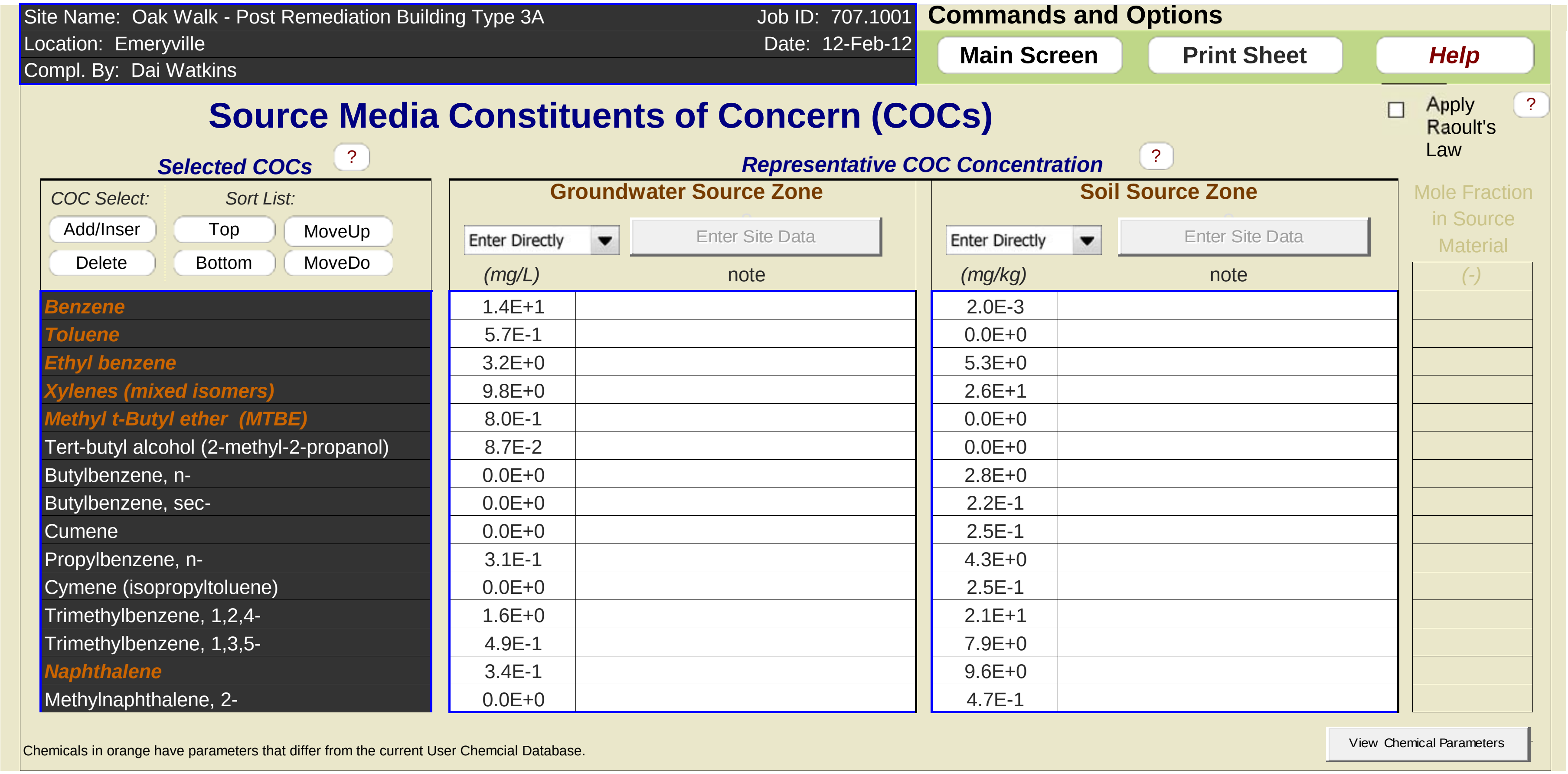
Child ▼

4. Target Health Risk Limits

	Individual	Cumulative
Target Cancer Risk (Carcinogens)	1.0E-6	1.0E-6
Target Hazard Quotient/Index (non-Carc.)	2.0E-1	2.0E-1

5. Commands and Options

RBCA Tool Kit for Chemical Releases, Version 2.51



Site Name: Oak Walk - Post Remediation Building Type 3A
Job ID: 707.1001
Location: Emeryville
Date: 12-Feb-12
Compl. By: Dai Watkins

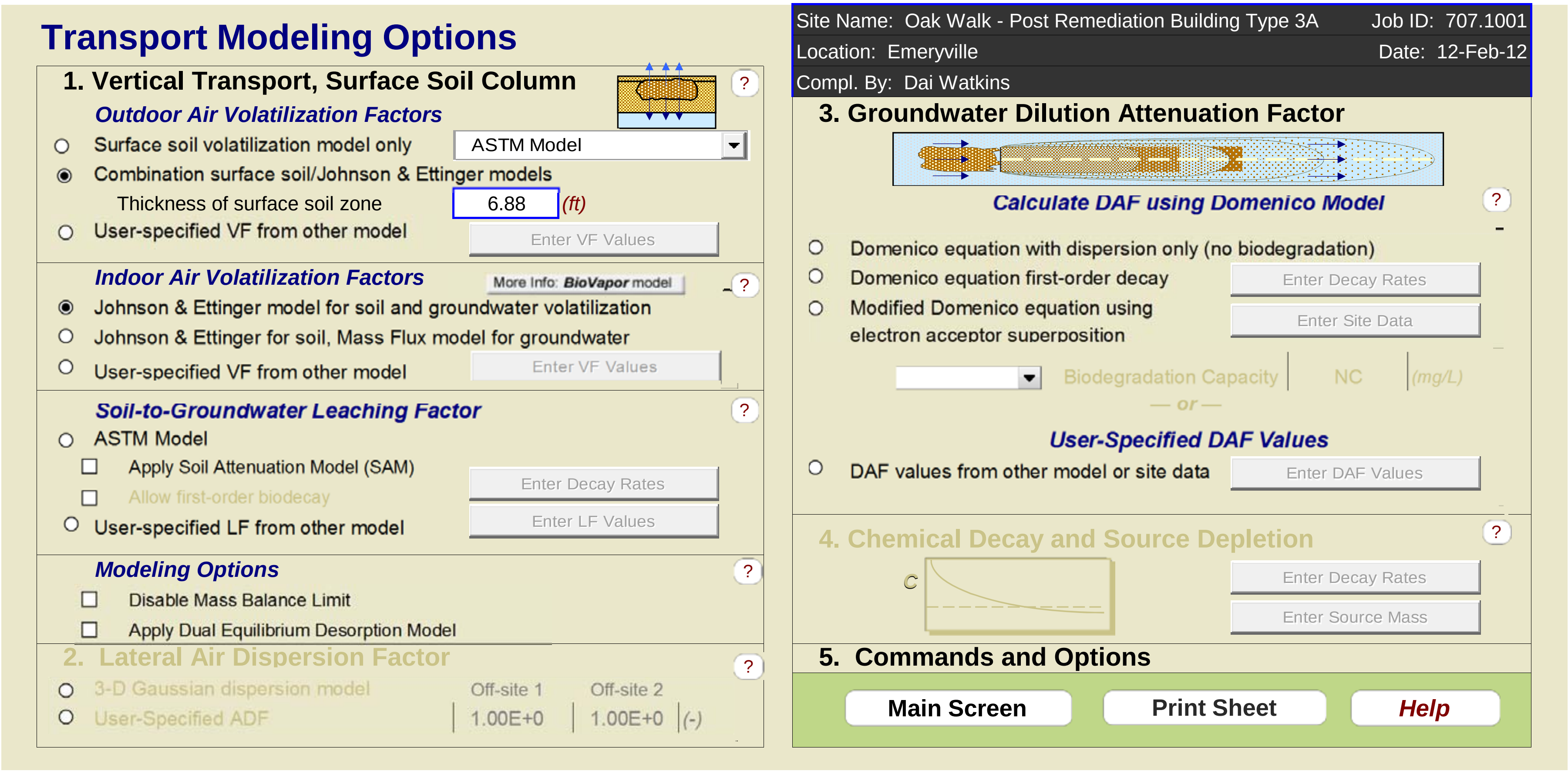
Source Media Constituents of Concern (COCs)

☐ Apply Raoult's Law

Selected COCs	Representative COC Concentration Groundwater Source Zone (mg/L)	note	Soil Source Zone (mg/kg)	note	Mole Fraction in Source Material (-)
Benzene	1.4E+1		2.0E-3		
Toluene	5.7E-1		0.0E+0		
Ethyl benzene	3.2E+0		5.3E+0		
Xylenes (mixed isomers)	9.8E+0		2.6E+1		
Methyl t-Butyl ether (MTBE)	8.0E-1		0.0E+0		
Tert-butyl alcohol (2-methyl-2-propanol)	8.7E-2		0.0E+0		
Butylbenzene, n-	0.0E+0		2.8E+0		
Butylbenzene, sec-	0.0E+0		2.2E-1		
Cumene	0.0E+0		2.5E-1		
Propylbenzene, n-	3.1E-1		4.3E+0		
Cymene (isopropyltoluene)	0.0E+0		2.5E-1		
Trimethylbenzene, 1,2,4-	1.6E+0		2.1E+1		
Trimethylbenzene, 1,3,5-	4.9E-1		7.9E+0		
Naphthalene	3.4E-1		9.6E+0		
Methylnaphthalene, 2-	0.0E+0		4.7E-1		

Chemicals in orange have parameters that differ from the current User Chemcial Database.

RBCA Tool Kit for Chemical Releases, Version 2.6



Transport Modeling Options

Site Name: Oak Walk - Post Remediation Building Type 3A Job ID: 707.1001
Location: Emeryville Date: 12-Feb-12
Compl. By: Dai Watkins

1. Vertical Transport, Surface Soil Column

Outdoor Air Volatilization Factors

○ Surface soil volatilization model only ASTM Model
● Combination surface soil/Johnson & Ettinger models
Thickness of surface soil zone 6.88 *(ft)*
○ User-specified VF from other model

Indoor Air Volatilization Factors

● Johnson & Ettinger model for soil and groundwater volatilization
○ Johnson & Ettinger for soil, Mass Flux model for groundwater
○ User-specified VF from other model

Soil-to-Groundwater Leaching Factor

○ ASTM Model
☐ Apply Soil Attenuation Model (SAM)
☐ Allow first-order biodecay
○ User-specified LF from other model

Modeling Options

☐ Disable Mass Balance Limit
☐ Apply Dual Equilibrium Desorption Model

2. Lateral Air Dispersion Factor

	Off-site 1	Off-site 2	
○ 3-D Gaussian dispersion model			
○ User-Specified ADF	1.00E+0	1.00E+0	(-)

3. Groundwater Dilution Attenuation Factor

Calculate DAF using Domenico Model

○ Domenico equation with dispersion only (no biodegradation)
○ Domenico equation first-order decay
○ Modified Domenico equation using electron acceptor superposition

Biodegradation Capacity NC (mg/L)

— or —

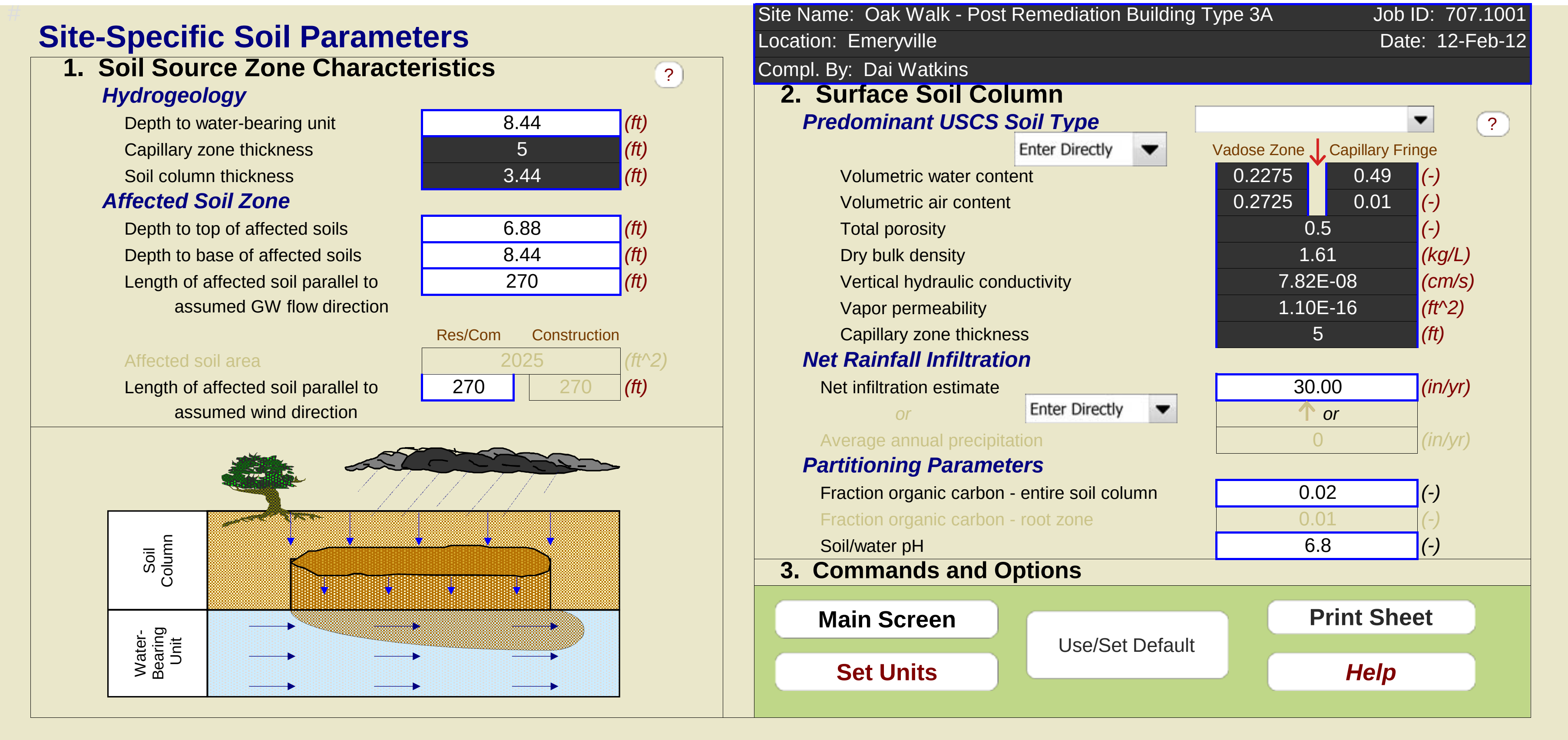
User-Specified DAF Values

○ DAF values from other model or site data

4. Chemical Decay and Source Depletion

5. Commands and Options

RBCA Tool Kit for Chemical Releases, Version 2.6



Site Name: Oak Walk - Post Remediation Building Type 3A Job ID: 707.1001
Location: Emeryville Date: 12-Feb-12
Compl. By: Dai Watkins

Site-Specific Soil Parameters

1. Soil Source Zone Characteristics

Hydrogeology

Depth to water-bearing unit	8.44	(ft)
Capillary zone thickness	5	(ft)
Soil column thickness	3.44	(ft)

Affected Soil Zone

Depth to top of affected soils	6.88		(ft)
Depth to base of affected soils	8.44		(ft)
Length of affected soil parallel to assumed GW flow direction	270		(ft)
	Res/Com	Construction	
Affected soil area	2025		(ft^2)
Length of affected soil parallel to assumed wind direction	270	270	(ft)

2. Surface Soil Column

Predominant USCS Soil Type

Enter Directly

	Vadose Zone	Capillary Fringe	
Volumetric water content	0.2275	0.49	(-)
Volumetric air content	0.2725	0.01	(-)
Total porosity	0.5		(-)
Dry bulk density	1.61		(kg/L)
Vertical hydraulic conductivity	7.82E-08		(cm/s)
Vapor permeability	1.10E-16		(ft^2)
Capillary zone thickness	5		(ft)

Net Rainfall Infiltration

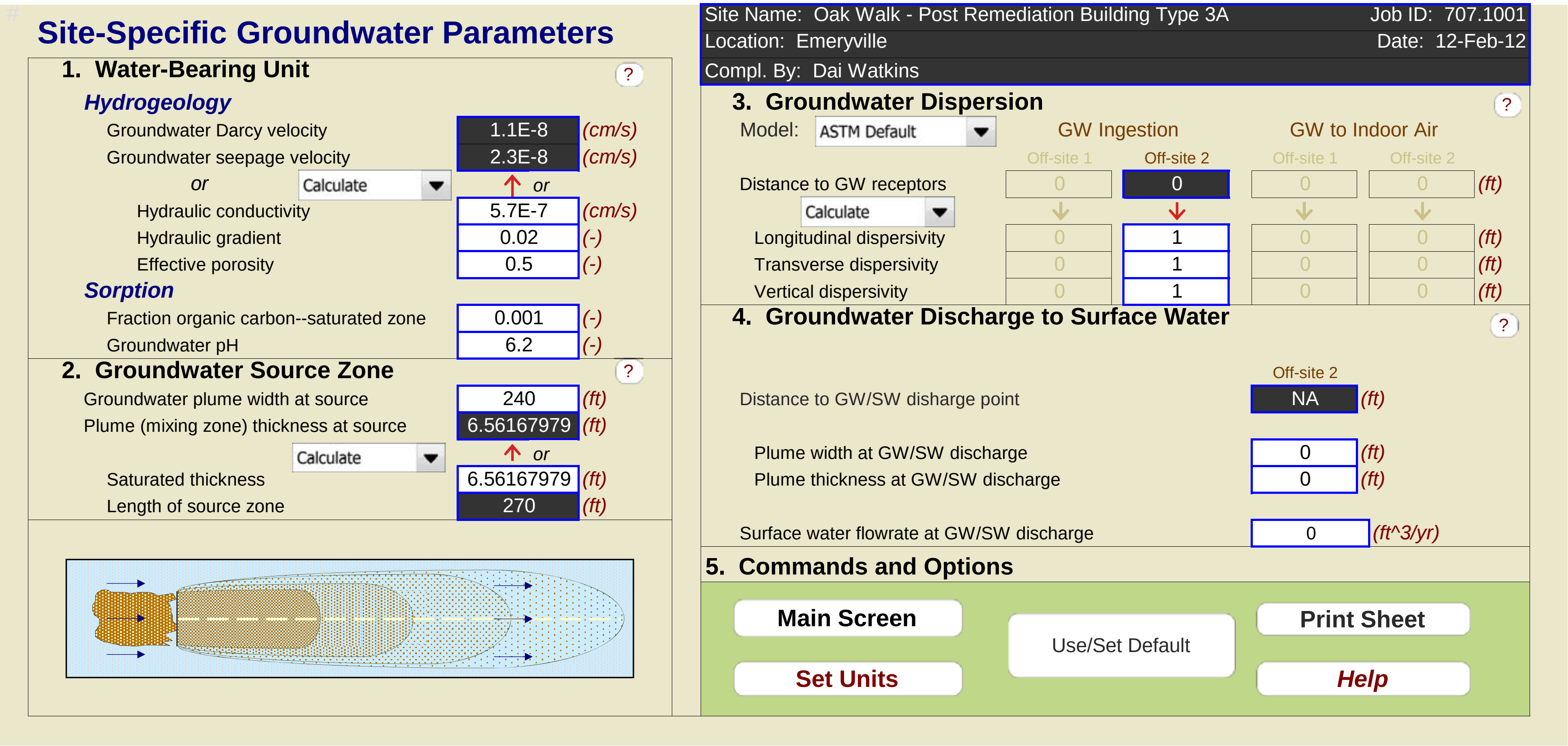
Net infiltration estimate	30.00	(in/yr)
or Enter Directly	or	
Average annual precipitation	0	(in/yr)

Partitioning Parameters

Fraction organic carbon - entire soil column	0.02	(-)
Fraction organic carbon - root zone	0.01	(-)
Soil/water pH	6.8	(-)

3. Commands and Options

RBCA Tool Kit for Chemical Releases, Version 2.6



Site-Specific Groundwater Parameters

Site Name: Oak Walk - Post Remediation Building Type 3A
Job ID: 707.1001
Location: Emeryville
Date: 12-Feb-12
Compl. By: Dai Watkins

1. Water-Bearing Unit

Hydrogeology

Groundwater Darcy velocity	1.1E-8	(cm/s)
Groundwater seepage velocity	2.3E-8	(cm/s)
or Calculate	or	
Hydraulic conductivity	5.7E-7	(cm/s)
Hydraulic gradient	0.02	(-)
Effective porosity	0.5	(-)

Sorption

Fraction organic carbon--saturated zone	0.001	(-)
Groundwater pH	6.2	(-)

2. Groundwater Source Zone

Groundwater plume width at source	240	(ft)
Plume (mixing zone) thickness at source	6.56167979	(ft)
Calculate	or	
Saturated thickness	6.56167979	(ft)
Length of source zone	270	(ft)

3. Groundwater Dispersion

Model: ASTM Default

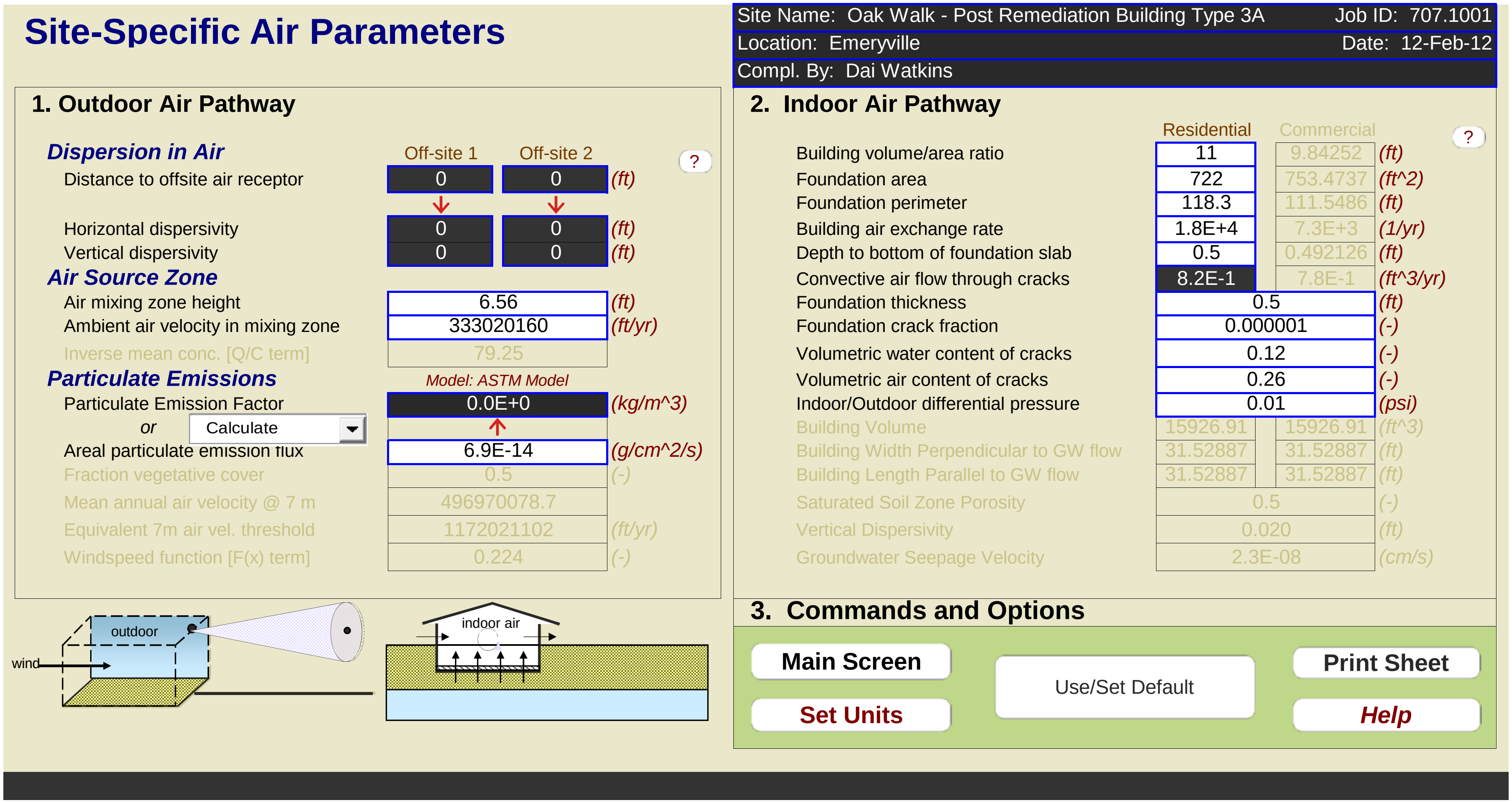
	GW Ingestion		GW to Indoor Air		
	Off-site 1	Off-site 2	Off-site 1	Off-site 2	
Distance to GW receptors	0	0	0	0	(ft)
Calculate					
Longitudinal dispersivity	0	1	0	0	(ft)
Transverse dispersivity	0	1	0	0	(ft)
Vertical dispersivity	0	1	0	0	(ft)

4. Groundwater Discharge to Surface Water

	Off-site 2	
Distance to GW/SW disharge point	NA	(ft)
Plume width at GW/SW discharge	0	(ft)
Plume thickness at GW/SW discharge	0	(ft)
Surface water flowrate at GW/SW discharge	0	(ft^3/yr)

5. Commands and Options

RBCA Tool Kit for Chemical Releases, Version 2.6



Site-Specific Air Parameters

Site Name: Oak Walk - Post Remediation Building Type 3A
Job ID: 707.1001
Location: Emeryville
Date: 12-Feb-12
Compl. By: Dai Watkins

1. Outdoor Air Pathway

	Off-site 1	Off-site 2	
Dispersion in Air			
Distance to offsite air receptor	0	0	(ft)
Horizontal dispersivity	0	0	(ft)
Vertical dispersivity	0	0	(ft)
Air Source Zone			
Air mixing zone height	6.56		(ft)
Ambient air velocity in mixing zone	333020160		(ft/yr)
Inverse mean conc. [Q/C term]	79.25		
Particulate Emissions	*Model: ASTM Model*		
Particulate Emission Factor	0.0E+0		(kg/m^3)
or Calculate			
Areal particulate emission flux	6.9E-14		(g/cm^2/s)
Fraction vegetative cover	0.5		(-)
Mean annual air velocity @ 7 m	496970078.7		
Equivalent 7m air vel. threshold	1172021102		(ft/yr)
Windspeed function [F(x) term]	0.224		(-)

2. Indoor Air Pathway

	Residential	Commercial	
Building volume/area ratio	11	9.84252	(ft)
Foundation area	722	753.4737	(ft^2)
Foundation perimeter	118.3	111.5486	(ft)
Building air exchange rate	1.8E+4	7.3E+3	(1/yr)
Depth to bottom of foundation slab	0.5	0.492126	(ft)
Convective air flow through cracks	8.2E-1	7.8E-1	(ft^3/yr)
Foundation thickness	0.5		(ft)
Foundation crack fraction	0.000001		(-)
Volumetric water content of cracks	0.12		(-)
Volumetric air content of cracks	0.26		(-)
Indoor/Outdoor differential pressure	0.01		(psi)
Building Volume	15926.91	15926.91	(ft^3)
Building Width Perpendicular to GW flow	31.52887	31.52887	(ft)
Building Length Parallel to GW flow	31.52887	31.52887	(ft)
Saturated Soil Zone Porosity	0.5		(-)
Vertical Dispersivity	0.020		(ft)
Groundwater Seepage Velocity	2.3E-08		(cm/s)

3. Commands and Options

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Orange = One or more parameter differs from User Chemical Database

Constituent	CAS Number	Type	Molecular Weight (g/mole)		Aqueous Solubility (@ 20 - 25 C) (mg/L)		Soil Saturation Limit Calculated (mg/kg)	Vapor Pressure (@ 20 - 25 C) (mm Hg)		Henry's Constant (@ 20 - 25 C) (unitless)		log (Koc) or log (Kd) (@ 20 - 25 C) log(L/kg)		
Benzene	71-43-2	O	78.11364	***TX08***	1770	***TX08***	2.66E+03	9.50E+01	***TX08***	2.27E-01	***TX08***	1.82E+00	Koc	***TX08***
Toluene	108-88-3	O	92.14052	***TX08***	530	***TX08***	1.58E+03	2.82E+01	***TX08***	2.76E-01	***TX08***	2.15E+00	Koc	***TX08***
Ethyl benzene	100-41-4	O	106.1674	***TX08***	169	***TX08***	7.23E+02	9.60E+00	***TX08***	3.28E-01	***TX08***	2.31E+00	Koc	***TX08***
Xylenes (mixed isomers)	1330-20-7	O	106.1674	***TX08***	198	***TX08***	9.88E+02	8.06E+00	***TX08***	2.93E-01	***TX08***	2.38E+00	Koc	***TX08***
Methyl t-Butyl ether (MTBE)	1634-04-4	O	88.14968	***TX08***	48000	***TX08***	2.05E+04	2.49E+02	***TX08***	2.44E-02	***TX08***	1.15E+00	Koc	***TX08***
Tert-butyl alcohol (2-methyl-2-propanol)	75-65-0	O	74.1224	TX11	235208.1557	TX11	5.31E+04	3.14E+01	TX11	5.42E-04	TX11	6.25E-01	Koc	TX11
Butylbenzene, n-	104-51-8	O	134.22	TX11	10.76	TX11	6.52E+02	8.14E-01	TX11	5.57E-01	TX11	3.48E+00	Koc	TX11
Butylbenzene, sec-	135-98-8	O	134.22	TX11	18.1	TX11	7.60E+02	1.25E+00	TX11	5.07E-01	TX11	3.32E+00	Koc	TX11
Cumene	98-82-8	O	120.19428	TX11	50	TX11	3.48E+03	4.60E+00	TX11	6.07E-01	TX11	3.54E+00	Koc	TX11
Propylbenzene, n-	103-65-1	O	120.19	TX11	42.019	TX11	9.09E+02	2.71E+00	TX11	4.24E-01	TX11	3.03E+00	Koc	TX11
Cymene (isopropyltoluene)	99-87-6	O	134.22	TX11	17.15	TX11	7.90E+02	1.08E+00	TX11	4.66E-01	TX11	3.36E+00	Koc	TX11
Trimethylbenzene, 1,2,4-	95-63-6	O	120.19	TX11	56.8	TX11	1.07E+03	1.59E+00	TX11	1.84E-01	TX11	2.97E+00	Koc	TX11
Trimethylbenzene, 1,3,5-	108-67-8	O	120.19	TX11	51.48	TX11	1.06E+03	2.13E+00	TX11	2.72E-01	TX11	3.01E+00	Koc	TX11
Naphthalene	91-20-3	O	128.17352	***TX08***	31.4	***TX08***	9.77E+02	8.89E-02	***TX08***	2.00E-02	***TX08***	3.19E+00	Koc	***TX08***
Methylnaphthalene, 2-	91-57-6	O	142.2004	TX11	25.4	TX11	2.20E+03	6.75E-02	TX11	1.85E-02	TX11	3.64E+00	Koc	TX11

Site Name: Oak Walk - Post Remediation Building Type 3A

Site Location: Emeryville

Job ID: 707.1001

Date Completed: 12-Feb-12

Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

	pH specific Kd for non-organics							log(Kow)		Diffusion Coefficients			
Orange = One or more parameter differs from User Chemical Database	Surface Soil Column			Water Bearing Unit				(@ 20 - 25 C)		Air		Water	
Constituent	Slope	y-Intercept	logKd_pH (L/kg)	Slope	y-Intercept	logKd_pH (L/kg)		log(L/kg)		(cm^2/s)		(cm^2/s)	
Benzene	-	-	-	-	-	-	-	1.99E+00	***TX08***	8.80E-02	***TX08***	9.80E-06	***TX08***
Toluene	-	-	-	-	-	-	-	2.54E+00	***TX08***	8.70E-02	***TX08***	8.60E-06	***TX08***
Ethyl benzene	-	-	-	-	-	-	-	3.03E+00	***TX08***	7.50E-02	***TX08***	7.80E-06	***TX08***
Xylenes (mixed isomers)	-	-	-	-	-	-	-	3.09E+00	***TX08***	7.40E-02	***TX08***	8.50E-06	***TX08***
Methyl t-Butyl ether (MTBE)	-	-	-	-	-	-	-	1.43E+00	***TX08***	7.92E-02	***TX08***	9.41E-05	***TX08***
Tert-butyl alcohol (2-methyl-2-propanol)	-	-	-	-	-	-	-	6.90E-01	TX11	8.52E-02	TX11	9.11E-06	TX11
Butylbenzene, n-	-	-	-	-	-	-	-	4.29E+00	TX11	5.70E-02	TX11	6.74E-06	TX11
Butylbenzene, sec-	-	-	-	-	-	-	-	4.09E+00	TX11	5.76E-02	TX11	6.75E-06	TX11
Cumene	-	-	-	-	-	-	-	3.45E+00	TX11	6.50E-02	TX11	7.10E-06	TX11
Propylbenzene, n-	-	-	-	-	-	-	-	3.73E+00	TX11	6.22E-02	TX11	7.21E-06	TX11
Cymene (isopropyltoluene)	-	-	-	-	-	-	-	4.14E+00	TX11	5.72E-02	TX11	6.73E-06	TX11
Trimethylbenzene, 1,2,4-	-	-	-	-	-	-	-	3.65E+00	TX11	6.22E-02	TX11	7.28E-06	TX11
Trimethylbenzene, 1,3,5-	-	-	-	-	-	-	-	3.70E+00	TX11	6.21E-02	TX11	7.23E-06	TX11
Naphthalene	-	-	-	-	-	-	-	3.17E+00	***TX08***	5.90E-02	***TX08***	7.50E-06	***TX08***
Methylnaphthalene, 2-	-	-	-	-	-	-	-	3.72E+00	TX11	6.29E-02	TX11	7.20E-06	TX11

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Job ID: 707.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Parameters

Orange = One or more parameter differs from User Chemical Database	Analytical Detection Limits				Half Life (First-Order Decay)			Soil-to-Plant Biotransfer Factors			Relative Bioavailability Factor		Leaf Concen. Factor Calculated (mg/kg)/(mg/L)	Root Concen. Factor Calculated (mg/kg)/(mg/L)	Bioconcentration Factor	
Constituent	Groundwater (mg/L)		Soil (mg/kg)		Saturated (days)	Unsaturated (days)		Above-grd (unitless)	Below-grd (unitless)							
Benzene	2.00E-03	S	5.00E-03	S	7.20E+02	7.20E+02	H	-	-	-	1.00E+00	***TX08***	1.17E+00	1.85E+00	12.6	LY
Toluene	2.00E-03	S	5.00E-03	S	2.80E+01	2.80E+01	H	-	-	-	1.00E+00	***TX08***	1.94E+00	3.55E+00	70	LY
Ethyl benzene	2.00E-03	S	5.00E-03	S	2.28E+02	2.28E+02	H	-	-	-	1.00E+00	***TX08***	3.13E+00	7.34E+00	120	LY
Xylenes (mixed isomers)	5.00E-03	S	5.00E-03	S	3.60E+02	3.60E+02	H	-	-	-	1.00E+00	***TX08***	3.29E+00	8.02E+00	130	LY
Methyl t-Butyl ether (MTBE)	-	-	-	-	3.60E+02	1.80E+02	H	-	-	-	1.00E+00	***TX08***	7.63E-01	1.20E+00	7.2	LY
Tert-butyl alcohol (2-methyl-2-propanol)	-	-	-	-	3.60E+02	3.60E+02	H	-	-	-	1.00E+00	TX11	4.15E-01	9.23E-01	2	LY
Butylbenzene, n-	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	6.35E+00	6.15E+01	1100	LY
Butylbenzene, sec-	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	6.11E+00	4.34E+01	760	LY
Cumene	-	-	-	-	1.60E+01	1.60E+01	H	-	-	-	1.00E+00	TX11	4.43E+00	1.45E+01	250	LY
Propylbenzene, n-	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	5.28E+00	2.33E+01	400	LY
Cymene (isopropyltoluene)	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	6.18E+00	4.74E+01	820	LY
Trimethylbenzene, 1,2,4-	-	-	-	-	5.60E+01	5.60E+01	H	-	-	-	1.00E+00	TX11	5.05E+00	2.03E+01	350	LY
Trimethylbenzene, 1,3,5-	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	5.20E+00	2.22E+01	380	LY
Naphthalene	1.00E-02	S2	1.00E-02	S2	2.58E+02	2.58E+02	H	-	-	-	1.00E+00	***TX08***	3.54E+00	9.14E+00	430	LY
Methylnaphthalene, 2-	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	5.24E+00	2.28E+01	390	LY

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Job ID: 707.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

Dermal Exposure

Orange = One or more parameter differs from User Chemical Database

	Water Dermal Permeability Data					
Constituent	**Dermal Permeability Coeff. (cm/hr)**	**Lag time for Dermal Exposure (hr)**	**Critical Exposure Time (hr)**	**Relative Contr of Derm Perm Coeff**	**Water/Skin Derm Ads. Fact Calculated**	
Benzene	0.021	0.26	0.63	0.013	0.073391787	D
Toluene	0.045	0.32	0.77	0.054	0.159834535	D
Ethyl benzene	0.074	0.39	1.3	0.14	0.266633684	D
Xylenes (mixed isomers)	0.08	0.39	1.4	0.16	0.286510345	D
Methyl t-Butyl ether (MTBE)	-	-	-	-	-	-
Tert-butyl alcohol (2-methyl-2-propanol)	-	-	-	-	-	-
Butylbenzene, n-	-	-	-	-	-	-
Butylbenzene, sec-	-	-	-	-	-	-
Cumene	-	-	-	-	-	-
Propylbenzene, n-	-	-	-	-	-	-
Cymene (isopropyltoluene)	-	-	-	-	-	-
Trimethylbenzene, 1,2,4-	-	-	-	-	-	-
Trimethylbenzene, 1,3,5-	-	-	-	-	-	-
Naphthalene	0.069	0.53	2.2	0.2	0.27002	D
Methylnaphthalene, 2-	-	-	-	-	-	-

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Job ID: 707.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

Orange = One or more parameter differs from User Chemical Database

	Dermal Relative Abs. Factor	Absorbtion Fraction		
Constituent	Calculated	Dermal (unitless)	Gastrointestinal (unitless)	
Benzene	0	0	0.97	***TX08***
Toluene	0	0	0.8	***TX08***
Ethyl benzene	0	0	0.97	***TX08***
Xylenes (mixed isomers)	0	0	0.92	***TX08***
Methyl t-Butyl ether (MTBE)	0	0	0.8	***TX08***
Tert-butyl alcohol (2-methyl-2-propanol)	0	0	0.8	TX11
Butylbenzene, n-	0.2	0.1	0.5	TX11
Butylbenzene, sec-	0	0	0.8	TX11
Cumene	0	0	0.8	TX11
Propylbenzene, n-	0	0	0.8	TX11
Cymene (isopropyltoluene)	0	0	0.8	TX11
Trimethylbenzene, 1,2,4-	0	0	0.8	TX11
Trimethylbenzene, 1,3,5-	0	0	0.8	TX11
Naphthalene	0.146067416	0.13	0.89	***TX08***
Methylnaphthalene, 2-	0.146067416	0.13	0.89	TX11

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Job ID: 707.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

Regulatory Standards

Orange = One or more parameter differs from User Chemical Database

Constituent	Maximum Contaminant Level (mg/L)		Time-Weighted Average Workplace Criteria (mg/m^3)		UK Soil Guideline Values				
					Residential/Plant mg/kg	Residential/No Plant mg/kg	Allotments mg/kg	Commercial/Ind. mg/kg	
Benzene	0.005	MC	3.19	OS	-	-	-	-	-
Toluene	1	MC	754	OS	4	2	3	2	UK2
Ethyl benzene	0.7	MC	435	OS	3	3	3	1	UK1
Xylenes (mixed isomers)	10	MC	435	OS	-	-	-	-	-
Methyl t-Butyl ether (MTBE)	-	-	144	AC	-	-	-	-	-
Tert-butyl alcohol (2-methyl-2-propanol)	-	-	300	OS	-	-	-	-	-
Butylbenzene, n-	-	-	-	-	-	-	-	-	-
Butylbenzene, sec-	-	-	-	-	-	-	-	-	-
Cumene	-	-	245	OS	-	-	-	-	-
Propylbenzene, n-	-	-	-	-	-	-	-	-	-
Cymene (isopropyltoluene)	-	-	-	-	-	-	-	-	-
Trimethylbenzene, 1,2,4-	-	-	-	-	-	-	-	-	-
Trimethylbenzene, 1,3,5-	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	50	OS	-	-	-	-	-
Methylnaphthalene, 2-	-	-	-	-	-	-	-	-	-

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Job ID: 707.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

	Regulatory Standards									
	Surface Water Quality Criteria									
Orange = One or more parameter differs from User Chemical Database	Aquatic Life Protection				Human Health Protection					
Constituent	Freshwater (mg/L)		Marine (mg/L)		Drink & Freshwater Fish (mg/L)		Freshwater Fish (mg/L)		Saltwater Fish (mg/L)	
Benzene	-	-	-	-	0.005	T3	0.106	T3	0.0708	T3
Toluene	-	-	-	-	6.8	E	200	E	200	E
Ethyl benzene	-	-	-	-	3.1	E	29	E	29	E
Xylenes (mixed isomers)	-	-	-	-	-	-	-	-	-	-
Methyl t-Butyl ether (MTBE)	-	-	-	-	-	-	-	-	-	-
Tert-butyl alcohol (2-methyl-2-propanol)	-	-	-	-	-	-	-	-	-	-
Butylbenzene, n-	-	-	-	-	-	-	-	-	-	-
Butylbenzene, sec-	-	-	-	-	-	-	-	-	-	-
Cumene	-	-	-	-	-	-	-	-	-	-
Propylbenzene, n-	-	-	-	-	-	-	-	-	-	-
Cymene (isopropyltoluene)	-	-	-	-	-	-	-	-	-	-
Trimethylbenzene, 1,2,4-	-	-	-	-	-	-	-	-	-	-
Trimethylbenzene, 1,3,5-	-	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-	-	-
Methylnaphthalene, 2-	-	-	-	-	-	-	-	-	-	-

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Job ID: 707.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

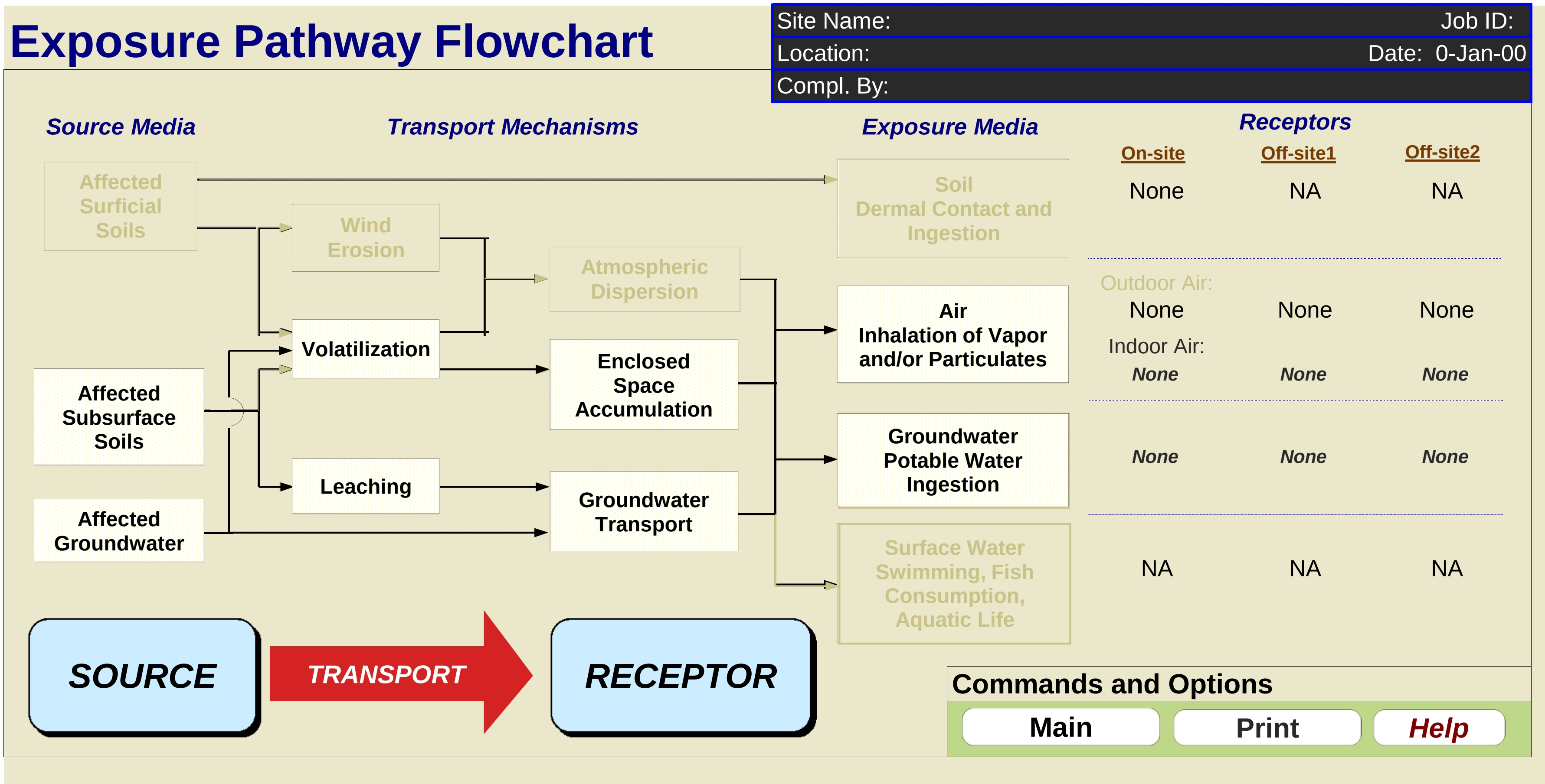
CHEMICAL DATA FOR SELECTED COCs

Orange = One or more parameter differs from User Chemical Database

	Toxicity Parameters											
Constituent	**Oral RfD or TDSI (mg/kg/day)**		**Dermal RfD or TDSI (mg/kg/day)**		**Inhalation Equivalent RfC or TCA (mg/m^3)**		**Oral Equivalent Slope Factor 1/(mg/kg/day)**		**Dermal Equivalent Slope Factor 1/(mg/kg/day)**		**Inhalation Equivalent Unit Risk Factor 1/(µg/m^3)**	
Benzene	0.004	EPA-I	0.004	D2	0.28	***TX08***	***0.1***	***OEHHA***	***0.055***	D2	***0.000029***	***OEHHA***
Toluene	0.08	EPA-I	0.08	D2	***5***	***EPA-I***	-	-	-	-	***0.000034***	***OEHHA***
Ethyl benzene	0.1	EPA-I	0.1	D2	***1***	***EPA-I***	***0.011***	***OEHHA***	-	-	***0.0000025***	***OEHHA***
Xylenes (mixed isomers)	0.2	EPA-I	0.2	D2	***0.1***	***EPA-I***	-	-	-	-	-	-
Methyl t-Butyl ether (MTBE)	0.01	***OEHHA***	0.01	D2	3	EPA-I	0.0018	***OEHHA***	0.0018	D2	0.00000026	***OEHHA***
Tert-butyl alcohol (2-methyl-2-propanol)	0.09	TX11	0.09	D2	-	-	-	-	-	-	-	-
Butylbenzene, n-	0.05	TX11	0.05	D2	-	-	-	-	-	-	-	-
Butylbenzene, sec-	0.04	TX11	0.04	D2	-	-	-	-	-	-	-	-
Cumene	0.1	EPA-I	0.1	D2	0.4	EPA-I	-	-	-	-	-	-
Propylbenzene, n-	0.04	TX11	0.04	D2	0.4	TX11	-	-	-	-	-	-
Cymene (isopropyltoluene)	0.1	TX11	0.1	D2	-	-	-	-	-	-	-	-
Trimethylbenzene, 1,2,4-	0.05	TX11	0.05	D2	0.007	TX11	-	-	-	-	-	-
Trimethylbenzene, 1,3,5-	0.05	TX11	0.05	D2	0.006	TX11	-	-	-	-	-	-
Naphthalene	0.02	EPA-I	0.02	D2	0.003	EPA-I	-	-	-	-	***0.000034***	***OEHHA***
Methylnaphthalene, 2-	0.004	EPA-I	0.004	D2	-	-	-	-	-	-	-	-

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Job ID: 707.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

RBCA Tool Kit for Chemical Releases, Version 2.51



Exposure Pathway Flowchart

Site Name:
Job ID:
Location:
Date: 0-Jan-00
Compl. By:

Receptors	On-site	Off-site1	Off-site2
	None	NA	NA
Outdoor Air:	None	None	None
Indoor Air:	*None*	*None*	*None*
	None	*None*	*None*
	NA	NA	NA

Commands and Options

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville

Completed By: Dai Watkins
Date Completed: 12-Feb-12

Exposure Parameters		**Residential**				**Commercial/Industrial**		**User Defined**
		Child*	Adolescent	Adult	Age Adjusted**	Adult	Construct.	
ATc	Averaging time for carcinogens (yr)	70	70	70	NA	70	70	-
ATn	Averaging time for non-carcinogens (yr)	6	12	30	NA	25	1	-
BW	Body weight (kg)	15	35	70	NA	70	70	-
ED	Exposure duration (yr)	6	12	30	NA	25	1	-
τ	Averaging time for vapor flux (yr)	30	30	30	NA	30	30	-
EF	Exposure frequency (days/yr)	350	350	350	NA	250	180	-
EFD	Exposure frequency for dermal exposure	350	350	350	NA	250	180	-
IRw	Ingestion rate of water (L/day)	1	1	2	2.5	1	NA	-
IRs	Ingestion rate of soil (mg/day)	200	200	100	387	50	100	-
SA	Skin surface area (dermal) (cm^2)	2023	2023	3160	4771	3160	3160	-
M	Soil to skin adherence factor	0.5	0.5	0.5	NA	0.5	0.5	-
ETswim	Swimming exposure time (hr/event)	1	3	3	NA	NA	NA	NA
EVswim	Swimming event frequency (events/yr)	12	12	12	NA	NA	NA	NA
IRswim	Water ingestion while swimming (L/hr)	0.5	0.5	0.05	0.3	NA	NA	NA
SAswim	Skin surface area for swimming (cm^2)	3500	8100	23000	15680	NA	NA	NA
IRfish	Ingestion rate of fish (kg/yr)	0.025	0.025	0.025	0.053	NA	NA	NA
Flfish	Contaminated fish fraction (unitless)	1	1	1	NA	NA	NA	NA
IRbg	Below-ground vegetable ingestion	0.002	0.002	0.006	2.053	NA	NA	NA
IRabg	Above-ground vegetable ingestion	0.001	0.001	0.002	0.887	NA	NA	NA
VGbg	Above-ground Veg. Ingest. Correction Factor	0.01	0.01	0.01	NA	NA	NA	NA
VGabg	Below-ground Veg. Ingest. Correction Factor	0.01	0.01	0.01	NA	NA	NA	NA

* = Child Receptor used for Non-Carcinogens
** = Age-adjusted rate is effective value corresponding to adult exposure factors.

Complete Exposure Pathways and Receptors	**On-site**	**Off-site 1**	**Off-site 2**
Groundwater:			
Groundwater Ingestion	None	None	None
Soil Leaching to Groundwater Ingestion	None	None	None
Apply MCL Values	No	No	No
Applicable Surface Water Exposure Routes:			
Swimming	NA	NA	None
Fish Consumption	NA	NA	None
Aquatic Life Protection	NA	NA	None
Soil:			
Direct Contact: direct combined pathways	None	NA	NA
Apply CLEA- UK SGV levels		No	
Outdoor Air:			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	Res./Constr.	None	None
Volatilization from Groundwater	Residential	None	None
Indoor Air:			
Volatilization from Soils	Residential	NA	NA
Volatilization from Groundwater	Residential	None	None
Soil Leaching to Groundwater Volatilization	None	None	None

Receptor Distance from Source Media	**On-site**	**Off-site 1**	**Off-site 2**	**(Units)**
Groundwater receptor	NA	NA	NA	(ft)
Outdoor air inhalation receptor	0	NA	NA	(ft)
Indoor air inhalation receptor	0	NA	NA	(ft)

Target Health Risk Values		**Individual**	**Cumulative**
TR	Target Risk (carcinogens)	1.0E-6	1.0E-6
THQ	Target Hazard Quotient (non-carcinogenic risk)	2.0E-1	2.0E-1

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & Subsurface Models: ASTM Model
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Use dual equilibrium desorption model?	No
Apply Mass Balance Limit for Soil Volatilization?	No
Apply UK (CLEA) SGV as soil concentration limit	No
Vegetable calculation options	NA
Air dilution factor	NA
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville

Completed By: Dai Watkins
Date Completed: 12-Feb-12

Surface Soil Column Parameters		**Value**			**(Units)**
h_{cap}	Capillary zone thickness	***5***			(ft)
h_v	Vadose zone thickness	***3.44***			(ft)
ρ_s	Soil bulk density	***1.61***			(g/cm^3)
f_{oc}	Fraction organic carbon	***0.02***			(-)
θ_T	Soil total porosity	***0.5***			(-)
		capillary	**vadose**	**foundation**	
θ_w	Volumetric water content	***0.49***	***0.2275***	0.12	(-)
θ_a	Volumetric air content	***0.01***	***0.2725***	0.26	(-)
K_{vs}	Vertical hydraulic conductivity	***7.82E-08***			(cm/s)
k_v	Vapor permeability	***1.1E-16***			(ft^2)
L_{gw}	Depth to groundwater	***8.44***			(ft)
pH	Soil/groundwater pH	6.8			(-)
			Construction		
W	Length of source-zone area parallel to wind	***270***	270		(ft)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(ft)
L_{ss}	Thickness of affected surface soils	***6.88***			(ft)
A	Source zone area	***2025***			(ft^2)
L_s	Depth to top of affected soils	***6.88***			(ft)
L_{base}	Depth to base of affected soils	***8.44***			(ft)
L_{subs}	Thickness of affected soils	***1.56***			(ft)

Outdoor Air Parameters		**Value**	**(Units)**
U_{air}	Ambient air velocity in mixing zone	***333020160***	(ft/yr)
δ_{air}	Air mixing zone height	***6.56***	(ft)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		**Residential**	**Commercial**	**(Units)**
L_b	Building volume/area ratio	***11***	NA	(ft)
A_b	Foundation area	***722***	NA	(ft^2)
X_{crk}	Foundation perimeter	***118.3***	NA	(ft)
ER	Building air exchange rate	***17975.52***	NA	(1/yr)
L_{crk}	Foundation thickness	***0.5***	NA	(ft)
Z_{crk}	Depth to bottom of foundation slab	***0.5***	NA	(ft)
η	Foundation crack fraction	***0.000001***	NA	(-)
dP	Indoor/outdoor differential pressure	***0.01***	NA	(psi)
Q_s	Convective air flow through slab	***0.818611198***	NA	(ft^3/yr)
θ_{wcrack}	Volumetric water content of cracks	0.12	NA	(-)
θ_{acrack}	Volumetric air content of cracks	0.26	NA	(-)
BV	Building Volume	NA	NA	(ft^3)
w	Building Width Perpendicular to GW flow	NA	NA	(ft)
L	Building Length Parallel to GW flow	NA	NA	(ft)
ν	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		**Value**	**(Units)**
δ_{gw}	Groundwater mixing zone depth	NA	(ft)
I_f	Net groundwater infiltration rate	NA	(in/yr)
U_{gw}	Groundwater Darcy velocity	NA	(cm/s)
V_{gw}	Groundwater seepage velocity	NA	(cm/s)
K_s	Saturated hydraulic conductivity	NA	(cm/s)
i	Groundwater gradient	NA	(-)
S_w	Width of groundwater source zone	NA	(ft)
S_d	Depth of groundwater source zone	NA	(ft)
θ_{eff}	Effective porosity in water-bearing unit	NA	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	NA	(-)
pH_{sat}	Groundwater pH	NA	(-)
	Biodegradation considered?	NA	

Transport Parameters		**Off-site 1**	**Off-site 2**	**Off-site 1**	**Off-site 2**	**(Units)**
Lateral Groundwater Transport		**Groundwater Ingestion**		**Groundwater to Indoor Air**		
α_x	Longitudinal dispersivity	NA	NA	NA	NA	(ft)
α_y	Transverse dispersivity	NA	NA	NA	NA	(ft)
α_z	Vertical dispersivity	NA	NA	NA	NA	(ft)
Lateral Outdoor Air Transport		**Soil to Outdoor Air Inhal.**		**GW to Outdoor Air Inhal.**		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(ft)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(ft)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		**Off-site 2**	**(Units)**
Q_{sw}	Surface water flowrate	NA	(ft^3/yr)
W_{pi}	Width of GW plume at SW discharge	NA	(ft)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(ft)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

SOILS (6.9 - 8.4 ft): VAPOR INTRUSION INTO BUILDINGS

Constituents of Concern	1) Source Medium Soil Conc. (mg/kg)	2) NAF Value (L/kg) Receptor On-site (0 ft) Residential	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) On-site (0 ft) Residential	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) On-site (0 ft) Residential	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) On-site (0 ft) Residential
Benzene *	2.0E-3	1.1E+6	1.9E-9	4.1E-1	7.8E-10
Toluene *	0.0E+0	1.7E+6	0.0E+0	4.1E-1	0.0E+0
Ethyl benzene *	5.3E+0	2.1E+6	2.5E-6	4.1E-1	1.0E-6
Xylenes (mixed isomers) *	2.6E+1	2.8E+6	9.2E-6	9.6E-1	8.8E-6
Methyl t-Butyl ether (MTBE) *	0.0E+0	2.9E+6	0.0E+0	4.1E-1	0.0E+0
Tert-butyl alcohol (2-methyl-2-propar	0.0E+0	6.6E+7	0.0E+0	9.6E-1	0.0E+0
Butylbenzene, n-	2.8E+0	1.9E+7	1.5E-7	9.6E-1	1.4E-7
Butylbenzene, sec-	2.2E-1	1.4E+7	1.6E-8	9.6E-1	1.5E-8
Cumene	2.5E-1	1.9E+7	1.3E-8	9.6E-1	1.2E-8
Propylbenzene, n-	4.3E+0	8.6E+6	5.0E-7	9.6E-1	4.8E-7
Cymene (isopropyltoluene)	2.5E-1	1.7E+7	1.5E-8	9.6E-1	1.4E-8
Trimethylbenzene, 1,2,4-	2.1E+1	1.7E+7	1.2E-6	9.6E-1	1.2E-6
Trimethylbenzene, 1,3,5-	7.9E+0	1.3E+7	6.2E-7	9.6E-1	5.9E-7
Naphthalene *	9.6E+0	2.6E+8	3.6E-8	4.1E-1	1.5E-8
Methylnaphthalene, 2-	4.7E-1	7.9E+8	5.9E-10	9.6E-1	5.7E-10

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Completed By: Dai Watkins

Date Completed: 12-Feb-12
Job ID: 707.1001

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RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

GROUNDWATER: VAPOR INTRUSION INTO BUILDINGS

Exposure Concentration

	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Groundwater Conc. (mg/L)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	1.4E+1	7.1E+5			2.0E-5		
Toluene *	5.7E-1	5.9E+5			9.7E-7		
Ethyl benzene *	3.2E+0	5.1E+5			6.3E-6		
Xylenes (mixed isomers) *	9.8E+0	5.7E+5			1.7E-5		
Methyl t-Butyl ether (MTBE) *	8.0E-1	6.7E+6			1.2E-7		
Tert-butyl alcohol (2-methyl-2-propanol)	8.7E-2	2.9E+8			3.0E-10		
Butylbenzene, n-	0.0E+0	3.2E+5			0.0E+0		
Butylbenzene, sec-	0.0E+0	3.5E+5			0.0E+0		
Cumene	0.0E+0	2.9E+5			0.0E+0		
Propylbenzene, n-	3.1E-1	4.1E+5			7.6E-7		
Cymene (isopropyltoluene)	0.0E+0	3.8E+5			0.0E+0		
Trimethylbenzene, 1,2,4-	1.6E+0	9.3E+5			1.7E-6		
Trimethylbenzene, 1,3,5-	4.9E-1	6.3E+5			7.8E-7		
Naphthalene *	3.4E-1	8.5E+6			4.0E-8		
Methylnaphthalene, 2-	0.0E+0	9.1E+6			0.0E+0		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk - Post Remediation Building Type 3A
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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR INTRUSION INTO BUILDINGS

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	4.1E-1			8.1E-6		
Toluene *	4.1E-1			4.0E-7		
Ethyl benzene *	4.1E-1			2.6E-6		
Xylenes (mixed isomers) *	9.6E-1			1.6E-5		
Methyl t-Butyl ether (MTBE) *	4.1E-1			4.9E-8		
Tert-butyl alcohol (2-methyl-2-propanol)	9.6E-1			2.8E-10		
Butylbenzene, n-	9.6E-1			0.0E+0		
Butylbenzene, sec-	9.6E-1			0.0E+0		
Cumene	9.6E-1			0.0E+0		
Propylbenzene, n-	9.6E-1			7.3E-7		
Cymene (isopropyltoluene)	9.6E-1			0.0E+0		
Trimethylbenzene, 1,2,4-	9.6E-1			1.7E-6		
Trimethylbenzene, 1,3,5-	9.6E-1			7.4E-7		
Naphthalene *	4.1E-1			1.6E-8		
Methylnaphthalene, 2-	9.6E-1			0.0E+0		

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk - Post Remediation Building Type 3A
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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

MAXIMUM PATHWAY EXPOSURE (mg/m^3)

(Maximum average exposure concentration from soil and groundwater routes.)

Constituents of Concern	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	8.1E-6		
Toluene *	4.0E-7		
Ethyl benzene *	2.6E-6		
Xylenes (mixed isomers) *	1.6E-5		
Methyl t-Butyl ether (MTBE) *	4.9E-8		
Tert-butyl alcohol (2-methyl-2-propanol)	2.8E-10		
Butylbenzene, n-	1.4E-7		
Butylbenzene, sec-	1.5E-8		
Cumene	1.2E-8		
Propylbenzene, n-	7.3E-7		
Cymene (isopropyltoluene)	1.4E-8		
Trimethylbenzene, 1,2,4-	1.7E-6		
Trimethylbenzene, 1,3,5-	7.4E-7		
Naphthalene *	1.6E-8		
Methylnaphthalene, 2-	5.7E-10		

Site Name: Oak Walk - Post Remediation Building Type 3A
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TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

CARCINOGENIC RISK

	(1) Carcinogenic Classification	(2) Maximum Carcinogenic Exposure (mg/m^3)			(3) Inhalation Unit Risk Factor	(4) Individual COC Risk (2) x (3) x 1000		
Constituents of Concern		On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	(µg/m^3)^-1	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	TRUE	8.1E-6	-	-	2.9E-5	2.4E-7		
Toluene *	TRUE	4.0E-7	-	-	3.4E-5	1.4E-8		
Ethyl benzene *	TRUE	2.6E-6	-	-	2.5E-6	6.4E-9		
Xylenes (mixed isomers) *	FALSE	-	-	-	-			
Methyl t-Butyl ether (MTBE) *	TRUE	4.9E-8	-	-	2.6E-7	1.3E-11		
Tert-butyl alcohol (2-methyl-2-propanol)	FALSE	-	-	-	-			
Butylbenzene, n-	FALSE	-	-	-	-			
Butylbenzene, sec-	FALSE	-	-	-	-			
Cumene	FALSE	-	-	-	-			
Propylbenzene, n-	FALSE	-	-	-	-			
Cymene (isopropyltoluene)	FALSE	-	-	-	-			
Trimethylbenzene, 1,2,4-	FALSE	-	-	-	-			
Trimethylbenzene, 1,3,5-	FALSE	-	-	-	-			
Naphthalene *	TRUE	1.6E-8	-	-	3.4E-5	5.6E-10		
Methylnaphthalene, 2-	FALSE	-	-	-	-			

Total Pathway Carcinogenic Risk = **2.6E-7**

Site Name: Oak Walk - Post Remediation Building Type 3A
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TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

TOXIC EFFECTS

	(5) Maximum Toxicant Exposure (mg/m^3)			(6) Inhalation Reference Concentration	(7) Individual COC Hazard Quotient (5) / (6)		
Constituents of Concern	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	(mg/m^3)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	1.9E-5	NC	NC	2.8E-1	6.8E-5		
Toluene *	9.3E-7	NC	NC	5.0E+0	1.9E-7		
Ethyl benzene *	6.0E-6	NC	NC	1.0E+0	6.0E-6		
Xylenes (mixed isomers) *	1.6E-5	NC	NC	1.0E-1	1.6E-4		
Methyl t-Butyl ether (MTBE) *	1.2E-7	NC	NC	3.0E+0	3.8E-8		
Tert-butyl alcohol (2-methyl-2-propanol)	2.8E-10	NC	NC	-			
Butylbenzene, n-	1.4E-7	NC	NC	-			
Butylbenzene, sec-	1.5E-8	NC	NC	-			
Cumene	1.2E-8	NC	NC	4.0E-1	3.1E-8		
Propylbenzene, n-	7.3E-7	NC	NC	4.0E-1	1.8E-6		
Cymene (isopropyltoluene)	1.4E-8	NC	NC	-			
Trimethylbenzene, 1,2,4-	1.7E-6	NC	NC	7.0E-3	2.4E-4		
Trimethylbenzene, 1,3,5-	7.4E-7	NC	NC	6.0E-3	1.2E-4		
Naphthalene *	3.8E-8	NC	NC	3.0E-3	1.3E-5		
Methylnaphthalene, 2-	5.7E-10	NC	NC	-			
				Total Pathway Hazard Index =	**6.1E-4**		

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Completed By: Dai Watkins

Date Completed: 12-Feb-12
Job ID: 707.1001

RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

SUBSURFACE SOILS (6.9 - 8.4 ft):

VAPOR INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Soil Conc. (mg/kg)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	2.0E-3	9.7E+4			2.1E-8		
Toluene *	0.0E+0	9.7E+4			0.0E+0		
Ethyl benzene *	5.3E+0	9.7E+4			5.5E-5		
Xylenes (mixed isomers) *	2.6E+1	9.7E+4			2.7E-4		
Methyl t-Butyl ether (MTBE) *	0.0E+0	9.7E+4			0.0E+0		
Tert-butyl alcohol (2-methyl-2-propanol)	0.0E+0	1.4E+5			0.0E+0		
Butylbenzene, n-	2.8E+0	9.7E+4			2.8E-5		
Butylbenzene, sec-	2.2E-1	9.7E+4			2.3E-6		
Cumene	2.5E-1	9.7E+4			2.6E-6		
Propylbenzene, n-	4.3E+0	9.7E+4			4.5E-5		
Cymene (isopropyltoluene)	2.5E-1	9.7E+4			2.6E-6		
Trimethylbenzene, 1,2,4-	2.1E+1	9.7E+4			2.2E-4		
Trimethylbenzene, 1,3,5-	7.9E+0	9.7E+4			8.2E-5		
Naphthalene *	9.6E+0	8.2E+5			1.2E-5		
Methylnaphthalene, 2-	4.7E-1	2.3E+6			2.0E-7		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Completed By: Dai Watkins

Date Completed: 12-Feb-12
Job ID: 707.1001

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (6.9 - 8.4 ft):

VAPOR INHALATION (cont'd)

	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
Constituents of Concern	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	4.1E-1			8.5E-9		
Toluene *	4.1E-1			0.0E+0		
Ethyl benzene *	4.1E-1			2.3E-5		
Xylenes (mixed isomers) *	9.6E-1			2.6E-4		
Methyl t-Butyl ether (MTBE) *	4.1E-1			0.0E+0		
Tert-butyl alcohol (2-methyl-2-propanol)	9.6E-1			0.0E+0		
Butylbenzene, n-	9.6E-1			2.7E-5		
Butylbenzene, sec-	9.6E-1			2.2E-6		
Cumene	9.6E-1			2.5E-6		
Propylbenzene, n-	9.6E-1			4.3E-5		
Cymene (isopropyltoluene)	9.6E-1			2.5E-6		
Trimethylbenzene, 1,2,4-	9.6E-1			2.1E-4		
Trimethylbenzene, 1,3,5-	9.6E-1			7.8E-5		
Naphthalene *	4.1E-1			4.8E-6		
Methylnaphthalene, 2-	9.6E-1			1.9E-7		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
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RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

GROUNDWATER: VAPOR INHALATION

Exposure Concentration

	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Groundwater Conc. (mg/L)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	1.4E+1	3.7E+5			3.8E-5		
Toluene *	5.7E-1	4.2E+5			1.4E-6		
Ethyl benzene *	3.2E+0	4.6E+5			7.0E-6		
Xylenes (mixed isomers) *	9.8E+0	4.2E+5			2.3E-5		
Methyl t-Butyl ether (MTBE) *	8.0E-1	4.7E+4			1.7E-5		
Tert-butyl alcohol (2-methyl-2-propanol)	8.7E-2	7.4E+5			1.2E-7		
Butylbenzene, n-	0.0E+0	5.3E+5			0.0E+0		
Butylbenzene, sec-	0.0E+0	5.3E+5			0.0E+0		
Cumene	0.0E+0	5.0E+5			0.0E+0		
Propylbenzene, n-	3.1E-1	5.0E+5			6.2E-7		
Cymene (isopropyltoluene)	0.0E+0	5.3E+5			0.0E+0		
Trimethylbenzene, 1,2,4-	1.6E+0	4.9E+5			3.2E-6		
Trimethylbenzene, 1,3,5-	4.9E-1	5.0E+5			9.9E-7		
Naphthalene *	3.4E-1	4.9E+5			6.9E-7		
Methylnaphthalene, 2-	0.0E+0	5.2E+5			0.0E+0		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
Completed By: Dai Watkins

Date Completed: 12-Feb-12
Job ID: 707.1001

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR INHALATION (cont'd)

	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)
Constituents of Concern	Residential	None	None	Residential	None	None
Benzene *	4.1E-1			1.6E-5		
Toluene *	4.1E-1			5.6E-7		
Ethyl benzene *	4.1E-1			2.9E-6		
Xylenes (mixed isomers) *	9.6E-1			2.2E-5		
Methyl t-Butyl ether (MTBE) *	4.1E-1			7.0E-6		
Tert-butyl alcohol (2-methyl-2-propanol)	9.6E-1			1.1E-7		
Butylbenzene, n-	9.6E-1			0.0E+0		
Butylbenzene, sec-	9.6E-1			0.0E+0		
Cumene	9.6E-1			0.0E+0		
Propylbenzene, n-	9.6E-1			6.0E-7		
Cymene (isopropyltoluene)	9.6E-1			0.0E+0		
Trimethylbenzene, 1,2,4-	9.6E-1			3.1E-6		
Trimethylbenzene, 1,3,5-	9.6E-1			9.5E-7		
Naphthalene *	4.1E-1			2.8E-7		
Methylnaphthalene, 2-	9.6E-1			0.0E+0		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville
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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

MAXIMUM PATHWAY EXPOSURE (mg/m^3)

Maximum average expsosure concentration from soil and groundwater routes.)

	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
Constituents of Concern	Residential	Construction Worker	None	None
Benzene *	1.6E-5			
Toluene *	5.6E-7			
Ethyl benzene *	2.3E-5			
Xylenes (mixed isomers) *	2.6E-4			
Methyl t-Butyl ether (MTBE) *	7.0E-6			
Tert-butyl alcohol (2-methyl-2-propanol)	1.1E-7			
Butylbenzene, n-	2.7E-5			
Butylbenzene, sec-	2.2E-6			
Cumene	2.5E-6			
Propylbenzene, n-	4.3E-5			
Cymene (isopropyltoluene)	2.5E-6			
Trimethylbenzene, 1,2,4-	2.1E-4			
Trimethylbenzene, 1,3,5-	7.8E-5			
Naphthalene *	4.8E-6			
Methylnaphthalene, 2-	1.9E-7			

Site Name: Oak Walk - Post Remediation Building Type 3A
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TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

CARCINOGENIC RISK

Constituents of Concern	(1) Is Carcinogenic	(2) Maximum Carcinogenic Exposure (mg/m^3)				(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000			
		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
		Residential	Construction Worker	None	None		Residential	Construction Worker	None	None
Benzene *	TRUE	1.6E-5		-	-	2.9E-5	4.5E-7			
Toluene *	TRUE	5.6E-7		-	-	3.4E-5	1.9E-8			
Ethyl benzene *	TRUE	2.3E-5		-	-	2.5E-6	5.7E-8			
Xylenes (mixed isomers) *	FALSE	-	-	-	-	-				
Methyl t-Butyl ether (MTBE) *	TRUE	7.0E-6		-	-	2.6E-7	1.8E-9			
Tert-butyl alcohol (2-methyl-2-propa	FALSE	-	-	-	-	-				
Butylbenzene, n-	FALSE	-	-	-	-	-				
Butylbenzene, sec-	FALSE	-	-	-	-	-				
Cumene	FALSE	-	-	-	-	-				
Propylbenzene, n-	FALSE	-	-	-	-	-				
Cymene (isopropyltoluene)	FALSE	-	-	-	-	-				
Trimethylbenzene, 1,2,4-	FALSE	-	-	-	-	-				
Trimethylbenzene, 1,3,5-	FALSE	-	-	-	-	-				
Naphthalene *	TRUE	4.8E-6		-	-	3.4E-5	1.6E-7			
Methylnaphthalene, 2-	FALSE	-	-	-	-	-				
Total Pathway Carcinogenic Risk =							**7.0E-7**			

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville

Completed By: Dai Watkins
Date Completed: 12-Feb-12

Job ID: 707.1001

RBCA SITE ASSESSMENT

9 OF 9

TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

TOXIC EFFECTS

Constituents of Concern	(5) Maximum Toxicant Exposure (mg/m^3)				(6) Inhalation Reference Conc. (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)			
	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Residential	Construction Worker	None	None		Residential	Construction Worker	None	None
Benzene *	3.7E-5				2.8E-1	1.3E-4			
Toluene *	1.3E-6				5.0E+0	2.6E-7			
Ethyl benzene *	5.3E-5				1.0E+0	5.3E-5			
Xylenes (mixed isomers) *	2.6E-4				1.0E-1	2.6E-3			
Methyl t-Butyl ether (MTBE) *	1.6E-5				3.0E+0	5.4E-6			
Tert-butyl alcohol (2-methyl-2-propa	1.1E-7				-				
Butylbenzene, n-	2.7E-5				-				
Butylbenzene, sec-	2.2E-6				-				
Cumene	2.5E-6				4.0E-1	6.2E-6			
Propylbenzene, n-	4.3E-5				4.0E-1	1.1E-4			
Cymene (isopropyltoluene)	2.5E-6				-				
Trimethylbenzene, 1,2,4-	2.1E-4				7.0E-3	3.0E-2			
Trimethylbenzene, 1,3,5-	7.8E-5				6.0E-3	1.3E-2			
Naphthalene *	1.1E-5				3.0E-3	3.8E-3			
Methylnaphthalene, 2-	1.9E-7				-				
					Total Pathway Hazard Index =	**4.9E-2**			

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville

Completed By: Dai Watkins
Date Completed: 12-Feb-12

Job ID: 707.1001

RBCA Tool Kit for Chemical Releases, Version 2.51

RBCA SITE ASSESSMENT

Baseline Risk Summary-All Pathways

Site Name: Oak Walk - Post Remediation Building Type 3A
Site Location: Emeryville

Completed By: Dai Watkins
Date Completed: 12-Feb-12

1 of 1

BASELINE RISK SUMMARY TABLE

	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		**Cumulative COC Risk**		**Risk Limit(s) Exceeded?**	**Hazard Quotient**		**Hazard Index**		**Toxicity Limit(s) Exceeded?**
EXPOSURE PATHWAY	**Maximum Value**	**Target Risk**	**Total Value**	**Target Risk**		**Maximum Value**	**Applicable Limit**	**Total Value**	**Applicable Limit**	
OUTDOOR AIR EXPOSURE PATHWAYS										
■	4.5E-7	1.0E-6	7.0E-7	1.0E-6	☐	3.0E-2	2.0E-1	4.9E-2	2.0E-1	☐
INDOOR AIR EXPOSURE PATHWAYS										
■	2.4E-7	1.0E-6	2.6E-7	1.0E-6	☐	2.4E-4	2.0E-1	6.1E-4	2.0E-1	☐
SOIL EXPOSURE PATHWAYS										
☐	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
GROUNDWATER EXPOSURE PATHWAYS										
☐	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
SURFACE WATER EXPOSURE PATHWAYS										
☐	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐

CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	4.5E-7	***1.0E-6***	***7.0E-7***	***1.0E-6***	☐	***3.0E-2***	***2.0E-1***	***4.9E-2***	***2.0E-1***	☐
	Outdoor Air		***Outdoor Air***			***Outdoor Air***		***Outdoor Air***		

APPENDIX C

Health Risk Assessment for Building Type 1

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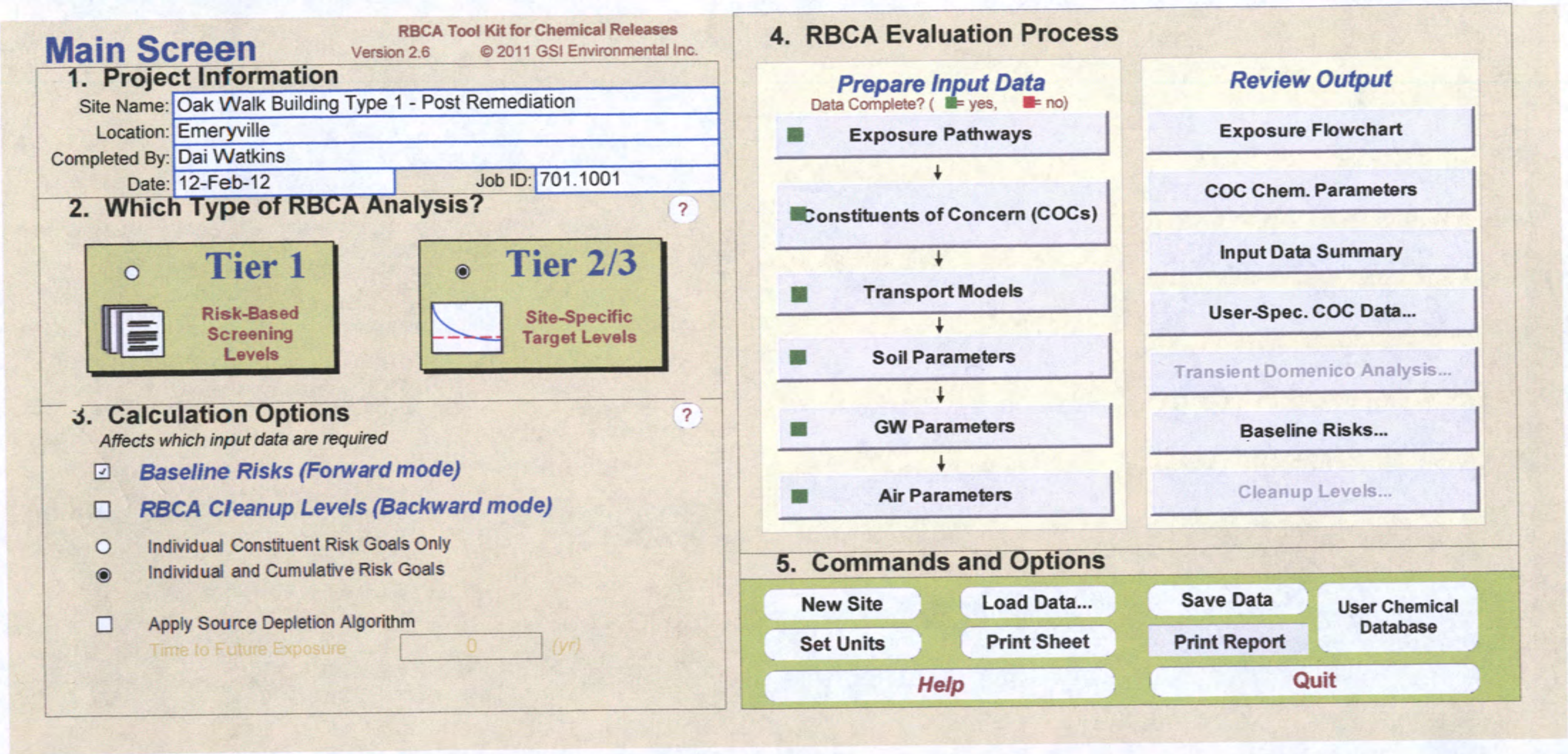

Main Screen

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Version 2.6 © 2011 GSI Environmental Inc.

1. Project Information

Site Name: Oak Walk Building Type 1 - Post Remediation
Location: Emeryville
Completed By: Dai Watkins
Date: 12-Feb-12
Job ID: 701.1001

2. Which Type of RBCA Analysis?

○ Tier 1 Risk-Based Screening Levels
● Tier 2/3 Site-Specific Target Levels

3. Calculation Options

Affects which input data are required

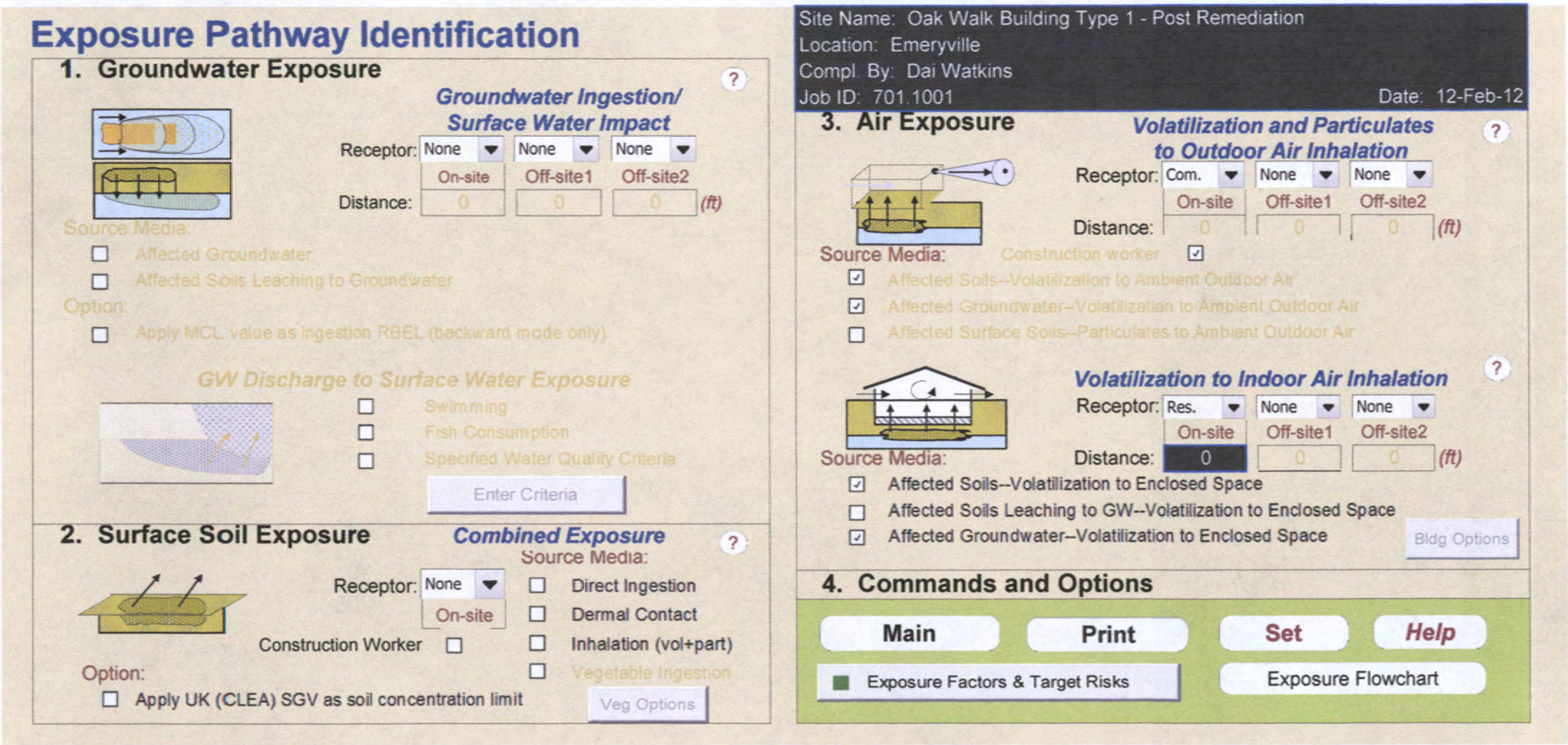
☑ Baseline Risks (Forward mode)
☐ RBCA Cleanup Levels (Backward mode)
○ Individual Constituent Risk Goals Only
● Individual and Cumulative Risk Goals
☐ Apply Source Depletion Algorithm
Time to Future Exposure 0 (yr)

4. RBCA Evaluation Process

Prepare Input Data
Data Complete? (🟩= yes, 🟥= no)

🟩 Exposure Pathways
🟩 Constituents of Concern (COCs)
🟩 Transport Models
🟩 Soil Parameters
🟩 GW Parameters
🟩 Air Parameters

RBCA Tool Kit for Chemical Releases, Version 2.6



Exposure Pathway Identification

Site Name: Oak Walk Building Type 1 - Post Remediation
Location: Emeryville
Compl. By: Dai Watkins
Job ID: 701.1001
Date: 12-Feb-12

1. Groundwater Exposure

Groundwater Ingestion/ Surface Water Impact

	On-site	Off-site1	Off-site2	
Receptor:	None	None	None	
Distance:	0	0	0	(ft)

Source Media:
- ☐ Affected Groundwater
- ☐ Affected Soils Leaching to Groundwater

Option:
- ☐ Apply MCL value as ingestion RBEL (backward mode only)

GW Discharge to Surface Water Exposure
- ☐ Swimming
- ☐ Fish Consumption
- ☐ Specified Water Quality Criteria

2. Surface Soil Exposure

Combined Exposure

Receptor: None (On-site)
Construction Worker ☐

Source Media:
- ☐ Direct Ingestion
- ☐ Dermal Contact
- ☐ Inhalation (vol+part)
- ☐ Vegetable Ingestion

Option:
- ☐ Apply UK (CLEA) SGV as soil concentration limit

3. Air Exposure

Volatilization and Particulates to Outdoor Air Inhalation

	On-site	Off-site1	Off-site2	
Receptor:	Com.	None	None	
Distance:	0	0	0	(ft)

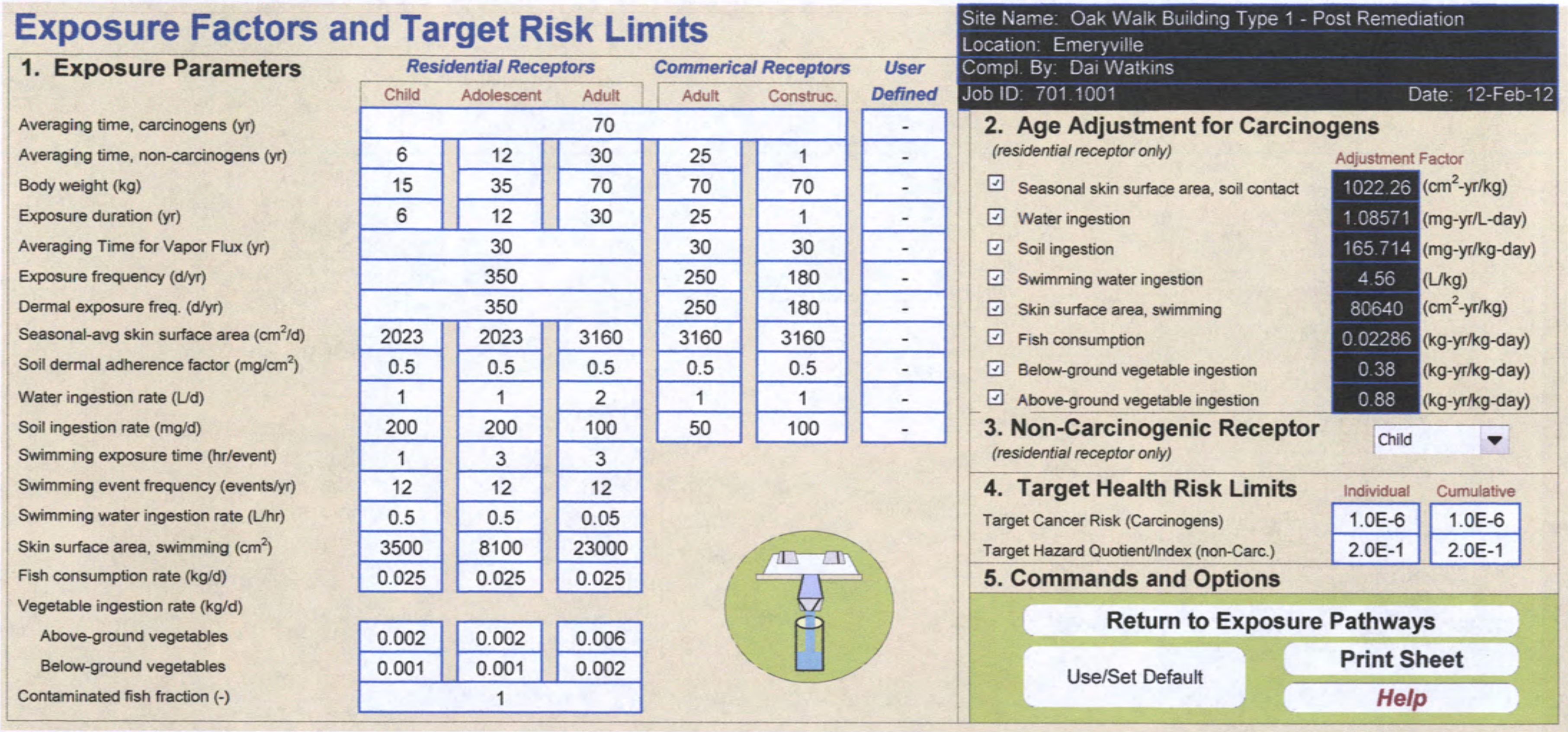
Source Media: Construction worker ☑
- ☑ Affected Soils--Volatilization to Ambient Outdoor Air
- ☑ Affected Groundwater--Volatilization to Ambient Outdoor Air
- ☐ Affected Surface Soils--Particulates to Ambient Outdoor Air

Volatilization to Indoor Air Inhalation

	On-site	Off-site1	Off-site2	
Receptor:	Res.	None	None	
Distance:	0	0	0	(ft)

Source Media:
- ☑ Affected Soils--Volatilization to Enclosed Space
- ☐ Affected Soils Leaching to GW--Volatilization to Enclosed Space
- ☑ Affected Groundwater--Volatilization to Enclosed Space

4. Commands and Options



Exposure Factors and Target Risk Limits

Site Name: Oak Walk Building Type 1 - Post Remediation
Location: Emeryville
Compl. By: Dai Watkins
Job ID: 701.1001
Date: 12-Feb-12

1. Exposure Parameters

	Residential Receptors			Commerical Receptors		User Defined
	Child	Adolescent	Adult	Adult	Construc.	
Averaging time, carcinogens (yr)	70					-
Averaging time, non-carcinogens (yr)	6	12	30	25	1	-
Body weight (kg)	15	35	70	70	70	-
Exposure duration (yr)	6	12	30	25	1	-
Averaging Time for Vapor Flux (yr)	30			30	30	-
Exposure frequency (d/yr)	350			250	180	-
Dermal exposure freq. (d/yr)	350			250	180	-
Seasonal-avg skin surface area (cm^2/d)	2023	2023	3160	3160	3160	-
Soil dermal adherence factor (mg/cm^2)	0.5	0.5	0.5	0.5	0.5	-
Water ingestion rate (L/d)	1	1	2	1	1	-
Soil ingestion rate (mg/d)	200	200	100	50	100	-
Swimming exposure time (hr/event)	1	3	3			
Swimming event frequency (events/yr)	12	12	12			
Swimming water ingestion rate (L/hr)	0.5	0.5	0.05			
Skin surface area, swimming (cm^2)	3500	8100	23000			
Fish consumption rate (kg/d)	0.025	0.025	0.025			
Vegetable ingestion rate (kg/d)						
Above-ground vegetables	0.002	0.002	0.006			
Below-ground vegetables	0.001	0.001	0.002			
Contaminated fish fraction (-)	1					

2. Age Adjustment for Carcinogens

(residential receptor only)

		Adjustment Factor	
☑	Seasonal skin surface area, soil contact	1022.26	(cm^2-yr/kg)
☑	Water ingestion	1.08571	(mg-yr/L-day)
☑	Soil ingestion	165.714	(mg-yr/kg-day)
☑	Swimming water ingestion	4.56	(L/kg)
☑	Skin surface area, swimming	80640	(cm^2-yr/kg)
☑	Fish consumption	0.02286	(kg-yr/kg-day)
☑	Below-ground vegetable ingestion	0.38	(kg-yr/kg-day)
☑	Above-ground vegetable ingestion	0.88	(kg-yr/kg-day)

3. Non-Carcinogenic Receptor

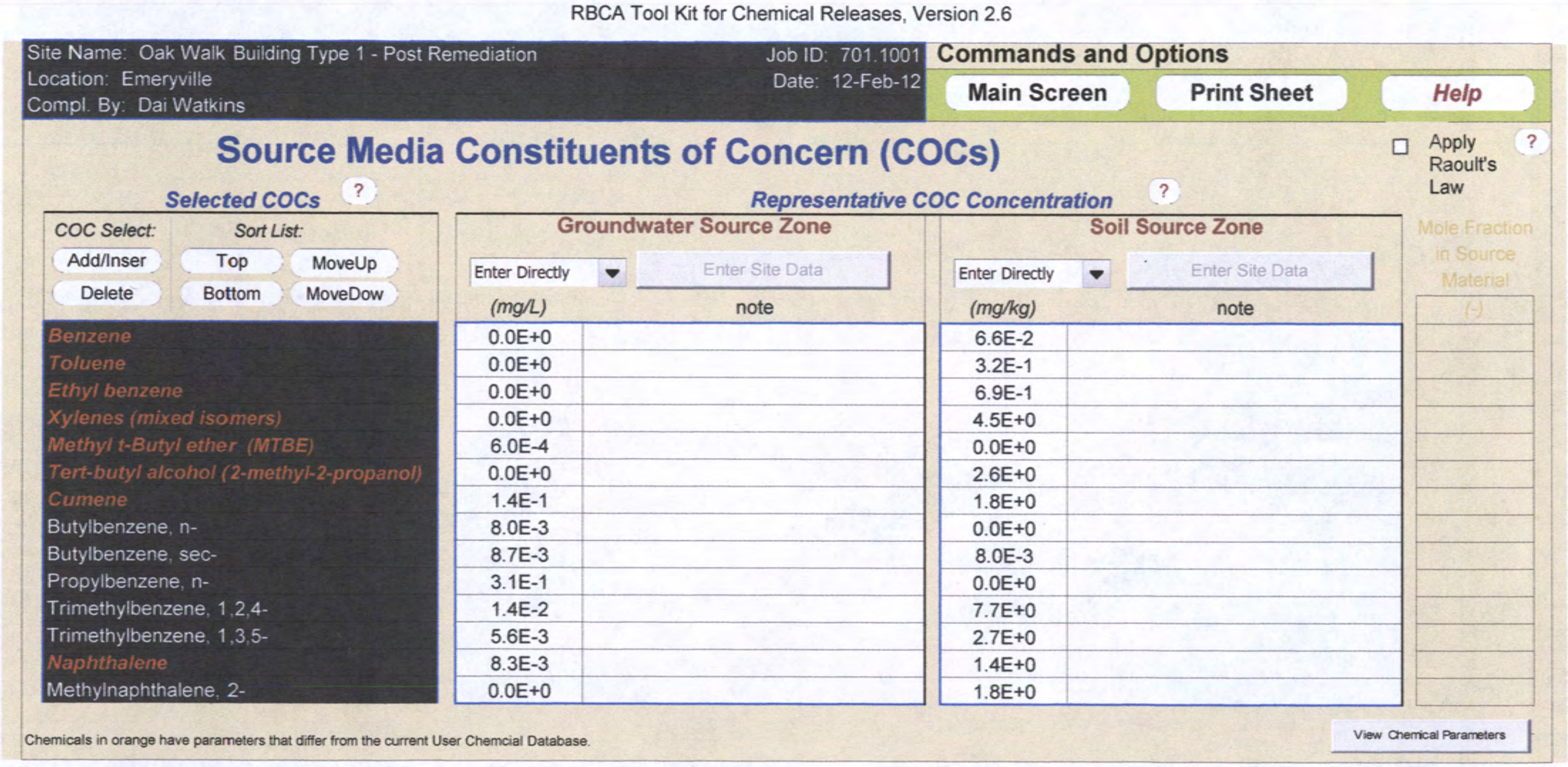
(residential receptor only)

Child ▼

4. Target Health Risk Limits

	Individual	Cumulative
Target Cancer Risk (Carcinogens)	1.0E-6	1.0E-6
Target Hazard Quotient/Index (non-Carc.)	2.0E-1	2.0E-1

5. Commands and Options



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Site Name: Oak Walk Building Type 1 - Post Remediation
Location: Emeryville
Compl. By: Dai Watkins

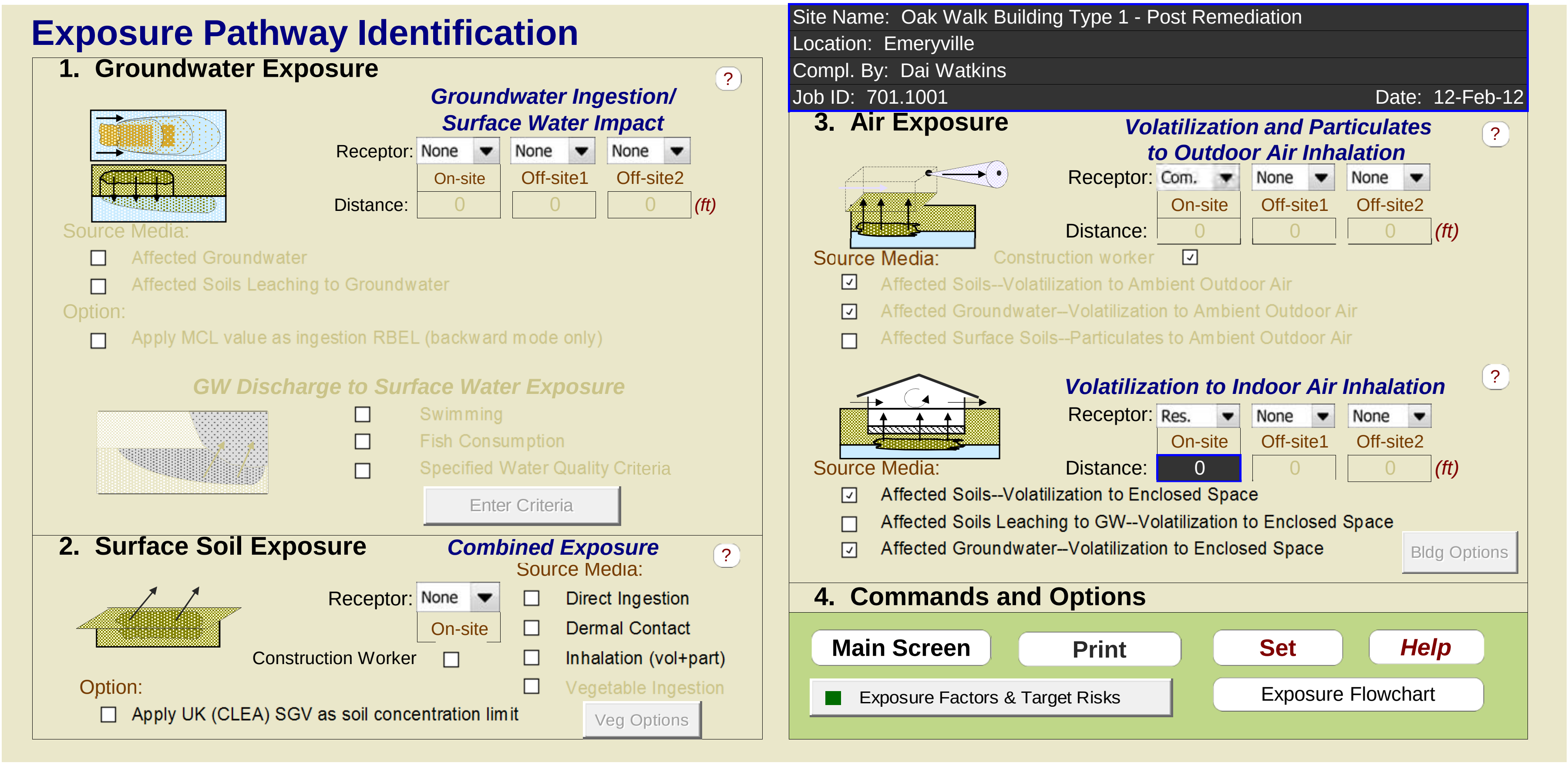
Job ID: 701.1001
Date: 12-Feb-12

Source Media Constituents of Concern (COCs)

Selected COCs	Representative COC Concentration: Groundwater Source Zone (mg/L)	note	Representative COC Concentration: Soil Source Zone (mg/kg)	note	Mole Fraction in Source Material (-)
Benzene	0.0E+0		6.6E-2		
Toluene	0.0E+0		3.2E-1		
Ethyl benzene	0.0E+0		6.9E-1		
Xylenes (mixed isomers)	0.0E+0		4.5E+0		
Methyl t-Butyl ether (MTBE)	6.0E-4		0.0E+0		
Tert-butyl alcohol (2-methyl-2-propanol)	0.0E+0		2.6E+0		
Cumene	1.4E-1		1.8E+0		
Butylbenzene, n-	8.0E-3		0.0E+0		
Butylbenzene, sec-	8.7E-3		8.0E-3		
Propylbenzene, n-	3.1E-1		0.0E+0		
Trimethylbenzene, 1,2,4-	1.4E-2		7.7E+0		
Trimethylbenzene, 1,3,5-	5.6E-3		2.7E+0		
Naphthalene	8.3E-3		1.4E+0		
Methylnaphthalene, 2-	0.0E+0		1.8E+0		

Chemicals in orange have parameters that differ from the current User Chemcial Database.

RBCA Tool Kit for Chemical Releases, Version 2.6



Exposure Pathway Identification

Site Name: Oak Walk Building Type 1 - Post Remediation
Location: Emeryville
Compl. By: Dai Watkins
Job ID: 701.1001
Date: 12-Feb-12

1. Groundwater Exposure

Groundwater Ingestion/ Surface Water Impact

	On-site	Off-site1	Off-site2	
Receptor:	None	None	None	
Distance:	0	0	0	(ft)

Source Media:
- ☐ Affected Groundwater
- ☐ Affected Soils Leaching to Groundwater

Option:
- ☐ Apply MCL value as ingestion RBEL (backward mode only)

GW Discharge to Surface Water Exposure
- ☐ Swimming
- ☐ Fish Consumption
- ☐ Specified Water Quality Criteria

Enter Criteria

2. Surface Soil Exposure

Combined Exposure

Receptor: None (On-site)

Construction Worker ☐

Source Media:
- ☐ Direct Ingestion
- ☐ Dermal Contact
- ☐ Inhalation (vol+part)
- ☐ Vegetable Ingestion

Veg Options

Option:
- ☐ Apply UK (CLEA) SGV as soil concentration limit

3. Air Exposure

Volatilization and Particulates to Outdoor Air Inhalation

	On-site	Off-site1	Off-site2	
Receptor:	Com.	None	None	
Distance:	0	0	0	(ft)

Source Media:

Construction worker ☑
- ☑ Affected Soils--Volatilization to Ambient Outdoor Air
- ☑ Affected Groundwater--Volatilization to Ambient Outdoor Air
- ☐ Affected Surface Soils--Particulates to Ambient Outdoor Air

Volatilization to Indoor Air Inhalation

	On-site	Off-site1	Off-site2	
Receptor:	Res.	None	None	
Distance:	0	0	0	(ft)

Source Media:
- ☑ Affected Soils--Volatilization to Enclosed Space
- ☐ Affected Soils Leaching to GW--Volatilization to Enclosed Space
- ☑ Affected Groundwater--Volatilization to Enclosed Space

Bldg Options

4. Commands and Options

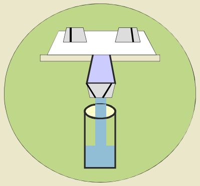
RBCA Tool Kit for Chemical Releases, Version 2.51

Exposure Factors and Target Risk Limits

Site Name: Oak Walk Building Type 1 - Post Remediation
Location: Emeryville
Compl. By: Dai Watkins
Job ID: 701.1001 Date: 12-Feb-12

1. Exposure Parameters

	Residential Receptors			*Commerical Receptors*		*User Defined*
	Child	Adolescent	Adult	Adult	Construc.	
Averaging time, carcinogens (yr)	70					-
Averaging time, non-carcinogens (yr)	6	12	30	25	1	-
Body weight (kg)	15	35	70	70	70	-
Exposure duration (yr)	6	12	30	25	1	-
Averaging Time for Vapor Flux (yr)	30			30	30	-
Exposure frequency (d/yr)	350			250	180	-
Dermal exposure freq. (d/yr)	350			250	180	-
Seasonal-avg skin surface area (cm^2/d)	2023	2023	3160	3160	3160	-
Soil dermal adherence factor (mg/cm^2)	0.5	0.5	0.5	0.5	0.5	-
Water ingestion rate (L/d)	1	1	2	1	1	-
Soil ingestion rate (mg/d)	200	200	100	50	100	-
Swimming exposure time (hr/event)	1	3	3			
Swimming event frequency (events/yr)	12	12	12			
Swimming water ingestion rate (L/hr)	0.5	0.5	0.05			
Skin surface area, swimming (cm^2)	3500	8100	23000			
Fish consumption rate (kg/d)	0.025	0.025	0.025			
Vegetable ingestion rate (kg/d)						
Above-ground vegetables	0.002	0.002	0.006			
Below-ground vegetables	0.001	0.001	0.002			
Contaminated fish fraction (-)	1					



2. Age Adjustment for Carcinogens

(residential receptor only)

	Adjustment Factor	
☑ Seasonal skin surface area, soil contact	1022.26	(cm^2-yr/kg)
☑ Water ingestion	1.08571	(mg-yr/L-day)
☑ Soil ingestion	165.714	(mg-yr/kg-day)
☑ Swimming water ingestion	4.56	(L/kg)
☑ Skin surface area, swimming	80640	(cm^2-yr/kg)
☑ Fish consumption	0.02286	(kg-yr/kg-day)
☑ Below-ground vegetable ingestion	0.38	(kg-yr/kg-day)
☑ Above-ground vegetable ingestion	0.88	(kg-yr/kg-day)

3. Non-Carcinogenic Receptor

(residential receptor only)

Child ▼

4. Target Health Risk Limits

	Individual	Cumulative
Target Cancer Risk (Carcinogens)	1.0E-6	1.0E-6
Target Hazard Quotient/Index (non-Carc.)	2.0E-1	2.0E-1

5. Commands and Options

Return to Exposure Pathways

Use/Set Default

Print Sheet

Help

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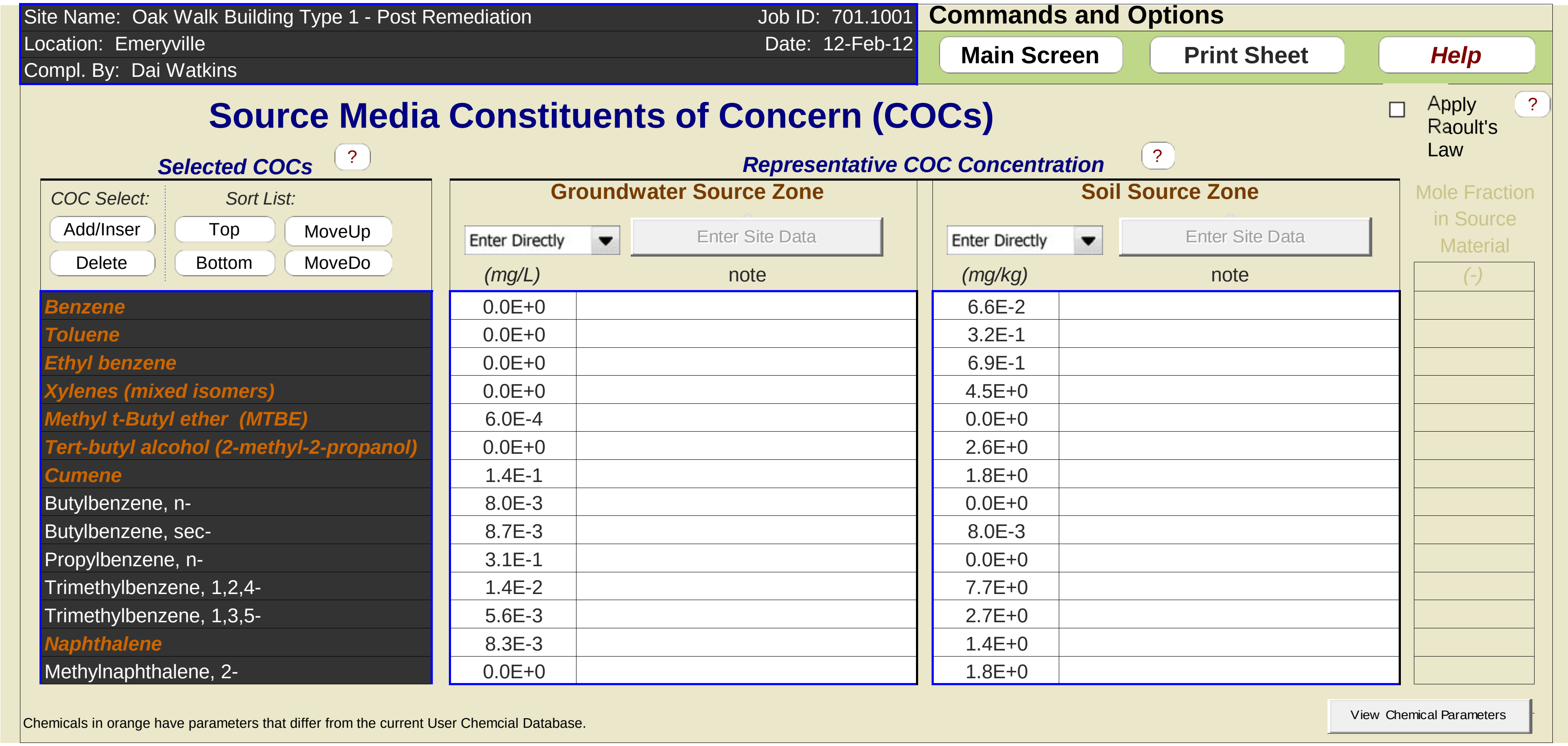

Site Name: Oak Walk Building Type 1 - Post Remediation
Job ID: 701.1001
Location: Emeryville
Date: 12-Feb-12
Compl. By: Dai Watkins

Source Media Constituents of Concern (COCs)

☐ Apply Raoult's Law

Representative COC Concentration

Groundwater Source Zone: Enter Directly

Soil Source Zone: Enter Directly

Selected COCs	Groundwater Source Zone		Soil Source Zone		Mole Fraction in Source Material
	(mg/L)	note	*(mg/kg)*	note	*(-)*
Benzene	0.0E+0		6.6E-2		
Toluene	0.0E+0		3.2E-1		
Ethyl benzene	0.0E+0		6.9E-1		
Xylenes (mixed isomers)	0.0E+0		4.5E+0		
Methyl t-Butyl ether (MTBE)	6.0E-4		0.0E+0		
Tert-butyl alcohol (2-methyl-2-propanol)	0.0E+0		2.6E+0		
Cumene	1.4E-1		1.8E+0		
Butylbenzene, n-	8.0E-3		0.0E+0		
Butylbenzene, sec-	8.7E-3		8.0E-3		
Propylbenzene, n-	3.1E-1		0.0E+0		
Trimethylbenzene, 1,2,4-	1.4E-2		7.7E+0		
Trimethylbenzene, 1,3,5-	5.6E-3		2.7E+0		
Naphthalene	8.3E-3		1.4E+0		
Methylnaphthalene, 2-	0.0E+0		1.8E+0		

Chemicals in orange have parameters that differ from the current User Chemcial Database.

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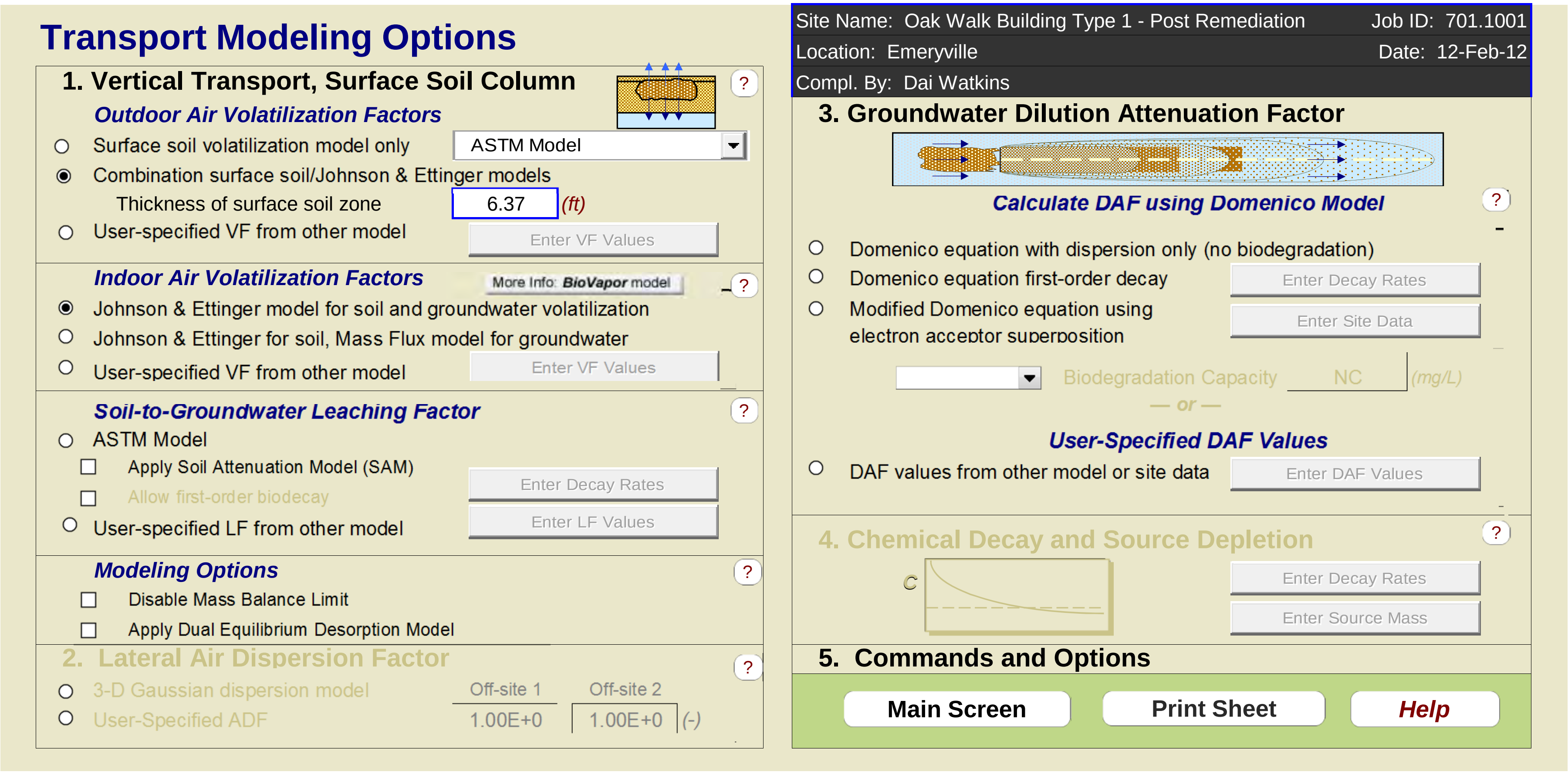

Transport Modeling Options

Site Name: Oak Walk Building Type 1 - Post Remediation Job ID: 701.1001
Location: Emeryville Date: 12-Feb-12
Compl. By: Dai Watkins

1. Vertical Transport, Surface Soil Column

Outdoor Air Volatilization Factors

- ○ Surface soil volatilization model only — ASTM Model
- ● Combination surface soil/Johnson & Ettinger models
  - Thickness of surface soil zone 6.37 (ft)
- ○ User-specified VF from other model

Indoor Air Volatilization Factors

- ● Johnson & Ettinger model for soil and groundwater volatilization
- ○ Johnson & Ettinger for soil, Mass Flux model for groundwater
- ○ User-specified VF from other model

Soil-to-Groundwater Leaching Factor

- ○ ASTM Model
  - ☐ Apply Soil Attenuation Model (SAM)
  - ☐ Allow first-order biodecay
- ○ User-specified LF from other model

Modeling Options

- ☐ Disable Mass Balance Limit
- ☐ Apply Dual Equilibrium Desorption Model

2. Lateral Air Dispersion Factor

- ○ 3-D Gaussian dispersion model
- ○ User-Specified ADF

	Off-site 1	Off-site 2	
	1.00E+0	1.00E+0	(-)

3. Groundwater Dilution Attenuation Factor

Calculate DAF using Domenico Model

- ○ Domenico equation with dispersion only (no biodegradation)
- ○ Domenico equation first-order decay
- ○ Modified Domenico equation using electron acceptor superposition

Biodegradation Capacity NC (mg/L)

— or —

User-Specified DAF Values

- ○ DAF values from other model or site data

4. Chemical Decay and Source Depletion

5. Commands and Options

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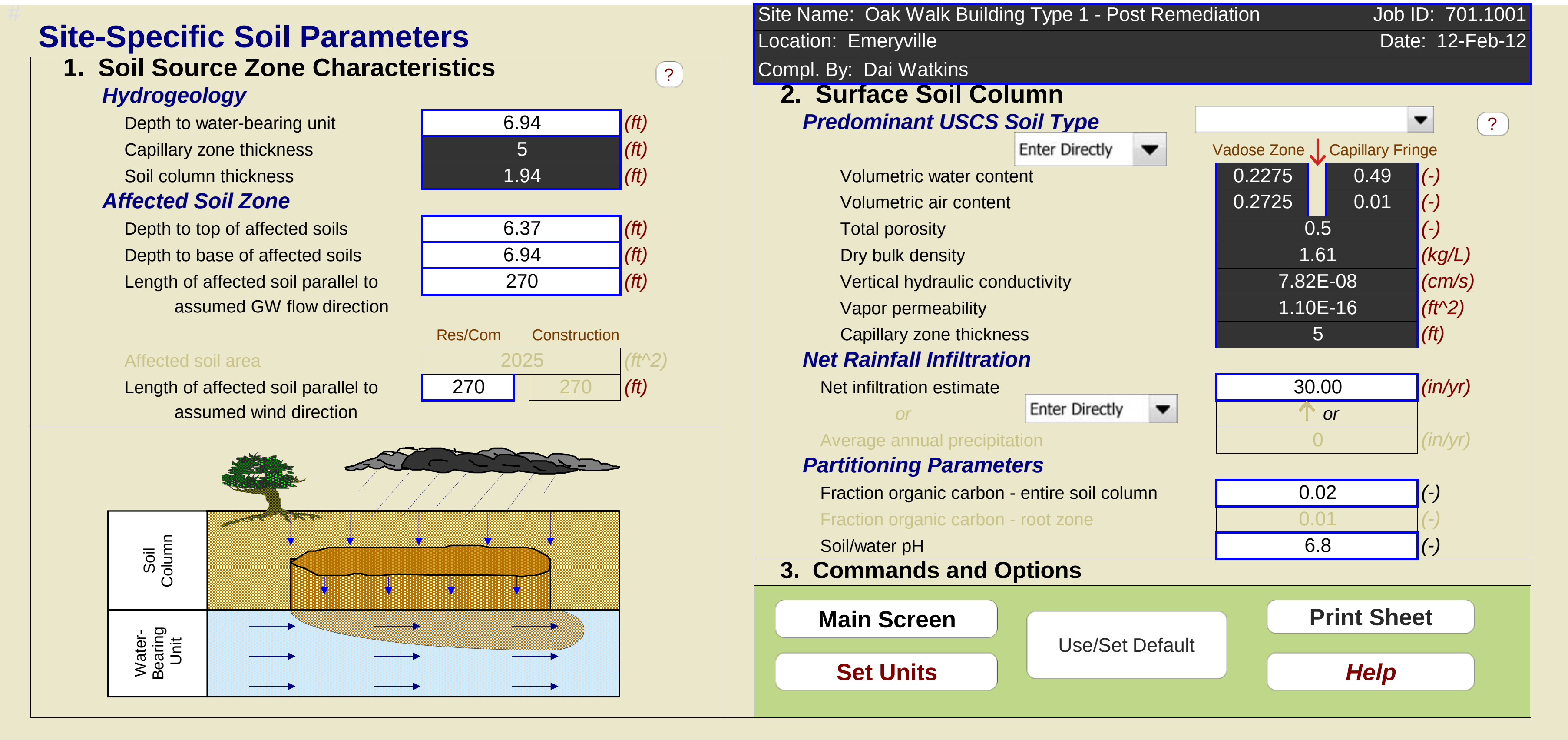


Site Name: Oak Walk Building Type 1 - Post Remediation
Job ID: 701.1001
Location: Emeryville
Date: 12-Feb-12
Compl. By: Dai Watkins

Site-Specific Soil Parameters

1. Soil Source Zone Characteristics

Hydrogeology

Depth to water-bearing unit	6.94	*(ft)*
Capillary zone thickness	5	*(ft)*
Soil column thickness	1.94	*(ft)*

Affected Soil Zone

Depth to top of affected soils	6.37		*(ft)*
Depth to base of affected soils	6.94		*(ft)*
Length of affected soil parallel to assumed GW flow direction	270		*(ft)*
	Res/Com	Construction	
Affected soil area	2025		*(ft^2)*
Length of affected soil parallel to assumed wind direction	270	270	*(ft)*

2. Surface Soil Column

Predominant USCS Soil Type

Enter Directly

	Vadose Zone	Capillary Fringe	
Volumetric water content	0.2275	0.49	*(-)*
Volumetric air content	0.2725	0.01	*(-)*
Total porosity	0.5		*(-)*
Dry bulk density	1.61		*(kg/L)*
Vertical hydraulic conductivity	7.82E-08		*(cm/s)*
Vapor permeability	1.10E-16		*(ft^2)*
Capillary zone thickness	5		*(ft)*

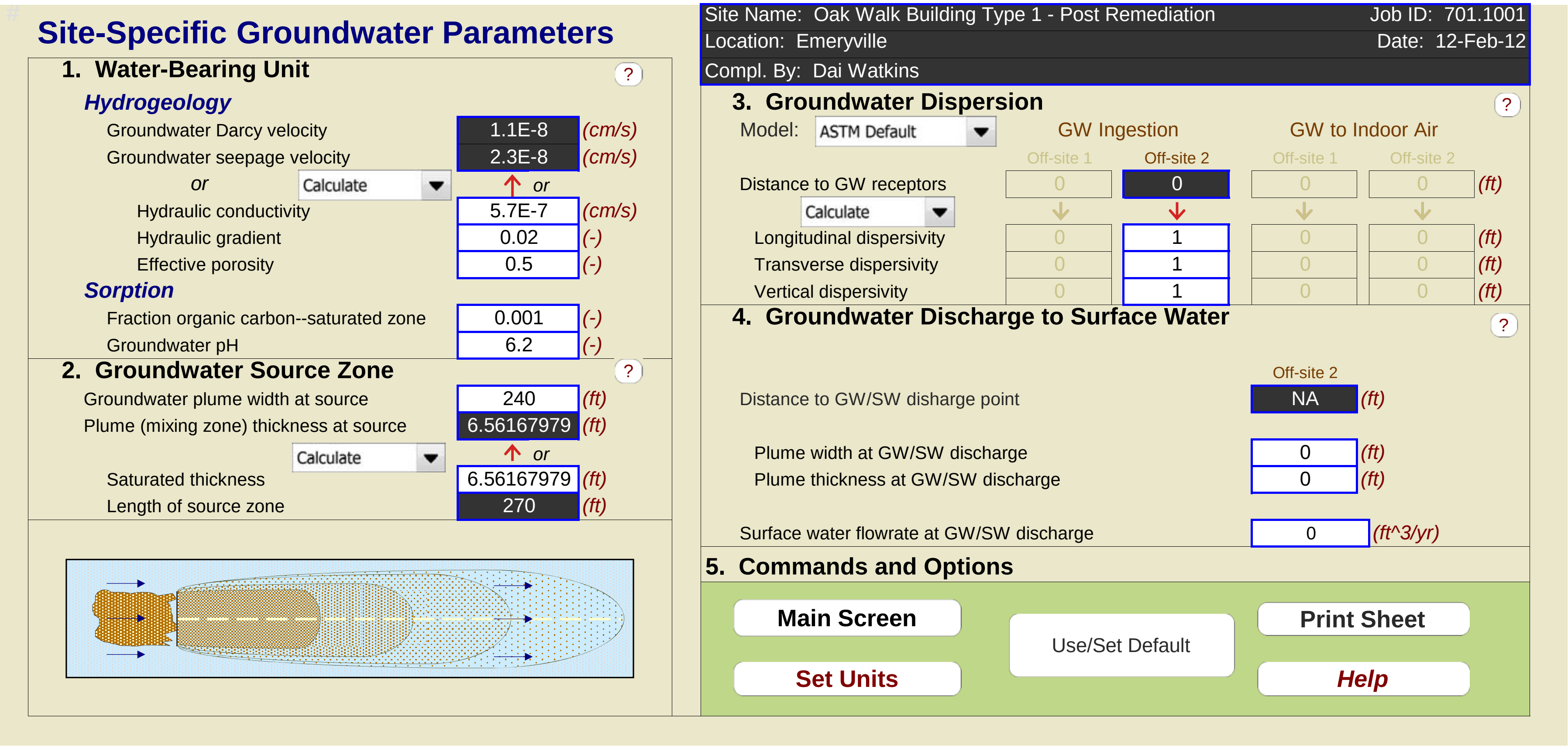
Net Rainfall Infiltration

Net infiltration estimate	30.00	*(in/yr)*
or Enter Directly	↑ *or*	
Average annual precipitation	0	*(in/yr)*

Partitioning Parameters

Fraction organic carbon - entire soil column	0.02	*(-)*
Fraction organic carbon - root zone	0.01	*(-)*
Soil/water pH	6.8	*(-)*

3. Commands and Options



Site-Specific Groundwater Parameters

Site Name: Oak Walk Building Type 1 - Post Remediation
Job ID: 701.1001
Location: Emeryville
Date: 12-Feb-12
Compl. By: Dai Watkins

1. Water-Bearing Unit

Hydrogeology

Groundwater Darcy velocity	1.1E-8	(cm/s)
Groundwater seepage velocity	2.3E-8	(cm/s)
or Calculate	or	
Hydraulic conductivity	5.7E-7	(cm/s)
Hydraulic gradient	0.02	(-)
Effective porosity	0.5	(-)

Sorption

Fraction organic carbon--saturated zone	0.001	(-)
Groundwater pH	6.2	(-)

2. Groundwater Source Zone

Groundwater plume width at source	240	(ft)
Plume (mixing zone) thickness at source	6.56167979	(ft)
Calculate	or	
Saturated thickness	6.56167979	(ft)
Length of source zone	270	(ft)

3. Groundwater Dispersion

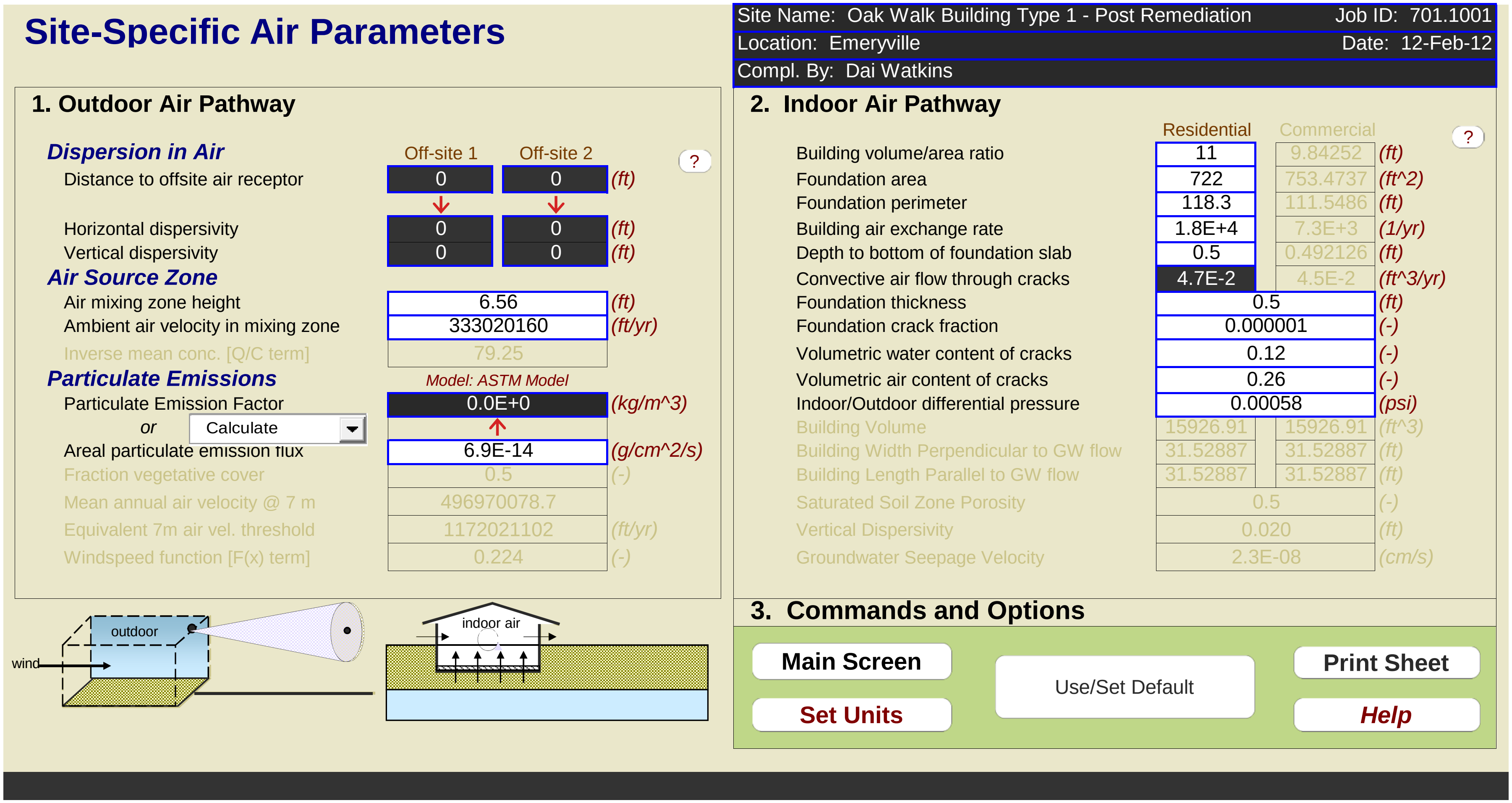
Model: ASTM Default

	GW Ingestion Off-site 1	GW Ingestion Off-site 2	GW to Indoor Air Off-site 1	GW to Indoor Air Off-site 2	
Distance to GW receptors	0	0	0	0	(ft)
Calculate					
Longitudinal dispersivity	0	1	0	0	(ft)
Transverse dispersivity	0	1	0	0	(ft)
Vertical dispersivity	0	1	0	0	(ft)

4. Groundwater Discharge to Surface Water

	Off-site 2	
Distance to GW/SW disharge point	NA	(ft)
Plume width at GW/SW discharge	0	(ft)
Plume thickness at GW/SW discharge	0	(ft)
Surface water flowrate at GW/SW discharge	0	(ft^3/yr)

5. Commands and Options



Site-Specific Air Parameters

Site Name: Oak Walk Building Type 1 - Post Remediation Job ID: 701.1001
Location: Emeryville Date: 12-Feb-12
Compl. By: Dai Watkins

1. Outdoor Air Pathway

Dispersion in Air

	Off-site 1	Off-site 2	
Distance to offsite air receptor	0	0	(ft)
Horizontal dispersivity	0	0	(ft)
Vertical dispersivity	0	0	(ft)

Air Source Zone

Air mixing zone height	6.56	(ft)
Ambient air velocity in mixing zone	333020160	(ft/yr)
Inverse mean conc. [Q/C term]	79.25	

Particulate Emissions

Model: ASTM Model

Particulate Emission Factor	0.0E+0	(kg/m^3)
or Calculate		
Areal particulate emission flux	6.9E-14	(g/cm^2/s)
Fraction vegetative cover	0.5	(-)
Mean annual air velocity @ 7 m	496970078.7	
Equivalent 7m air vel. threshold	1172021102	(ft/yr)
Windspeed function [F(x) term]	0.224	(-)

2. Indoor Air Pathway

	Residential	Commercial	
Building volume/area ratio	11	9.84252	(ft)
Foundation area	722	753.4737	(ft^2)
Foundation perimeter	118.3	111.5486	(ft)
Building air exchange rate	1.8E+4	7.3E+3	(1/yr)
Depth to bottom of foundation slab	0.5	0.492126	(ft)
Convective air flow through cracks	4.7E-2	4.5E-2	(ft^3/yr)
Foundation thickness	0.5		(ft)
Foundation crack fraction	0.000001		(-)
Volumetric water content of cracks	0.12		(-)
Volumetric air content of cracks	0.26		(-)
Indoor/Outdoor differential pressure	0.00058		(psi)
Building Volume	15926.91	15926.91	(ft^3)
Building Width Perpendicular to GW flow	31.52887	31.52887	(ft)
Building Length Parallel to GW flow	31.52887	31.52887	(ft)
Saturated Soil Zone Porosity	0.5		(-)
Vertical Dispersivity	0.020		(ft)
Groundwater Seepage Velocity	2.3E-08		(cm/s)

3. Commands and Options

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Orange = One or more parameter differs from User Chemical Database

Constituent	CAS Number	Type	Molecular Weight (g/mole)		Aqueous Solubility (@ 20 - 25 C) (mg/L)		Soil Saturation Limit Calculated (mg/kg)	Vapor Pressure (@ 20 - 25 C) (mm Hg)		Henry's Constant (@ 20 - 25 C) (unitless)		log (Koc) or log (Kd) (@ 20 - 25 C) log(L/kg)		
Benzene	71-43-2	O	78.11364	***TX08***	1770	***TX08***	2.66E+03	9.50E+01	***TX08***	2.27E-01	***TX08***	1.82E+00	Koc	***TX08***
Toluene	108-88-3	O	92.14052	***TX08***	530	***TX08***	1.58E+03	2.82E+01	***TX08***	2.76E-01	***TX08***	2.15E+00	Koc	***TX08***
Ethyl benzene	100-41-4	O	106.1674	***TX08***	169	***TX08***	7.23E+02	9.60E+00	***TX08***	3.28E-01	***TX08***	2.31E+00	Koc	***TX08***
Xylenes (mixed isomers)	1330-20-7	O	106.1674	***TX08***	198	***TX08***	9.88E+02	8.06E+00	***TX08***	2.93E-01	***TX08***	2.38E+00	Koc	***TX08***
Methyl t-Butyl ether (MTBE)	1634-04-4	O	88.14968	***TX08***	48000	***TX08***	2.05E+04	2.49E+02	***TX08***	2.44E-02	***TX08***	1.15E+00	Koc	***TX08***
Tert-butyl alcohol (2-methyl-2-propanol)	75-65-0	O	74.1224	***TX08***	235208.1557	***TX08***	5.31E+04	3.14E+01	***TX08***	5.42E-04	***TX08***	6.25E-01	Koc	***TX08***
Cumene	98-82-8	O	120.19428	***TX08***	50	***TX08***	3.48E+03	4.60E+00	***TX08***	6.07E-01	***TX08***	3.54E+00	Koc	***TX08***
Butylbenzene, n-	104-51-8	O	134.22	TX11	10.76	TX11	6.52E+02	8.14E-01	TX11	5.57E-01	TX11	3.48E+00	Koc	TX11
Butylbenzene, sec-	135-98-8	O	134.22	TX11	18.1	TX11	7.60E+02	1.25E+00	TX11	5.07E-01	TX11	3.32E+00	Koc	TX11
Propylbenzene, n-	103-65-1	O	120.19	TX11	42.019	TX11	9.09E+02	2.71E+00	TX11	4.24E-01	TX11	3.03E+00	Koc	TX11
Trimethylbenzene, 1,2,4-	95-63-6	O	120.19	TX11	56.8	TX11	1.07E+03	1.59E+00	TX11	1.84E-01	TX11	2.97E+00	Koc	TX11
Trimethylbenzene, 1,3,5-	108-67-8	O	120.19	TX11	51.48	TX11	1.06E+03	2.13E+00	TX11	2.72E-01	TX11	3.01E+00	Koc	TX11
Naphthalene	91-20-3	O	128.17352	***TX08***	31.4	***TX08***	9.77E+02	8.89E-02	***TX08***	2.00E-02	***TX08***	3.19E+00	Koc	***TX08***
Methylnaphthalene, 2-	91-57-6	O	142.2004	TX11	25.4	TX11	2.20E+03	6.75E-02	TX11	1.85E-02	TX11	3.64E+00	Koc	TX11

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
Job ID: 701.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Orange = One or more parameter differs from User Chemical Database	pH specific Kd for non-organics							log(Kow)		Diffusion Coefficients			
	Surface Soil Column			Water Bearing Unit				(@ 20 - 25 C)		Air		Water	
Constituent	**Slope**	**y-Intercept**	**logKd_pH (L/kg)**	**Slope**	**y-Intercept**	**logKd_pH (L/kg)**		**log(L/kg)**		**(cm^2/s)**		**(cm^2/s)**	
Benzene	-	-	-	-	-	-	-	1.99E+00	***TX08***	8.80E-02	***TX08***	9.80E-06	***TX08***
Toluene	-	-	-	-	-	-	-	2.54E+00	***TX08***	8.70E-02	***TX08***	8.60E-06	***TX08***
Ethyl benzene	-	-	-	-	-	-	-	3.03E+00	***TX08***	7.50E-02	***TX08***	7.80E-06	***TX08***
Xylenes (mixed isomers)	-	-	-	-	-	-	-	3.09E+00	***TX08***	7.40E-02	***TX08***	8.50E-06	***TX08***
Methyl t-Butyl ether (MTBE)	-	-	-	-	-	-	-	1.43E+00	***TX08***	7.92E-02	***TX08***	9.41E-05	***TX08***
Tert-butyl alcohol (2-methyl-2-propanol)	-	-	-	-	-	-	-	6.90E-01	***TX08***	8.52E-02	***TX08***	9.11E-06	***TX08***
Cumene	-	-	-	-	-	-	-	3.45E+00	***TX08***	6.50E-02	***TX08***	7.10E-06	***TX08***
Butylbenzene, n-	-	-	-	-	-	-	-	4.29E+00	TX11	5.70E-02	TX11	6.74E-06	TX11
Butylbenzene, sec-	-	-	-	-	-	-	-	4.09E+00	TX11	5.76E-02	TX11	6.75E-06	TX11
Propylbenzene, n-	-	-	-	-	-	-	-	3.73E+00	TX11	6.22E-02	TX11	7.21E-06	TX11
Trimethylbenzene, 1,2,4-	-	-	-	-	-	-	-	3.65E+00	TX11	6.22E-02	TX11	7.28E-06	TX11
Trimethylbenzene, 1,3,5-	-	-	-	-	-	-	-	3.70E+00	TX11	6.21E-02	TX11	7.23E-06	TX11
Naphthalene	-	-	-	-	-	-	-	3.17E+00	***TX08***	5.90E-02	***TX08***	7.50E-06	***TX08***
Methylnaphthalene, 2-	-	-	-	-	-	-	-	3.72E+00	TX11	6.29E-02	TX11	7.20E-06	TX11

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
Job ID: 701.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Parameters

Orange = One or more parameter differs from User Chemical Database

Constituent	Analytical Detection Limits Groundwater (mg/L)		Analytical Detection Limits Soil (mg/kg)		Half Life (First-Order Decay) Saturated (days)	Half Life (First-Order Decay) Unsaturated (days)		Soil-to-Plant Biotransfer Factors Above-grd (unitless)	Soil-to-Plant Biotransfer Factors Below-grd (unitless)		Relative Bioavailability Factor		Leaf Concen. Factor Calculated (mg/kg)/(mg/L)	Root Concen. Factor Calculated (mg/kg)/(mg/L)	Bioconcentration Factor	
Benzene	2.00E-03	S	5.00E-03	S	7.20E+02	7.20E+02	H	-	-	-	1.00E+00	***TX08***	1.17E+00	1.85E+00	12.6	LY
Toluene	2.00E-03	S	5.00E-03	S	2.80E+01	2.80E+01	H	-	-	-	1.00E+00	***TX08***	1.94E+00	3.55E+00	70	LY
Ethyl benzene	2.00E-03	S	5.00E-03	S	2.28E+02	2.28E+02	H	-	-	-	1.00E+00	***TX08***	3.13E+00	7.34E+00	120	LY
Xylenes (mixed isomers)	5.00E-03	S	5.00E-03	S	3.60E+02	3.60E+02	H	-	-	-	1.00E+00	***TX08***	3.29E+00	8.02E+00	130	LY
Methyl t-Butyl ether (MTBE)	-	-	-	-	3.60E+02	1.80E+02	H	-	-	-	1.00E+00	***TX08***	7.63E-01	1.20E+00	7.2	LY
Tert-butyl alcohol (2-methyl-2-propanol)	-	-	-	-	3.60E+02	3.60E+02	H	-	-	-	1.00E+00	***TX08***	4.15E-01	9.23E-01	2	LY
Cumene	-	-	-	-	1.60E+01	1.60E+01	H	-	-	-	1.00E+00	***TX08***	4.43E+00	1.45E+01	250	LY
Butylbenzene, n-	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	6.35E+00	6.15E+01	1100	LY
Butylbenzene, sec-	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	6.11E+00	4.34E+01	760	LY
Propylbenzene, n-	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	5.28E+00	2.33E+01	400	LY
Trimethylbenzene, 1,2,4-	-	-	-	-	5.60E+01	5.60E+01	H	-	-	-	1.00E+00	TX11	5.05E+00	2.03E+01	350	LY
Trimethylbenzene, 1,3,5-	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	5.20E+00	2.22E+01	380	LY
Naphthalene	1.00E-02	S2	1.00E-02	S2	2.58E+02	2.58E+02	H	-	-	-	1.00E+00	***TX08***	3.54E+00	9.14E+00	430	LY
Methylnaphthalene, 2-	-	-	-	-	-	-	-	-	-	-	1.00E+00	TX11	5.24E+00	2.28E+01	390	LY

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
Job ID: 701.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

Dermal Exposure

Orange = One or more parameter differs from User Chemical Database

	Water Dermal Permeability Data					
Constituent	Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff	Water/Skin Derm Ads. Fact Calculated	
Benzene	0.021	0.26	0.63	0.013	0.073391787	D
Toluene	0.045	0.32	0.77	0.054	0.159834535	D
Ethyl benzene	0.074	0.39	1.3	0.14	0.266633684	D
Xylenes (mixed isomers)	0.08	0.39	1.4	0.16	0.286510345	D
Methyl t-Butyl ether (MTBE)	-	-	-	-	-	-
Tert-butyl alcohol (2-methyl-2-propanol)	-	-	-	-	-	-
Cumene	-	-	-	-	-	-
Butylbenzene, n-	-	-	-	-	-	-
Butylbenzene, sec-	-	-	-	-	-	-
Propylbenzene, n-	-	-	-	-	-	-
Trimethylbenzene, 1,2,4-	-	-	-	-	-	-
Trimethylbenzene, 1,3,5-	-	-	-	-	-	-
Naphthalene	0.069	0.53	2.2	0.2	0.27002	D
Methylnaphthalene, 2-	-	-	-	-	-	-

Site Name: Oak Walk Building Type 1 - Post Remediation
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Job ID: 701.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

Orange = One or more parameter differs from User Chemical Database	Dermal Relative Abs. Factor	Absorbtion Fraction		
Constituent	**Calculated**	**Dermal (unitless)**	**Gastrointestinal (unitless)**	
Benzene	0	0	0.97	***TX08***
Toluene	0	0	0.8	***TX08***
Ethyl benzene	0	0	0.97	***TX08***
Xylenes (mixed isomers)	0	0	0.92	***TX08***
Methyl t-Butyl ether (MTBE)	0	0	0.8	***TX08***
Tert-butyl alcohol (2-methyl-2-propanol)	0	0	0.8	***TX08***
Cumene	0	0	0.8	***TX08***
Butylbenzene, n-	0.2	0.1	0.5	TX11
Butylbenzene, sec-	0	0	0.8	TX11
Propylbenzene, n-	0	0	0.8	TX11
Trimethylbenzene, 1,2,4-	0	0	0.8	TX11
Trimethylbenzene, 1,3,5-	0	0	0.8	TX11
Naphthalene	0.146067416	0.13	0.89	***TX08***
Methylnaphthalene, 2-	0.146067416	0.13	0.89	TX11

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
Job ID: 701.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

Regulatory Standards

	Surface Water Quality Criteria									
Orange = One or more parameter differs from User Chemical Database	Aquatic Life Protection				Human Health Protection					
Constituent	Freshwater (mg/L)		Marine (mg/L)		Drink & Freshwater Fish (mg/L)		Freshwater Fish (mg/L)		Saltwater Fish (mg/L)	
Benzene	-	-	-	-	0.005	T3	0.106	T3	0.0708	T3
Toluene	-	-	-	-	6.8	E	200	E	200	E
Ethyl benzene	-	-	-	-	3.1	E	29	E	29	E
Xylenes (mixed isomers)	-	-	-	-	-	-	-	-	-	-
Methyl t-Butyl ether (MTBE)	-	-	-	-	-	-	-	-	-	-
Tert-butyl alcohol (2-methyl-2-propanol)	-	-	-	-	-	-	-	-	-	-
Cumene	-	-	-	-	-	-	-	-	-	-
Butylbenzene, n-	-	-	-	-	-	-	-	-	-	-
Butylbenzene, sec-	-	-	-	-	-	-	-	-	-	-
Propylbenzene, n-	-	-	-	-	-	-	-	-	-	-
Trimethylbenzene, 1,2,4-	-	-	-	-	-	-	-	-	-	-
Trimethylbenzene, 1,3,5-	-	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-	-	-
Methylnaphthalene, 2-	-	-	-	-	-	-	-	-	-	-

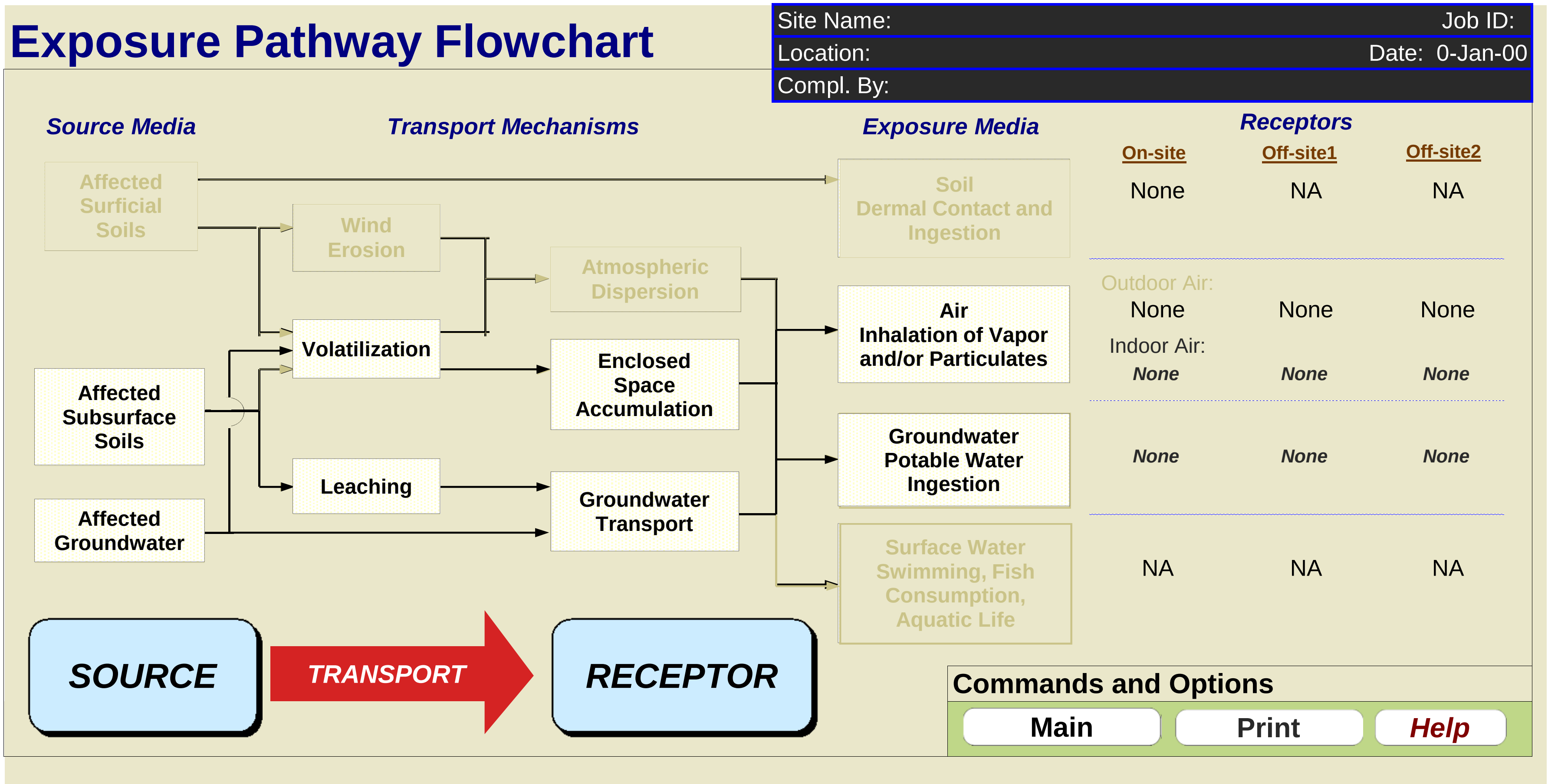
Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
Job ID: 701.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

CHEMICAL DATA FOR SELECTED COCs

	Toxicity Parameters											
Orange = One or more parameter differs from User Chemical Database Constituent	Oral RfD or TDSI (mg/kg/day)		Dermal RfD or TDSI (mg/kg/day)		Inhalation Equivalent RfC or TCA (mg/m^3)		Oral Equivalent Slope Factor 1/(mg/kg/day)		Dermal Equivalent Slope Factor 1/(mg/kg/day)		Inhalation Equivalent Unit Risk Factor 1/($\mu g/m^3$)	
Benzene	0.004	EPA-I	0.004	D2	0.28	***TX08***	***0.1***	***OEHHA***	***0.055***	D2	***0.000029***	***OEHHA***
Toluene	0.08	EPA-I	0.08	D2	***5***	***EPA-I***	-	-	-	-	***0.000034***	***OEHHA***
Ethyl benzene	0.1	EPA-I	0.1	D2	***1***	***EPA-I***	***0.011***	***OEHHA***	-	-	***0.0000025***	***OEHHA***
Xylenes (mixed isomers)	0.2	EPA-I	0.2	D2	***0.1***	***EPA-I***	-	-	-	-	-	-
Methyl t-Butyl ether (MTBE)	0.01	***OEHHA***	0.01	D2	3	EPA-I	0.0018	***OEHHA***	0.0018	D2	0.00000026	***OEHHA***
Tert-butyl alcohol (2-methyl-2-propanol)	0.09	***TX08***	0.09	D2	***0.3***	***TX08***	-	-	-	-	-	-
Cumene	0.1	EPA-I	0.1	D2	0.4	EPA-I	-	-	-	-	-	-
Butylbenzene, n-	0.05	TX11	0.05	D2	-	-	-	-	-	-	-	-
Butylbenzene, sec-	0.04	TX11	0.04	D2	-	-	-	-	-	-	-	-
Propylbenzene, n-	0.04	TX11	0.04	D2	0.4	TX11	-	-	-	-	-	-
Trimethylbenzene, 1,2,4-	0.05	TX11	0.05	D2	0.007	TX11	-	-	-	-	-	-
Trimethylbenzene, 1,3,5-	0.05	TX11	0.05	D2	0.006	TX11	-	-	-	-	-	-
Naphthalene	0.02	EPA-I	0.02	D2	0.003	EPA-I	-	-	-	-	***0.000034***	***OEHHA***
Methylnaphthalene, 2-	0.004	EPA-I	0.004	D2	-	-	-	-	-	-	-	-

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
Job ID: 701.1001
Date Completed: 12-Feb-12
Completed By: Dai Watkins

RBCA Tool Kit for Chemical Releases, Version 2.51



Exposure Pathway Flowchart

Site Name:
Job ID:
Location:
Date: 0-Jan-00
Compl. By:

Receptors	On-site	Off-site1	Off-site2
Soil Dermal Contact and Ingestion	None	NA	NA
Outdoor Air:	None	None	None
Indoor Air:	*None*	*None*	*None*
Groundwater Potable Water Ingestion	*None*	*None*	*None*
Surface Water Swimming, Fish Consumption, Aquatic Life	NA	NA	NA

Commands and Options

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville

Completed By: Dai Watkins
Date Completed: 12-Feb-12

Exposure Parameters		**Residential**				**Commercial/Industrial**		**User Defined**
		Child*	**Adolescent**	**Adult**	**Age Adjusted****	**Adult**	**Construct.**	
ATc	Averaging time for carcinogens (yr)	70	70	70	NA	70	70	-
ATn	Averaging time for non-carcinogens (yr)	6	12	30	NA	25	1	-
BW	Body weight (kg)	15	35	70	NA	70	70	-
ED	Exposure duration (yr)	6	12	30	NA	25	1	-
τ	Averaging time for vapor flux (yr)	30	30	30	NA	30	30	-
EF	Exposure frequency (days/yr)	350	350	350	NA	250	180	-
EFD	Exposure frequency for dermal exposure	350	350	350	NA	250	180	-
IRw	Ingestion rate of water (L/day)	1	1	2	2.5	1	NA	-
IRs	Ingestion rate of soil (mg/day)	200	200	100	387	50	100	-
SA	Skin surface area (dermal) (cm^2)	2023	2023	3160	4771	3160	3160	-
M	Soil to skin adherence factor	0.5	0.5	0.5	NA	0.5	0.5	-
ETswim	Swimming exposure time (hr/event)	1	3	3	NA	NA	NA	NA
EVswim	Swimming event frequency (events/yr)	12	12	12	NA	NA	NA	NA
IRswim	Water ingestion while swimming (L/hr)	0.5	0.5	0.05	0.3	NA	NA	NA
SAswim	Skin surface area for swimming (cm^2)	3500	8100	23000	15680	NA	NA	NA
IRfish	Ingestion rate of fish (kg/yr)	0.025	0.025	0.025	0.053	NA	NA	NA
Flfish	Contaminated fish fraction (unitless)	1	1	1	NA	NA	NA	NA
IRbg	Below-ground vegetable ingestion	0.002	0.002	0.006	2.053	NA	NA	NA
IRabg	Above-ground vegetable ingestion	0.001	0.001	0.002	0.887	NA	NA	NA
VGbg	Above-ground Veg. Ingest. Correction Factor	0.01	0.01	0.01	NA	NA	NA	NA
VGabg	Below-ground Veg. Ingest. Correction Factor	0.01	0.01	0.01	NA	NA	NA	NA

* = Child Receptor used for Non-Carcinogens
** = Age-adjusted rate is effective value corresponding to adult exposure factors.

Complete Exposure Pathways and Receptors	**On-site**	**Off-site 1**	**Off-site 2**
Groundwater:			
Groundwater Ingestion	None	None	None
Soil Leaching to Groundwater Ingestion	None	None	None
Apply MCL Values	No	No	No
Applicable Surface Water Exposure Routes:			
Swimming	NA	NA	None
Fish Consumption	NA	NA	None
Aquatic Life Protection	NA	NA	None
Soil:			
Direct Contact: direct combined pathways	None	NA	NA
Apply CLEA- UK SGV levels		No	
Outdoor Air:			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	Com./Constr.	None	None
Volatilization from Groundwater	Commercial	None	None
Indoor Air:			
Volatilization from Soils	Residential	NA	NA
Volatilization from Groundwater	Residential	None	None
Soil Leaching to Groundwater Volatilization	None	None	None

Receptor Distance from Source Media	**On-site**	**Off-site 1**	**Off-site 2**	**(Units)**
Groundwater receptor	NA	NA	NA	(ft)
Outdoor air inhalation receptor	0	NA	NA	(ft)
Indoor air inhalation receptor	0	NA	NA	(ft)

Target Health Risk Values		**Individual**	**Cumulative**
TR	Target Risk (carcinogens)	1.0E-6	1.0E-6
THQ	Target Hazard Quotient (non-carcinogenic risk)	2.0E-1	2.0E-1

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & Subsurface Models: ASTM Model
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Use dual equilibrium desorption model?	No
Apply Mass Balance Limit for Soil Volatilization?	No
Apply UK (CLEA) SGV as soil concentration limit	No
Vegetable calculation options	NA
Air dilution factor	NA
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville

Completed By: Dai Watkins
Date Completed: 12-Feb-12

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	***5***			(ft)
h_v	Vadose zone thickness	***1.94***			(ft)
ρ_s	Soil bulk density	***1.61***			(g/cm^3)
f_{oc}	Fraction organic carbon	***0.02***			(-)
θ_T	Soil total porosity	***0.5***			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	***0.49***	***0.2275***	0.12	(-)
θ_a	Volumetric air content	***0.01***	***0.2725***	0.26	(-)
K_{vs}	Vertical hydraulic conductivity	***7.82E-08***			(cm/s)
k_v	Vapor permeability	***1.1E-16***			(ft^2)
L_{gw}	Depth to groundwater	***6.94***			(ft)
pH	Soil/groundwater pH	6.8			(-)
			Construction		
W	Length of source-zone area parallel to wind	***270***	270		(ft)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(ft)
L_{ss}	Thickness of affected surface soils	***6.37***			(ft)
A	Source zone area	***2025***			(ft^2)
L_s	Depth to top of affected soils	***6.37***			(ft)
L_{base}	Depth to base of affected soils	***6.94***			(ft)
L_{subs}	Thickness of affected soils	***0.57***			(ft)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	***333020160***	(ft/yr)
δ_{air}	Air mixing zone height	***6.56***	(ft)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	***11***	NA	(ft)
A_b	Foundation area	***722***	NA	(ft^2)
X_{crk}	Foundation perimeter	***118.3***	NA	(ft)
ER	Building air exchange rate	***17975.52***	NA	(1/yr)
L_{crk}	Foundation thickness	***0.5***	NA	(ft)
Z_{crk}	Depth to bottom of foundation slab	***0.5***	NA	(ft)
η	Foundation crack fraction	***0.000001***	NA	(-)
dP	Indoor/outdoor differential pressure	***0.00058***	NA	(psi)
Q_s	Convective air flow through slab	***0.04747945***	NA	(ft^3/yr)
θ_{wcrack}	Volumetric water content of cracks	0.12	NA	(-)
θ_{acrack}	Volumetric air content of cracks	0.26	NA	(-)
BV	Building Volume	NA	NA	(ft^3)
w	Building Width Perpendicular to GW flow	NA	NA	(ft)
L	Building Length Parallel to GW flow	NA	NA	(ft)
ν	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(ft)
I_f	Net groundwater infiltration rate	NA	(in/yr)
U_{gw}	Groundwater Darcy velocity	NA	(cm/s)
V_{gw}	Groundwater seepage velocity	NA	(cm/s)
K_s	Saturated hydraulic conductivity	NA	(cm/s)
i	Groundwater gradient	NA	(-)
S_w	Width of groundwater source zone	NA	(ft)
S_d	Depth of groundwater source zone	NA	(ft)
θ_{eff}	Effective porosity in water-bearing unit	NA	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	NA	(-)
pH_{sat}	Groundwater pH	NA	(-)
	Biodegradation considered?	NA	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Groundwater to Indoor Air		
α_x	Longitudinal dispersivity	NA	NA	NA	NA	(ft)
α_y	Transverse dispersivity	NA	NA	NA	NA	(ft)
α_z	Vertical dispersivity	NA	NA	NA	NA	(ft)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(ft)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(ft)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(ft^3/yr)
W_{pi}	Width of GW plume at SW discharge	NA	(ft)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(ft)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

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RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

SOILS (6.4 - 6.9 ft): VAPOR INTRUSION INTO BUILDINGS

Constituents of Concern	1) Source Medium Soil Conc. (mg/kg)	2) NAF Value (L/kg) Receptor On-site (0 ft) Residential	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) On-site (0 ft) Residential	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) On-site (0 ft) Residential	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) On-site (0 ft) Residential
Benzene *	6.6E-2	2.6E+6	2.5E-8	4.1E-1	1.0E-8
Toluene *	3.2E-1	4.3E+6	7.5E-8	4.1E-1	3.1E-8
Ethyl benzene *	6.9E-1	6.0E+6	1.2E-7	4.1E-1	4.8E-8
Xylenes (mixed isomers) *	4.5E+0	7.9E+6	5.7E-7	9.6E-1	5.5E-7
Methyl t-Butyl ether (MTBE) *	0.0E+0	7.6E+6	0.0E+0	4.1E-1	0.0E+0
Tert-butyl alcohol (2-methyl-2-propar	2.6E+0	1.7E+8	1.6E-8	9.6E-1	1.5E-8
Cumene *	1.8E+0	6.0E+7	3.1E-8	9.6E-1	2.9E-8
Butylbenzene, n-	0.0E+0	6.4E+7	0.0E+0	9.6E-1	0.0E+0
Butylbenzene, sec-	8.0E-3	4.8E+7	1.7E-10	9.6E-1	1.6E-10
Propylbenzene, n-	0.0E+0	2.8E+7	0.0E+0	9.6E-1	0.0E+0
Trimethylbenzene, 1,2,4-	7.7E+0	5.6E+7	1.4E-7	9.6E-1	1.3E-7
Trimethylbenzene, 1,3,5-	2.7E+0	4.1E+7	6.5E-8	9.6E-1	6.3E-8
Naphthalene *	1.4E+0	8.9E+8	1.6E-9	4.1E-1	6.5E-10
Methylnaphthalene, 2-	1.8E+0	2.5E+9	7.0E-10	9.6E-1	6.8E-10

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
Completed By: Dai Watkins

Date Completed: 12-Feb-12
Job ID: 701.1001

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RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

GROUNDWATER: VAPOR INTRUSION INTO BUILDINGS

Exposure Concentration

	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Groundwater Conc. (mg/L)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	0.0E+0	1.7E+6			0.0E+0		
Toluene *	0.0E+0	1.5E+6			0.0E+0		
Ethyl benzene *	0.0E+0	1.4E+6			0.0E+0		
Xylenes (mixed isomers) *	0.0E+0	1.6E+6			0.0E+0		
Methyl t-Butyl ether (MTBE) *	6.0E-4	1.8E+7			3.4E-11		
Tert-butyl alcohol (2-methyl-2-propanol) *	0.0E+0	7.4E+8			0.0E+0		
Cumene *	1.4E-1	8.7E+5			1.6E-7		
Butylbenzene, n-	8.0E-3	1.1E+6			7.5E-9		
Butylbenzene, sec-	8.7E-3	1.2E+6			7.5E-9		
Propylbenzene, n-	3.1E-1	1.3E+6			2.4E-7		
Trimethylbenzene, 1,2,4-	1.4E-2	3.0E+6			4.7E-9		
Trimethylbenzene, 1,3,5-	5.6E-3	2.0E+6			2.8E-9		
Naphthalene *	8.3E-3	2.8E+7			2.9E-10		
Methylnaphthalene, 2-	0.0E+0	2.9E+7			0.0E+0		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk Building Type 1 - Post Remediation
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RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR INTRUSION INTO BUILDINGS

	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
Constituents of Concern	On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	4.1E-1			0.0E+0		
Toluene *	4.1E-1			0.0E+0		
Ethyl benzene *	4.1E-1			0.0E+0		
Xylenes (mixed isomers) *	9.6E-1			0.0E+0		
Methyl t-Butyl ether (MTBE) *	4.1E-1			1.4E-11		
Tert-butyl alcohol (2-methyl-2-propanol) *	9.6E-1			0.0E+0		
Cumene *	9.6E-1			1.5E-7		
Butylbenzene, n-	9.6E-1			7.2E-9		
Butylbenzene, sec-	9.6E-1			7.2E-9		
Propylbenzene, n-	9.6E-1			2.3E-7		
Trimethylbenzene, 1,2,4-	9.6E-1			4.5E-9		
Trimethylbenzene, 1,3,5-	9.6E-1			2.7E-9		
Naphthalene *	4.1E-1			1.2E-10		
Methylnaphthalene, 2-	9.6E-1			0.0E+0		

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk Building Type 1 - Post Remediation
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RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

SOIL LEACHING TO GW- VAPOR INTRUSION INTO BUILDINGS

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *						
Toluene *						
Ethyl benzene *						
Xylenes (mixed isomers) *						
Methyl t-Butyl ether (MTBE) *						
Tert-butyl alcohol (2-methyl-2-propanol) *						
Cumene *						
Butylbenzene, n-						
Butylbenzene, sec-						
Propylbenzene, n-						
Trimethylbenzene, 1,2,4-						
Trimethylbenzene, 1,3,5-						
Naphthalene *						
Methylnaphthalene, 2-						

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk Building Type 1 - Post Remediation
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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

MAXIMUM PATHWAY EXPOSURE (mg/m^3)

(Maximum average exposure concentration from soil and groundwater routes.)

Constituents of Concern	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	1.0E-8		
Toluene *	3.1E-8		
Ethyl benzene *	4.8E-8		
Xylenes (mixed isomers) *	5.5E-7		
Methyl t-Butyl ether (MTBE) *	1.4E-11		
Tert-butyl alcohol (2-methyl-2-propanol) *	1.5E-8		
Cumene *	1.5E-7		
Butylbenzene, n-	7.2E-9		
Butylbenzene, sec-	7.2E-9		
Propylbenzene, n-	2.3E-7		
Trimethylbenzene, 1,2,4-	1.3E-7		
Trimethylbenzene, 1,3,5-	6.3E-8		
Naphthalene *	6.5E-10		
Methylnaphthalene, 2-	6.8E-10		

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
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Date Completed: 12-Feb-12
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RBCA SITE ASSESSMENT

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TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

CARCINOGENIC RISK

	(1) Carcinogenic Classification	(2) Maximum Carcinogenic Exposure (mg/m^3)			(3) Inhalation Unit Risk Factor	(4) Individual COC Risk (2) x (3) x 1000		
Constituents of Concern		On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	(µg/m^3)^-1	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	TRUE	1.0E-8	-	-	2.9E-5	3.0E-10		
Toluene *	TRUE	3.1E-8	-	-	3.4E-5	1.0E-9		
Ethyl benzene *	TRUE	4.8E-8	-	-	2.5E-6	1.2E-10		
Xylenes (mixed isomers) *	FALSE	-	-	-	-			
Methyl t-Butyl ether (MTBE) *	TRUE	1.4E-11	-	-	2.6E-7	3.6E-15		
Tert-butyl alcohol (2-methyl-2-propanol)	FALSE	-	-	-	-			
Cumene *	FALSE	-	-	-	-			
Butylbenzene, n-	FALSE	-	-	-	-			
Butylbenzene, sec-	FALSE	-	-	-	-			
Propylbenzene, n-	FALSE	-	-	-	-			
Trimethylbenzene, 1,2,4-	FALSE	-	-	-	-			
Trimethylbenzene, 1,3,5-	FALSE	-	-	-	-			
Naphthalene *	TRUE	6.5E-10	-	-	3.4E-5	2.2E-11		
Methylnaphthalene, 2-	FALSE	-	-	-	-			
					Total Pathway Carcinogenic Risk =	**1.5E-9**		

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
Completed By: Dai Watkins

Date Completed: 12-Feb-12
Job ID: 701.1001

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RBCA SITE ASSESSMENT

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TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

TOXIC EFFECTS

	(5) Maximum Toxicant Exposure (mg/m^3)			(6) Inhalation Reference Concentration	(7) Individual COC Hazard Quotient (5) / (6)		
Constituents of Concern	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	(mg/m^3)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	2.4E-8	NC	NC	2.8E-1	8.7E-8		
Toluene *	7.2E-8	NC	NC	5.0E+0	1.4E-8		
Ethyl benzene *	1.1E-7	NC	NC	1.0E+0	1.1E-7		
Xylenes (mixed isomers) *	5.5E-7	NC	NC	1.0E-1	5.5E-6		
Methyl t-Butyl ether (MTBE) *	3.2E-11	NC	NC	3.0E+0	1.1E-11		
Tert-butyl alcohol (2-methyl-2-propanol)	1.5E-8	NC	NC	3.0E-1	5.0E-8		
Cumene *	1.5E-7	NC	NC	4.0E-1	3.8E-7		
Butylbenzene, n-	7.2E-9	NC	NC	-			
Butylbenzene, sec-	7.2E-9	NC	NC	-			
Propylbenzene, n-	2.3E-7	NC	NC	4.0E-1	5.7E-7		
Trimethylbenzene, 1,2,4-	1.3E-7	NC	NC	7.0E-3	1.9E-5		
Trimethylbenzene, 1,3,5-	6.3E-8	NC	NC	6.0E-3	1.0E-5		
Naphthalene *	1.5E-9	NC	NC	3.0E-3	5.1E-7		
Methylnaphthalene, 2-	6.8E-10	NC	NC	-			
				Total Pathway Hazard Index =	**3.6E-5**		

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
Completed By: Dai Watkins

Date Completed: 12-Feb-12
Job ID: 701.1001

RBCA Tool Kit for Chemical Releases, Version 2.51

RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

SUBSURFACE SOILS (6.4 - 6.9 ft):

VAPOR INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Soil Conc. (mg/kg)	On-site (0 ft) Commercial	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Commercial	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	6.6E-2	2.6E+5			2.5E-7		
Toluene *	3.2E-1	2.6E+5			1.2E-6		
Ethyl benzene *	6.9E-1	2.6E+5			2.6E-6		
Xylenes (mixed isomers) *	4.5E+0	2.6E+5			1.7E-5		
Methyl t-Butyl ether (MTBE) *	0.0E+0	2.6E+5			0.0E+0		
Tert-butyl alcohol (2-methyl-2-propanol) *	2.6E+0	2.6E+5			9.8E-6		
Cumene *	1.8E+0	2.6E+5			6.9E-6		
Butylbenzene, n-	0.0E+0	2.6E+5			0.0E+0		
Butylbenzene, sec-	8.0E-3	2.6E+5			3.0E-8		
Propylbenzene, n-	0.0E+0	2.6E+5			0.0E+0		
Trimethylbenzene, 1,2,4-	7.7E+0	2.6E+5			2.9E-5		
Trimethylbenzene, 1,3,5-	2.7E+0	2.6E+5			1.0E-5		
Naphthalene *	1.4E+0	7.6E+5			1.9E-6		
Methylnaphthalene, 2-	1.8E+0	2.1E+6			8.3E-7		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
Completed By: Dai Watkins

Date Completed: 12-Feb-12
Job ID: 701.1001

RBCA SITE ASSESSMENT

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (6.4 - 6.9 ft):

VAPOR INHALATION (cont'd)

	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)
Constituents of Concern	Commercial	None	None	Commercial	None	None
Benzene *	2.4E-1			6.1E-8		
Toluene *	2.4E-1			3.0E-7		
Ethyl benzene *	2.4E-1			6.4E-7		
Xylenes (mixed isomers) *	6.8E-1			1.2E-5		
Methyl t-Butyl ether (MTBE) *	2.4E-1			0.0E+0		
Tert-butyl alcohol (2-methyl-2-propanol)	6.8E-1			6.7E-6		
Cumene *	6.8E-1			4.8E-6		
Butylbenzene, n-	6.8E-1			0.0E+0		
Butylbenzene, sec-	6.8E-1			2.1E-8		
Propylbenzene, n-	6.8E-1			0.0E+0		
Trimethylbenzene, 1,2,4-	6.8E-1			2.0E-5		
Trimethylbenzene, 1,3,5-	6.8E-1			7.0E-6		
Naphthalene *	2.4E-1			4.5E-7		
Methylnaphthalene, 2-	6.8E-1			5.7E-7		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Oak Walk Building Type 1 - Post Remediation	Date Completed: 12-Feb-12
Site Location: Emeryville	Job ID: 701.1001
Completed By: Dai Watkins	

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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

GROUNDWATER: VAPOR INHALATION

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
	Groundwater Conc. (mg/L)	On-site (0 ft) Commercial	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Commercial	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	0.0E+0	3.7E+5			0.0E+0		
Toluene *	0.0E+0	4.2E+5			0.0E+0		
Ethyl benzene *	0.0E+0	4.6E+5			0.0E+0		
Xylenes (mixed isomers) *	0.0E+0	4.2E+5			0.0E+0		
Methyl t-Butyl ether (MTBE) *	6.0E-4	4.3E+4			1.4E-8		
Tert-butyl alcohol (2-methyl-2-propanol) *	0.0E+0	5.9E+5			0.0E+0		
Cumene *	1.4E-1	5.0E+5			2.8E-7		
Butylbenzene, n-	8.0E-3	5.3E+5			1.5E-8		
Butylbenzene, sec-	8.7E-3	5.3E+5			1.6E-8		
Propylbenzene, n-	3.1E-1	5.0E+5			6.3E-7		
Trimethylbenzene, 1,2,4-	1.4E-2	4.9E+5			2.8E-8		
Trimethylbenzene, 1,3,5-	5.6E-3	5.0E+5			1.1E-8		
Naphthalene *	8.3E-3	4.9E+5			1.7E-8		
Methylnaphthalene, 2-	0.0E+0	5.1E+5			0.0E+0		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 ft) Commercial	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Commercial	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene *	2.4E-1			0.0E+0		
Toluene *	2.4E-1			0.0E+0		
Ethyl benzene *	2.4E-1			0.0E+0		
Xylenes (mixed isomers) *	6.8E-1			0.0E+0		
Methyl t-Butyl ether (MTBE) *	2.4E-1			3.4E-9		
Tert-butyl alcohol (2-methyl-2-propanol)	6.8E-1			0.0E+0		
Cumene *	6.8E-1			1.9E-7		
Butylbenzene, n-	6.8E-1			1.0E-8		
Butylbenzene, sec-	6.8E-1			1.1E-8		
Propylbenzene, n-	6.8E-1			4.3E-7		
Trimethylbenzene, 1,2,4-	6.8E-1			1.9E-8		
Trimethylbenzene, 1,3,5-	6.8E-1			7.7E-9		
Naphthalene *	2.4E-1			4.2E-9		
Methylnaphthalene, 2-	6.8E-1			0.0E+0		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
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TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

MAXIMUM PATHWAY EXPOSURE (mg/m^3)

Maximum average expsosure concentration from soil and groundwater routes.)

	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
Constituents of Concern	Commercial	Construction Worker	None	None
Benzene *	6.1E-8			
Toluene *	3.0E-7			
Ethyl benzene *	6.4E-7			
Xylenes (mixed isomers) *	1.2E-5			
Methyl t-Butyl ether (MTBE) *	3.4E-9			
Tert-butyl alcohol (2-methyl-2-propanol) *	6.7E-6			
Cumene *	4.8E-6			
Butylbenzene, n-	1.0E-8			
Butylbenzene, sec-	2.1E-8			
Propylbenzene, n-	4.3E-7			
Trimethylbenzene, 1,2,4-	2.0E-5			
Trimethylbenzene, 1,3,5-	7.0E-6			
Naphthalene *	4.5E-7			
Methylnaphthalene, 2-	5.7E-7			

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville
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TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

CARCINOGENIC RISK

	(1) Is Carcinogenic	(2) Maximum Carcinogenic Exposure (mg/m^3)				(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000			
		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
Constituents of Concern		Commercial	Construction Worker	None	None		Commercial	Construction Worker	None	None
Benzene *	TRUE	6.1E-8		-	-	2.9E-5	1.8E-9			
Toluene *	TRUE	3.0E-7		-	-	3.4E-5	1.0E-8			
Ethyl benzene *	TRUE	6.4E-7		-	-	2.5E-6	1.6E-9			
Xylenes (mixed isomers) *	FALSE	-	-	-	-	-				
Methyl t-Butyl ether (MTBE) *	TRUE	3.4E-9		-	-	2.6E-7	8.8E-13			
Tert-butyl alcohol (2-methyl-2-propa	FALSE	-	-	-	-	-				
Cumene *	FALSE	-	-	-	-	-				
Butylbenzene, n-	FALSE	-	-	-	-	-				
Butylbenzene, sec-	FALSE	-	-	-	-	-				
Propylbenzene, n-	FALSE	-	-	-	-	-				
Trimethylbenzene, 1,2,4-	FALSE	-	-	-	-	-				
Trimethylbenzene, 1,3,5-	FALSE	-	-	-	-	-				
Naphthalene *	TRUE	4.5E-7		-	-	3.4E-5	1.5E-8			
Methylnaphthalene, 2-	FALSE	-	-	-	-	-				
						Total Pathway Carcinogenic Risk =	**2.9E-8**			

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville

Completed By: Dai Watkins
Date Completed: 12-Feb-12

Job ID: 701.1001

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RBCA SITE ASSESSMENT

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TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(Checked if Pathway is Complete)**

TOXIC EFFECTS

	(5) Maximum Toxicant Exposure (mg/m^3)				(6) Inhalation Reference Conc. (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)			
	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
Constituents of Concern	Commercial	Construction Worker	None	None		Commercial	Construction Worker	None	None
Benzene *	1.7E-7				2.8E-1	6.1E-7			
Toluene *	8.4E-7				5.0E+0	1.7E-7			
Ethyl benzene *	1.8E-6				1.0E+0	1.8E-6			
Xylenes (mixed isomers) *	1.2E-5				1.0E-1	1.2E-4			
Methyl t-Butyl ether (MTBE) *	9.5E-9				3.0E+0	3.2E-9			
Tert-butyl alcohol (2-methyl-2-propa	6.7E-6				3.0E-1	2.2E-5			
Cumene *	4.8E-6				4.0E-1	1.2E-5			
Butylbenzene, n-	1.0E-8				-				
Butylbenzene, sec-	2.1E-8				-				
Propylbenzene, n-	4.3E-7				4.0E-1	1.1E-6			
Trimethylbenzene, 1,2,4-	2.0E-5				7.0E-3	2.8E-3			
Trimethylbenzene, 1,3,5-	7.0E-6				6.0E-3	1.2E-3			
Naphthalene *	1.3E-6				3.0E-3	4.2E-4			
Methylnaphthalene, 2-	5.7E-7				-				

Total Pathway Hazard Index =	**4.6E-3**			

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville

Completed By: Dai Watkins
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Job ID: 701.1001

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RBCA SITE ASSESSMENT

Baseline Risk Summary-All Pathways

Site Name: Oak Walk Building Type 1 - Post Remediation
Site Location: Emeryville

Completed By: Dai Watkins
Date Completed: 12-Feb-12

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BASELINE RISK SUMMARY TABLE

	BASELINE CARCINOGENIC RISK					**BASELINE TOXIC EFFECTS**				
	Individual COC Risk		**Cumulative COC Risk**		**Risk Limit(s) Exceeded?**	**Hazard Quotient**		**Hazard Index**		**Toxicity Limit(s) Exceeded?**
EXPOSURE PATHWAY	**Maximum Value**	**Target Risk**	**Total Value**	**Target Risk**		**Maximum Value**	**Applicable Limit**	**Total Value**	**Applicable Limit**	
OUTDOOR AIR EXPOSURE PATHWAYS										
■	1.5E-8	1.0E-6	2.9E-8	1.0E-6	☐	2.8E-3	2.0E-1	4.6E-3	2.0E-1	☐
INDOOR AIR EXPOSURE PATHWAYS										
■	1.0E-9	1.0E-6	1.5E-9	1.0E-6	☐	1.9E-5	2.0E-1	3.6E-5	2.0E-1	☐
SOIL EXPOSURE PATHWAYS										
☐	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
GROUNDWATER EXPOSURE PATHWAYS										
☐	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
SURFACE WATER EXPOSURE PATHWAYS										
☐	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	1.5E-8	***1.0E-6***	***2.9E-8***	***1.0E-6***	☐	***2.8E-3***	***2.0E-1***	***4.6E-3***	***2.0E-1***	☐
	Outdoor Air		***Outdoor Air***			***Outdoor Air***		***Outdoor Air***		

APPENDIX D

Risk-based Site Evaluation Process

Source: Groundwater Services, Inc.

Overview of Risk Management Steps

Effective risk management at chemical release sites involves: i) identification of applicable risk factors on a site-specific basis; and ii) development and implementation of appropriate protective measures in the timeframe necessary to prevent unsafe conditions. Key elements of the risk-based site evaluation process include:

- ***Exposure Pathway Screening*:** Identify potential mechanisms for exposure of human or ecological receptors on a site-specific basis.
- ***Risk-Based Cleanup Objectives*:** For each complete exposure pathway, evaluate potential for exposure in excess of safe limits based on tiered evaluation of soil and groundwater cleanup limits.
- ***Remedy Selection*:** Develop risk-based exposure control strategy based on the nature and timing of the potential impact.
- ***Compliance Monitoring*:** If needed, conduct final compliance monitoring to confirm satisfactory remedy completion prior to formal case closure.

Further discussion of these process steps and relevant risk-based modeling tools is provided below.

Exposure Pathway Screening

The risk-based evaluation addresses the potential for constituent transport from the affected media source zone to a point of contact with a human or ecological receptor via various *exposure pathways*. For most remediation sites, the primary exposure pathways of human health concern are i) groundwater ingestion, ii) soil-to-groundwater release, and iii) soil ingestion, vapor inhalation, and dermal contact. Additional exposure pathways may apply based on site conditions and land use (e.g., surface water impacts, ecological exposures). To pose a risk, three components of each exposure pathway must be present: an affected source medium, a mechanism for constituent transport, and a receptor. In practical terms, exposure pathways may therefore be screened from further consideration based on the presence and mobility of the constituents of concern and the proximity of receptors to the source zone. For example, for an affected groundwater plume in a stable or diminishing condition, no potential exists for impacts on water supply wells located outside the current plume area.

Pathways determined to be potentially complete should be retained for site-specific evaluation. However, if the preliminary screening analysis shows no complete exposure pathways, no further evaluation is required.

- ***Applicable Data Evaluation Tools*:** The RBCA Tool Kit is organized to facilitate pathway screening via the "Exposure Pathway Identification" input screen. The user identifies affected source media and actual and/or potential receptors from among a matrix of possible options. Based on these selections, the complete exposure pathways may be viewed on the Exposure Flowchart output screen. In addition, ASTM standard E-1943, "Standard Guide for Remediation by Natural Attenuation (RNA)," outlines practical data evaluation methods for analysis of groundwater plume stability, including historical data plots, estimation of bulk attenuation rates, and modeling methods. The *GSI Natural Attenuation Tool Kit* developed for use with the ASTM RNA Standard, is also available from GSI (*http://www.gsi.net.com*).

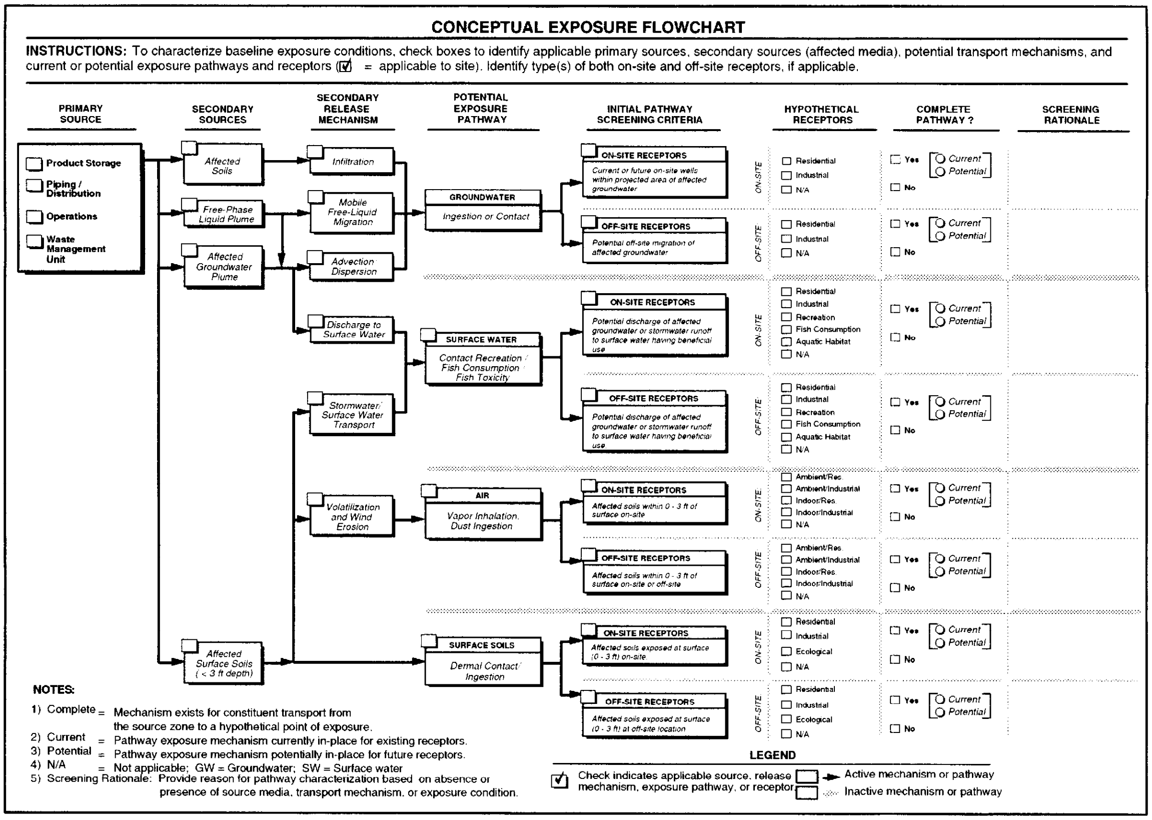


FIGURE A.1. CONCEPTUAL EXPOSURE FLOWCHART

Risk-Based Cleanup Objectives

The RBCA process employs a tiered approach to derivation of risk-based soil and groundwater cleanup goals, with each tier serving to refine the risk analysis based upon additional site data and more sophisticated fate and transport modeling methods. For example, Tiers 1 and 2 of the site evaluation process are amenable to use of simple analytical models to estimate risk-based concentration limits, while more complex and costly numerical modeling methods are reserved for Tier 3 evaluations. In each case, risk-based concentration limits are derived for relevant exposure pathways, receptors, and constituents of concern (COCs) and compared to measured source media concentrations. Source media exceeding these target levels will require either further investigation or remedial action in the timeframe necessary to control exposure. Summary information regarding principal calculation steps is provided below.

i) ***Media-Specific Cleanup Standards:*** For a given exposure pathway and COC, the risk-based standard represents a concentration in the affected source medium (soil or groundwater) that is protective of a human or ecological receptor located at a relevant point of exposure (POE). For example, for the human health soil-to-air exposure pathway, the cleanup standard is the mean concentration in the affected surface soil zone that will prevent unsafe human exposures via soil vapor or particulate release to air. The ASTM RBCA Standard and other regulatory programs distinguish between two types of risk-based cleanup standards: i) the Risk-Based Screening Level (RBSL), a *generic* target level utilized under Tier 1, and ii) a Site-Specific Target Level (SSTL), a *site-specific* target level utilized under Tier 2 or Tier 3. Under the RBCA process, Tier 1 RBSLs are based on an assumed exposure in immediate proximity to the source. If source media COC concentrations exceed Tier 1 RBSLs, the relevant exposure pathways and COCs may be further evaluated under Tier 2 or Tier 3 to calculate SSTLs, which would address actual site-specific exposure conditions , and where the POE may be located at some distance away from the source. For each complete exposure pathway, cleanup standards for the source medium can be back-calculated from safe exposure levels at the POE using the following general expressions:

Tier 1: $RBSL = RBEL \; x \; NAF_{CM}$

Tier 2: $SSTL = RBSL \; x \; NAF_{LT}$

where

RBEL = Risk-based *exposure* limit for direct intake of exposure medium (e.g. air concentration limit for inhalation).

NAF_{CM} = Natural attenuation factor defining natural reduction in constituent concentrations during cross-media (CM) transport (e.g., soil to air volatilization).

NAF_{LT} = Natural attenuation factor defining natural reduction in constituent concentrations during lateral transport (LT) (e.g., via dispersion during lateral migration in air).

RBSL or SSTL values must be developed for each complete exposure pathway and COC. For exposure pathways with multiple POEs (e.g., ambient vapor inhalation by on-site worker and by off-site resident), separate SSTLs must be developed for each POE using the appropriate RBEL value. In general, the RBEL value does not vary among Tiers 1, 2, and 3. Rather, the cleanup standard value is refined at each successive tier by improving the NAF estimations, based upon more complete site information and more sophisticated data evaluation and/or modeling methods. Determination of applicable RBEL and NAF values is addressed below.

ii) ***Risk-Based Exposure Limits:*** The RBEL represents the constituent concentration exposed to the receptor that does not exceed target risk limits, based on applicable regulatory criteria. The RBEL applies at the POE, i.e., the likely point of constituent intake or contact by a human or ecological receptor. For each complete exposure pathway and COC, the applicable RBEL must be matched to each relevant POE based on the type of exposure medium (air, water, soil) and the type of receptor (resident, commercial/industrial worker, etc.). For certain exposure media, human health-based exposure limits are specified under applicable regulations, such as Maximum Contaminant Levels (MCLs) for drinking water ingestion or Permissible Exposure Limits (PELs) for industrial air exposure. In the absence of such standards, human health RBELs can be derived for each constituent and exposure medium (air, water, soil) using the following general expressions:

Carcinogens: $$RBEL = \frac{TR}{E \cdot SF}$$

Non-carcinogens: $$RBEL = \frac{THQ \cdot RfD}{E}$$

where

E = effective exposure rate for specified pathway, based on applicable exposure factors (e.g., daily intake rate in mg/day per kg body weight),

TR = target risk limit for carcinogenic effects of individual constituents (dimensionless),

SF = slope factor for carcinogenic effects of COC $(mg/kg\text{-}day)^{-1}$,

THQ = target hazard quotient for non-carcinogenic effects of individual constituents (dimensionless), and

RfD = reference dose for non-carcinogenic effect of COC (mg/kg-day).

Applicable target risk limits (TR, THQ) for health protection can be matched to levels specified by the environmental regulatory authority. Toxicological parameters for each COC can be determined from published references, such as the U.S. EPA Integrated Risk Information System (IRIS). Exposure rates correspond to the chronic rate of contact or intake of the affected exposure medium (air, water, soil) by the receptor under anticipated land use conditions. As a conservative measure, these rates can be estimated based on standard exposure factors published by the regulatory authority or other source (e.g., American Industrial Health Council) for the anticipated land use at the site (e.g., residential, commercial, etc.).

Quantitative measures for derivation of RBELs for ecological receptors are not well defined. However, if the pathway screening evaluation indicates a reasonable potential for ecological exposure (e.g., surface water/aquatic species), applicable RBELs may be based on published standards or ecological screening criteria (e.g., surface water quality standard for aquatic life protection, ecological screening limits for terrestrial species, etc.). The U.S. EPA and various state agencies maintain databases of ecological screening levels for various types of receptors. However, given the highly conservative nature of these concentration limits, use of these values as ecological RBELs is appropriate only for preliminary screening-level analyses.

iii) ***Applicable Exposure Factors:*** For each complete pathway, *exposure factors* must be defined characterizing the potential duration, frequency, and rate of contact of the receptor with affected media at the POE. Depending upon the degree of conservatism desired, exposure activities can be characterized on the basis of either i) *most likely exposure* (MLE) factors, representing average exposure rates, or ii) *reasonable maximum exposure* (RME) factors, corresponding to the highest rate of exposure that could reasonably be expected to occur (i.e., upper 95% value). Standard RME and MLE exposure factors for various exposure pathways, under both residential and non-residential land use scenarios, are listed on Table A.1.

To select appropriate exposure factors, the user must first define the type of receptor anticipated under current and future land use (i.e., residential vs. commercial/industrial) and then evaluate the applicability of the standard factors to site-specific conditions. The likelihood that such exposure will occur and the degree of conservatism desired should be considered in selecting among MLE and RME values. A Tier 2 evaluation may use both MLE and RME values, in order to estimate the potential range of risks associated with exposure to the site. Modification of these standard values may be justified under certain conditions (e.g., frequency of dermal contact with soils in cold weather climates). For detailed information regarding derivation and application of these exposure factors, see U.S. EPA (1997; 1992a; 1991) and American Industrial Health Council (1994).

iv) ***Natural Attenuation Factor:*** For each complete exposure pathway, the NAF represents the cumulative effect of various partitioning, dilution, and attenuation factors acting to reduce constituent concentrations during transport from source to receptor (see Figure A.2). These NAF components may involve both cross-media transfer factors (NAF_{CM}, such as soil-to-air volatilization or soil-to-groundwater leaching) and lateral transport factors (NAF_{LT}, such as air dispersion or groundwater advection-dispersion; see Appendix B). For exposure pathways with multiple POEs, separate NAF_{LT} values must be derived for each POE location (e.g., ambient vapor inhalation by on-site worker and off-site resident; or groundwater ingestion at both hypothetical and actual wells). For a given site and exposure pathway, the NAF value may vary among evaluation of Tiers 1, 2, and 3, based on use of improved site data and evaluation methods.

For each complete exposure pathway and COC, the applicable NAF values can be derived based on either: i) the actual measured concentration ratio between the source medium and the POE or

TABLE A.1 STANDARD EXPOSURE FACTORS FOR TIER 1 AND TIER 2 EVALUATIONS

EXPOSURE PATHWAY		**Contact Rate (CR)**	**Exposure Frequency (EF)**	**Exposure Duration (ED)**	**Body Weight (BW)**	**Surface Contact Area (SA)**	**Soil Adherence Factor (AF)**	**Dermal Adsorption Factor (DA)**	**EXPOSURE RATE (E)**		
									Equation	**Value for Carcinogens**	**Value for Non-carcinogens**
RESIDENTIAL LAND USE											
Ingestion of potable water	MLE:	1.4 L/day	350 days/yr	8 years	70 kg	—	—	—	$\frac{CR \cdot EF \cdot ED}{BW \cdot AT}$	0.0022 L/kg-day	0.019 L/kg-day
	RME:	2 L/day	350 days/yr	30 years	70 kg	—	—	—		0.0012 L/kg-day	0.027 L/kg-day
Ingestion of soil and dust	MLE:	25 mg/day	350 days/yr	8 years	70 kg	—	—	—	$\frac{CR \cdot EF \cdot ED}{BW \cdot AT}$	0.039 mg/kg-day	0.34 mg/kg-day
	RME:	100 mg/day	350 days/yr	30 years	70 kg	—	—	—		0.59 mg/kg-day	1.4 mg/kg-day
Inhalation of volatiles	MLE:	—	350 days/yr	8 years	—	—	—	—	$\frac{EF \cdot ED}{AT}$	40 days/yr	350 days/yr
	RME:	—	350 days/yr	30 years	—	—	—	—		150 days/yr	350 days/yr
Dermal contact with soils	MLE:	—	40 days/yr	9 years	70 kg	5000 cm^2	0.2 mg/cm^2-day	Organics: 0.04* Metals: 0.001*	$\frac{EF \cdot ED \cdot SA \cdot AF \cdot DA}{BW \cdot AT}$	0.008 mg/kg-day**	0.063 mg/kg-day**
	RME:	—	350 days/yr	30 years	70 kg	5800 cm^2	1.0 mg/cm^2-day	Organics: 0.04* Metals: 0.001*		1.4 mg/kg-day**	3.2 mg/kg-day**
COMMERCIAL / INDUSTRIAL LAND USE											
Ingestion of potable water	MLE:	1 L/day	250 days/yr	4 years	70 kg	—	—	—	$\frac{CR \cdot EF \cdot ED}{BW \cdot AT}$	0.00056 L/kg-day	0.0098 L/kg-day
	RME:	1 L/day	250 days/yr	25 years	70 kg	—	—	—		0.0035 L/kg-day	0.0098 L/kg-day
Ingestion of soil and dust	MLE:	50 mg/day	250 days/yr	4 years	70 kg	—	—	—	$\frac{CR \cdot EF \cdot ED}{BW \cdot AT}$	0.028 mg/kg-day	0.49 mg/kg-day
	RME:	50 mg/day	250 days/yr	25 years	70 kg	—	—	—		0.17 mg/kg-day	0.49 mg/kg-day
Inhalation of volatiles	MLE:	—	250 days/yr	4 years	—	—	—	—	$\frac{EF \cdot ED}{AT}$	14 days/yr	250 days/yr
	RME:	—	250 days/yr	25 years	—	—	—	—		89 days/yr	250 days/yr
Dermal contact with soils	MLE:	—	40 days/yr	4 years	70 kg	5000 cm^2	0.2 mg/cm^2-day	Organics: 0.04* Metals: 0.001*	$\frac{EF \cdot ED \cdot SA \cdot AF \cdot DA}{BW \cdot AT}$	0.0036 mg/kg-day**	0.063 mg/kg-day**
	RME:	—	250 days/yr	25 years	70 kg	5800 cm^2	1.0 mg/cm^2-day	Organics: 0.04* Metals: 0.001*		1.4 mg/kg-day**	2.3 mg/kg-day**

NOTES: 1) Exposure factors shown above are matched to published U.S. EPA guidelines, when available (U.S. EPA, 1997, 1992a, 1991a). If no EPA value available, other peer-reviewed reference applied (American Industrial Health Council, 1994).

2) MLE = Most Likely Exposure; corresponding to mean exposure rate for exposed population (American Industrial Health Council, 1994; U.S. EPA, 1992a).

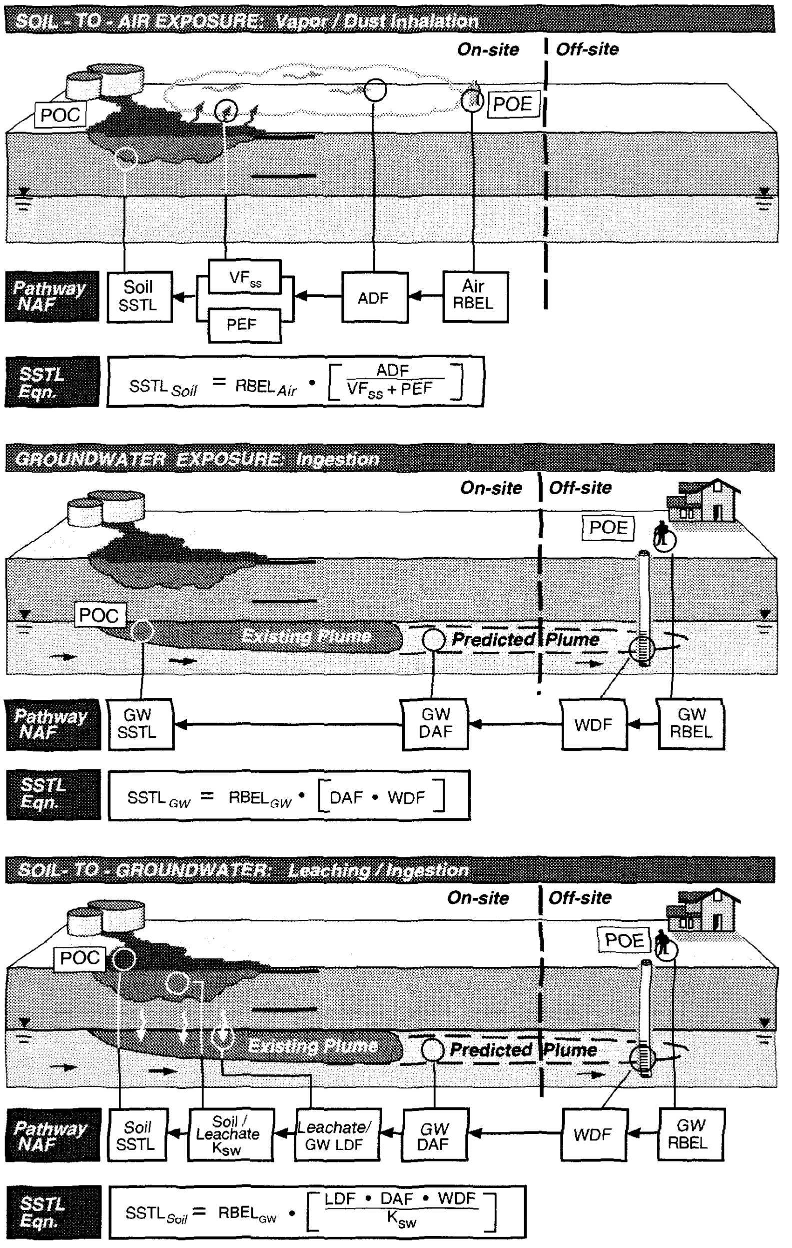
3) RME = Reasonable Maximum Exposure; corresponding to upper 95% exposure rate for exposed population (American Industrial Health Council, 1994; U.S. EPA, 1997, 1992a, 1991a).

4) AT = Averaging Time. For carcinogens, AT = 70 yrs x 365 days/yr. For non-carcinogens, AT = ED x 365 days/yr.

5) * = Default value. Use chemical-specific data if available. Values shown represent mid- to upper-range values per U.S. EPA, 1992b; Howard et al., 1991.

6) ** = Calculations of dermal contact with soils or sediments are based on organic default values. Contact rates for soil ingestion and dermal contact shown above are based upon adult receptor.

ii) fate-and-transport modeling analyses predicting this concentration ratio. For purpose of simplicity and accuracy, direct field measurements represent the preferred method of NAF estimation, whenever feasible. However, due to temporal variability and sampling difficulties, some of these factors can prove difficult to quantify via direct field measurements (e.g., soil volatilization or leaching factors). In this case, modeling analyses, based on appropriate site-specific data and conservative assumptions, provide a convenient method of estimation. NAF_{LT} for groundwater may be referred to as a groundwater dilution attenuation factor (DAF). DAFs are amenable to direct measurement via wells spaced along the centerline of the plume. In all cases, time-series groundwater monitoring data should be evaluated to establish the stability condition of the affected groundwater plume. Stable or diminishing plumes pose no risk to downgradient receptors located outside the plume area (i.e., DAF = infinite). Consequently, groundwater modeling analyses are necessary only for plumes for which available data either are insufficient to establish the stability condition or indicate an expanding plume.



NOTES:

SSTL = Site-Specific Target Level; i.e., allowable COC concentration in source medium.

RBEL = Risk-Based Exposure Limit, i.e., allowable COC concentration in exposure medium at point of exposure.

COC = Constituent of Concern

GW = Groundwater

POC = Point of Compliance

POE = Point of Exposure

Natural Attenuation Factors:

NAF = Natural Attenuation Factor.

VF_{ss} = Volatilization Factor for surface soils (mg/m^3 - air) / (mg/kg-soil).

PEF = Particulate Emission Factor for surface soils (g/cm^2 - s).

ADF = Air Dispersion Factor (mg/m^3 - air at POC) / (mg/m^3 - air at POE).

DAF = Groundwater Dilution-Attenuation Factor (mg/L - GW at POC) / (mg/L - GW at POE).

WDF = Well Dilution Factor (mg/L - well discharge) / (mg/L - plume edge).

LDF = Leachate - Groundwater Dilution Factor (cm^3/yr - GW) / (cm^3/yr - Leachate).

K_{sw} = Soil - Water Partition Factor (mg/L-water) / (mg/kg-soil).

FIGURE A.2. BACK-CALCULATION OF SSTL VALUES FOR SOIL AND GROUNDWATER *vi)* ***Risk Reduction Requirements:*** The SSTL represents an action level for affected media in the source zone. Source media containing COC concentrations in excess of applicable SSTLs will require further assessment or remediation to control exposure via the relevant exposure pathway(s). If the SSTLs were estimated on the basis of limited site-specific data or highly conservative assumptions, the appropriate response may be further site assessment and re-evaluation of appropriate target levels. For those pathways for which the results of the site-specific evaluation are reliable, appropriate remedies and exposure control measures must be selected and implemented, as discussed in Remedy Selection below.

- ***Applicable Data Evaluation Tools:*** Derivation of SSTL values involves calculation of NAF values for each complete exposure pathway and relevant constituents of concern. Analytical models which can be used for estimation of steady-state NAF values for various air, soil, and groundwater exposure pathways under Tiers 1 and 2 are incorporated in the RBCA Tool Kit. As noted above, it is advisable to evaluate SSTLs for both *actual* and *potential* POE locations in order to support remedy selection. In addition to steady-state models, the Transient Domenico Worksheet can be used to provide important information regarding the timing and duration of potential groundwater impacts.

Remedy Selection

For each exposure pathway determined to pose a health/environmental concern, a cost-effective remedy must be selected and implemented to achieve necessary risk reduction in the appropriate timeframe. This step of the site evaluation process involves development of an overall *exposure control strategy* and selection of optimal remediation technologies to implement this strategy.

The goal of risk-based site management is to minimize risk by preventing exposure to harmful levels of site constituents. Risk reduction can be achieved by addressing any component of the exposure pathway: i) removing or treating the source, ii) interrupting contaminant transport mechanisms, or iii) controlling activities at the point of exposure. The remedial action plan may consist of one or more exposure control strategies, including:

i) ***Removal/Treatment Action*****:** Removal or treatment of affected source media (i.e., affected soils, groundwater, etc.) to reduce COC concentrations to levels less than or equal to applicable SSTLs (e.g., via excavation, soil venting, pump-and-treat, etc.).

ii) ***Containment Measures*****:** Long-term engineering controls to prevent migration of harmful concentrations of COCs from the source to the POE (e.g., surface cover/capping, barrier walls, soil stabilization, hydraulic containment, etc.).

iii) ***Natural Attenuation Monitoring*****:** Periodic sampling and analysis to confirm stabilization or reduction of affected media concentrations via natural attenuation processes.

iv) ***Institutional Controls*****:** Legal or administrative measures to control the nature and frequency of human activity at the POE (e.g., deed notice, alternative water supply, etc.).

The appropriate exposure control strategy for a given site will depend on the nature of the risk reduction requirements. For example, as shown on Figure A.4, engineered remedies (such as removal/ treatment or containment strategies) are appropriate for response to current or anticipated impacts on actual receptors. If risk reduction is required only for protection of potential future receptors (e.g., hypothetical water well users), groundwater remediation by natural attenuation may be employed to confirm plume stabilization or reduction. No response action is required if constituent concentrations do not exceed SSTL values for either actual or potential receptors. The estimated *time to impact* determined in the risk-based site evaluation is also a key consideration in the remedy selection process. For example, if source media concentrations presently exceed an applicable SSTL value but the corresponding RBEL is not likely to be exceeded at the POE for an extended time period, additional time may be available for re-evaluation of potential exposure conditions based on site-specific monitoring program.

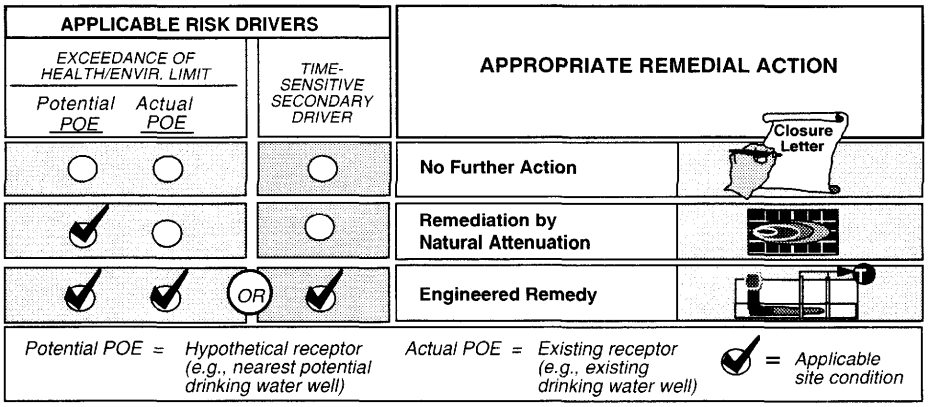


FIGURE A.4. POTENTIAL RISK-BASED REMEDY SELECTION CRITERIA

Compliance Monitoring Program Design

Under many regulatory programs, a final compliance monitoring period is required to confirm satisfactory completion of the remedy. Compliance monitoring (or *verification sampling*) typically involves sampling of one or more locations on an established schedule to identify either i) an exceedance of an applicable concentration limit or ii) a change of condition (e.g., change of land use, failure of engineering control) that might invalidate the basis for the remedy selection. If, upon completion of the monitoring period, compliance with applicable concentration limits is demonstrated, no further action is required.

- ***Applicable Data Evaluation Tools*:** To confirm compliance with applicable cleanup standards, compliance monitoring *action levels* for the groundwater exposure pathway can be derived using the same models used for SSTL calculation. Under this approach, groundwater compliance monitoring locations are selected between the source location (point of compliance) and the point of exposure (POE). By adjusting the distance variable on Transient Domenico Worksheet in the RBCA Tool Kit, the NAF value can be calculated for constituent transport from each monitoring point to the POE. The action level can be calculated as the arithmetic product of the NAF times the applicable RBEL for each constituent. If action levels are exceeded during the compliance monitoring period, further evaluation may be required to ensure adequate protection of downgradient receptors.

Model Selection Guidelines

Under the risk-based site evaluation process outlined above, fate-and-transport models are used to derive SSTL values based on estimation of the pathway-specific natural attenuation factor (NAF). Whenever feasible, direct field measurements represent the preferred method of NAF estimation. However, if the exposure pathway is not amenable to direct NAF measurement (e.g., volatilization factors, leachate factors, etc.) or if time-series analyses show the contaminant zone to be expanding over time, modeling analyses, based on appropriate site-specific data and conservative assumptions, can provide a convenient method of estimating future exposure levels.

The "best" model for a given site will be the simplest model providing a reliable and reasonably conservative prediction of potential exposure. Under the ASTM RBCA process, relatively simple analytical modeling tools are applied under Tiers 1 and 2, followed by more sophisticated modeling methods, if warranted, under Tier 3. The choice between simple and complex modeling methods should be dictated by the adequacy of the site database and the relative degree of error likely to be introduced by the model itself. In addition, the cost of upgrading to a more complex Tier 3 site evaluation must be warranted by the potential reduction in site remediation costs or the complex nature of the anticipated exposure condition. General guidelines for application of various types of fate-and-transport models under Tiers 1,2, and 3 are summarized below.

Model Dimensions: For each of the exposure pathways addressed in the RBCA standard, fate-and-transport models are available to estimate NAF values based on either a one-, two-, or three-dimensional analysis of contaminant transport. In reality, all contaminant transport occurs in three dimensions; however, one-dimensional (1-D) or two-dimensional (2-D) modeling tools may be employed for purpose of conservatism and simplicity. One-dimensional models, which ignore lateral and vertical dispersion effects, may significantly overestimate exposure levels and underestimate the pathway NAF. For this purpose, 2-D fate-and-transport models are commonly employed for Tier 1 and Tier 2 analyses, as presented in Appendix X3 of the *ASTM RBCA Standard (PS 104, 1998*a)and included in the RBCA Tool Kit. Three-dimensional transport models may provide a more accurate and less conservative NAF estimate under a Tier 3 evaluation, but must be supported by three-dimensional characterization of key transport parameters (e.g., hydraulic conductivity, etc.). While three-dimensional models are not included in the RBCA Tool Kit, NAF values calculated by these models may be entered directly into the software in order to calculate baseline risks and cleanup standards.

Steady-State vs. Transient Analyses: Steady-state fate-and-transport models, which assume a constant source concentration and constant flow conditions over time, provide a conservative (lowerbound) NAF estimate corresponding to maximum chronic exposure conditions. In reality, following termination of the release, source concentrations in soil and groundwater are likely to diminish over time, resulting in time-variable exposure concentrations at the POE. For purpose of simplicity and conservatism, steady-state, constant-source models, providing a lowerbound NAF value, are commonly employed under Tiers 1 and 2. However, to support risk management decisions, these constant-source models can be run in a transient mode to predict the *time to impact*, i.e., the time required for the exposure concentration to exceed the RBEL at the POE. Under Tier 3, fully transient models, simulating both time-variable source concentrations and transport phenomena, can be used to characterize both the timing and *duration* of the RBEL exceedance. Again, these more sophisticated Tier 3 analyses should be based on sufficient site-specific data to support reliable modeling results.

Probabilistic vs. Deterministic Models: Under Tiers 1 and 2, exposure concentrations and NAF values are characterized on the basis of *deterministic* models which provide a unique output value for each unique set of input values. Uncertainty in the modeling analysis is addressed by means of a *sensitivity study*, i.e., by varying key input values to evaluate their potential impact on the model output. Under Tier 3, *probabilistic* modeling may be employed as a more sophisticated approach to management of model uncertainty. In probabilistic modeling, for each key input parameter, the user provides a probability distribution corresponding to the range and type of distribution observed for the parameter at the site. The model then completes the fate-and-transport calculation for the full range of these input values, effectively conducting multiple random model sensitivity studies. The model result is not a unique value but a probability distribution defining the possible range of results (e.g., exposure concentration, NAF value) for the specified site conditions. The probabilistic analysis provides the user with relatively sophisticated information regarding possible exposure conditions (e.g., for a given SSTL value, what is the probability that the RBEL will be exceeded at any future time?) However, to support reliable results, this Tier 3 modeling method will typically require significant additional site characterization data relative to Tier 1 or Tier 2 deterministic analyses.

RBCA Tool Kit for Chemical Releases

The RBCA Tool Kit has been developed expressly for use with the Tier 1 and Tier 2 site evaluation procedures outlined in the ASTM RBCA Standard (PS 104, 1998a).Based upon site-specific data supplied by the user, the RBCA Tool Kit combines fate-and-transport modeling and risk characterization functions to compute: exposure concentrations, average daily intake, baseline risk levels, and risk-based media cleanup standards

Key features of the RBCA Tool Kit relevant to SSTL calculations and risk-based remedy selection are outlined below.

MODEL CALCULATION FUNCTIONS

Using a system of ten analytical models linked to internal libraries of standard exposure factors and chemical/toxicological data for over 90 compounds, the RBCA Tool Kit can calculate either baseline risk levels or cleanup standards for each complete exposure pathway identified by the user. Key calculation steps are as follows:

Exposure Concentrations**:** Based on representative concentrations of constituents of concern (COCs) present in the affected source media, maximum steady-state concentrations likely to occur at the point of exposure (POE) are calculated using the steady-state analytical fate-and-transport models identified in Appendix X3 of ASTM PS 104. To perform these calculations, the system evaluates cross-media partitioning (e.g., volatilization from soil to air) and lateral transport from the source to the POE (e.g., contaminant transport via air or groundwater flow). The source media and optional exposure pathways included in the software are as follows:

SOURCE MEDIA	EXPOSURE PATHWAYS
Surface Soils	Inhalation of Vapor and Particulates
	Dermal Contact with Soil
	Ingestion of Soil and Dust
	Leaching to Groundwater
Subsurface Soils	Inhalation of Vapor
	Leaching to Groundwater
Groundwater	Ingestion of Potable Water
	Inhalation of Vapor
	Discharge to Surface Water
	- Ingestion/Dermal Contact via Swimming
	- Ingestion via Fish Consumption
	- Aquatic Life Protection

Average Daily Intake**:** Based upon the exposure factors selected by the user, the average daily chemical intake for each receptor along each selected pathway is calculated in accordance with EPA guidelines (see Connor et al., 1997). These values are used in baseline risk calculations for each complete pathway.

Baseline Risk Characterization**:** Human health risks associated with exposure to COCs are calculated by the software on the basis of average daily intake rates and the corresponding toxicological parameters for carcinogenic and non-carcinogenic effects. For each complete pathway, the system output provides both individual and additive constituent results for carcinogens and non-carcinogens.

***Media Cleanup Values*:** The RBCA Tool Kit has the ability to i) compare the site data to Tier 1 Risk-Based Screening Levels (RBSLs), computed using the default parameter values as listed in ASTM PS 104, or ii) calculate Tier 2 Site-Specific Target Levels (SSTLs) based on user-supplied site information. For each source medium (i.e., affected soil and groundwater), the software reports target concentrations for all complete pathways and identifies the applicable (i.e., minimum) value for source remediation. The equations used by the RBCA Tool Kit to calculate RBSLs and SSTLs are presented in Table A.2.

TABLE A.2 RBSL AND SSTL EQUATIONS USED IN THE RBCA TOOL KIT

GROUNDWATER EXPOSURE PATHWAY	
Groundwater Ingestion	
Carcinogens: $RBSL_{GW} = \frac{TR \cdot BW \cdot AT_C}{SFo \cdot EF \cdot ED \cdot IR_w}$ Non-Carcinogens: $RBSL_{GW} = \frac{THQ \cdot RfDo \cdot BW \cdot AT_n}{EF \cdot ED \cdot IR_w}$	$SSTL_{GW} = RBSL_{GW} \cdot DAF$
Soil Leaching to Groundwater → Groundwater Ingestion	
Carcinogens: $RBSL_S = \frac{TR \cdot BW \cdot AT_C}{SFo \cdot EF \cdot ED \cdot IR_w \cdot LF}$ Non-Carc.: $RBSL_S = \frac{THQ \cdot RfDo \cdot BW \cdot AT_n}{EF \cdot ED \cdot IR_w \cdot LF}$	$SSTL_S = RBSL_S \cdot DAF$
SOIL EXPOSURE PATHWAY	
Surface Soil Ingestion, Inhalation, and Dermal Contact	
Carcinogens: $RBSL_{SS} = \frac{TR \cdot BW \cdot AT_C}{EF \cdot ED \cdot \left[(SFo \cdot IR_s) + (URF \cdot 1000 \cdot BW \cdot (VF_{ss} + VF_p)) + (SFd \cdot SA \cdot M \cdot RAF_d) \right]}$ Non-Carc.: $RBSL_{SS} = \frac{THQ \cdot BW \cdot AT_n}{EF \cdot ED \cdot \left[\left(\frac{IR_s}{RfDo} \right) + \left(\frac{BW \cdot (VF_{ss} + VF_p)}{RfC} \right) + \left(\frac{SA \cdot M \cdot RAF_d}{RfDd} \right) \right]}$	$SSTL_{SS} = RBSL_{SS}$ *(No lateral transport; receptor at source.)*
OUTDOOR AIR EXPOSURE PATHWAY	
Subsurface Soil Volatilization to Ambient Air	
Carcinogens: $RBSL_S = \frac{TR \cdot AT_C}{EF \cdot ED \cdot URF \cdot 1000 \cdot VF_{samb}}$ Non-Carcinogens: $RBSL_S = \frac{THQ \cdot RfC \cdot AT_n}{EF \cdot ED \cdot VF_{samb}}$	$SSTL_S = RBSL_S \cdot ADF$
Groundwater Volatilization to Ambient Air	
Carcinogens: $RBSL_{GW} = \frac{TR \cdot AT_C}{EF \cdot ED \cdot URF \cdot 1000 \cdot VF_{wamb}}$ Non-Carcinogens: $RBSL_{GW} = \frac{THQ \cdot RfC \cdot AT_n}{EF \cdot ED \cdot VF_{wamb}}$	$SSTL_{GW} = RBSL_{GW} \cdot ADF$

Continued

TABLE A.2 RBSL AND SSTL EQUATIONS USED IN THE RBCA TOOL KIT **Continued**

INDOOR AIR EXPOSURE PATHWAY	
Subsurface Soil Volatilization to Enclosed Space	
Carcinogens: $RBSL_S = \frac{TR \cdot AT_C}{EF \cdot ED \cdot URF \cdot 1000 \cdot VF_{sesp}}$ Non-Carcinogens: $RBSL_S = \frac{THQ \cdot RfC \cdot AT_n}{EF \cdot ED \cdot VF_{sesp}}$	$SSTL_{GW} = RBSL_{GW}$ *(No lateral transport; receptor at source.)*
Groundwater Volatilization to Enclosed Space	
Carcinogens: $RBSL_{GW} = \frac{TR \cdot AT_C}{EF \cdot ED \cdot URF \cdot 1000 \cdot VF_{wesp}}$ Non-Carcinogens: $RBSL_{GW} = \frac{THQ \cdot RfC \cdot AT_n}{EF \cdot ED \cdot VF_{wesp}}$	$SSTL_{GW} = RBSL_{GW}$ *(No lateral transport; receptor at source.)*
SURFACE WATER EXPOSURE PATHWAY	
Groundwater Discharge to Surface Water → Swimming and Fish Consumption	
RBSL not applicable. *(Receptor located away from source.)*	Carcinogens: $SSTL_{GW} = \frac{TR \cdot BW \cdot AT_C \cdot DAF \cdot DF_{gw-sw}}{ED \cdot \left[(SFo \cdot EV \cdot ET \cdot IR_{sw}) + (SFd \cdot EV \cdot SA_{sw} \cdot Z) + (SFo \cdot IR_{fish} \cdot FI_{fish} \cdot BCF) \right]}$ Non-Carc.: $SSTL_{GW} = \frac{THQ \cdot BW \cdot AT_n \cdot DAF \cdot DF_{gw-sw}}{ED \cdot \left[\left(\frac{EV \cdot ET \cdot IR_{sw}}{RfDo} \right) + \left(\frac{EV \cdot SA_{sw} \cdot Z}{RfDd} \right) + \left(\frac{IR_{fish} \cdot FI_{fish} \cdot BCF}{RfDo} \right) \right]}$
Soil Leaching to Groundwater → Groundwater Discharge to Surface Water → Swimming and Fish Consumption	
RBSL not applicable. *(Receptor located away from source.)*	Carcinogens: $SSTL_S = \frac{TR \cdot BW \cdot AT_C \cdot DAF \cdot DF_{gw-sw}}{ED \cdot \left[(SFo \cdot EV \cdot ET \cdot IR_{sw}) + (SFd \cdot EV \cdot SA_{sw} \cdot Z) + (SFo \cdot IR_{fish} \cdot FI_{fish} \cdot BCF) \right] \cdot LF}$ Non-Carc.: $SSTL_S = \frac{THQ \cdot BW \cdot AT_n \cdot DAF \cdot DF_{gw-sw}}{ED \cdot \left[\left(\frac{EV \cdot ET \cdot IR_{sw}}{RfDo} \right) + \left(\frac{EV \cdot SA_{sw} \cdot Z}{RfDd} \right) + \left(\frac{IR_{fish} \cdot FI_{fish} \cdot BCF}{RfDo} \right) \right] \cdot LF}$
Groundwater Discharge to Surface Water → Aquatic Life Protection	
RBSL not applicable. *(Receptor located away from source.)*	Carcinogens: $SSTL_{GW} = AQL \cdot DAF \cdot DF_{gw-sw}$ Non-Carcinogens: $SSTL_{GW} = AQL \cdot DAF \cdot DF_{gw-sw}$
Soil Leaching to Groundwater → Groundwater Discharge to Surface Water → Aquatic Life Protection	
RBSL not applicable. *(Receptor located away from source.)*	Carcinogens: $SSTL_S = \frac{AQL \cdot DAF \cdot DF_{gw-sw}}{LF}$ Non-Carcinogens: $SSTL_S = \frac{AQL \cdot DAF \cdot DF_{gw-sw}}{LF}$

Continued

TABLE A.2 RBSL AND SSTL EQUATIONS USED IN THE RBCA TOOL KIT ***Continued***

PARAMETER DEFINITIONS

ADF	Lateral air dispersion factor (unitless)
AQL	Aquatic protection criteria (mg/L)
AT_c	Averaging time - carcinogens (yr)
AT_n	Averaging time - non-carcinogens (yr)
BCF	Bioconcentration factor (mg/kg-fish)/(mg/L-wat)
BW	Body weight (kg)
DAF	Lateral groundwater dilution-attenuation factor (unitless)
$DF_{gw\text{-}sw}$	Groundwater to surface water dilution factor (unitless)
ED	Exposure duration (yr)
EF	Exposure frequency (d/yr)
ET	Exposure time (hr/event)
EV	Event frequency (events/yr)
FI_{fish}	Fraction of ingested fish from affected surface water (unitless)
IR_{fish}	Rate of fish consumption (kg/yr)
IR_s	Soil ingestion rate (kg/d)
IR_{sw}	Water ingestion rate while swimming (L/hr)
IR_w	Water ingestion rate (L/d)
LF	Soil-to-GW leaching factor (mg/L-wat)/(mg/kg-soil)
M	Soil-to-skin adherence factor ($mg/cm^2/d$)
RAF_d	Relative absorption factor for soil dermal contact (unitless)
$RBSL_{GW}$	Risk-based screening level for groundwater (mg/L)
$RBSL_S$	Risk-based screening level for soil (mg/kg)
$RBSL_{SS}$	Risk-based screening level for surface soil (mg/kg)
RfC	Reference concentration (mg/m^3)
RfDd	Chronic dermal reference dose (mg/kg/d)
RfDo	Chronic oral reference dose (mg/kg/d)
SA	Skin surface area for soil dermal contact (cm^2)
SA_{sw}	Skin surface area for swimming dermal contact (cm^2)
SFd	Dermal slope factor $(mg/kg/d)^{-1}$
SFo	Oral slope factor $(mg/kg/d)^{-1}$
$SSTL_{GW}$	Site-specific target level for groundwater (mg/L)
$SSTL_s$	Site-specific target level for soil (mg/kg)
$SSTL_{ss}$	Site-specific target level for surface soil (mg/kg)
THQ	Target hazard quotient
TR	Target risk
URF	Unit risk factor $(\mu g/m^3)^{-1}$
VF_p	Particulate emission factor (mg/m^3-air)/(mg/kg-soil)
VF_{samb}	Subsurface soil to ambient air volatilization factor (mg/m^3-air)/(mg/kg-soil)
VF_{sesp}	Subsurface soil to enclosed space volatilization factor (mg/m^3-air)/(mg/kg-soil)
VF_{ss}	Surface soil to ambint air volatilization factor (mg/m^3-air)/(mg/kg-soil)
VF_{wamb}	GW to ambient air volatilization factor (mg/m^3-air)/(mg/L-wat)
VF_{wesp}	GW to enclosed space volatilization factor (mg/m^3-air)/(mg/L-wat)
Z	Water to skin dermal absorption factor (cm/event)

RISK-BASED DECISION SUPPORT FEATURES

The RBCA Tool Kit includes several features designed to support key steps of the risk-based site evaluation process, including the following:

Step-by-Step Evaluation Process: From the Main Screen of the graphical user interface, the user is guided through all the necessary steps for completing the Tier 1 or Tier 2 evaluation process. On subsequent screens the interface leads the user through exposure pathway identification, model selection, site-specific parameter input, and output review. All output screens may be printed in a report-quality format.

Analysis of Actual and Potential POEs: Multiple off-site exposure points are allowed for the groundwater and outdoor air pathways. This enables the user to evaluate risks at both actual (e.g. an actual nearby well) and potential (e.g., a hypothetical well at the property boundary) POEs. Whether site risks affect an actual or potential POE adds a qualitative dimension to the risk calculations which may be an important factor in remedy selection at some sites.

Transient Groundwater Modeling Analyses: An optional Transient Domenico Worksheet is provided to allow the user to estimate the time required for site constituents to impact off-site groundwater POEs. Groundwater risk levels and cleanup standards calculated by the software are based on steady-state concentrations. However, the time to reach steady-state concentrations at off-site POEs may be very long for some constituents. Thus, the time required to exceed a concentration limit at a POE may be an important factor in remedy selection as near-term impacts may require a significantly different response than longer-term impacts (e.g., an engineered response vs. natural attenuation).

Summary

The RBCA Tool Kit for Chemical Releases provides a system of simple analytical fate-and-transport models that can be used for comprehensive risk-based evaluation of potential soil, air, groundwater, and surface water exposure pathways. However, as with all predictive modeling efforts, reliable results require proper characterization of site-specific input parameters. In all cases, model predictions must be shown to be consistent with the actual constituent distributions observed at the site. Use of the Tier 1 and Tier 2 calculation methods outlined in the ASTM RBCA Standard (PS 104, 1998) and incorporated in the RBCA Tool Kit can significantly reduce the time and effort required for evaluation of risk reduction requirements and selection of appropriate exposure control methods. However, proper scientific and/or engineering expertise is required both for characterization of input parameters and assessment of model results.

APPENDIX E

Fate and Transport Modeling Methods

Source: Groundwater Services, Inc.

The RBCA Tool Kit contains a series of fate and transport models for predicting COC concentrations at points of exposure (POEs) located downwind or downgradient of source areas for air or groundwater exposure pathways, respectively. Under Tiers 1 and 2, relatively simple analytical models are to be employed for these calculations. The RBCA Tool Kit is consistent with Appendix X3 of ASTM PS-104, although selected algorithms and default parameters have been updated to reflect advances in evaluation methods.

The idealized schematic shown on Figure B.1 illustrates the steps included in the RBCA Tool Kit for predicting transport of contaminants from the source zone to the POE for air and groundwater exposure pathways. Each element in Figure B.1 represents a step-specific attenuation factor, corresponding to either a cross-media transfer factor (CM) or a lateral transport factor (LT). The effective NAF value for each COC on each pathway is then calculated as the arithmetic product of the various attenuation factors occurring along the flow path from source to receptor. These steady-state NAF values are then used for calculation of baseline risks and back-calculation of Site-Specific Target Levels (SSTLs). Please note that fate and transport modeling is *not* required for direct exposure pathways, such as soil ingestion or dermal contact, where the source and exposure concentrations are equal (i.e., NAF = 1). Analytical models used for conservative estimation of each transport factor are described below.

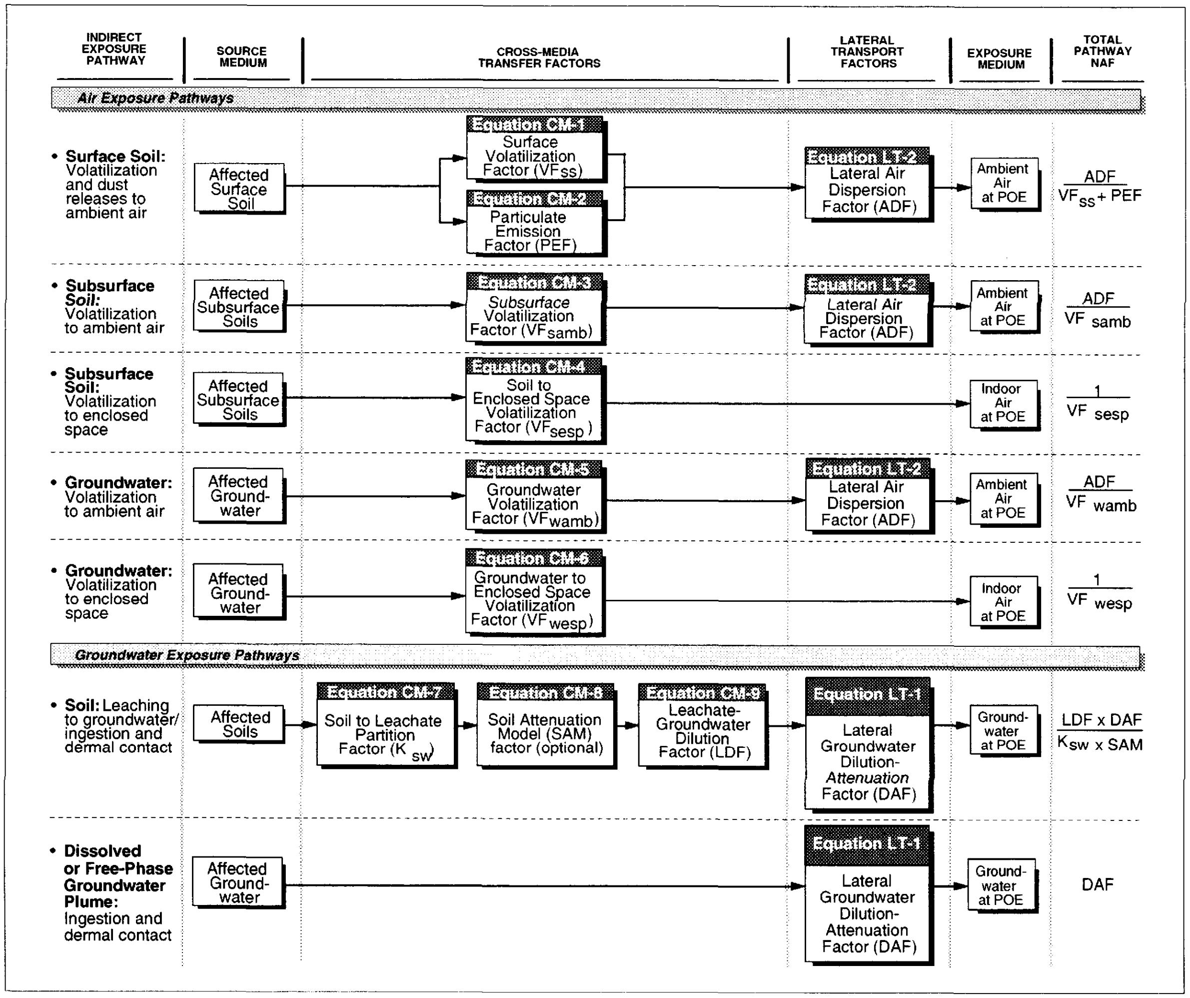


FIGURE B.1. NAF CALCULATION SCHEMATIC FOR INDIRECT EXPOSURE PATHWAYS

Cross-Media Transfer Factors

Exposure pathways involving transport of COCs from one medium to another (e.g., soil-to-air, soil-to-groundwater) require estimation of the corresponding cross-media transfer factor. Various analytical expressions are available for estimating soil-to-air *volatilization factors* as a function of site soil characteristics and the physical/chemical properties of volatile organic COCs. *Leaching factors* for organic and inorganic constituent releases from soil to groundwater can similarly be estimated as a function of COC characteristics, soil conditions, and annual rainfall infiltration. Cross-media transfer equations incorporated in the RBCA Tool Kit are presented in Figure B.2. Detailed discussion of each of these cross-media factors is provided below.

- ***VF_{SS}: Surface Soil Volatilization Factor (Equation CM-1)***

  The surface volatilization factor is the steady-state ratio of the predicted concentration of an organic constituent in the ambient air breathing zone to the source concentration in the surface soil. The surface volatilization factor incorporates two cross-media transfer elements: i) organic vapor flux from the surface soil mass to ground surface and ii) mixing of soil vapors in the ambient air breathing zone directly over the affected surface soil. For each site, the applicable VF_{SS} value corresponds to the lesser result of two calculation methods (termed CM-1a and CM-1b on Figure B.2). Equation CM-1a typically controls for low-volatility compounds, as it assumes there is an infinite source of chemical in the surface soils and uses a volatilization rate based primarily on chemical properties. Equation CM-1b, which typically controls for volatile organic compounds (VOCs), is based on a mass balance approach. In this equation, a finite amount of chemical is assumed to be present in the surface soil (based on the representative COC concentration), volatilizing at a constant rate over the duration of the exposure period (e.g., 25-30 years). Both expressions account for the dilution of chemicals in ambient air above the source zone due to mixing with ambient air moving across the site. A simple box model is used for this dilution calculation, based on the following adjustable default assumptions: 2-meter mixing zone height and 225 cm/sec (5 mph) lateral wind speed. The length of the mixing zone is set equal to the lateral dimension of the exposed affected surface soil area parallel to the assumed wind direction.

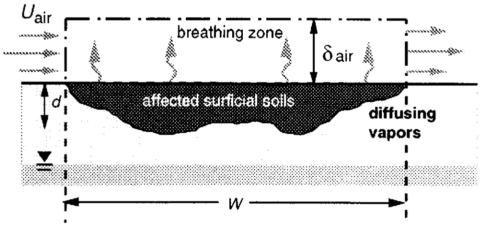
  Key assumptions used in this model and their effect on the SSTL calculation are as follows:

KEY ASSUMPTIONS: VF_{SS}	**EFFECT ON CLEANUP STANDARD**
• **Uniform COC Concentrations**: Constituent levels uniformly distributed in soil and constant over exposure period.	-----
• **No COC Decay**: No biodegradation or other loss mechanism in soil or vapor phase.	⇩
• **Finite Source Term**: Source term mass adjusted for constant volatilization over exposure period.	-----

- ***PEF: Soil Particulate Emission Factor (Equation CM-2)***

  The Particulate Emission Factor (PEF) is the steady-state ratio of the predicted concentration of chemicals in particulates in the ambient air breathing zone to the source concentration of chemical in the surface soil. The factor incorporates two cross-media transfer elements: i) the release rate of soil particulates (dust) from ground surface and ii) mixing of these particulates in the ambient air breathing zone directly over the affected surface soil. The particulate release rate is commonly matched to a conservative default value of 6.9×10^{-14} g/cm^2-sec (approximately 0.2 lbs/acre-year), unless a more appropriate site-specific estimate is available. (If the site is paved, the particulate release rate and resultant PEF value for the covered soil area will be zero.) Particulates are assumed to be diluted by lateral air flow directly over the source zone. For this purpose, a simple box model is employed, based on the following adjustable default assumptions: 2-meter mixing zone height and 225 cm/sec (5 mph) lateral wind speed. The length of the mixing zone is matched to the lateral dimension of the exposed affected surface soil area parallel to the assumed wind direction.

Equation CM-1: Surface Soil Volatilization Factor (VFss)



CM-1a:

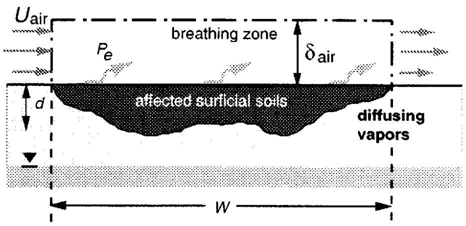
$$VF_{ss}\left[\frac{(mg/m^3-air)}{(mg/kg-soil)}\right]=\frac{2W\rho_s}{U_{air}\delta_{air}}\sqrt{\frac{D_s^{eff}H}{\pi\tau(\theta_{ws}+k_s\rho_s+H\theta_{as})}}\times10^3$$

or CM-1b:

$$VF_{ss}\left[\frac{(mg/m^3-air)}{(mg/kg-soil)}\right]=\frac{W\rho_s d}{U_{air}\delta_{air}\tau}\times10^3$$

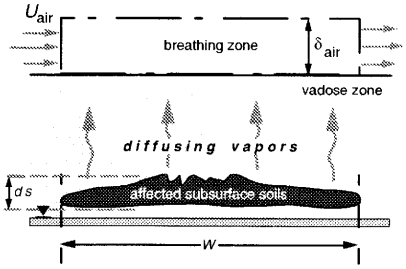
whichever is less

Equation CM-2: Soil Particulate Emission Factor (PEF)



$$PEF\left[\frac{(mg/m^3-air)}{(mg/kg-soil)}\right]=\frac{P_eW}{U_{air}\delta_{air}}\times10^3$$

Equation CM-3: Subsurface Soil Volatilization Factor (VFsamb)



CM-3a:

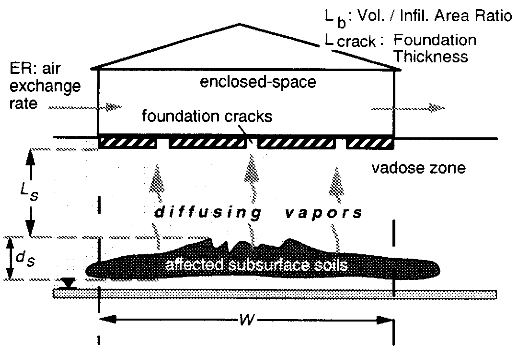
$$VF_{samb}\left[\frac{(mg/m^3-air)}{(mg/kg-soil)}\right]=\frac{H\rho_s}{[\theta_{ws}+k_s\rho_s+H\theta_{as}]\left[1+\frac{U_{air}\delta_{air}L_s}{D_s^{eff}W}\right]}\times10^3$$

or CM-3b:

$$VF_{samb}\left[\frac{(mg/m^3-air)}{(mg/kg-soil)}\right]=\frac{W\rho_s d_s}{U_{air}\delta_{air}\tau}\times10^3$$

whichever is less

Equation CM-4: Subsurface Soil to Enclosed Space Volatilization Factor (VFsesp)



CM-4a:

For $Q_s=0$:

$$VF_{sesp}\left[\frac{(mg/m^3-air)}{(mg/kg-soil)}\right]=\frac{\frac{H\rho_s}{[\theta_{ws}+k_s\rho_s+H\theta_{as}]}\left[\frac{D_s^{eff}/L_s}{ER\,L_B}\right]}{1+\left[\frac{D_s^{eff}/L_s}{ER\,L_B}\right]+\left[\frac{D_s^{eff}/L_s}{(D_{crack}^{eff}/L_{crack})\cdot\eta}\right]}\text{x}10^3$$

For $Q_s>0$:

$$VF_{sesp}\left[\frac{(mg/m^3-air)}{(mg/kg-soil)}\right]=\frac{\frac{H\rho_s}{[\theta_{ws}+k_s\rho_s+H\theta_{as}]}\left[\frac{D_s^{eff}/L_s}{ER\,L_B}\right]e^{\xi}}{e^{\xi}+\left[\frac{D_s^{eff}/L_s}{ER\,L_B}\right]+\left[\frac{D_s^{eff}/L_s}{(Q_s/A_b)}\right]\left[e^{\xi}-1\right]}\text{x}10^3$$

or CM-4b:

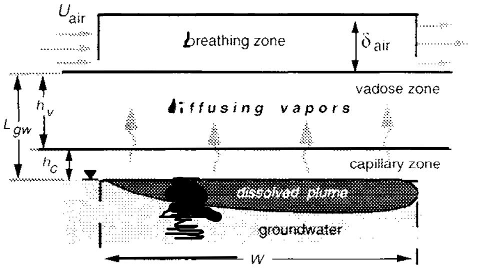
$$VF_{sesp}\left[\frac{(mg/m^3-air)}{(mg/kg-soil)}\right]=\frac{\rho_s d_s}{L_B ER\tau}\text{x}\times10^3$$

whichever is less

FIGURE B.2. CROSS-MEDIA TRANSFER FACTORS IN THE RBCA TOOL KIT ***Continued***

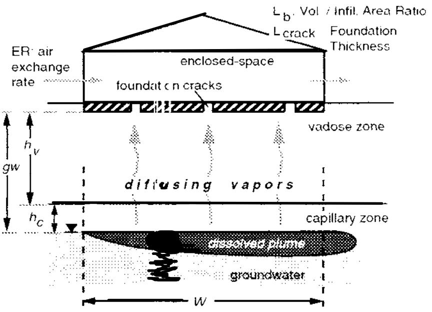
Continued

Equation CM-5: Groundwater Volatilization Factor (VFwamb)



$$VF_{wamb}\left[\frac{(mg\ /\ m^3-air\ )}{(mg/L\ \ -H_2O\ )}\right]=\frac{H}{1+\left[\frac{U_{air}\ \delta_{air}\ L_{GW}}{D_{ws}^{eff}\ W}\right]}\times10^{3}$$

Equation CM-6: Groundwater to Enclosed Space Volatilization Factor (VFwesp)



For $Q_s = 0$:

$$VF_{wesp}\left[\frac{(mg\ /\ m^3-air)}{(mg\ /\ L-H_2O)}\right]=\frac{H\left[\frac{D_{ws}^{eff}\ /\ L_{GW}}{ER\ L_B}\right]}{1+\left[\frac{D_{ws}^{eff}\ /\ L_{GW}}{ER\ L_B}\right]+\left[\frac{D_{ws}^{eff}\ /\ L_{GW}}{\left(D_{crack}^{eff}\ /\ L_{crack}\right)\cdot\eta}\right]}\times10^3$$

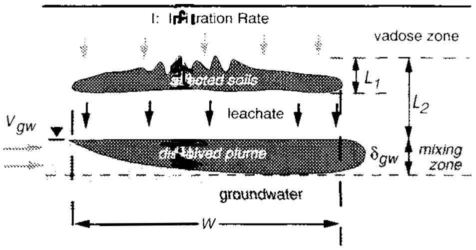
For $Q_s > 0$:

$$VF_{wesp}\left[\frac{(mg\ /\ m^3-air)}{(mg\ /\ L-H_2O)}\right]=\frac{H\left[\frac{D_{ws}^{eff}\ /\ L_{GW}}{ER\ L_B}\right]e^{\xi}}{e^{\xi}+\left[\frac{D_{ws}^{eff}\ /\ L_{GW}}{ER\ L_B}\right]+\left[\frac{D_{ws}^{eff}\ /\ L_{GW}}{Q_s\ /\ A_b}\right]\left[e^{\xi}-1\right]}\times10^{3}$$

Equation CM-7: Soil Leachate Partition Factor(Ksw)

Equation CM-8: Optional Soil Attenuation Model (SAM) Factor

Equation CM-9: Leachate-Groundwater Dilution Factor (LDF)



CM-7: $$K_{sw}\left[\frac{(mg\ /\ L-H_2O)}{(mg/kg-soil)}\right]=\frac{\rho_s}{\theta_{ws}+k_s\rho_s+H\theta_{as}}$$

CM-8: $$SAM\left[dimensionless\right]=\frac{L_1}{L_2}$$

CM-9: $$LDF\left[dimensionless\right]=1+\frac{V_{gw}\delta_{gw}}{I\cdot W}$$

Effective Diffusion Coefficients

Effective diffusivity in vadose zone soils:

$$D_s^{eff}\left[\frac{cm^2}{s}\right]=D^{air}\frac{\theta_{as}^{3.33}}{\theta_T^2}+\left[\frac{D^{wat}}{H}\right]\left[\frac{\theta_{ws}^{3.33}}{\theta_T^2}\right]$$

Effective diffusivity through foundation cracks:

$$D_{crack}^{eff}\left[\frac{cm^2}{s}\right]=D^{air}\frac{\theta_{acrack}^{3.33}}{\theta_T^2}+\left[\frac{D^{wat}}{H}\right]\left[\frac{\theta_{wcrack}^{3.33}}{\theta_T^2}\right]$$

Effective diffusivity above the water table.

$$D_{ws}^{eff}\left[\frac{cm^2}{s}\right]=(h_c+h_v)\left[\frac{h_c}{D_{cap}^{eff}}+\frac{h_v}{D_s^{eff}}\right]^{-1}$$

Effective diffusivity in the capillary zone:

$$D_{cap}^{eff}\left[\frac{cm^2}{s}\right]=D^{air}\frac{\theta_{acap}^{3.33}}{\theta_T^2}+\left[\frac{D^{wat}}{H}\right]\left[\frac{\theta_{wcap}^{3.33}}{\theta_T^2}\right]$$

Convective Air Flow Through Foundation Cracks

$$\xi=\frac{Q_s\ /\ A_b}{\left(D_{crack}^{eff}\ /\ L_{crack}\right)\cdot\eta}$$

$$Q_s=\frac{2\pi\ \Delta p\ k_v\ X_{crack}}{\mu_{air}\ \ln\left[\frac{2\ Z_{crack}\ X_{crack}}{A_b\ \eta}\right]}$$

FIGURE B.2. CROSS-MEDIA TRANSFER FACTORS IN THE RBCA TOOL KIT ***Continued***

Continued

Definitions for Cross-Media Transfer Equations

A_b	Area of building foundation (cm^2)
d	Lower depth of surficial soil zone (cm)
d_s	Thickness of affected subsurface soils
D^{air}	Diffusion coefficient in air (cm^2/s)
D^{wat}	Diffusion coefficient in water (cm^2/s)
ER	Enclosed-space air exchange rate (l/s)
f_{oc}	Fraction of organic carbon in soil (g-C/g-soil)
H	Henry's law constant (cm^3-H_2O)/(cm^3-air)
h_c	Thickness of capillary fringe (cm)
h_v	Thickness of vadose zone (cm)
I	Infiltration rate of water through soil (cm/year)
k_{oc}	Carbon-water sorption coefficient (g-H_2O/g-C)
k_s	Soil-water sorption coefficient = foc . koc (g-H_2O/g-soil)
L_B	Enclosed space volume/infiltration area ratio (cm)
L_{crack}	Enclosed space foundation or wall thickness (cm)
L_{GW}	Depth to groundwater = $h_{cap} + h_v$ (cm)
L_s	Depth to subsurface soil sources (cm)
L_1	Thickness of affected soils (cm)
L_2	Distance from top of affected soils to top of water-bearing unit = L_{GW} - L_S (cm)
P_e	Particulate emission rate (g/cm^2-s)
U_{air}	Wind speed above ground surface in ambient mixing zone (cm/s)

V_{gw}	Groundwater Darcy velocity (cm/s)
W	Width of source area parallel to wind, or groundwater flow direction (cm)
X_{crack}	Enclosed space foundation perimeter (cm)
Z_{crack}	Depth to base of enclosed space foundation (cm)
δ_{air}	Ambient air mixing zone height (cm)
δ_{gw}	Groundwater mixing zone thickness (cm)
η	Areal fraction of cracks in foundations/walls (cm^2-cracks/cm^2-total area)
θ_{acap}	Volumetric air content in capillary fringe soils (cm^3-air/cm^3-soil)
θ_{acrack}	Volumetric air content in foundation/wall cracks (cm^3-air/cm^3 total volume)
θ_{as}	Volumetric air content in vadose zone soils (cm^3-air/cm^3-soil)
θ_T	Total soil porosity (cm^3-pore-space/ cm^3-soil)
θ_{wcap}	Volumetric water content in capillary fringe soils (cm^3-H_2O/cm^3-soil)
θ_{wcrack}	Volumetric water content in foundation/wall cracks (cm^3-H_2O)/cm^3 total volume)
θ_{ws}	Volumetric water content in vadose zone soils (cm^3-H_2O/cm^3-soil)
ρ_s	Soil bulk density (g-soil/cm^3-soil)
τ	Averaging time for vapor flux (s)

FIGURE B.2. CROSS-MEDIA TRANSFER FACTORS IN THE RBCA TOOL KIT

Key assumptions incorporated in this model and their effect on the SSTL calculation are as follows:

KEY ASSUMPTIONS: PEF	EFFECT ON CLEANUP STANDARD
• **Uniform COC Concentrations**: Constituent levels uniformly distributed in soil and constant over exposure period.	-----
• **No COC Decay**: No biodegradation or other loss mechanism in soil or vapor phase.	⇩
• **Default Emission Rate**: Conservative particulate emission rate.	⇩

- ***VF_{samb}- Subsurface Soil Volatilization Factor (Equation CM-3)***

The subsurface soil volatilization factor is comparable to the surface volatilization equation, except that the algorithm has been adjusted to account for vapor flux from greater soil depths. The volatilization factor accounts for two cross-media transfer elements: i) organic vapor flux from the subsurface affected soil mass to ground surface and ii) mixing of soil vapors in the ambient air breathing zone directly over the affected soil zone. As with the surface soil volatilization factor, VFss, the applicable subsurface soil volatilization factor, VFsamb, corresponds to the lesser result of two calculation methods (termed CM-3a and CM-3b on Figure B.2). Equation CM-3a, which corresponds to the expression given in Appendix X3 of ASTM PS-104, assumes a constant source mass in the subsurface and can severely overpredict the soil vapor flux rate. To correct for this problem, Equation CM-3b, which accounts for a mass balance of the volatilized source mass over the exposure period (similar to Equation CM-1b) has been incorporated in the RBCA Tool Kit. With either equation (CM-3a or CM 3-b), dilution of soil vapors in the ambient air breathing zone is estimated using the same box model described for Equation CM-1.

Key assumptions incorporated in this model and their effect on the SSTL calculation are as follows:

KEY ASSUMPTIONS: VF_{samb}	**EFFECT ON CLEANUP STANDARD**
• **Uniform COC Concentrations**: Constituent levels uniformly distributed in soil and constant over exposure period.	-----
• **No COC Decay**: No biodegradation or other loss mechanism in soil or vapor phase.	⇩
• **Finite Source Term**: Source term mass adjusted for constant volatilization over exposure period.	-----

- ***VF_{sesp}. Subsurface Soil-to-Enclosed-Space Volatilization Factor (Equation CM-4)***

  This factor is the steady-state ratio of the predicted concentration of a chemical constituent in indoor air to the concentration in underlying subsurface soils. Again, two expressions are evaluated: i) Equation CM-4a, which assumes an infinite source mass and is of the same form as Equation CM-3a with a term added to represent diffusion through cracks in the foundation of the building, and ii) Equation CM-4b which accounts for a finite source mass volatilizing at a constant rate over the exposure period. The applicable VF_{sesp} value corresponds to the lesser of these two expressions. The soil-to-enclosed-space volatilization factor incorporates two cross-media transfer elements: i) organic vapor flux from the underlying soil mass through the building floor and ii) mixing of soil vapors with indoor air. Tier 1 default assumptions in the software include: i) a 1% open crack space in the foundation allowing vapors to diffuse into the building and ii) a building air exchange rate of 20 exchanges per day (commercial) or 12 exchanges per day (residential). When used with these default values, the expression yields very conservative results and can represent the controlling pathway for SSTL calculations for many sites. In such case, users are advised to conduct direct air or soil vapor measurements prior to proceeding with remedial measures for this pathway.

  Key assumptions used in this model and their effect on the SSTL calculation are as follows:

KEY ASSUMPTIONS: VF_{sesp}	**EFFECT ON CLEANUP STANDARD**
• **Uniform COC Concentrations**: Constituent levels uniformly distributed in soil and constant over exposure period.	-----
• **No COC Decay**: No biodegradation or other loss mechanism in soil or vapor phase.	⇩
• **Finite Source Term**: Source term mass adjusted for constant volatilization over exposure period.	-----
• **Default Building Parameters**: Conservative default values for foundation crack area and air exchange rate.	⇩

- ***VF_{wamb}: Groundwater Volatilization Factor (Equation CM-5)***

  The groundwater volatilization factor is the steady-state ratio of the predicted concentration of a chemical constituent in ambient air to the source concentration in underlying affected groundwater. Vapor flux rates from groundwater to soil vapor and thence from soil vapor to ground surface are generally lower than those associated with direct volatilization from affected soils. Consequently, this groundwater-to-ambient-air volatilization factor is typically not significant in comparison to soil volatilization factors (i.e., Equations CM-1 or CM-3). This factor accounts for i) steady-state partitioning of dissolved organic constituents from groundwater to the soil vapor phase, ii) soil vapor flux rates to ground surface, and iii) mixing of soil vapors in the ambient air breathing zone directly over the plume. Dilution of vapors in the breathing zone is estimated using a box model, as described for Equation CM-1 above.

Key assumptions incorporated in this model and their effect on the SSTL calculation are as follows:

KEY ASSUMPTIONS: VF_{wamb}	**EFFECT ON CLEANUP STANDARD**
• **Vapor Equilibrium**: Soil vapor concentrations reach immediate equilibrium with groundwater source.	⇩
• **No COC Decay**: No biodegradation or other loss mechanism in groundwater or vapor phase.	⇩
• **Infinite Source**: COC mass in source term constant over time.	⇩

- ***VF_{wesp}: Groundwater to Enclosed Space Volatilization Factor (Equation CM-6)***

This factor is the steady-state ratio of the predicted concentration of a chemical constituent in indoor air to the source concentration in the underlying affected groundwater. The algorithm is equivalent to Equation CM-5, modified to address vapor diffusion through a building floor and enclosed space accumulation. *Tier 1 default values are the same as those specified for Equation CM-4 and, as noted* previously, can provide a relatively conservative (upper-range) estimate of indoor vapor concentrations. If this pathway produces the controlling (minimum) RBSL or SSTL value for a given site, the user is advised to conduct direct air or soil vapor measurements to evaluate the actual need for remedial measures.

Key assumptions used in this model and their effect on the SSTL calculation are as follows:

KEY ASSUMPTIONS: VF_{wesp}	**EFFECT ON CLEANUP STANDARD**
• **Vapor Equilibrium**: Soil vapor concentrations reach immediate equilibrium with groundwater source.	⇩
• **No COC Decay**: No biodegradation or other loss mechanism in groundwater or vapor phase.	⇩
• **Infinite Source**: COC mass in source term constant over time.	⇩
• **Default Building Factors**: Conservative default values for foundation crack area and air exchange rate.	⇩

- ***K_{sw}: Soil Leachate Partition Factor (Equation CM-7)***

The soil leachate partition factor is the steady-state ratio between the concentration of an organic constituent in soil pore water and the source concentration on the affected soil mass. This factor is used to represent the release of soil constituents to leachate percolating through the affected soil zone.

Key assumptions used *in this equation and their effect on the SSTL calculation are as follows:*

KEY ASSUMPTIONS: K_{SW}	**EFFECT ON CLEANUP STANDARD**
• **Leachate Equilibrium**: Leachate concentrations reach immediate equilibrium with affected soil source.	⇩
• **No COC Decay**: No biodegradation or other loss mechanism in soil or leachate.	⇩
• **Infinite Source**: COC mass in soil constant over time.	⇩

- ***SAM: Optional Soil Attenuation Model (SAM) factor (Equation CM-8)***
  An optional factor based on the Soil Attenuation Model (see Connor *et al.*, 1997) may be applied to incorporate depth effects by accounting for the sorption of constituents from the leachate onto clean soils underlying the affected soil zone. The presence of clean intervening soils reduces constituent concentrations ultimately delivered to the underlying groundwater. In deeper groundwater systems, wherein a significant thickness of unaffected soils underlies the affected soil zone, neglecting the sorptive capacity of the intervening soils can prove overly conservative. Note that SAM corresponds to movement of *dissolved* constituents through porous media and does not apply to cases involving downward migration of mobile NAPL materials.

  Key assumptions used in this equation and their effect on the SSTL calculation are as follows:

KEY ASSUMPTIONS: SAM	EFFECT ON CLEANUP STANDARD
• **No COC Decay**: No biodegradation or other loss mechanism in soil or leachate.	⇩
• **Infinite Source**: COC mass in soil constant over time.	⇩

- ***LDF: Leachate-Groundwater Dilution Factor (Equation CM-9)***
  The LDF factor accounts for dilution of chemical constituents as leachate from the overlying affected soil zone mixes with groundwater in the underlying water-bearing unit. As indicated on Figure B.1, the leachate dilution factor (LDF) divided by the soil-leachate partition factor (K_{sw}) represents the steady-state ratio between the concentration of a constituent in the groundwater zone and the source concentration in the overlying affected soil. To estimate the leachate dilution factor, a simple box model is used to estimate dilution within a mixing zone in the water-bearing unit directly beneath the affected soil mass (see Equation CM-9, Figure B.2). The leachate volume entering the water-bearing unit is represented by the deep infiltration term, I, which typically falls in the range of 0.5% - 5% of annual site precipitation. For the Tier 1 RBSL calculation, a conservative default infiltration value of 30 cm/year is used, consistent with the example provided in ASTM PS-104, Appendix X3. For many sites, this default value (equivalent to an annual rainfall rate of over 200 in/year) may significantly overestimate actual leachate rates.

  Key assumptions used in this equation and their effect on the SSTL calculation are as follows:

KEY ASSUMPTIONS: LDF	EFFECT ON CLEANUP STANDARD
• **Rainfall Infiltration**: Deep percolation through affected soil assumed to reach water-bearing unit regardless of soil thickness or permeability.	⇩
• **No COC Decay**: No biodegradation or other loss in mechanism groundwater zone.	⇩
• **Default Dilution Parameters**: Conservative default value for infiltration rate.	⇩

Lateral Transport Factors

During lateral transport within air or groundwater, COC concentrations in the flow stream will be diminished due to mixing and attenuation effects (see Figure B.1). Site-specific attenuation factors characterizing COC mass dilution or loss during lateral transport can be estimated using the air dispersion and groundwater transport models provided in the RBCA Tool Kit. Equations for the steady-state analytical transport models incorporated in the RBCA Tool Kit are shown on Figure B.3. The user must provide information regarding COC properties and transport parameters (flow velocities, dispersion coefficients, retardation factors, decay factors, etc.), as required for the selected contaminant transport model. Calculation procedures for lateral air dispersion and groundwater dilution-attenuation factors are described below.

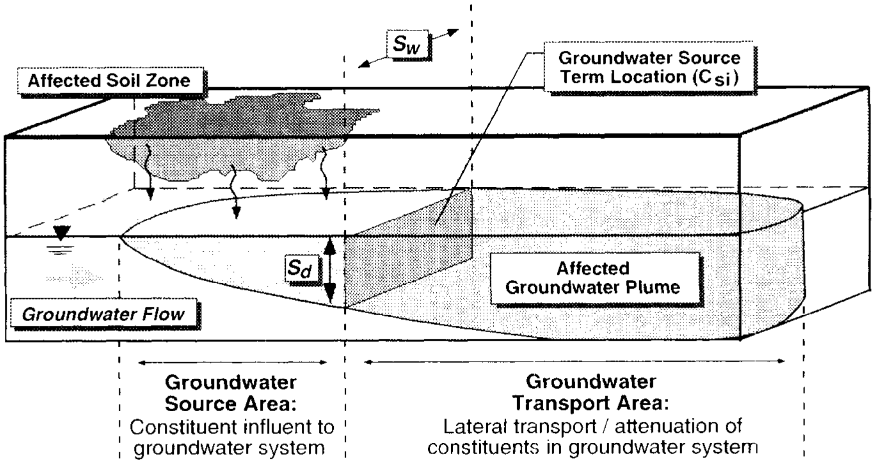
- ***DAF: Lateral Groundwater Dilution Attenuation Factor (Equation LT-1)***
  To account for attenuation of affected groundwater concentrations between the source and POE, the Domenico analytical solute transport model has been incorporated into the RBCA Tool Kit. This model uses a partially or completely penetrating vertical plane source, perpendicular to groundwater flow, to simulate the release of constituents from the mixing zone to the migrating groundwater (see Figure B.3). Within the groundwater flow regime, the model accounts for the effects of advection, dispersion, sorption, and biodegradation. Given a representative source zone concentration for each COC, the model can predict steady-state plume concentrations at any point (x, y, z) in the downgradient flow system. In the RBCA Tool Kit, the model is set to predict centerline plume concentrations at any downgradient distance x, based on 1-D advective flow and 3-D dispersion. The receptor well is assumed to be located on the plume centerline, directly downgradient of the source zone at a location specified by the user. Source concentrations and critical flow parameters must be provided by the user. Guidelines for selection of key input parameters are outlined below.

  i) **Groundwater Source Term.** The Domenico model represents the groundwater source term as a vertical plane source, perpendicular to groundwater flow, releasing dissolved constituents into groundwater passing through the plane. In the RBCA Tool Kit, the source plane dimensions are matched to the source width and thickness specified by the user. The user should provide source dimensions equivalent to the measured thickness and transverse width of the groundwater plume at the source point (area of maximum plume concentration). The source is assumed to be constant, with source zone concentrations set equal to the representative COC concentrations supplied by the user. Representative source concentrations must be provided for each COC. These values should correspond to the maximum COC concentrations measured at the plume "core" unless sufficient data are available to describe a representative maximum based on statistical estimates. If non-aqueous phase liquids (NAPLs) are present, maximum COC solubility limits in groundwater can be corrected for mixture effects by using Raoult's Law. For this purpose, the user must provide data regarding the mole fractions of principal NAPL constituents.

  ii) **Flow and Mixing Parameters.** The degree of contaminant mixing predicted by the model will be a function of the dispersion coefficients, hydraulic conductivity, hydraulic flow gradient, and effective soil porosity specified by the user. Hydraulic conductivity and flow gradient should be matched directly to site measurements. In many cases, the effective soil porosity of the water-bearing unit can be reasonably estimated based on soil type using published references. Typical default values are provided in the software. Selection of dispersion coefficients can prove problematic, given the impracticability of direct site measurements. Two dispersivity relationships are incorporated in the RBCA Tool Kit: i) the method employed in ASTM E-1739 (1995) and ii) the Xu and Eckstien (1995) dispersivity model. These relationships allow the user to estimate dispersion coefficients based on the distance from the source to the receptor.

  iii) **Retardation Factors.** The rate of plume migration can be reduced due to constituent sorption to the solid matrix of the water-bearing unit. The user is referred to standard hydrogeologic texts regarding calculation of retardation factors for both inorganic and organic plume constituents. The RBCA Tool Kit calculates a retardation factor for each COC using information on the organic-carbon partition coefficient (k_{OC}) of the constituent and the fraction organic carbon (f_{OC}) of the soil matrix. Sorption can significantly affect the NAF calculation if first-order decay conditions are assumed to apply. However, the retardation factor will not affect model results under steady-state conditions.

  iv) **First-Order Decay Parameters.** Under steady-state conditions, hydrolysis and biodegradation represent the principal mechanisms of organic contaminant mass reduction during groundwater plume transport within the subsurface. Many groundwater transport models account for these attenuation phenomena by means of a first-order decay function within the advection-dispersion equation. In the RBCA Tool Kit, the user may elect to use a version of the Domenico solute transport model incorporating first-order decay (see Equation LT-1a on Figure B.3). Considerable care must be exercised in the selection of a first-order decay coefficient for each COC in order to



SELECTION OF GROUNDWATER MODEL INPUT PARAMETERS

For use of Domenico groundwater solute transport model, select source term location, dimensions, and concentration as follows:

1) Groundwater Source Term Location

The source term corresponds to a vertical source plane, normal to the direction of groundwater flow, located at the downgradient limit of the area serving as the principal source of constituent release to groundwater (e.g., affected unsaturated zone soils, NAPL plume, spill area, etc.). If the point of maximum plume concentration is significantly displaced from the initial suspected point of release, this plume "core" should be used as the source point for the groundwater ingestion pathway. However, the downgradient edge of the affected soil zone should be retained as the source location for the soil-to-groundwater leaching pathway. Distances to downgradient points of exposure (POEs) should then be measured from the applicable source location along the principal direction of groundwater flow.

2) Groundwater Source Term Width, S_W

The width of the source term should be matched to the following dimensions:

- **i)** for groundwater ingestion, the measured groundwater plume width, (as defined by RBSL), perpendicular to the principal direction of groundwater flow at the designated source term location.
- **ii)** for soil-to-groundwater impacts, the maximum width of the affected soil zone (as defined by RBSL), perpendicular to the principal groundwater flow direction.

3) Groundwater Source Term Thickness, S_d

The thickness of the source term should be determined by one of the following methods:

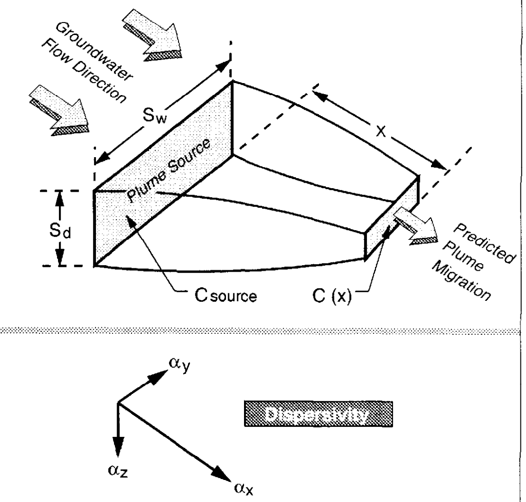
- **i)** measure the vertical extent of the affected groundwater plume at the designated source term location, based on depth-specific groundwater sampling and testing; or
- **ii)** for unconfined water-bearing unit, estimate mixing zone depth at the source location based on the observed magnitude of water table fluctuation.

4) Groundwater Source Term Concentration, C_{si}

To calculate baseline risk levels, the user must also provide a groundwater source concentration C_{si} for each constituent of concern (COC). The vertical plane source acts as a constant source term, applying these input concentrations to all groundwater flowing through the source location. For input to the Domenico model, the source concentration of each COC may be matched to the average concentration (i.e., either mean or 95% UCL) measured across the plume width at the source location.

FIGURE B.3. DEFINITION OF DOMENICO MODEL SOURCE TERM

Equation LT- I: Lateral Groundwater Dilution Attenuation Factor



LT-1a: Solute Transport with First-Order Decay:

$$\frac{C(x)_i}{Csi} = \exp\left(\frac{x}{2\alpha_x}\left[1-\sqrt{1+\frac{4\lambda_i\alpha_x R_i}{v}}\right]\right) erf\left(\frac{S_w}{4\sqrt{\alpha_y x}}\right) erf\left(\frac{S_d}{2\sqrt{\alpha_z x}}\right)$$

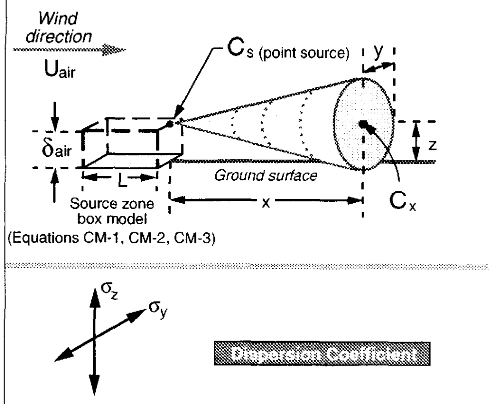
where: $v = \dfrac{K \cdot i}{\theta_e}$

LT-1b: Solute Transport with Biodegradation by Electron-Acceptor Superposition Method:

$$C(x)_i = \left[(C_{si} + BC_i) erf\left(\frac{S_w}{4\sqrt{\alpha_y x}}\right) erf\left(\frac{S_d}{2\sqrt{\alpha_z x}}\right)\right] - BC_i$$

where: $BC_i = BC_T \text{ x} \dfrac{C_{si}}{\sum C_{si}}$ and $BC_T = \Sigma \dfrac{C(ea)_n}{UF_n}$

Equation LT-2: Lateral Air Dispersion Factor



$$\frac{C(x)_i}{C_{si}} = \left(\frac{Q}{2\pi U_{air}\sigma_y\sigma_z}\right) \exp\left(-\frac{y^2}{2\sigma_y^2}\right)\left(\exp\left(-\frac{(z-\delta_{air})^2}{2\sigma_z^2}\right) + \exp\left(-\frac{(z+\delta_{air})^2}{2\sigma_z^2}\right)\right)$$

where: $Q = \dfrac{U_{air}(\delta_{air})(A)}{L}$

Definitions for Lateral Transport Equations

$C(x)_i$	Concentration of constituent *i* at distance x downstream of source (mg/L) or (mg/m^3)
C_{si}	Concentration of constituent *i* in Source Zone (mg/L) or (mg/m^3)
BC_i	Biodegradation capacity available for constituent *i*
BC_T	Total biodegradation capacity of all electron acceptors in groundwater
$C(ea)_n$	Concentration of electron acceptor *n* in groundwater
UF_n	Utilization factor for electron acceptor *n* (i.e., mass ratio of electron acceptor to hydrocarbon consumed in biodegradation reaction)
x	Distance downgradient of source (cm)
α_x	Longitudinal groundwater dispersivity (cm)
α_y	Transverse groundwater dispersivity (cm)
α_z	Vertical groundwater dispersivity (cm)
θ_e	Effective soil porosity

λ_i	First-order degradation rate (day^{-1}) for constituent *i*
v	Groundwater seepage velocity (cm/day)
K	Hydraulic conductivity (cm/day)
R_i	Constituent retardation factor
i	Hydraulic gradient (cm/cm)
S_w	Source width (cm)
S_d	Source depth (cm)
δ_{air}	Ambient air mixing zone height (cm)
Q	Air volumetric flow rate through mixing zone (cm^3/s)
U_{air}	Wind Speed (cm/sec)
σ_y	Transverse air dispersion coefficient (cm)
σ_z	Vertical air dispersion coefficient (cm)
y	Lateral distance from source zone (cm)
z	*Height of breathing zone (assumed equal to δ_{air}) (cm)*
A	Cross-sectional area of air emissions source (cm^2)
L	Length of air emissions source parallel to wind direction (cm)

FIGURE B.4. LATERAL TRANSPORT EQUATIONS IN THE RBCA TOOL KIT avoid significantly over-predicting or under-predicting actual biodecay rates. An optional method for preliminary selection of decay coefficients is as follows:

Literature Values: Various published references are available regarding decay half-life values for hydrolysis and biodegradation. The chemical/toxicological database in the RBCA Tool Kit includes minimum published decay rate coefficients (representing maximum decay half-lives) for each chemical, and the user may select to use these or enter other values. These first-order decay coefficients are provided for informational purposes and may used for preliminary analyses. Note, however, that the use of minimum published decay rates will not necessarily ensure conservative modeling results (i.e., predict worst-case exposure concentrations and more stringent cleanup standards).

v) **Electron-Limited Biodegradation Rates.** As an alternative to a first-order decay function, the user may select a groundwater contaminant transport model incorporating a direct simulation of in-situ biodegradation processes. To account for stoichiometric constraints, such models commonly simulate solute transport of both organic and electron acceptors with an instantaneous reaction assumption. Given proper characterization of background concentrations of key electron acceptors, source zone COC concentrations, and groundwater flow parameters, these models can generally be relied upon to estimate biodegradation effects on organic plume concentrations at the POE, without the difficulty associated with selection of a site-specific, first-order decay rate. Note, however, that this method is not valid for modeling the sequential degradation of chlorinated compounds.

For this purpose, the RBCA Tool Kit includes a version of the Domenico solute transport model incorporating an electron acceptor superposition algorithm (see Equation LT-1b on Figure B.4), as employed in the BIOSCREEN model (Newell et al., 1996). Based on the biodegradation capacity of electron acceptors present in the groundwater system, this algorithm will correct the non-decayed groundwater plume concentrations predicted by the Domenico model for the effects of organic constituent biodegradation. This calculation procedure is illustrated in Figure B.5 and discussed in further detail below.

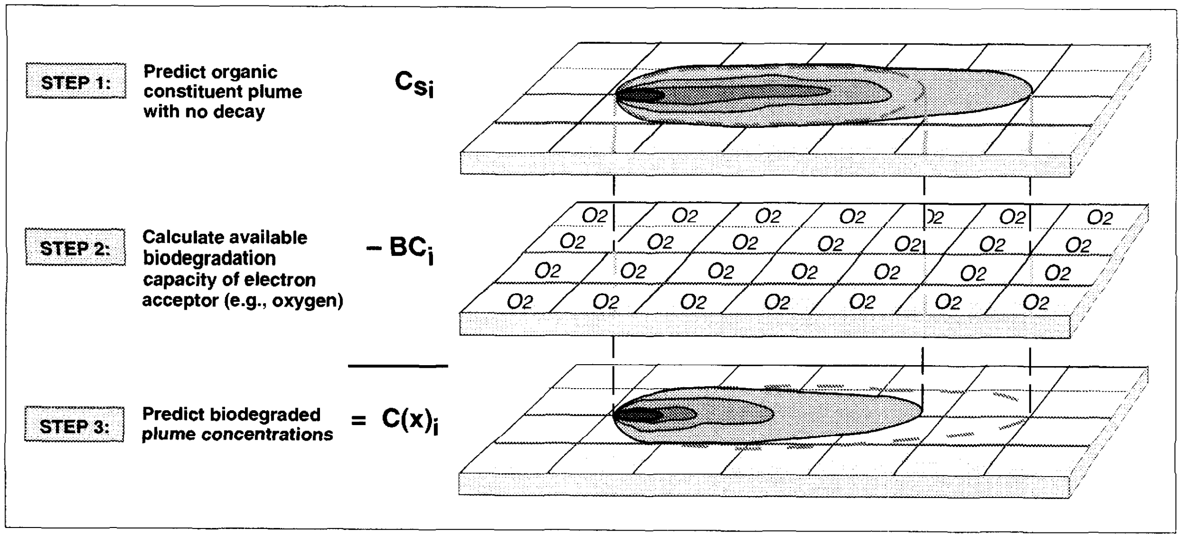


FIGURE B.5. ELECTRON ACCEPTOR SUPERPOSITION METHOD

Based on the stoichiometric equation for the biodegradation reaction, a *utilization factor,* representing the ratio of electron acceptor mass to hydrocarbon mass consumed during biodegradation, can be defined for each electron acceptor. Utilization factors for the principal electron acceptors relating to the degradation of BTEX present in shallow groundwater systems, as reported in the research literature, are summarized on Table B.1.

TABLE B.1 UTILIZATION FACTORS FOR SELECTED ELECTRON ACCEPTORS

ELECTRON ACCEPTOR	UTILIZATION FACTOR (gm/gm)
Oxygen	3.14
Nitrate	4.9
Ferrous Iron (for Ferric Iron)	21.8
Sulfate	4.6
Methane (for Carbon Dioxide)	0.78

Note: "Electron Acceptor" refers to actual electron acceptor or surrogate by-products. Utilization Factor represents the mass ratio of electron acceptor to BTEX quantity consumed (gm/gm) in biodegradation reaction within groundwater. The values listed in this table are for BTEX compounds only. Care should be exercised in selecting appropriate utilization factors for other non-chlorinated hydrocarbons.

Given these values, the potential BTEX mass removal or biodegradation capacity (BC_n) of a given electron acceptor *n* can then be estimated as the concentration of that electron acceptor ($C(ea)_n$) in the groundwater divided by its utilization factor (UF_n). The total biodegradation capacity of the groundwater mass mixing with the BTEX plume is the sum of the individual capacities for each of the principal electron acceptors (i.e., $BC_T = \Sigma\, BC_n$ for n = oxygen, nitrate, iron, sulfate, etc.). Note that, in this process, *electron acceptors* are defined as three easily measured electron acceptors (dissolved oxygen, nitrate, and sulfate) and surrogate by-products for two other difficult-to-quantify electron acceptors (ferrous iron instead of ferric iron and methane instead of carbon dioxide). The concentrations of the actual electron acceptors are measured in background wells, while the concentration of the by-products are measured in the source zone. For this calculation, using the background concentration of each electron acceptor (oxygen, nitrate, sulfate) from outside the plume will provide an upperbound estimate of BC_T. For a lowerbound estimate, the calculation may be based upon the difference in the electron acceptor concentrations (oxygen, nitrate, sulfate) measured inside and outside the plume area (i.e., *$C(ea)_n$-outside* minus *$C(ea)_n$-inside*), thereby accounting for non-utilization of a portion of the electron acceptor mass.

The total biodegradation capacity of the groundwater mass must be distributed among the various organic constituents present in the dissolved contaminant plume. Compared to the rate of plume transport, biodegradation reactions occur relatively instantaneously upon mixing of a readily degradable organic plume (e.g., monoaromatic hydrocarbons) with the background electron acceptor mass. Given the relatively uniform rate of biodecay of the organic compounds typically present in petroleum hydrocarbon products, the portion of the total biodegradation capacity available for removal of each constituent *i* (BC_i) can be estimated based on the mass percentage of each constituent in the plume (i.e., $BC_i = BC_T \cdot Cs_i/Cs_i$, where Cs_i = source concentration of constituent *i*). This assumption will prove reasonable for mixtures of all-readily degradable compounds, due to the relatively uniform biokinetic rates within these groups. However, within mixed degradable and non-degradable constituent plumes (e.g., benzene with dichloroethane), the readily degradable compounds will actually consume a disproportionate share of the biodegradation capacity.

If the user elects to use the electron acceptor superposition option, the RBCA Tool Kit will i) estimate the total biodegradation capacity (BC_T) of the groundwater mass based on the electron acceptor concentrations provided by the user, ii) allocate an available biodegradation capacity (BC_i) to each of the various dissolved organic constituents based on the concentration data provided by the user, and iii) correct the steady-state plume concentrations predicted by the Domenico solute transport model for the effects of biodegradation using Equation LT-1b (see Figure B.4).

Key assumptions used in the groundwater solute transport model and their effect on the SSTL calculation are as follows:

KEY ASSUMPTIONS: LATERAL GROUNDWATER DAF	EFFECT ON CLEANUP STANDARD
• **Infinite Source**: Groundwater source term constant over time with no depletion.	⇩
• **Vertical Dispersion**: Assumes one-directional (downward) vertical dispersion.	⇩
• **Infinite Aquifer Thickness**: Neglects boundary effects on vertical dispersion.	⇧
• **Dispersion Coefficient**: Fixed proportions assumed among longitudinal, transverse, and vertical dispersion coefficients.	-----
• **Receptor Location**: Downgradient receptor well assumed to be on plume centerline.	⇩
• **Biodegradation Rate**: First-order of decay rate may be specified by user per site data.	⇧

- ***ADF: Lateral Air Dispersion Factor (Equation LT-2)***
  The RBCA Tool Kit includes a 3-dimensional Gaussian dispersion model to account for transport of air-borne contaminants from the source area to a downwind POE (see Equation LT-2 on Figure B.4). The model incorporates two conservative assumptions: i) a source zone height equivalent to the breathing zone and ii) a receptor located directly downwind of the source at all times. As indicated on Figure B.1, an effective pathway NAF value is calculated as the steady-state ratio between the ambient organic vapor or particulate concentration at the downwind POE and the source concentration in the on-site affected soil zone. The model requires input data for the affected soil zone dimensions and concentrations, wind speed, and horizontal and vertical air dispersion coefficients to compute the resulting COC concentrations in ambient air at the POE. Guidelines for estimating key input parameters are provided below:

  i) **Air Source Term:** In the RBCA Tool Kit, the source term for the air dispersion model is matched to the ambient air vapor concentrations determined in accordance with the soil-to-air cross-media transfer equations CM-1, CM-2, and CM-3 shown on Figure B.2. Specifically, the source concentration for off-site vapor transport is equivalent to the vapor concentration exiting the box model for the surface soil and subsurface soil volatilization algorithms (see Figure B.2). The model assumes the source zone to be a point source (located in the center of the affected soil area) with the same mass flux as the entire affected soil zone. The off-site receptor is assumed to be located directly downwind of the source point for the full duration of the exposure period. To define the source term, the user must provide the same soil information as required for the volatilization factors (i.e., affected soil zone concentrations, dimensions, etc.).

  Please note that for receptors located directly over or adjacent to the affected soil zone (i.e., inside the "mixing zone" for Equations CM-1, CM-2, or CM-3), the Gaussian dispersion model is not needed and can be shut off by entering a value of zero for the distance from the source to the off-site receptor in the RBCA Tool Kit.

  ii) **Wind Speed*:*** Wind speed should be matched to the average annual wind speed through the mixing zone. The model assumes the wind direction to be in a straight line from the source to the specified POE at all times for the full duration of the exposure period. In the RBCA Tool Kit, a default wind speed value of 225 cm/sec (~ 5 mph) is assumed unless the user enters a site-specific value.

  iii) **Air Dispersion Coefficients:** Estimating dispersion coefficients requires knowledge of the atmospheric stability class and the distance between the source and POE. Stability is an indicator of atmospheric turbulence and, at any one time, depends upon i) static stability (the change of temperature with height), ii) thermal turbulence (caused by ground heating), and iii) mechanical turbulence (a function of wind speed and roughness). The Pasquill-Gifford system for stability classification is summarized on Figure B.6. Corresponding horizontal and vertical dispersion coefficients for each class are provided on Figure B.7. Stability Class A, which represents extremely unstable air with a high potential for mixing, occurs under low wind conditions and high levels of incoming solar radiation. At the other extreme, Stability Classes E and F represent stable atmospheric conditions, with a lower potential for mixing, and occur with higher wind speeds and greater cloud cover (see DeVaull et al., 1994).

The stability class for a given site can vary with rapidly changing weather conditions. Long-term weather patterns can be characterized on the basis of STAR summaries, comprised of joint frequency distributions of stability class, wind direction, and wind speed, which are available from the National Climatic Data Center in Asheville, North Carolina. Comprehensive atmospheric dispersion models, such as the Industrial Source Complex Long-Term (ISCLT) model, can directly incorporate STAR data to predict constituent dispersion in any direction from the source area. However, due to the complexity and expense of this modeling effort, use of models such as the ISCLT would normally correspond to a Tier 3 evaluation under the RBCA process.

To facilitate a Tier 2 evaluation of downwind receptor impacts, the RBCA Tool Kit employs a simple Gaussian dispersion model to predict maximum exposure concentrations at the POE under steady-state conditions, incorporating the conservative receptor assumptions noted above. A reasonable estimate of downwind COC concentrations can be obtained by assuming a wind turbulence consistent with Stability Class C for the full exposure period. For most locations, Stability Class C (slightly unstable) is representative of average annual conditions over time and can be used to estimate typical dispersion coefficients. Note that, even when these average dispersion coefficients are employed, the exposure concentrations predicted by the RBCA Tool Kit model are likely to be conservative, given that the POE is assumed to be located directly downwind of the source zone at all times during the exposure period.

Key assumptions incorporated in this model and their affect on the SSTL calculation are as follows:

KEY ASSUMPTIONS: LATERAL AIR DISPERSION FACTOR	EFFECT ON CLEANUP STANDARD
• **Source Term**: Vapor source concentration based on steady-state, soil-to-air cross-media equations.	⇩
• **Default Stability Class**: Default dispersion coefficients matched to Class C stability classification (slightly unstable).	-----
• **Receptor Location**: Receptor assumed to be located directly downwind of source zone at all times during exposure period.	⇩

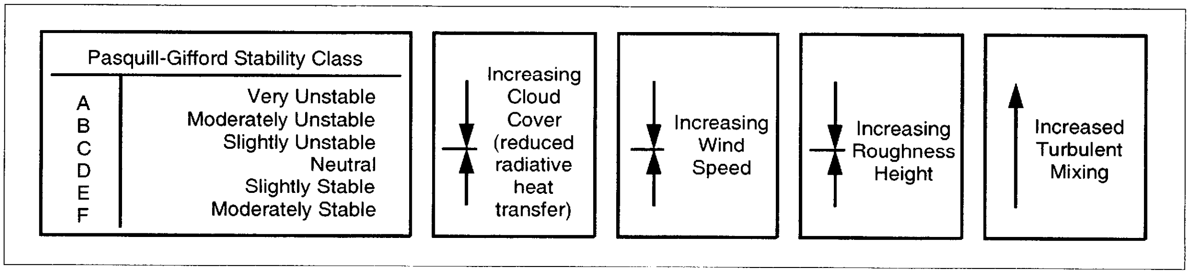


FIGURE B.6. STABILITY CLASSIFICATION FOR AIR TRANSPORT MODELING
SOURCE: DEVAULL ET AL, 1994

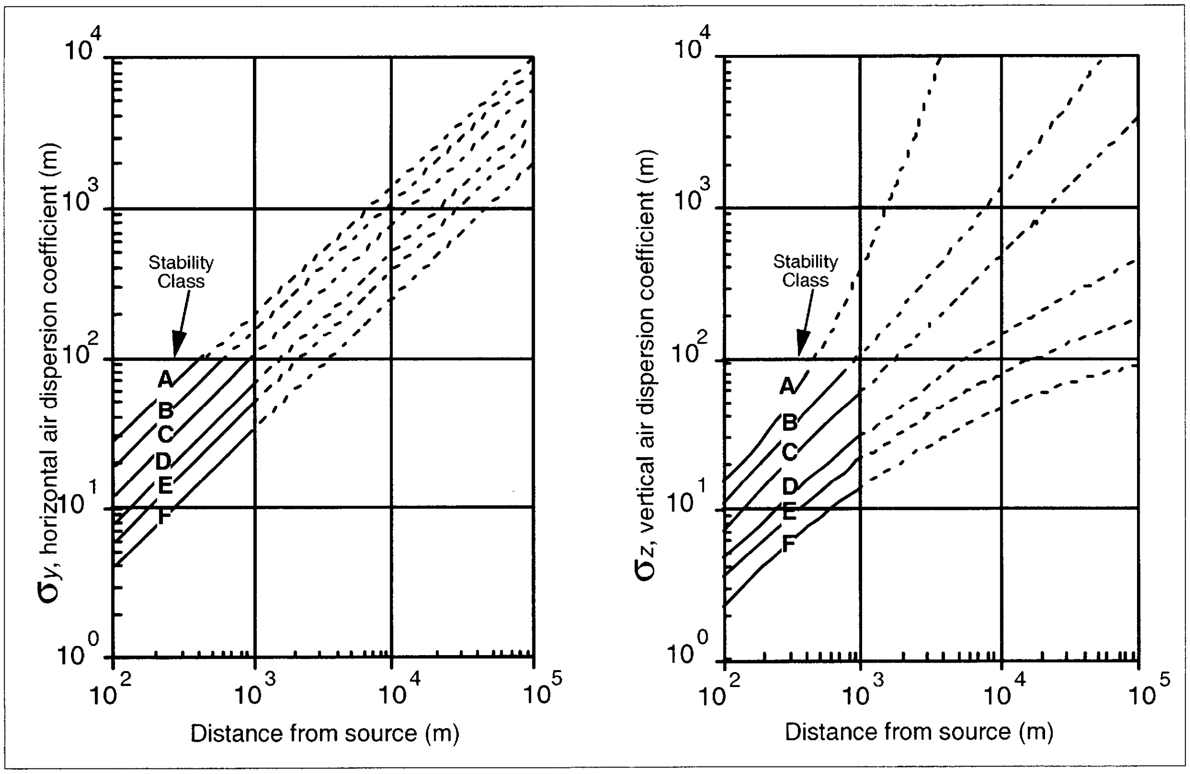


FIGURE B.7. DISPERSION COEFFICIENTS FOR AIR STABILITY CLASSIFICATIONS
SOURCE: EPA, 1988

APPENDIX F

Boring, Trench and Monitoring Well Logs

The San Joaquin Company Inc.

Trench Log

Surface Elevation: 43.3 - 43.2 ft.

Trench Length at Surface: 13.0 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 8.5 ft.

Depth to First Water: n/a ft.

Depth to Water on: Not measured ft.

NOTES:
1. Uniform Soil Classifications are from field observations only. No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet MSL.

3. Ground surface elevations adjusted to conform to common datum reference as site borings (April 2005).

Trench ID: **Trench 1**

Project: Oak Walk Project

Project No.: 0004.081

Owner: Bay Rock Residential LLC

Location: San Pablo Avenue, Emeryville, California

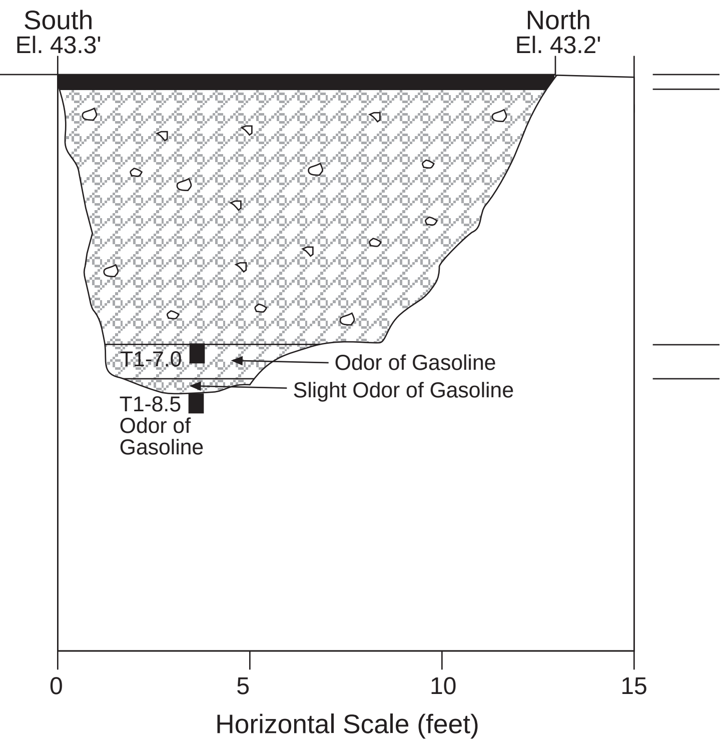
Date Excavated: 12/03/03

Excavation By: Dietz Irrigation

Logged By: D J Watkins

Equipment Operator: H B Dietz

Equipment Used: Case Excavator



Depth (Feet)	Sample	Trench Log / Description
0		Bituminous Macadam 4 in.
2		
4		(SC) - Brown / black, Silty CLAY with bricks and other debris (FILL)
6		
	soil	(SC) - Grey / green with brown stiff Silty CLAY
8	soil	(SC) - Brown, medium soft Silty CLAY
10		
12		
14		
16		
18		
20		
22		
24		
26		
28		
30		

Exploratory Trench 1
Average trench width 4 feet, Trench Length 13 feet

The San Joaquin Company Inc.

Trench Log

Trench ID: **Trench 2**

Project: Oak Walk Project

Project No.: 0004.081

Owner: Bay Rock Residential LLC

Location: San Pablo Avenue, Emeryville, California

Date Excavated: 12/03/03

Excavation By: Dietz Irrigation

Logged By: D J Watkins

Equipment Operator: H B Dietz

Equipment Used: Case Excavator

Surface Elevation: 44.6 - 45.1 ft.

Trench Length at Surface: 12.5 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 8.5 ft.

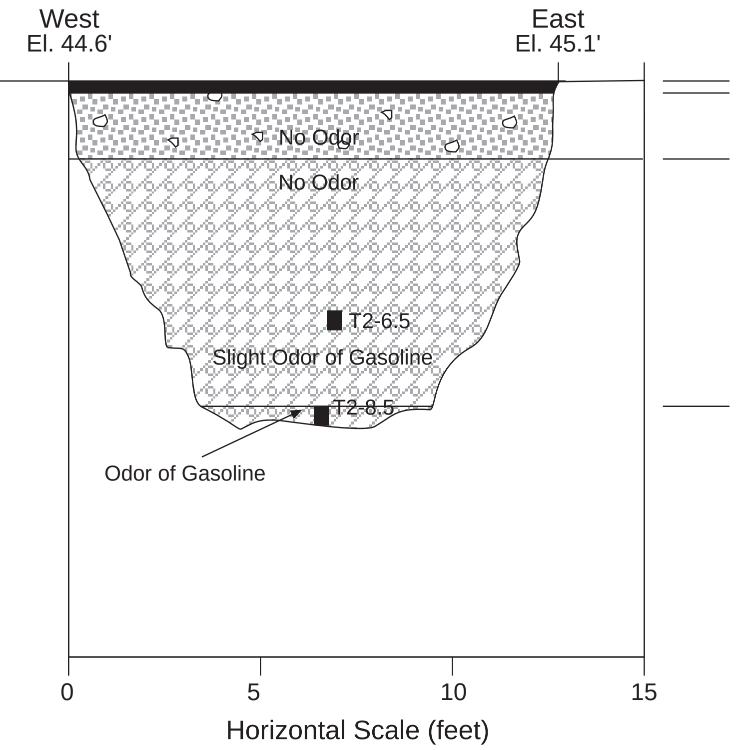
Depth to First Water: n/a ft.

Depth to Water on: Not measured ft.

NOTES:
1. Uniform Soil Classifications are from field observations only. No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet MSL.

3. Ground surface elevations adjusted to conform to common datum reference as site borings (April 2005).



Depth (Feet)	Sample	Trench Log / Description
0		Bituminous Macadam 3 in.
		(SP) - Light brown, Sandy Gravel (FILL)
2		
4		
		(SC) - Dark gray / black, soft Silty CLAY (FILL)
6	soil	
8		
	soil	(SC) - Grey / green, medium soft Silty CLAY
10		
12		
14		
16		
18		
20		
22		
24		
26		
28		
30		

Exploratory Trench 2
Average trench width 4 feet, Trench Length 12.5 feet

The San Joaquin Company Inc.

Trench Log

Surface Elevation: 47.2 - 47.7 ft.

Trench Length at Surface: 31.0 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 9.5 ft.

Depth to First Water: 9.0 ft.

Depth to Water on: Not measured ft.

NOTES:
1. Uniform Soil Classifications are from field observations only. No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet MSL.

3. Ground surface elevations adjusted to conform to common datum reference as site borings (April 2005).

Trench ID: **Trench 3**

Project: Oak Walk Project

Project No.: 0004.081

Owner: Bay Rock Residential LLC

Location: San Pablo Avenue, Emeryville, California

Date Excavated: 12/03/03

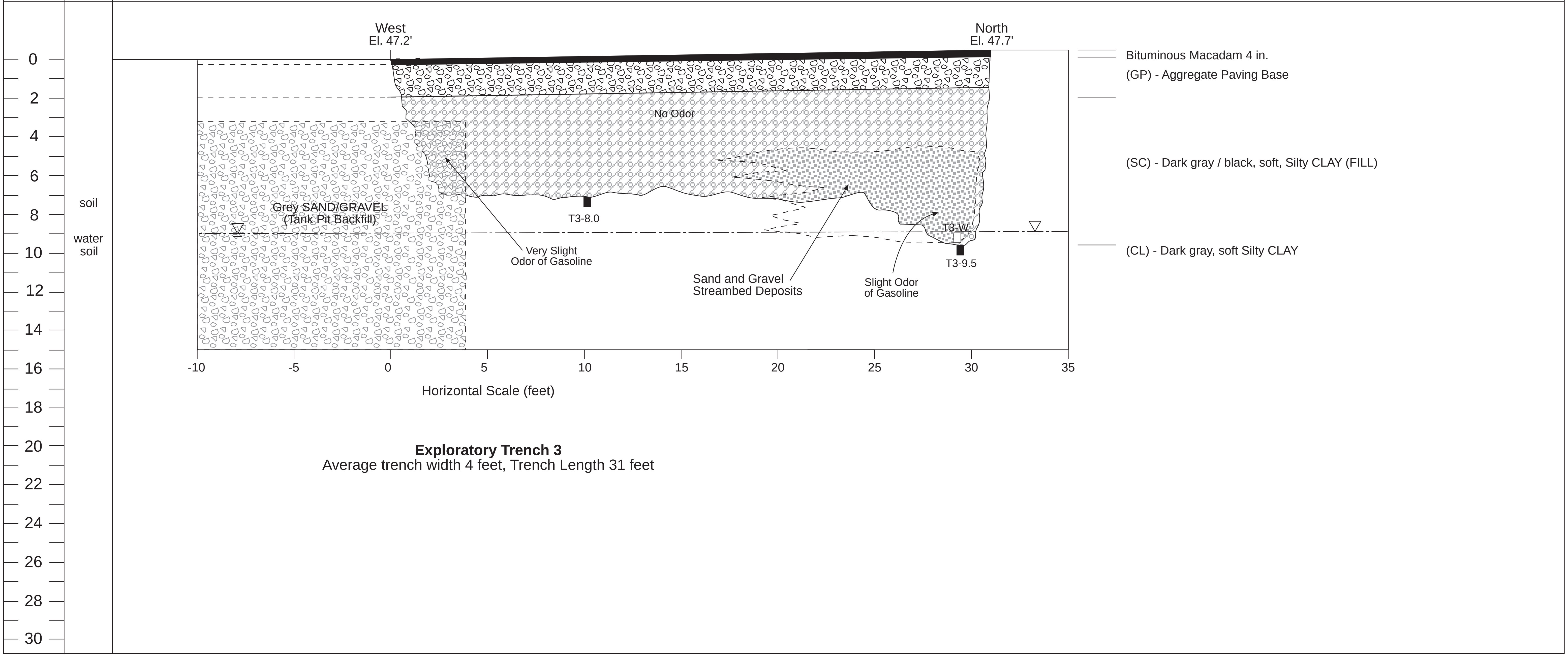
Excavation By: Dietz Irrigation

Logged By: D J Watkins

Equipment Operator: H B Dietz

Equipment Used: Case Excavator

Depth (Feet)	Sample	Trench Log / Description



Exploratory Trench 3
Average trench width 4 feet, Trench Length 31 feet

The San Joaquin Company Inc.

Trench Log

Surface Elevation: 48.0 - 48.13 ft.

Trench Length at Surface: 14.0 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 10.5 ft.

Depth to First Water: n/a ft.

Depth to Water on: Not measured ft.

NOTES:
1. Uniform Soil Classifications are from field observations only. No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet MSL.

3. Ground surface elevations adjusted to conform to common datum reference as site borings (April 2005).

Trench ID: **Trench 4**

Project: Oak Walk Project

Project No.: 0004.081

Owner: Bay Rock Residential LLC

Location: San Pablo Avenue, Emeryville, California

Date Excavated: 12/03/03

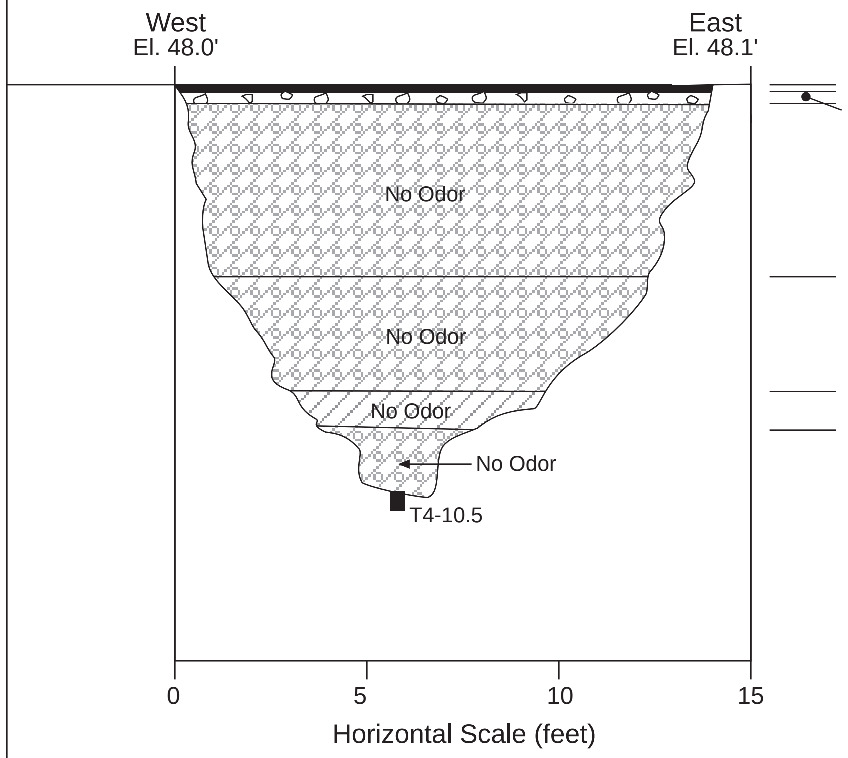
Excavation By: Dietz Irrigation

Logged By: D J Watkins

Equipment Operator: H B Dietz

Equipment Used: Case Excavator

Depth (Feet)	Sample	Trench Log / Description
0		Bituminous Macadam, 2 in. (GP) - Aggregate paving base, 4in.
2		(SC) - Dark gray / black, soft Silty CLAY with some glass (FILL)
4		
6		(SC) - Light brown, medium stiff Silty CLAY
8		(CL) - Gray / green, moderately stiff CLAY
10	soil	(SC) - Light brown, medium stiff Silty CLAY
12		
14		
16		
18		
20		
22		
24		
26		
28		
30		



Exploratory Trench 4
Average trench width 4 feet, Trench Length 14.0 feet

The San Joaquin Company Inc.

Trench Log

Surface Elevation: 45.1 - 45.2 ft.

Trench Length at Surface: 21.0 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 8.5 ft.

Depth to First Water: n/a ft.

Depth to Water on: Not measured ft.

NOTES:
1. Uniform Soil Classifications are from field observations only. No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet MSL.

3. Ground surface elevations adjusted to conform to common datum reference as site borings (April 2005).

Trench ID: **Trench 5**

Project: Oak Walk Project

Project No.: 0004.081

Owner: Bay Rock Residential LLC

Location: San Pablo Avenue, Emeryville, California

Date Excavated: 12/02/03

Excavation By: Dietz Irrigation

Logged By: D J Watkins

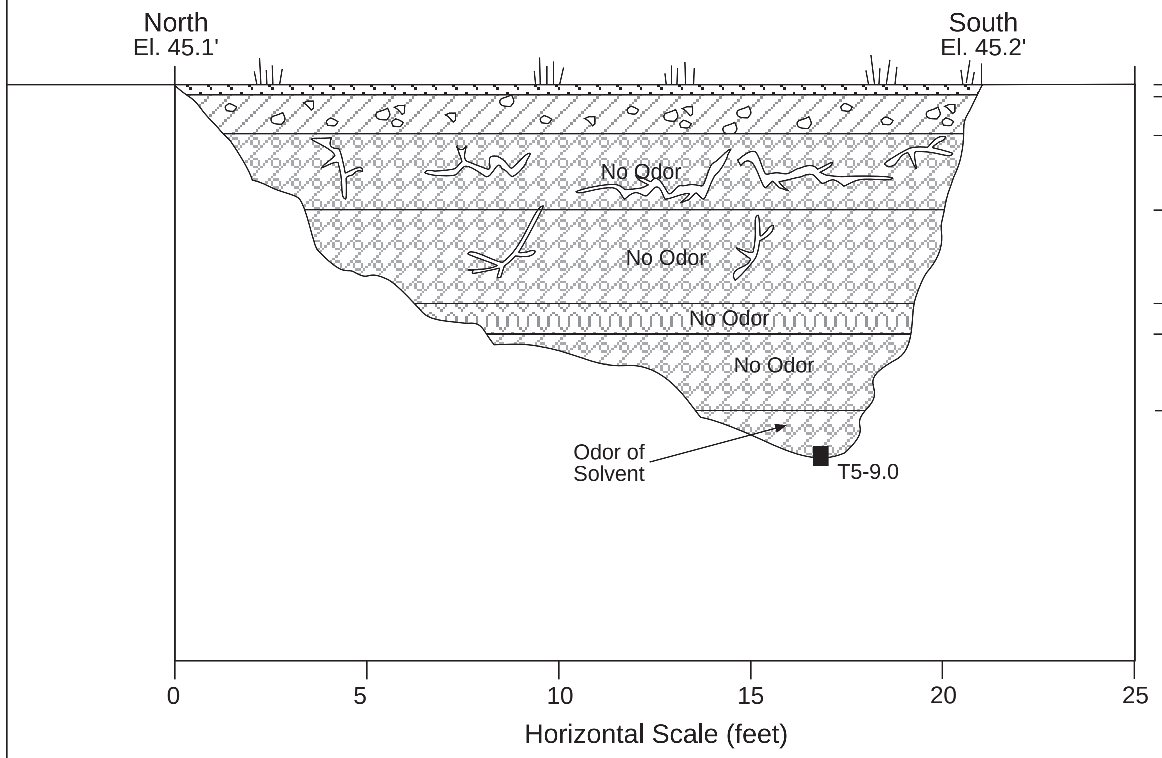
Equipment Operator: H B Dietz

Equipment Used: Case Excavator

Depth (Feet) | Sample | Trench Log / Description

0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30

soil



Topsoil under grass, 3 in.
Random FILL

(SC) - Brown, soft Silty CLAY with heavy tree roots

(SC) - Brown, soft Silty CLAY with tree roots

(Pt) - Vegetative Matter with dryrot fungus in Silty CLAY

(SC) - Brown, medium stiff Silty CLAY

(SC) - Grey/ green, medium stiff Silty CLAY

Exploratory Trench 5
Average trench width 4 feet, Trench Length 21.0 feet

The San Joaquin Company Inc.

Trench Log

Surface Elevation: 44.1 - 43.6 ft.

Trench Length at Surface: 17.25 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 8.5 ft.

Depth to First Water: n/a ft.

Depth to Water on: Not measured ft.

NOTES:
1. Uniform Soil Classifications are from field observations only. No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet MSL.

3. Ground surface elevations adjusted to conform to common datum reference as site borings (April 2005).

Trench ID: **Trench 6**

Project: Oak Walk Project

Project No.: 0004.081

Owner: Bay Rock Residential LLC

Location: San Pablo Avenue, Emeryville, California

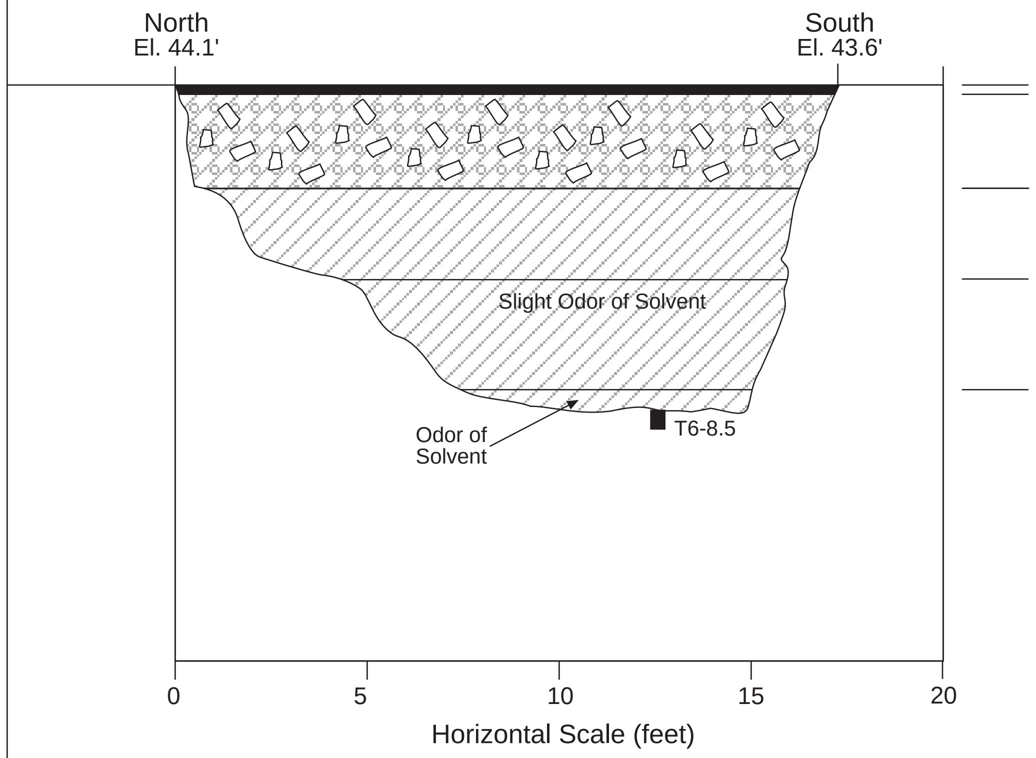
Date Excavated: 12/02/03

Excavation By: Dietz Irrigation

Logged By: D J Watkins

Equipment Operator: H B Dietz

Equipment Used: Case Excavator



Depth (Feet)	Sample	Trench Log / Description
0		Bituminous macadam, 2in.
2		(SC) - Silty CLAY with bricks (Random FILL)
4		(CL) - Dark grey / black, medium soft Silty CLAY (FILL)
6		(CL) - Light brown, medium firm Silty CLAY
8	soil	(CL) - Grey/ green, medium soft Silty CLAY with some Gravel
10		
12		
14		
16		
18		
20		
22		
24		
26		
28		
30		

Exploratory Trench 6
Average trench width 4 feet, Trench Length 17.25 feet
]

The San Joaquin Company Inc.

Trench Log

Surface Elevation: 43.9 - 43.8 ft.

Trench Length at Surface: 21.5 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 9.5 ft.

Depth to First Water: 8.0 ft.

Depth to Water on: Not measured ft.

NOTES:
1. Uniform Soil Classifications are from field observations only. No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet MSL.

3. Ground surface elevations adjusted to conform to common datum reference as site borings (April 2005).

Trench ID: **Trench 7**

Project: Oak Walk Project

Project No.: 0004.081

Owner: Bay Rock Residential LLC

Location: San Pablo Avenue, Emeryville, California

Date Excavated: 12/02/03

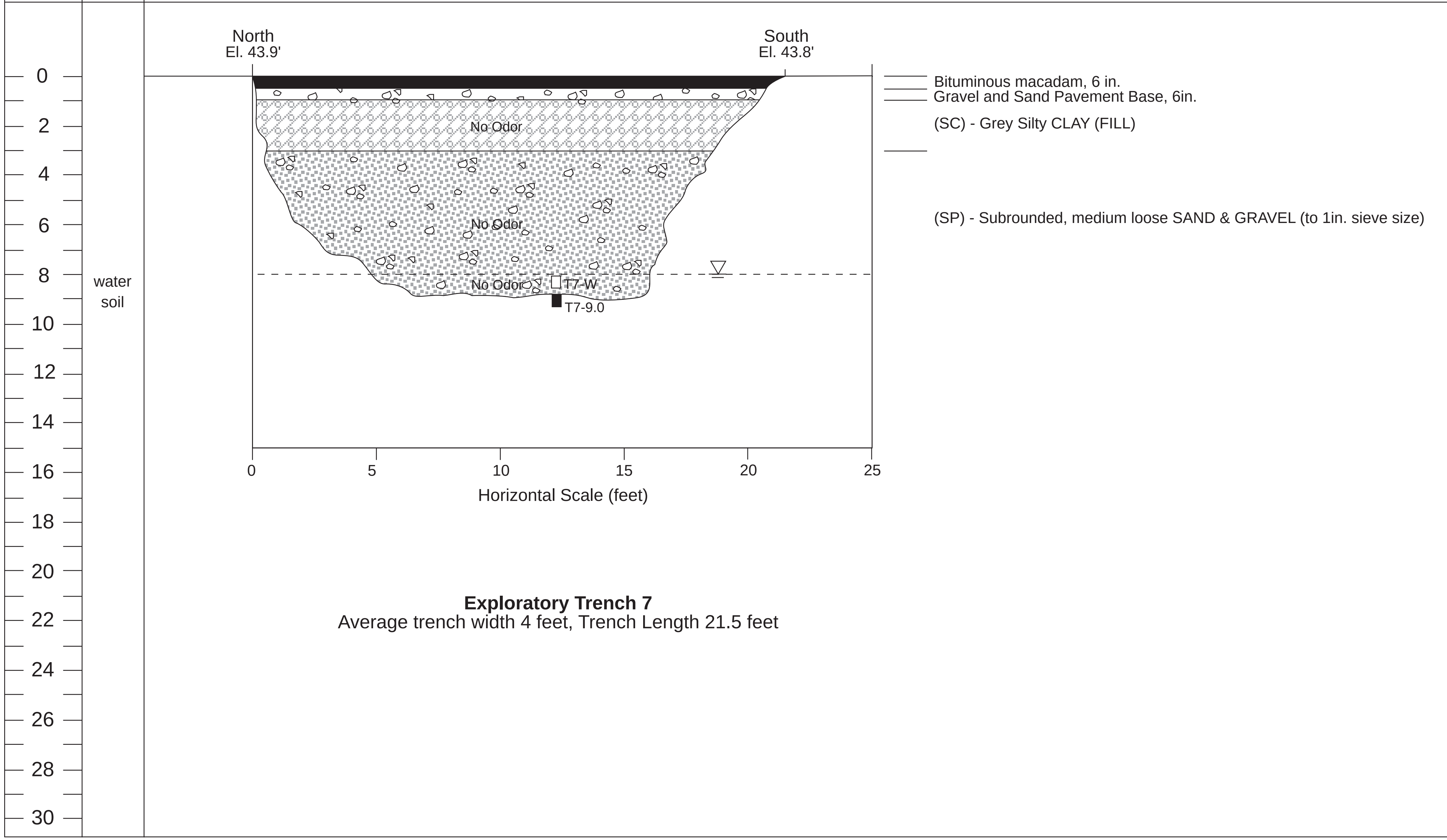
Excavation By: Dietz Irrigation

Logged By: D J Watkins

Equipment Operator: H B Dietz

Equipment Used: Case Excavator

Depth (Feet)	Sample	Trench Log / Description
	water soil	



Bituminous macadam, 6 in.
Gravel and Sand Pavement Base, 6in.

(SC) - Grey Silty CLAY (FILL)

(SP) - Subrounded, medium loose SAND & GRAVEL (to 1in. sieve size)

Exploratory Trench 7
Average trench width 4 feet, Trench Length 21.5 feet

The San Joaquin Company Inc.

Trench Log

Surface Elevation: 45.2 - 45.4 ft.

Trench Length at Surface: 13.5 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 9.0 ft.

Depth to First Water: n/a ft.

Depth to Water on: Not measured ft.

NOTES:
1. Uniform Soil Classifications are from field observations only. No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet MSL.

3. Ground surface elevations adjusted to conform to common datum reference as site borings (April 2005).

Trench ID: **Trench 8**

Project: Oak Walk Project

Project No.: 0004.081

Owner: Bay Rock Residential LLC

Location: San Pablo Avenue, Emeryville, California

Date Excavated: 12/02/03

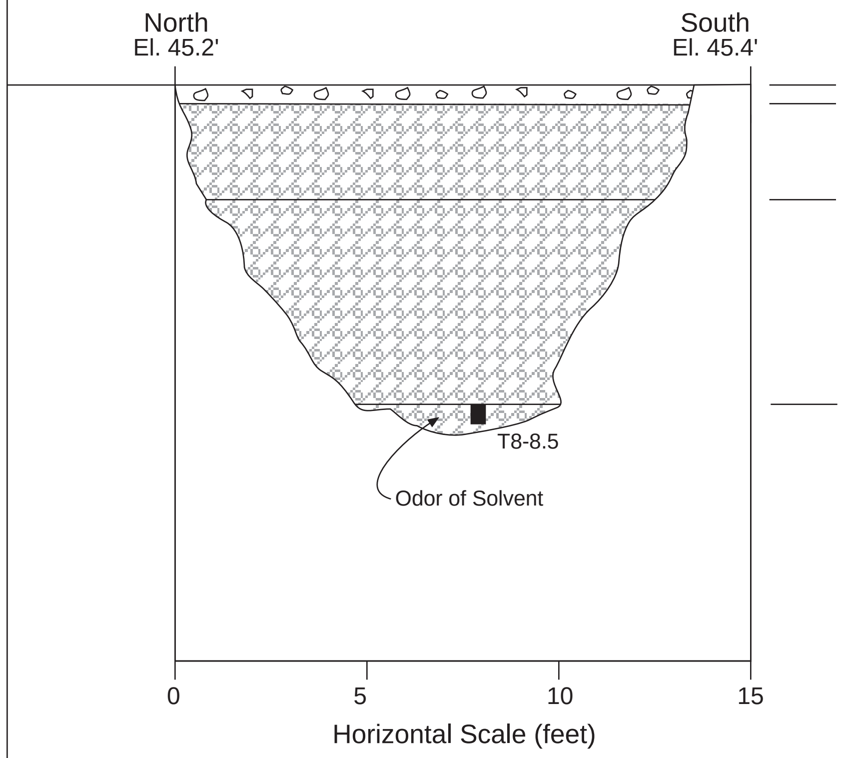
Excavation By: Dietz Irrigation

Logged By: D J Watkins

Equipment Operator: H B Dietz

Equipment Used: Case Excavator

Depth (Feet)	Sample	Trench Log / Description
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30	soil	(GP) - Aggregate paving base, 4in. (SC) - Dark gray / black, soft Silty CLAY (FILL) (SC) - Light brown, soft to slightly firm Silty CLAY (SC) - Gray / green, moderately firm Silty CLAY



Exploratory Trench 8
Average trench width 4 feet, Trench Length 13.5 feet

The San Joaquin Company Inc. **Trench Log**

Surface Elevation: 44.78 - 45.94 ft.

Trench Length at Surface: 153.6 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 20.5 ft.

Depth to First Water: 17.0 ft.

Depth to Water on: 10/01/07 : 11.0ft ft.

NOTES:
1. Uniform Soil Classifications are from field observations only.
No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet NAVD.

Trench ID: **Trench 9**

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: San Pablo Avenue, Emeryville, California

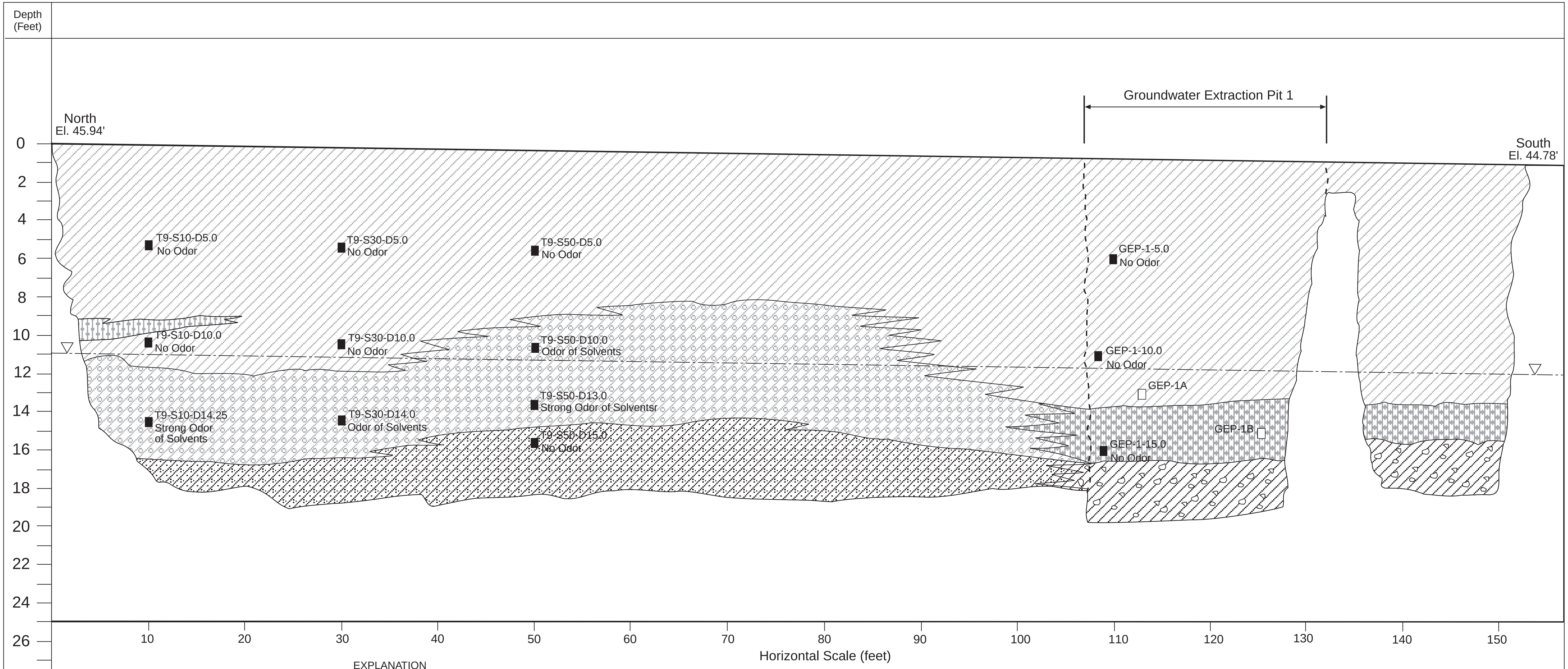
Date Excavated: 09/21/07 - 09/24/07

Excavation By: Dietz Engineering & Construction, Inc.

Logged By: D J Watkins

Equipment Operator: J.C. Dietz

Equipment Used: Case Excavator



EXPLANATION

T9-S10-D14.25 ■ Soil Sample Location

GEP-1A ☐ Water Sample Location

▨ Brown Clay (CL)

▨ Brown Sandy Clay (CL)

▨ Yellow Brown Clayey Sand (SC)

▨ Brown Silty Sand (SC)

▨ Silty Gravel (GM)

▨ Brown Gravelly Clay (CL)

▽ Groundwater Level (10/01/07)

Exploratory Trench 9
Average trench width 4 feet, Trench Length 153.6 feet

The San Joaquin Company Inc.

Trench Log

Surface Elevation: 45.66 - 47.11 ft.

Trench Length at Surface: 156.8 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 20.5 ft.

Depth to First Water: 17.0 ft.

Depth to Water on: 09/21/07 : 12.5ft ft.

NOTES:
1. Uniform Soil Classifications are from field observations only.
No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet NAVD.

Trench ID: **Trench 10**

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: San Pablo Avenue, Emeryville, California

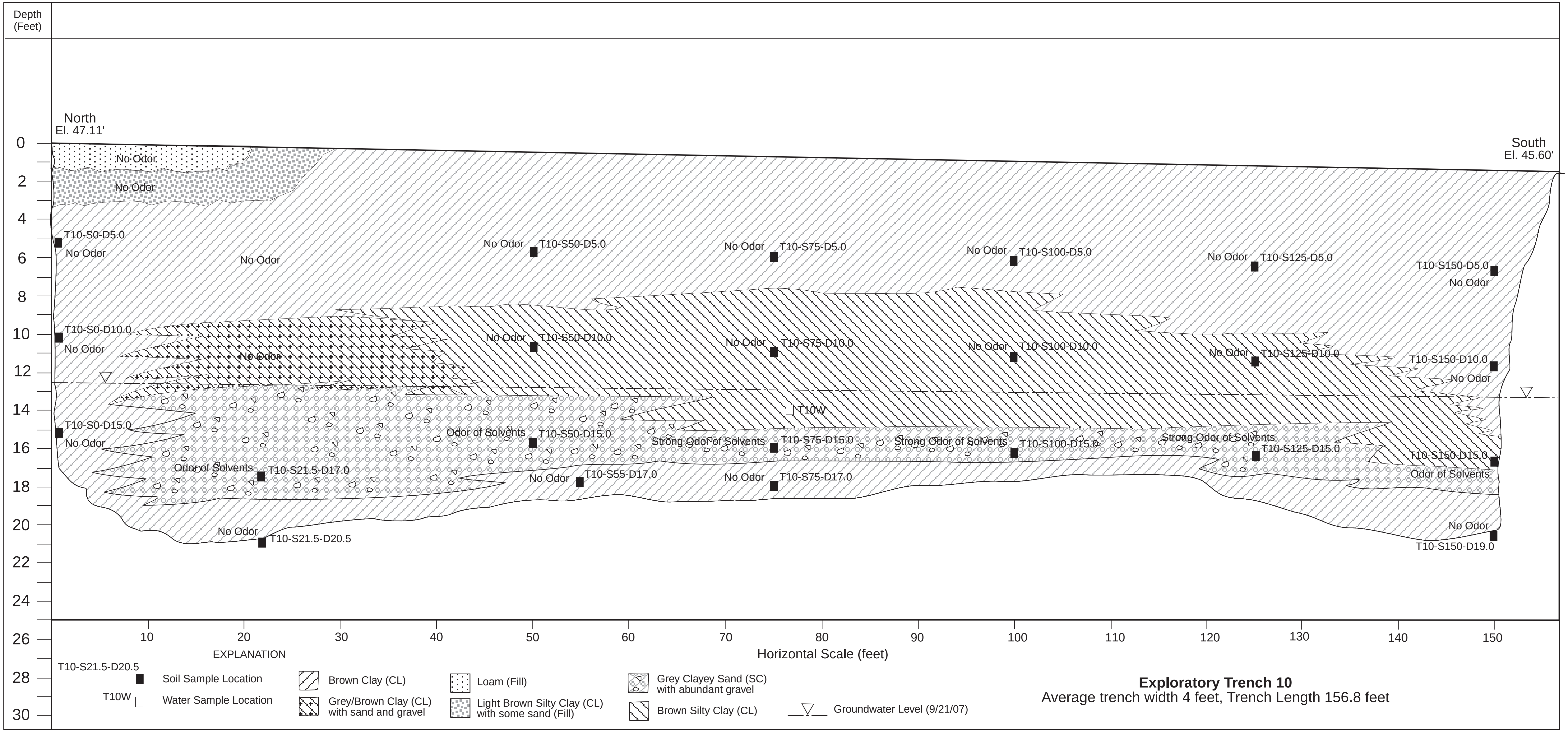
Date Excavated: 09/21/07 - 09/24/07

Excavation By: Dietz Engineering & Construction, Inc.

Logged By: D J Watkins

Equipment Operator: J.C. Dietz

Equipment Used: Case Excavator



Exploratory Trench 10
Average trench width 4 feet, Trench Length 156.8 feet

Trench Log

Surface Elevation: 46.61 - 48.95 ft.

Trench Length at Surface: 29.5 ft.

Trench Width at Surface: 4.0 ft.

Maximum Depth of Trench: 15.0 ft.

Depth to First Water: n/a ft.

Depth to Water on: 08/08/07 : 10.87ft ft.

NOTES:
1. Uniform Soil Classifications are from field observations only.
No geotechnical engineering laboratory tests were performed.

2. All Elevations are in feet NAVD.

Trench ID: **Trench 11**

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: San Pablo Avenue, Emeryville, California

Date Excavated: 08/08/07

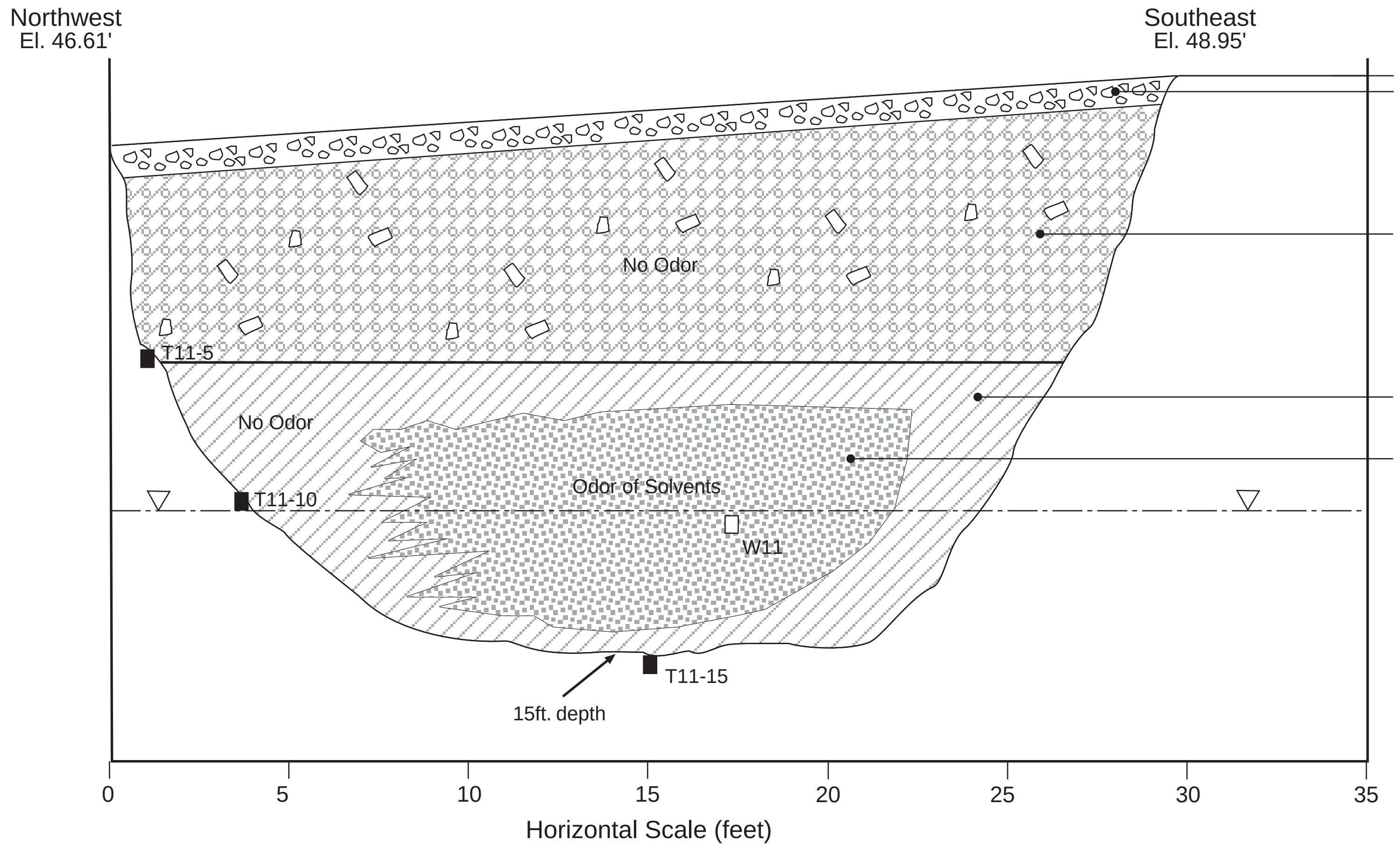
Excavation By: Dietz Engineering & Construction, Inc.

Logged By: D J Watkins

Equipment Operator: J.C. Dietz

Equipment Used: Case Excavator

Depth (Feet)	Sample	Trench Log / Description
0		
2		
4		
6		
8	soil	
10		
12	soil water	
14		
16	soil	
18		
20		
22		
24		
26		
28		
30		



(GP) - Aggregate paving base, 4in. (FILL)

(SC) - Light brown, medium stiff Silty CLAY, with some Gravel and inclusions of crockery and other artifacts (FILL)

(SC) - Dark grey, medium stiff Silty CLAY

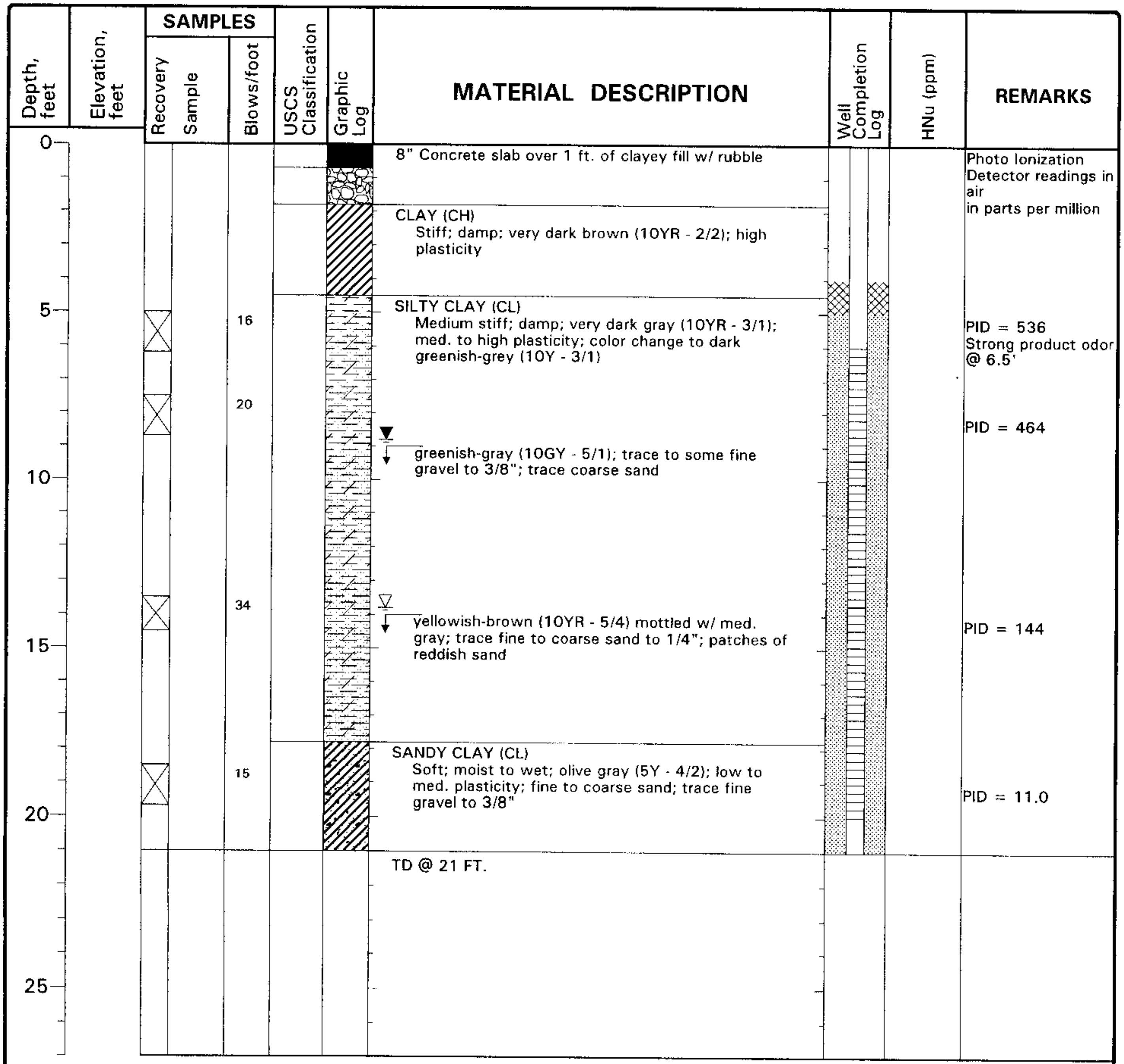
(SC) - Gray SAND and Gravel streambed deposits, loose

Exploratory Trench 11
Average trench width 4 feet, Trench Length 29.5 feet

Project: 40th Street UST, Emeryville, CA
Project Number: 94114NA
Location: Northeast corner of San Pablo Ave. and 40th St.

Log of Well EW-1

Date(s) Drilled	3/24/97	Total Depth Drilled (feet)	21.0	Top of Casing Elevation (feet)	
Groundwater Level (feet)	First ∇ 13.8	Completion ▼ 8.8	12 Hours ∇		
Logged by	W. Dittman	Checked by			
Diameter of Hole (inches)	10	Diameter of Well (inches)	4		
Number of Samples	Disturbed	Undisturbed 4			
Drilling Company	Gregg Drilling	Drilling Method	Hollow Stem Auger	Drill Rig Type	Mobile B61
Sampler Type	2" cal mod	Drill Bit Size	10"	Type of Well Casing	4" PVC Sch. 40
Screen Perforation	0.020" Slotted 6-20ft	Type of Sand Pack	#3 Lonestar Sand 5-21ft		
Type of Seals	Neat Cement 1 to 4 ft.; Bentonite Pellets 4 to 5 ft.				
Comments					



8" Concrete slab over 1 ft. of clayey fill w/ rubble

CLAY (CH)
Stiff; damp; very dark brown (10YR - 2/2); high plasticity

SILTY CLAY (CL)
Medium stiff; damp; very dark gray (10YR - 3/1); med. to high plasticity; color change to dark greenish-grey (10Y - 3/1)

▼ greenish-gray (10GY - 5/1); trace to some fine gravel to 3/8"; trace coarse sand

∇ yellowish-brown (10YR - 5/4) mottled w/ med. gray; trace fine to coarse sand to 1/4"; patches of reddish sand

SANDY CLAY (CL)
Soft; moist to wet; olive gray (5Y - 4/2); low to med. plasticity; fine to coarse sand; trace fine gravel to 3/8"

TD @ 21 FT.

Remarks:

Photo Ionization Detector readings in air
in parts per million

PID = 536
Strong product odor @ 6.5'

PID = 464

PID = 144

PID = 11.0

3/27/97 SFOUADW EMERY

Woodward-Clyde Consultants

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: MW-2

Project: Oak Walk

Project No.: 0004.083

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 44.40 ft.

Surface Elevation: 44.70 ft.

Depth to Water: 5.98 ft.

Date Installed: 04/07/04

Total depth of Boring: 20 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

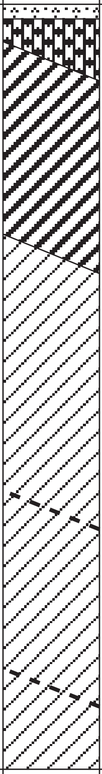
Casing Material: PVC

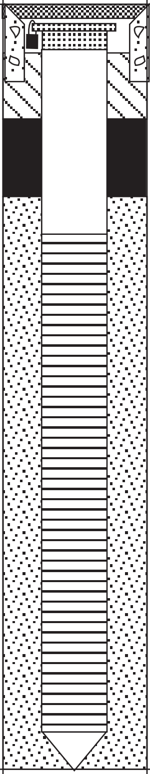
Drilling Company: Gregg Drilling & Testing

Drilling Method: Hollow Stem Auger

Driller: Don Kiersnas

Logged By: Dennis Alexander





Depth (Feet)	Sample 3.0 | 2.5 | 0.75	Blows/ 6 in.	Graphic Log	Description	Well Construction
0				Concrete Paving Dark brown Silty Sandy GRAVEL (GM), dense, moist (Fill)	Light Duty Well-Head Box (with bolted cover and O-ring seal Set in concrete) Portland Cement Grout
2				Mottled dark gray-brown-dark brown CLAY (CH), very stiff, moist, high plasticity, with trace fine sand Moderate odor of gasoline	
4		Cuttings 9 15 25			Prefabricated Self-expanding Bentonite Seal
6					▼ 05/19/04
8				Mottled blue-gray and orange-brown CLAY (CL), hard, moist, medium plasticity, with little to some fine sands, and a trace of subangular gravel to 1/4" diameter Moderate to strong odor of gasoline	2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots
10		13 18 21			No.3 Monterey Sand Filter
12					
14		20 26 32		Mottled brown and blue-gray Sandy CLAY (CL), hard, moist, medium plasticity, with some fine sands, few angular to subrounded gravel to 1/2" diameter Slight odor of gasoline	
16					
18				Mottled orange-brown and blue-gray CLAY (CL), very stiff, moist, medium plasticity, with some very fine sands, trace fine subrounded gravels to 1/4' diameter No odor	▽
20		8 11 15		TD Boring @ 20 feet	Conical PVC casing cap
22					
24					
26					
28					
30					

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-3**

Project: Oak Walk

Project No.: 0004.083

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 45.49 ft.

Surface Elevation: 45.9 ft.

Depth to Water: 5.66 ft.

Date Installed: 04/07/04

Total depth of Boring: 20 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

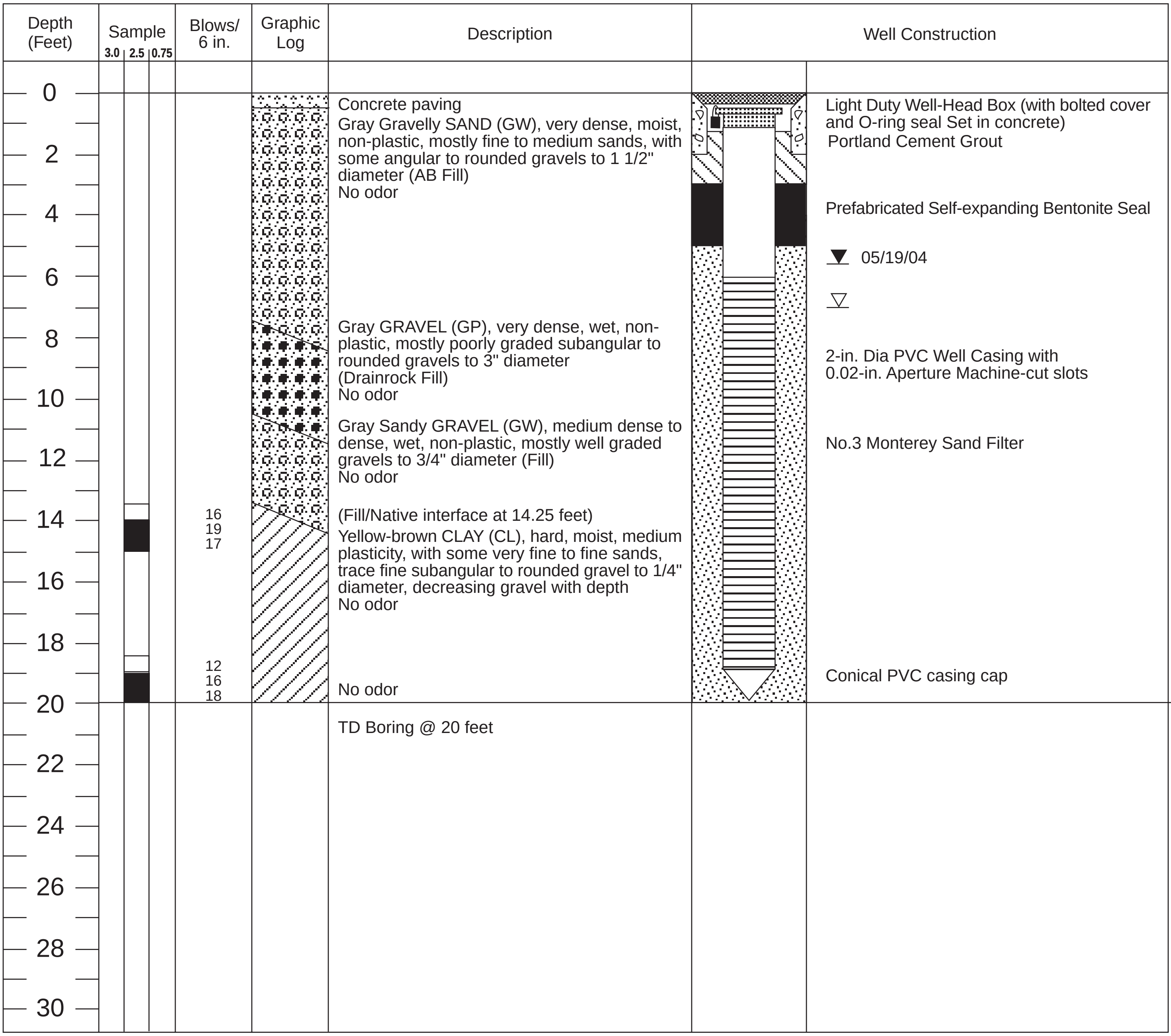
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Hollow Stem Auger

Driller: Don Kiersnas

Logged By: Dennis Alexander



Blows/ 6 in.	Description	Well Construction
	Concrete paving Gray Gravelly SAND (GW), very dense, moist, non-plastic, mostly fine to medium sands, with some angular to rounded gravels to 1 1/2" diameter (AB Fill) No odor	Light Duty Well-Head Box (with bolted cover and O-ring seal Set in concrete) Portland Cement Grout
		Prefabricated Self-expanding Bentonite Seal
		▼ 05/19/04
		▽
	Gray GRAVEL (GP), very dense, wet, non-plastic, mostly poorly graded subangular to rounded gravels to 3" diameter (Drainrock Fill) No odor	2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots
	Gray Sandy GRAVEL (GW), medium dense to dense, wet, non-plastic, mostly well graded gravels to 3/4" diameter (Fill) No odor	No.3 Monterey Sand Filter
16 19 17	(Fill/Native interface at 14.25 feet) Yellow-brown CLAY (CL), hard, moist, medium plasticity, with some very fine to fine sands, trace fine subangular to rounded gravel to 1/4" diameter, decreasing gravel with depth No odor	
12 16 18	No odor	Conical PVC casing cap
	TD Boring @ 20 feet	

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-4**

Project: Oak Walk

Project No.: 0004.083

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 47.31 ft.

Surface Elevation: 47.5 ft.

Depth to Water: 6.19 ft.

Date Installed: 04/30/04

Total depth of Boring: 20 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2.0 in.

Total depth of Well: 20 ft.

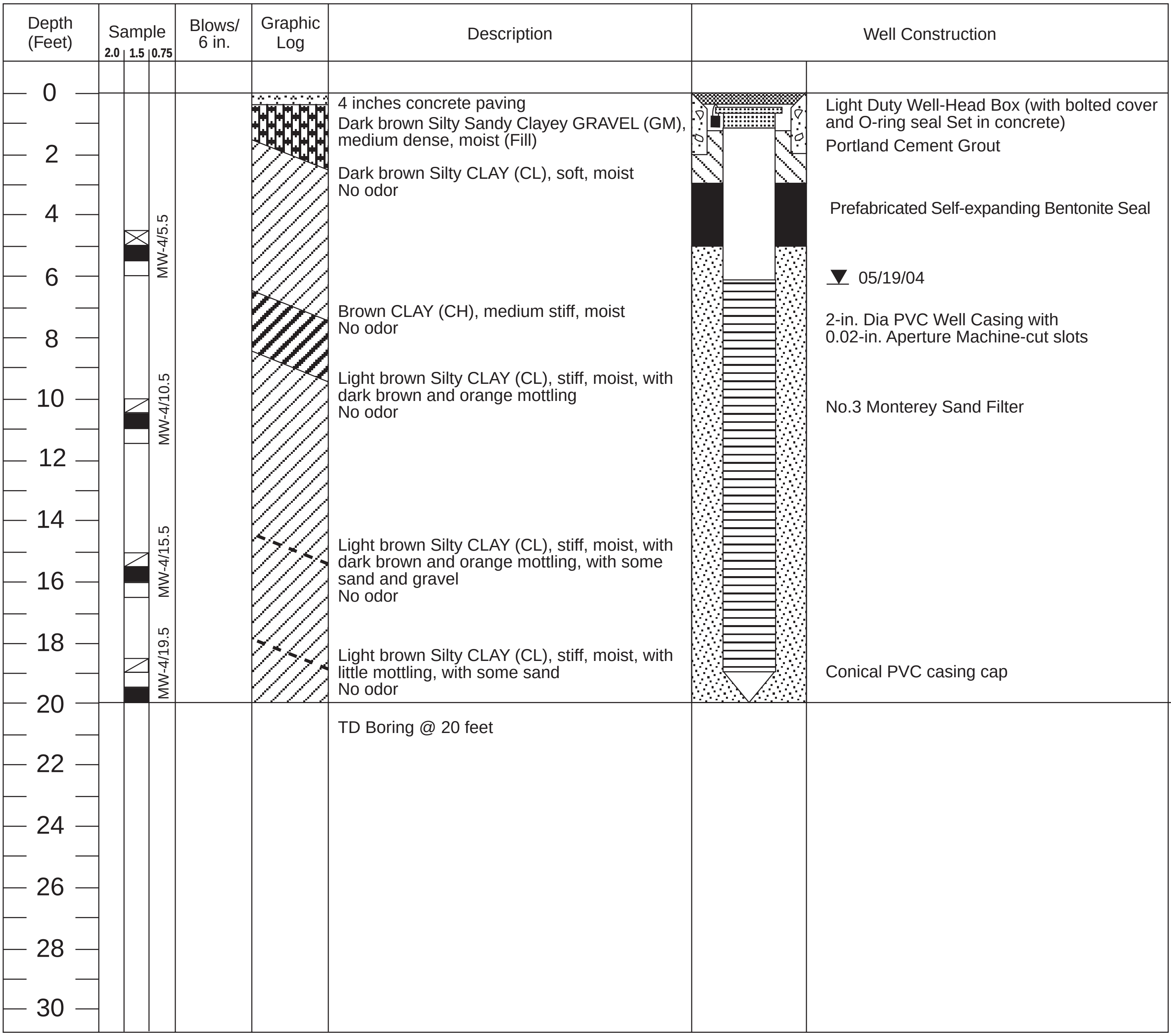
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Hollow Stem Auger

Driller: Bobby Deason

Logged By: Steve Flexser



4 inches concrete paving

Dark brown Silty Sandy Clayey GRAVEL (GM), medium dense, moist (Fill)

Dark brown Silty CLAY (CL), soft, moist
No odor

Brown CLAY (CH), medium stiff, moist
No odor

Light brown Silty CLAY (CL), stiff, moist, with dark brown and orange mottling
No odor

Light brown Silty CLAY (CL), stiff, moist, with dark brown and orange mottling, with some sand and gravel
No odor

Light brown Silty CLAY (CL), stiff, moist, with little mottling, with some sand
No odor

TD Boring @ 20 feet

Light Duty Well-Head Box (with bolted cover and O-ring seal Set in concrete)

Portland Cement Grout

Prefabricated Self-expanding Bentonite Seal

▼ 05/19/04

2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots

No.3 Monterey Sand Filter

Conical PVC casing cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: MW-5

Project: Oak Walk

Project No.: 0004.083

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 42.51 ft.

Surface Elevation: 42.9 ft.

Depth to Water: 7.39 ft.

Date Installed: 04/30/04

Total depth of Boring: 20 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2.0 in.

Total depth of Well: 20 ft.

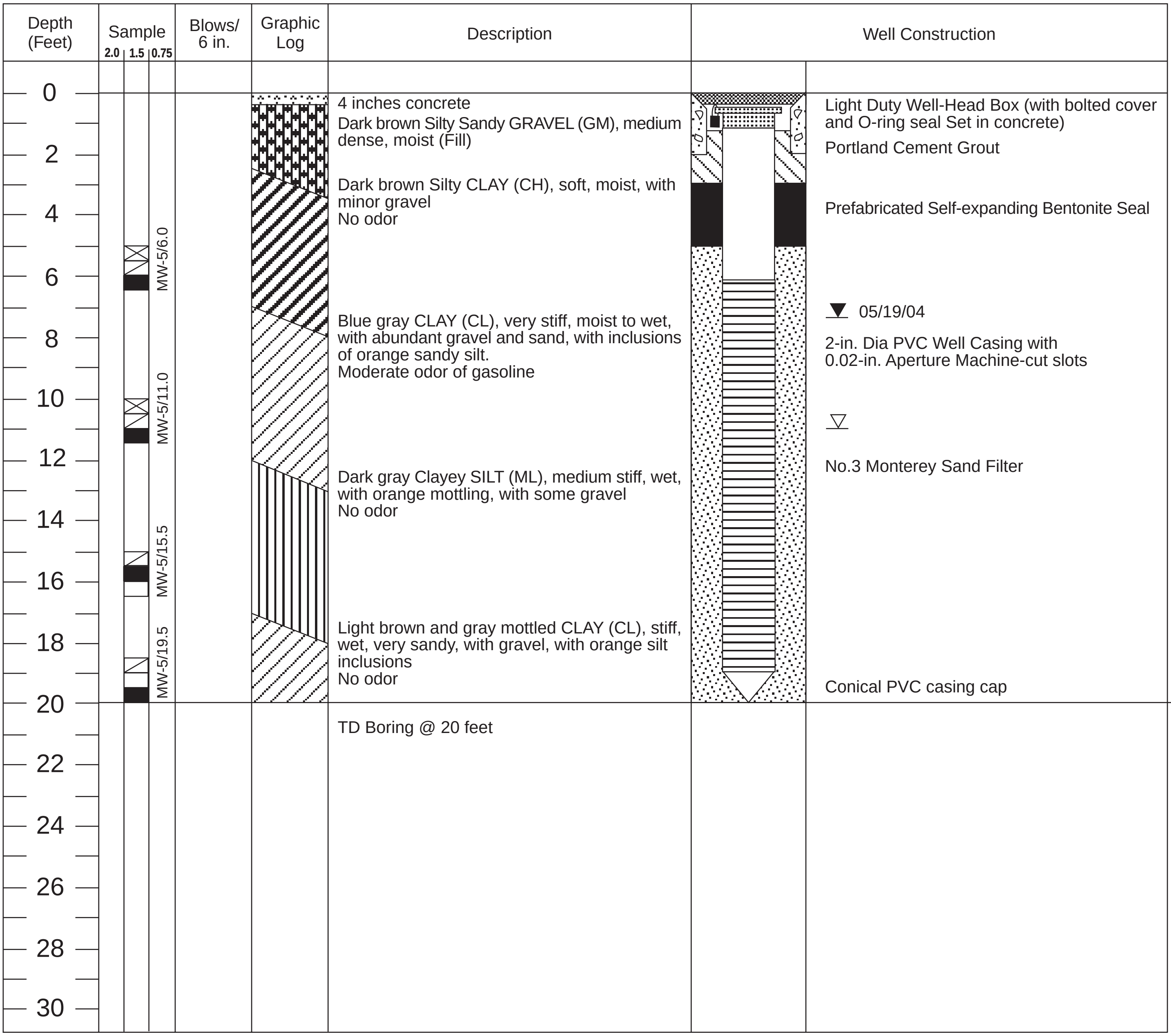
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Hollow Stem Auger

Driller: Bobby Deason

Logged By: Steve Flexser



4 inches concrete

Dark brown Silty Sandy GRAVEL (GM), medium dense, moist (Fill)

Dark brown Silty CLAY (CH), soft, moist, with minor gravel
No odor

Blue gray CLAY (CL), very stiff, moist to wet, with abundant gravel and sand, with inclusions of orange sandy silt.
Moderate odor of gasoline

Dark gray Clayey SILT (ML), medium stiff, wet, with orange mottling, with some gravel
No odor

Light brown and gray mottled CLAY (CL), stiff, wet, very sandy, with gravel, with orange silt inclusions
No odor

TD Boring @ 20 feet

Light Duty Well-Head Box (with bolted cover and O-ring seal Set in concrete)

Portland Cement Grout

Prefabricated Self-expanding Bentonite Seal

▼ 05/19/04

2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots

▽

No.3 Monterey Sand Filter

Conical PVC casing cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-6**

Project: Oak Walk

Project No.: 0004.083

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 43.35 ft.

Surface Elevation: 43.9 ft.

Depth to Water: 7.16 ft.

Date Installed: 04/07/04

Total depth of Boring: 20 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

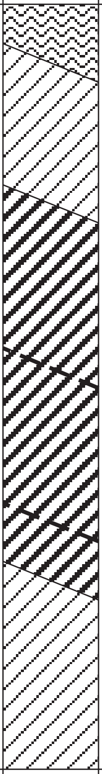
Casing Material: PVC

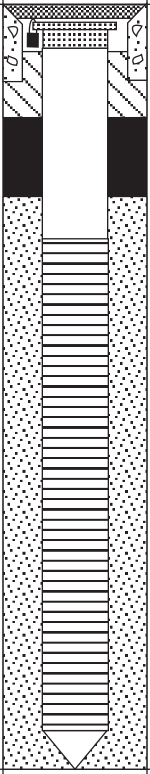
Drilling Company: Gregg Drilling & Testing

Drilling Method: Hollow Stem Auger

Driller: Don Kiersnas

Logged By: Dennis Alexander





Depth (Feet)	Sample 3.0 | 2.5 | 0.75	Blows/ 6 in.	Description	Well Construction
0			Garden Soil (Fill)	Light Duty Well-Head Box (with bolted cover and O-ring seal Set in concrete)
2			Mottled Gray-brown and orange-brown Sandy CLAY (CL), very stiff, moist, medium plasticity, with some fine sands, little medium to coarse sands, few subangular to rounded gravels to 3/4" diameter No odor	Portland Cement Grout
4	ES	10 11 14		Prefabricated Self-expanding Bentonite Seal
6		5 5 6	Gray-brown CLAY (CH), stiff, moist, high plasticity, trace to some fine sands No odor	▼ 05/19/04
8				2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots
10	ES	16 20 27	Light olive brown CLAY (CH), hard, moist, high plasticity, some fine sands, few medium to coarse sands little angular to subrounded gravels to 1/2" diameter No odor	No.3 Monterey Sand Filter
12				
14	ES	16 22 27	Mottled orange-brown and light Gray-dark brown CLAY (CH), hard, moist, high plasticity, with some very fine to fine sands, and gravelly sand lens at 15 feet No odor	
16			Mottled orange-brown and light Gray CLAY (CL), very stiff, moist, medium plasticity, with some fine sands, medium to coarse sands, and subrounded to rounded fine gravels to 1/4" diameter No odor	
18				
20	ES	12 15 18		Conical PVC casing cap
			TD Boring @ 20 feet	
22				
24				
26				
28				
30				

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-6A**

Project: Bay Rock Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 43.18 ft.

Surface Elevation: 43.6 ft.

Depth to Water: 8.30 ft.

Date Installed: 09/27/08

Total depth of Boring: 20.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

Casing Material: PVC

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Open Stem Auger

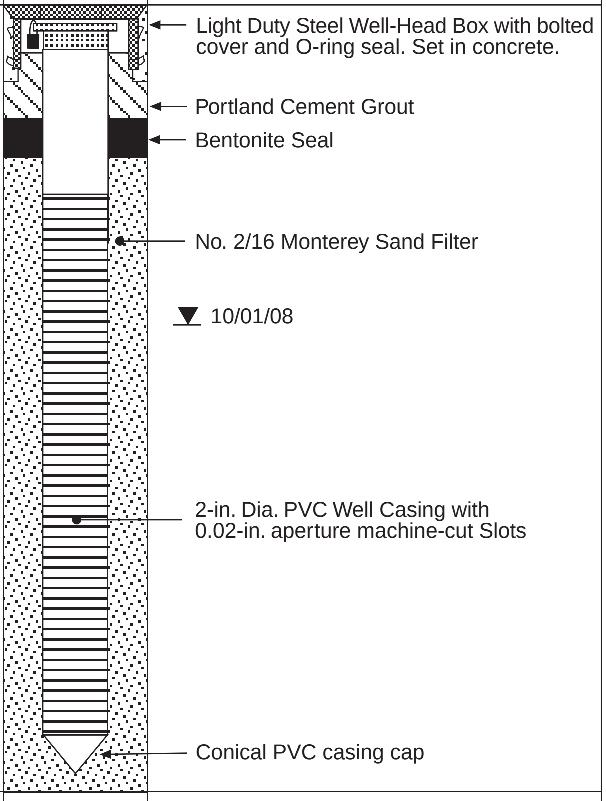
Driller: Jesse Pattison

Logged By: Dai Watkins

Depth (Feet)	Sample ID	Description
0		Dark brown Silty CLAY (FILL), No Odor
4.5		Mottled Gray-brown and Orange-brown Sandy CLAY (CL), very stiff, moist, medium plasticity, with minor subangular to rounded gravel to 1/2" dia., No Odor
5	MW-6A-5.0	
10	MW-6A-10.0	
14.5		Light brown Silty Sandy CLAY (CL), with some subrounded gravels to 1/4" diameter, No Odor
15	MW-6A-15.0	
19.5		Brown Silty Sandy CLAY (CL), soft, moist, No Odor
20	MW-6A-20.0	
20.5		TD Boring @ 20.5 feet

Sample: 3.0 | 2.5 | 0.75

Well Construction



No water detected at time boring was drilled

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-7**

Project: Oak Walk

Project No.: 0004.083

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 44.75 ft.

Surface Elevation: 45.2 ft.

Depth to Water: 8.40 ft.

Date Installed: 04/06/04

Total depth of Boring: 20 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

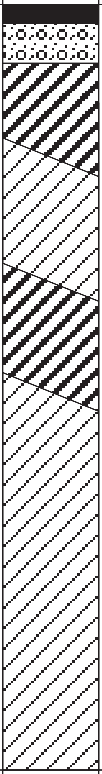
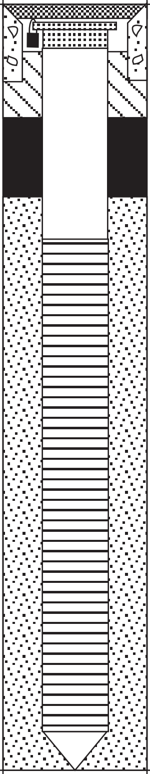
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Hollow Stem Auger

Driller: Don Kiersnas

Logged By: Dennis Alexander

Depth (Feet)	Sample			Blows/ 6 in.	Graphic Log	Description	Well Construction	
	3.0	2.5	0.75					
0						5" Bituminous Macadam paving Class II Cal Trans paving base (GW)		Heavy Duty Well-Head Box (with bolted cover and O-ring seal Set in concrete)
2				13 21 25		Dark Gray-brown CLAY (CH), hard, moist, high plasticity, with some fine sand, trace angular gravel to 1/2" diameter. No odor		Portland Cement Grout
4				6 9 13		Dark brown CLAY (CL), very stiff, moist, medium plasticity, little to some fine sands, trace angular to subangular gravel to 1-1/2" diameter No odor		Prefabricated Self-expanding Bentonite Seal
6				9 11 13				2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots
8				9 18 28		Mottled olive-brown and orange-brown CLAY (CH), hard, moist, high plasticity, with some fine sands, few medium to coarse sands, trace angular gravels to 1/2" diameter, and small sandy lenses with trace gravel No odor		▼ 05/20/04
10								No.3 Monterey Sand Filter
12						Mottled orange-brown and light olive brown CLAY (CL), very stiff, moist to wet, medium plasticity, with some fine sands, few medium to coarse sands, and few angular to rounded gravels to 1" diameter No odor		
14				13 21 33				
16						Decreasing sands and gravels to 18 feet		
18								▽
20				9 11 12		No odor TD Boring @ 20 feet		Conical PVC casing cap
22								
24								
26								
28								
30								

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-8**

Project: Oak Walk

Project No.: 0004.083

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 48.38 ft.

Surface Elevation: 48.5 ft.

Depth to Water: 9.65 ft.

Date Installed: 04/07/04

Total depth of Boring: 20 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

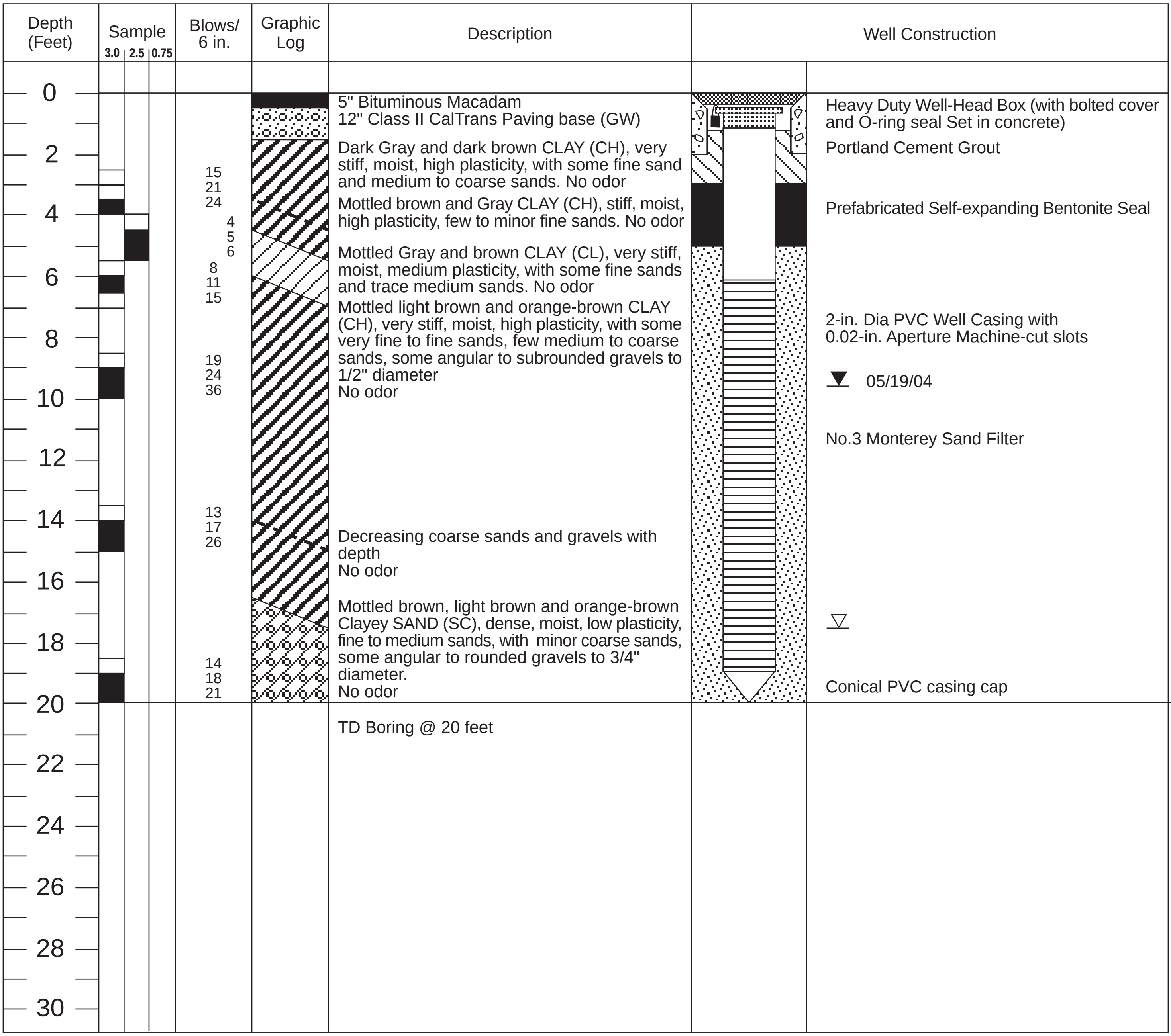
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Hollow Stem Auger

Driller: Don Kiersnas

Logged By: Dennis Alexander



Depth (Feet)	Blows/ 6 in.	Description	Well Construction
0		5" Bituminous Macadam 12" Class II CalTrans Paving base (GW)	Heavy Duty Well-Head Box (with bolted cover and O-ring seal Set in concrete)
2	15 21 24	Dark Gray and dark brown CLAY (CH), very stiff, moist, high plasticity, with some fine sand and medium to coarse sands. No odor	Portland Cement Grout
4	4 5 6	Mottled brown and Gray CLAY (CH), stiff, moist, high plasticity, few to minor fine sands. No odor	Prefabricated Self-expanding Bentonite Seal
6	8 11 15	Mottled Gray and brown CLAY (CL), very stiff, moist, medium plasticity, with some fine sands and trace medium sands. No odor Mottled light brown and orange-brown CLAY (CH), very stiff, moist, high plasticity, with some very fine to fine sands, few medium to coarse sands, some angular to subrounded gravels to 1/2" diameter No odor	2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots
8			▼ 05/19/04
10	19 24 36		No.3 Monterey Sand Filter
12			
14	13 17 26	Decreasing coarse sands and gravels with depth No odor	
16			
18	14 18 21	Mottled brown, light brown and orange-brown Clayey SAND (SC), dense, moist, low plasticity, fine to medium sands, with minor coarse sands, some angular to rounded gravels to 3/4" diameter. No odor	▽ Conical PVC casing cap
20		TD Boring @ 20 feet	
22			
24			
26			
28			
30			

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-09**

Project: Bay Rock Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 47.85 ft.

Surface Elevation: 48.0 ft.

Depth to Water: 10.75 ft.

Date Installed: 09/27/08

Total depth of Boring: 20.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

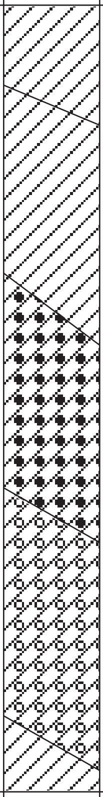
Casing Material: PVC

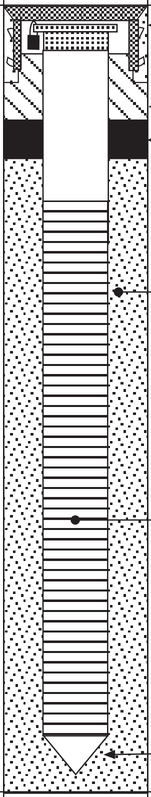
Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Open Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins





Depth (Feet)	Sample 3.0 | 2.5 | 0.75	Sample ID	Graphic Log	Description	Well Construction
0				Brown Silty CLAY (FILL), loose, with vegetative matter, No Odor	Light Duty Steel Well-Head Box with bolted cover and O-ring seal. Set in concrete.
2					Portland Cement Grout
4				Brown Silty CLAY (CL), stiff, No Odor	Bentonite Seal
6		MW-9-5.0			
8					No.2/16 Monterey Sand Filter
10		MW-9-10.0		Gray and Orange-brown Silty Sandy GRAVEL (GC) to 1/2” dia. with some Clay, stiff, moist, dense, increasing density and moisture with depth, slight odor of solvents	▼ 10/01/08
12					
14					2-in. Dia. PVC Well Casing with 0.02-in. aperture machine-cut Slots
16		MW-9-15.0		Gray/brown Silty Clayey SAND (SC), with some subrounded gravels to 3/4" dia., No Odor Increasing density and moisture with depth	▽ First Water
18					
20		MW-9-20.0		Brown Silty CLAY (CL), medium stiff, wet, No Odor	Conical PVC casing cap
22				TD Boring @ 20.5 feet	
24					
26					
28					
30					

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-10**

Project: Bay Rock Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 45.66 ft.

Surface Elevation: 45.9 ft.

Depth to Water: 9.39 ft.

Date Installed: 09/27/08

Total depth of Boring: 20.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

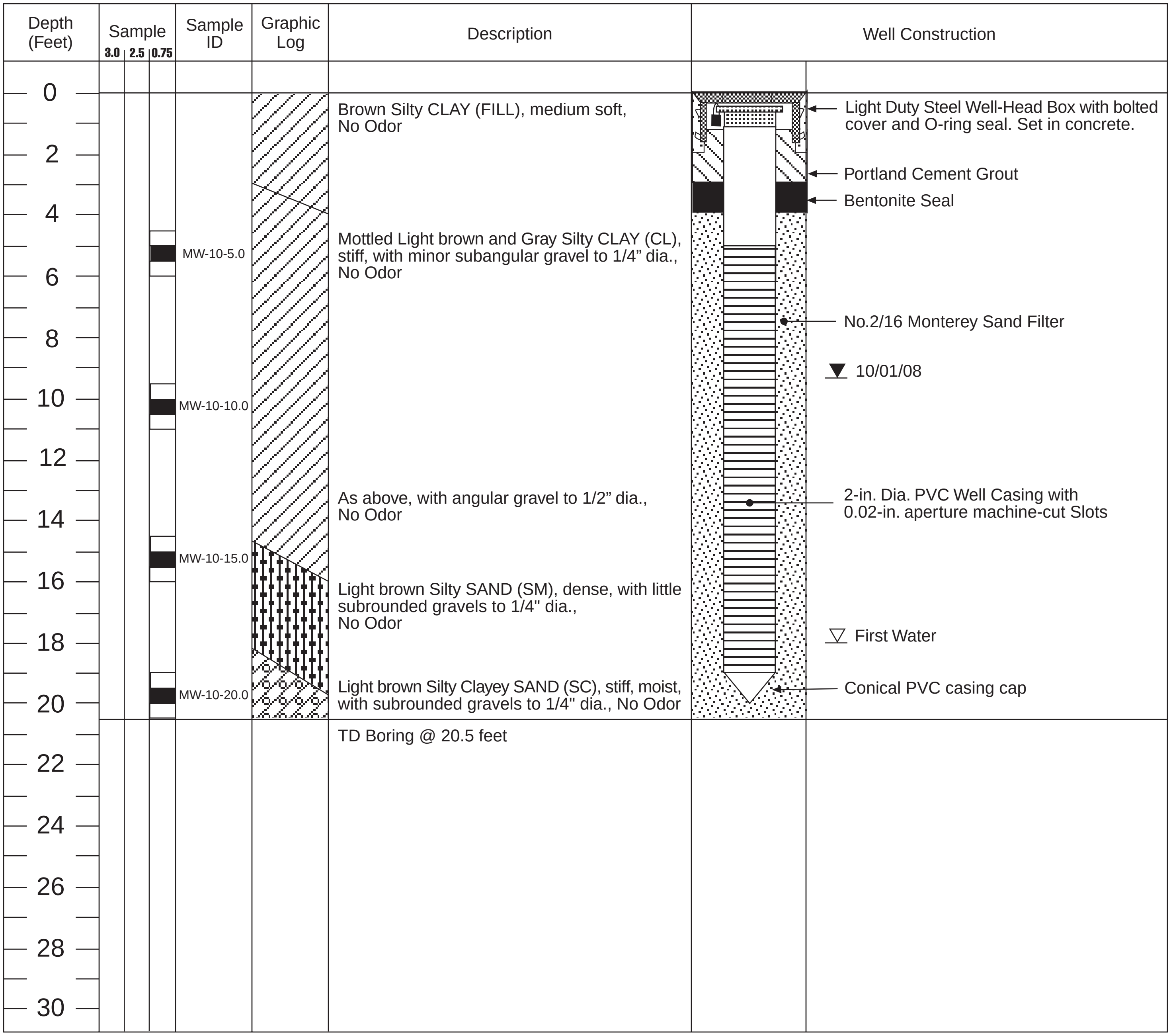
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Open Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins



Brown Silty CLAY (FILL), medium soft, No Odor

Mottled Light brown and Gray Silty CLAY (CL), stiff, with minor subangular gravel to 1/4" dia., No Odor

As above, with angular gravel to 1/2" dia., No Odor

Light brown Silty SAND (SM), dense, with little subrounded gravels to 1/4" dia., No Odor

Light brown Silty Clayey SAND (SC), stiff, moist, with subrounded gravels to 1/4" dia., No Odor

TD Boring @ 20.5 feet

Light Duty Steel Well-Head Box with bolted cover and O-ring seal. Set in concrete.

Portland Cement Grout

Bentonite Seal

No.2/16 Monterey Sand Filter

▼ 10/01/08

2-in. Dia. PVC Well Casing with 0.02-in. aperture machine-cut Slots

▽ First Water

Conical PVC casing cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-11**

Project: Bay Rock Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 45.10 ft.

Surface Elevation: 45.5 ft.

Depth to Water: 9.79 ft.

Date Installed: 09/27/08

Total depth of Boring: 20.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

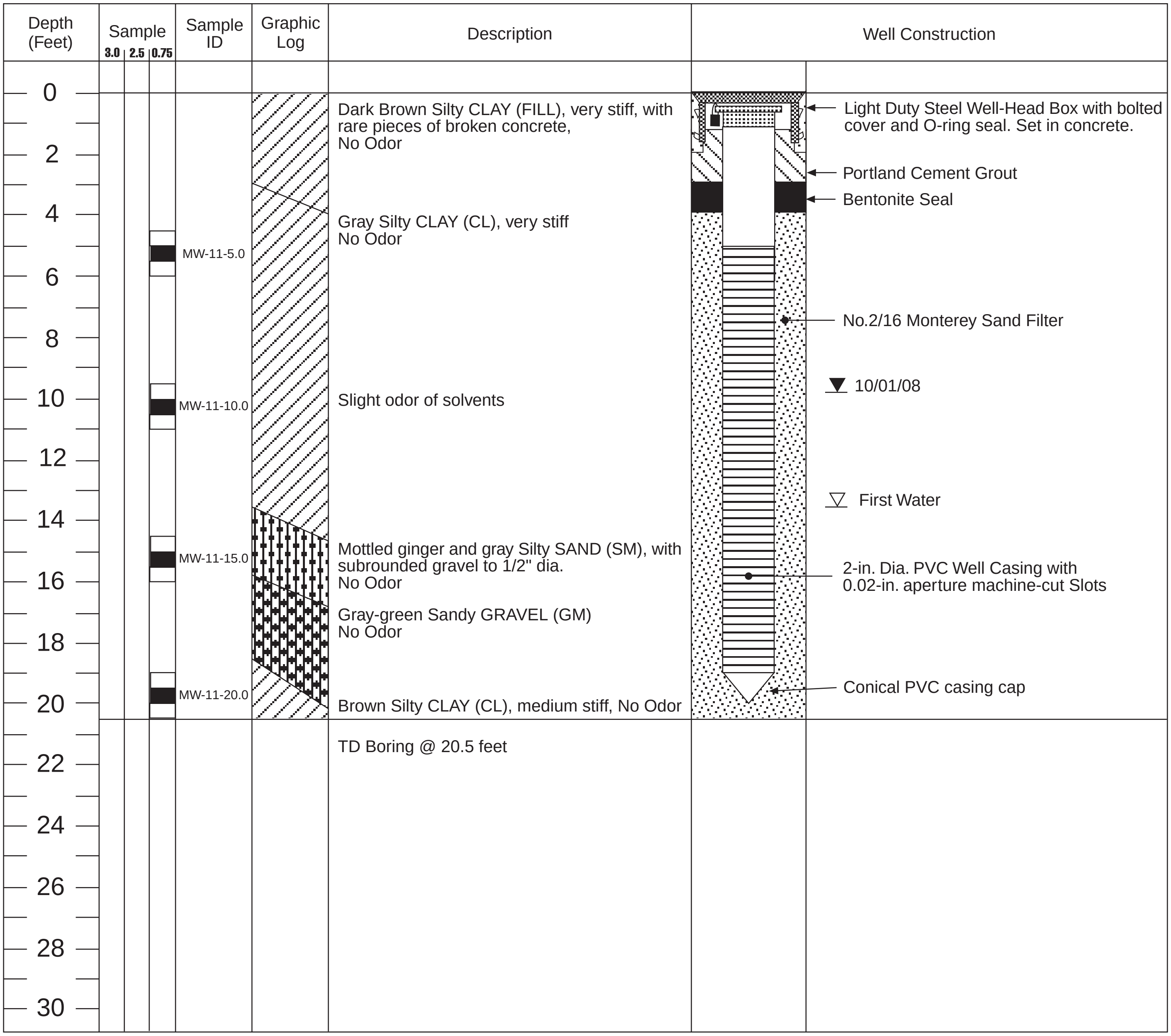
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Open Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins



Dark Brown Silty CLAY (FILL), very stiff, with rare pieces of broken concrete,
No Odor

Gray Silty CLAY (CL), very stiff
No Odor

Slight odor of solvents

Mottled ginger and gray Silty SAND (SM), with subrounded gravel to 1/2" dia.
No Odor

Gray-green Sandy GRAVEL (GM)
No Odor

Brown Silty CLAY (CL), medium stiff, No Odor

TD Boring @ 20.5 feet

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-12**

Project: Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 42.93 ft.

Surface Elevation: 43.2 ft.

Depth to Water: 6.67 ft.

Date Installed: 02/09/09

Total depth of Boring: 20.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

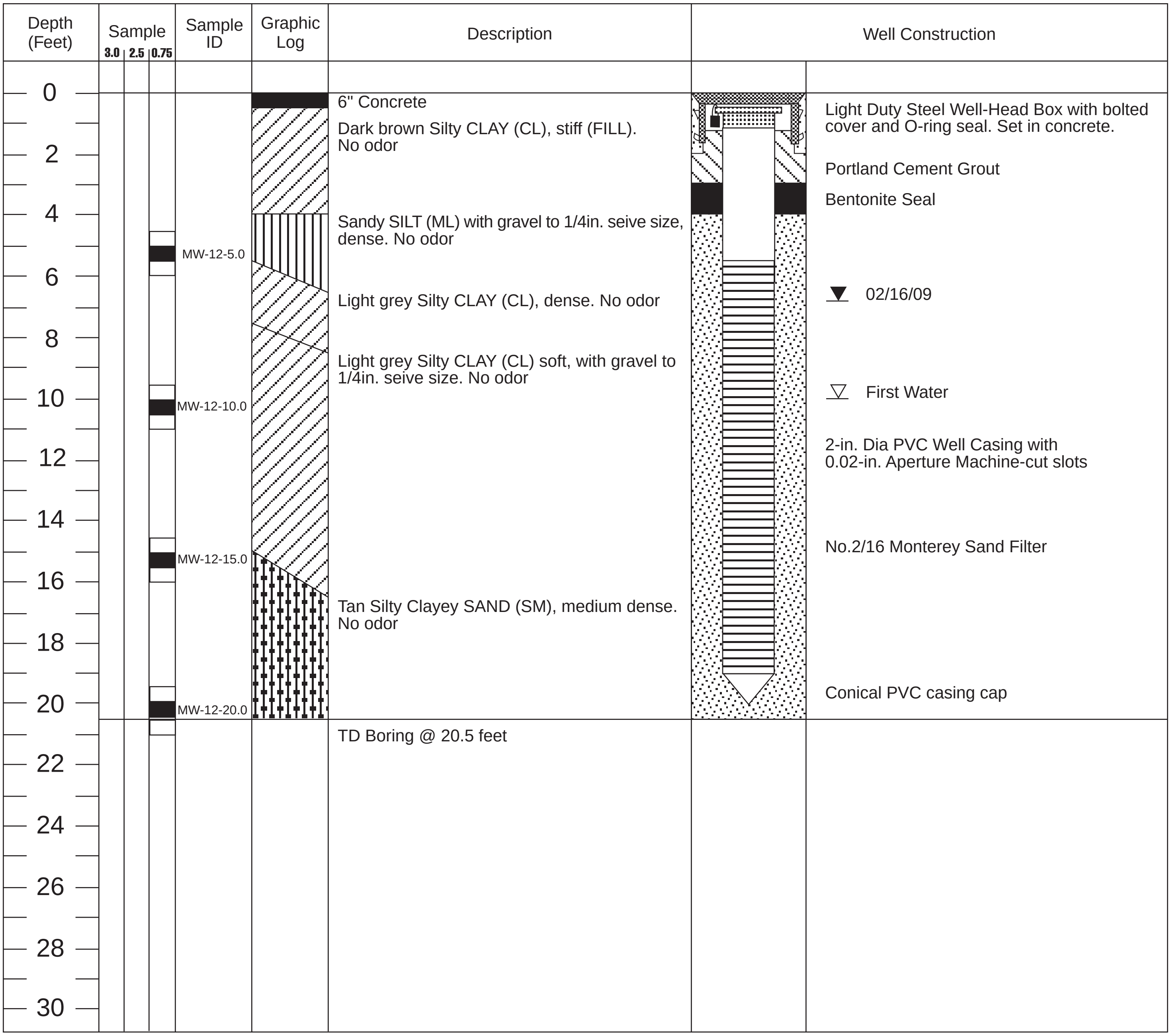
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Hollow Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins



Depth (Feet)	Sample ID	Description	Well Construction
0		6" Concrete	Light Duty Steel Well-Head Box with bolted cover and O-ring seal. Set in concrete.
		Dark brown Silty CLAY (CL), stiff (FILL). No odor	Portland Cement Grout
4		Sandy SILT (ML) with gravel to 1/4in. seive size, dense. No odor	Bentonite Seal
	MW-12-5.0		
6		Light grey Silty CLAY (CL), dense. No odor	▼ 02/16/09
8		Light grey Silty CLAY (CL) soft, with gravel to 1/4in. seive size. No odor	
10	MW-12-10.0		▽ First Water
12			2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots
15	MW-12-15.0		No.2/16 Monterey Sand Filter
17		Tan Silty Clayey SAND (SM), medium dense. No odor	
20	MW-12-20.0		Conical PVC casing cap
		TD Boring @ 20.5 feet	

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-13**

Project: Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 45.56 ft.

Surface Elevation: 45.9 ft.

Depth to Water: 5.56 ft.

Date Installed: 02/09/09

Total depth of Boring: 20.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

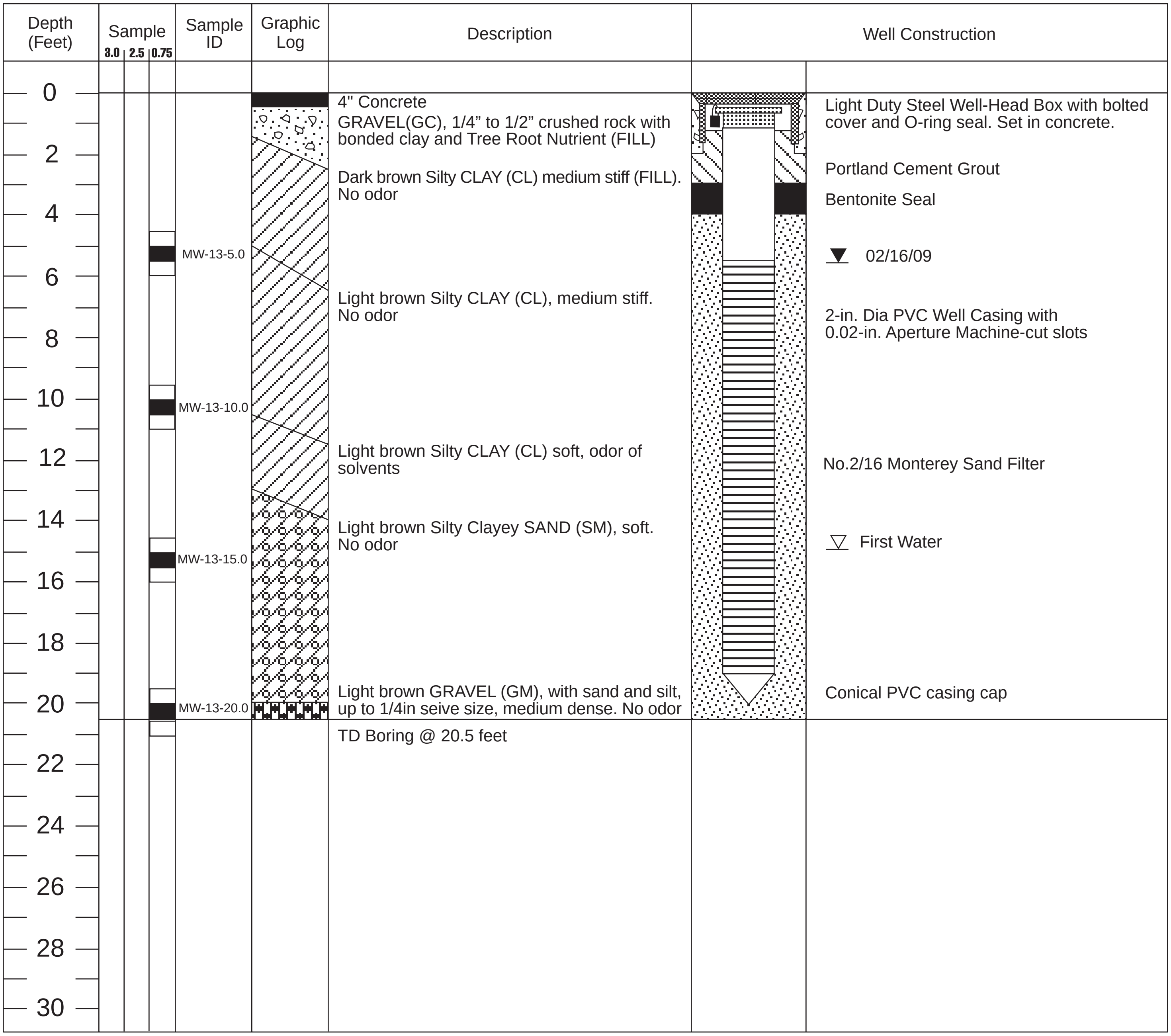
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Hollow Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins



4" Concrete

GRAVEL(GC), 1/4” to 1/2” crushed rock with bonded clay and Tree Root Nutrient (FILL)

Dark brown Silty CLAY (CL) medium stiff (FILL). No odor

Light brown Silty CLAY (CL), medium stiff. No odor

Light brown Silty CLAY (CL) soft, odor of solvents

Light brown Silty Clayey SAND (SM), soft. No odor

Light brown GRAVEL (GM), with sand and silt, up to 1/4in seive size, medium dense. No odor

TD Boring @ 20.5 feet

Light Duty Steel Well-Head Box with bolted cover and O-ring seal. Set in concrete.

Portland Cement Grout

Bentonite Seal

▼ 02/16/09

2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots

No.2/16 Monterey Sand Filter

▽ First Water

Conical PVC casing cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-14**

Project: Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 45.19 ft.

Surface Elevation: 45.7 ft.

Depth to Water: 6.51 ft.

Date Installed: 02/09/09

Total depth of Boring: 20.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20 ft.

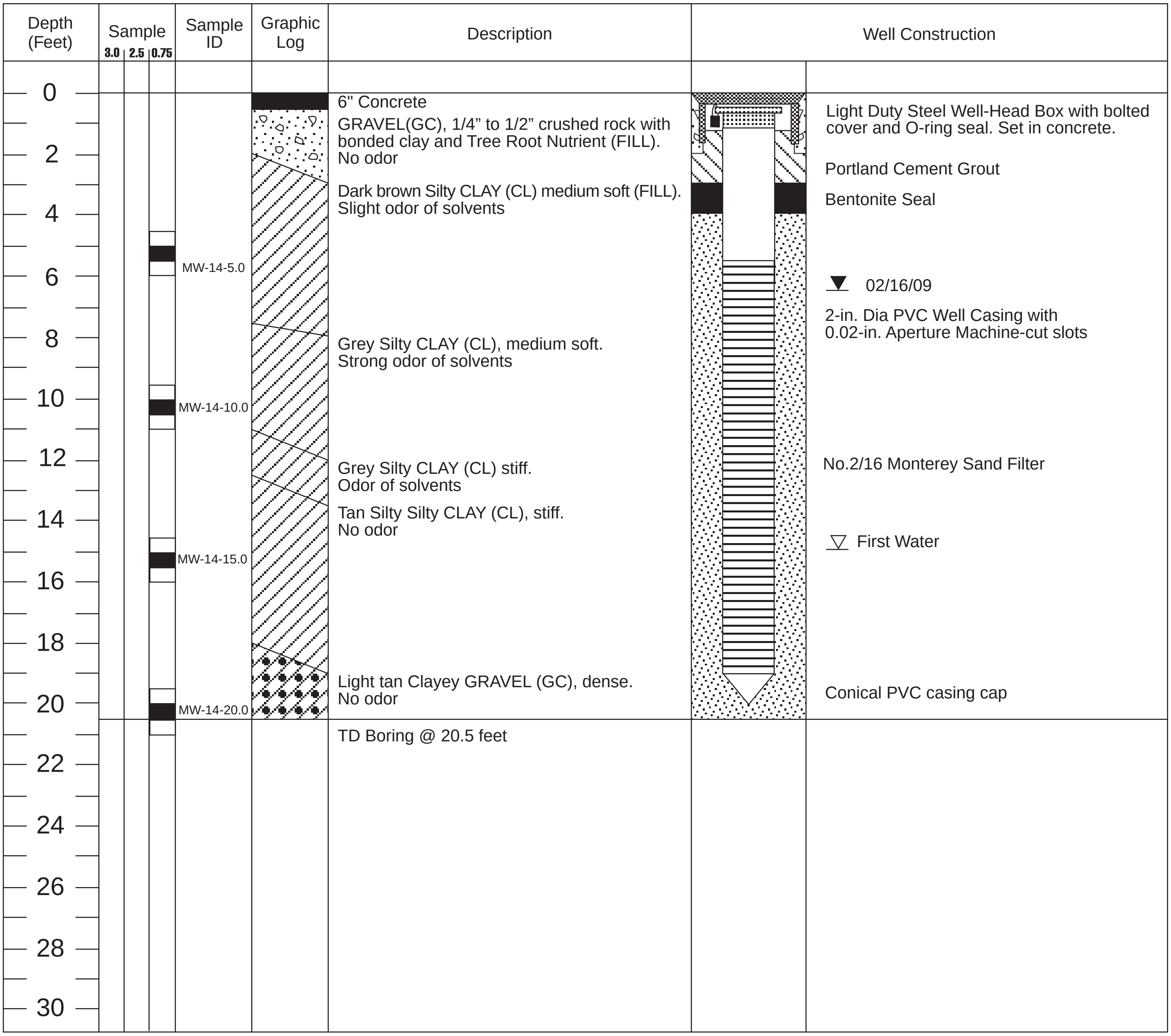
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Hollow Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins



6" Concrete

GRAVEL(GC), 1/4” to 1/2” crushed rock with bonded clay and Tree Root Nutrient (FILL). No odor

Dark brown Silty CLAY (CL) medium soft (FILL). Slight odor of solvents

Grey Silty CLAY (CL), medium soft. Strong odor of solvents

Grey Silty CLAY (CL) stiff. Odor of solvents

Tan Silty Silty CLAY (CL), stiff. No odor

Light tan Clayey GRAVEL (GC), dense. No odor

TD Boring @ 20.5 feet

Light Duty Steel Well-Head Box with bolted cover and O-ring seal. Set in concrete.

Portland Cement Grout

Bentonite Seal

▼ 02/16/09

2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots

No.2/16 Monterey Sand Filter

▽ First Water

Conical PVC casing cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: MW-15

Project: Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 43.55 ft.

Surface Elevation: 43.8 ft.

Depth to Water: 6.22 ft.

Date Installed: 02/09/09

Total depth of Boring: 20.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 20.5 ft.

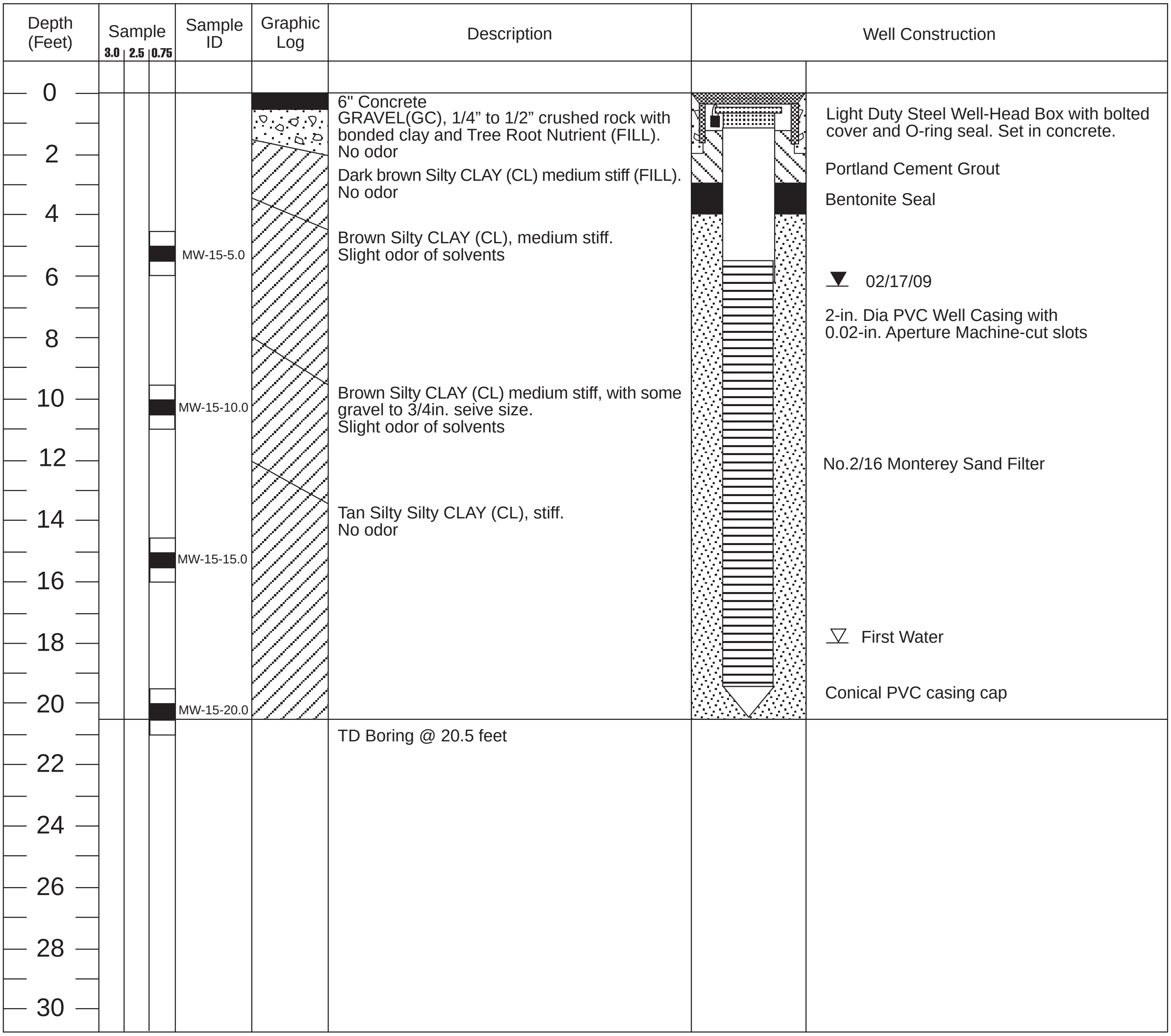
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Hollow Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins



Depth (Feet)	Sample ID	Description	Well Construction
0		6" Concrete GRAVEL(GC), 1/4” to 1/2” crushed rock with bonded clay and Tree Root Nutrient (FILL). No odor	Light Duty Steel Well-Head Box with bolted cover and O-ring seal. Set in concrete.
2		Dark brown Silty CLAY (CL) medium stiff (FILL). No odor	Portland Cement Grout
4			Bentonite Seal
	MW-15-5.0	Brown Silty CLAY (CL), medium stiff. Slight odor of solvents	
6			▼ 02/17/09 2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots
10	MW-15-10.0	Brown Silty CLAY (CL) medium stiff, with some gravel to 3/4in. seive size. Slight odor of solvents	
12			No.2/16 Monterey Sand Filter
14		Tan Silty Silty CLAY (CL), stiff. No odor	
	MW-15-15.0		
18			▽ First Water
20	MW-15-20.0		Conical PVC casing cap
		TD Boring @ 20.5 feet	

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: MW-16A

Project: Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 44.50 ft.

Surface Elevation: 44.8 ft.

Depth to Water: 6.14 ft.

Date Installed: 02/10/09

Total depth of Boring: 15.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 15 ft.

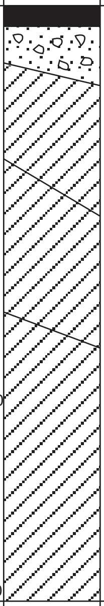
Casing Material: PVC

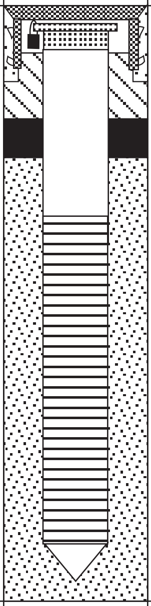
Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Hollow Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins





Depth (Feet)	Sample 3.0 | 2.5 | 0.75	Sample ID	Description	Well Construction
0			6" Concrete GRAVEL(GC), 1/4" to 1/2" crushed rock with bonded clay and Tree Root Nutrient (FILL). No odor	Light Duty Steel Well-Head Box with bolted cover and O-ring seal. Set in concrete.
2			Black Silty CLAY (CL) medium soft. No odor	Portland Cement Grout Bentonite Seal
4		MW-16A-5.0		
6			Grey Silty CLAY (CL), with some gravel to 1/8in. seive size, medium stiff. Slight odor of gasoline	▼ 02/16/09 2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots
8			Light brown Silty CLAY (CL) with grey mottling, medium stiff. Odor of gasoline	
10		MW-16A-10.0		No.2/16 Monterey Sand Filter
12				▽ First Water
14		MW-16A-15.0	Slight odor of gasoline	Conical PVC casing cap
16			TD Boring @ 15.5 feet	
18				
20				
22				
24				
26				
28				
30				

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-16B**

Project: Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 44.59 ft.

Surface Elevation: 44.8 ft.

Depth to Water: 9.0 ft.

Date Installed: 02/10/09

Total depth of Boring: 25.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 25.0 ft.

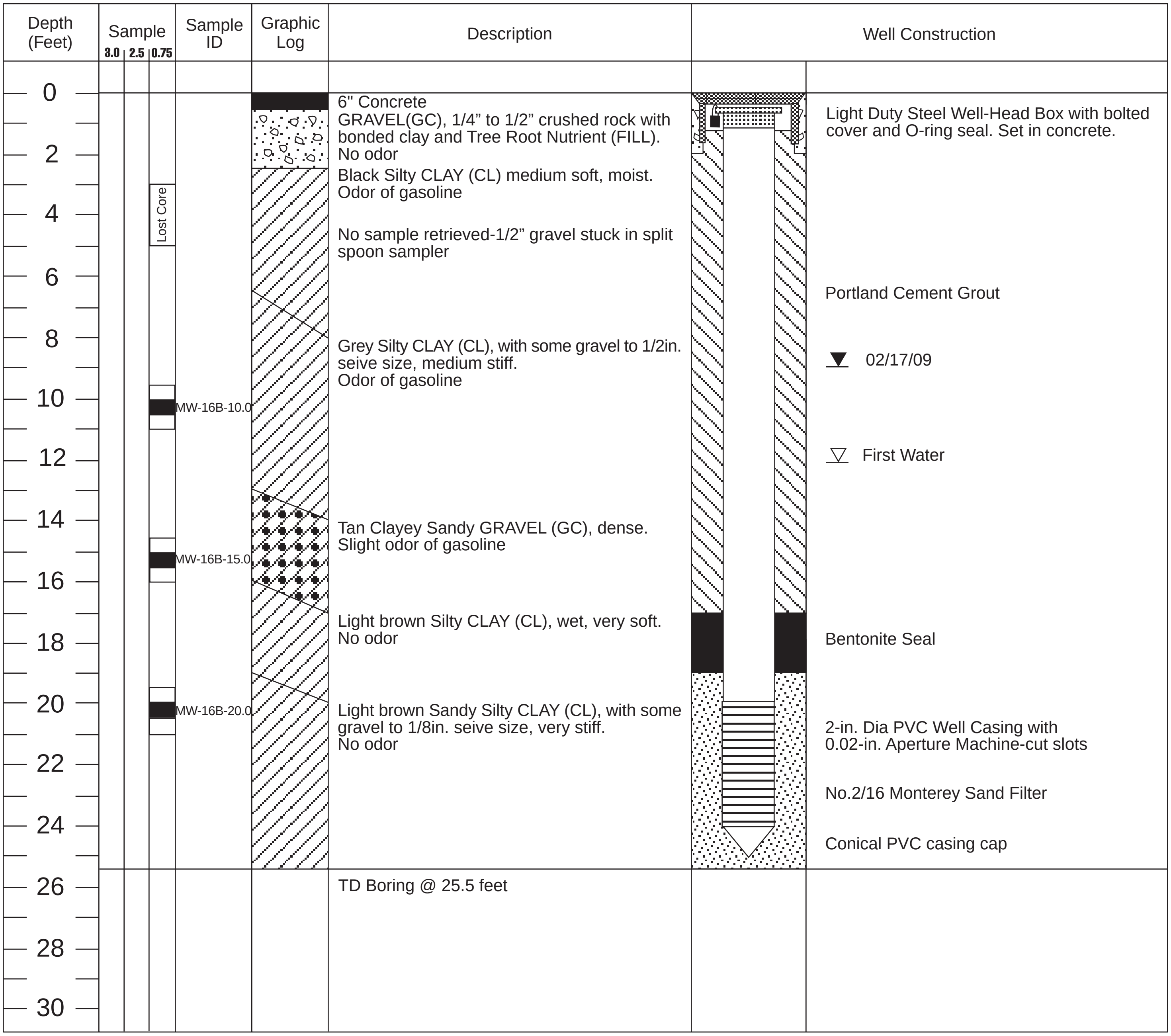
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Hollow Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins



6" Concrete

GRAVEL(GC), 1/4” to 1/2” crushed rock with bonded clay and Tree Root Nutrient (FILL). No odor

Black Silty CLAY (CL) medium soft, moist. Odor of gasoline

No sample retrieved-1/2” gravel stuck in split spoon sampler

Grey Silty CLAY (CL), with some gravel to 1/2in. seive size, medium stiff. Odor of gasoline

Tan Clayey Sandy GRAVEL (GC), dense. Slight odor of gasoline

Light brown Silty CLAY (CL), wet, very soft. No odor

Light brown Sandy Silty CLAY (CL), with some gravel to 1/8in. seive size, very stiff. No odor

TD Boring @ 25.5 feet

Light Duty Steel Well-Head Box with bolted cover and O-ring seal. Set in concrete.

Portland Cement Grout

▼ 02/17/09

▽ First Water

Bentonite Seal

2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots

No.2/16 Monterey Sand Filter

Conical PVC casing cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-16C**

Project: Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 44.48 ft.

Surface Elevation: 44.8 ft.

Depth to Water: 13.95 ft.

Date Installed: 02/10/09

Total depth of Boring: 35.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 35.0 ft.

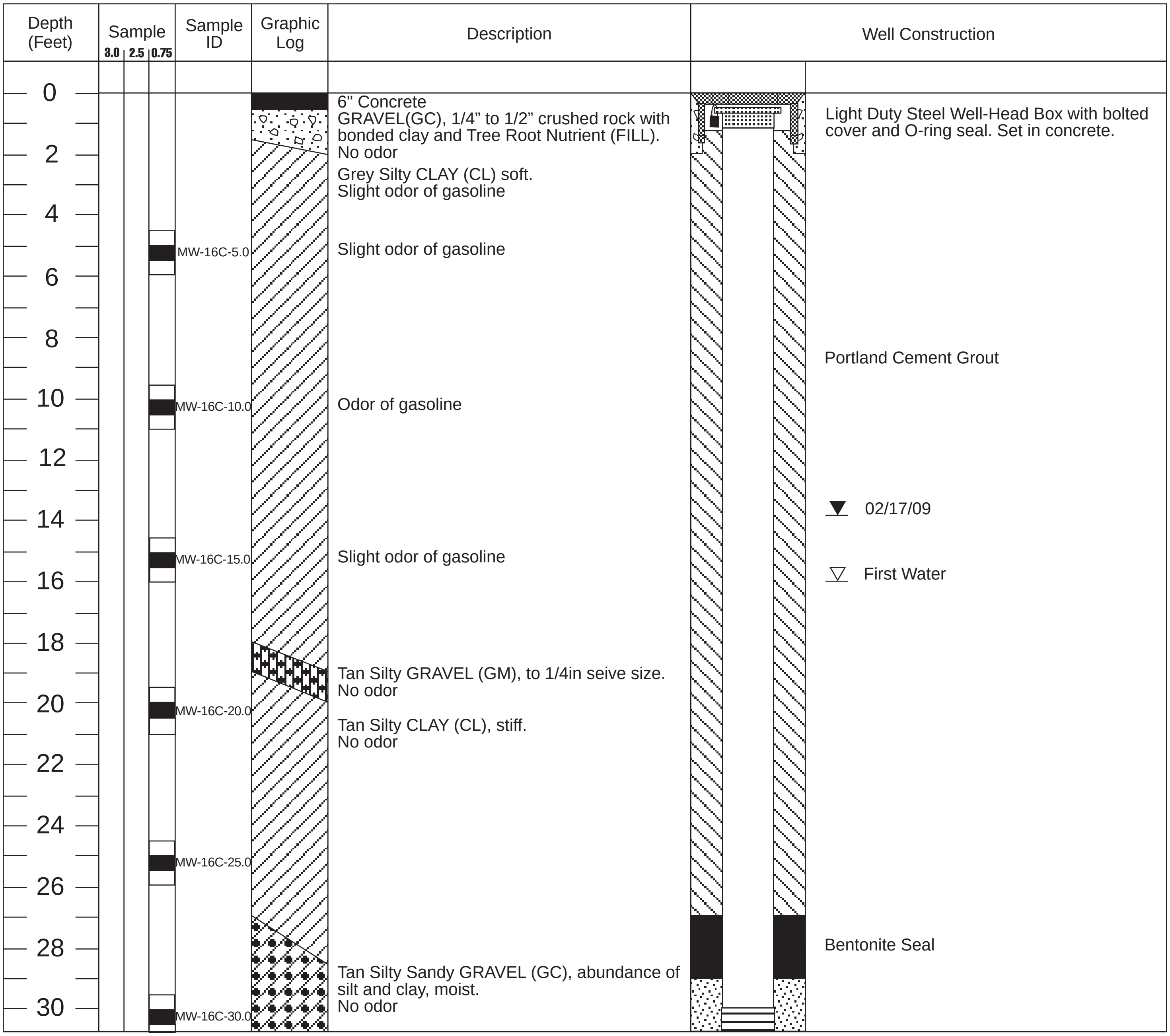
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Hollow Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins



6" Concrete
GRAVEL(GC), 1/4” to 1/2” crushed rock with bonded clay and Tree Root Nutrient (FILL).
No odor

Grey Silty CLAY (CL) soft.
Slight odor of gasoline

Slight odor of gasoline

Odor of gasoline

Slight odor of gasoline

Tan Silty GRAVEL (GM), to 1/4in seive size.
No odor

Tan Silty CLAY (CL), stiff.
No odor

Tan Silty Sandy GRAVEL (GC), abundance of silt and clay, moist.
No odor

Light Duty Steel Well-Head Box with bolted cover and O-ring seal. Set in concrete.

Portland Cement Grout

▼ 02/17/09

▽ First Water

Bentonite Seal

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MW-16C**

Project: Oak Walk

Project No.: 0004.087

Owner: Bay Rock Oaks LLC

Location: Emeryville, California

Top of Casing Elevation: 44.48 ft.

Surface Elevation: 44.8 ft.

Depth to Water: 13.95 ft.

Date Installed: 02/10/09

Total depth of Boring: 35.5 ft.

Boring Diameter: 8 in.

Well Casing Diameter: 2 in.

Total depth of Well: 35.0 ft.

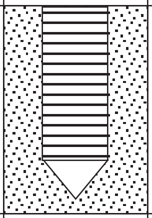
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Hollow Stem Auger

Driller: Jesse Pattison

Logged By: Dai Watkins

Depth (Feet)	Sample			Sample ID	Graphic Log	Description	Well Construction	
	3.0	2.5	0.75					
30			■	MW-16C-30.0	●	Tan Silty Sandy GRAVEL (GC), abundance of silt and clay, moist. No odor		2-in. Dia PVC Well Casing with 0.02-in. Aperture Machine-cut slots No.2/16 Monterey Sand Filter Conical PVC casing cap
32								
34			Lost Core		▨	Light brown Silty CLAY (CL), very soft. No odor Lost core		
36						TD Boring @ 35.5 feet		
38								
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MWT-1**

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 42.98 ft.

Surface Elevation: 43.32 ft.

Depth to Water: 8.43 ft.

Date Installed: 04/02/04

Total depth of Boring: 20 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20 ft.

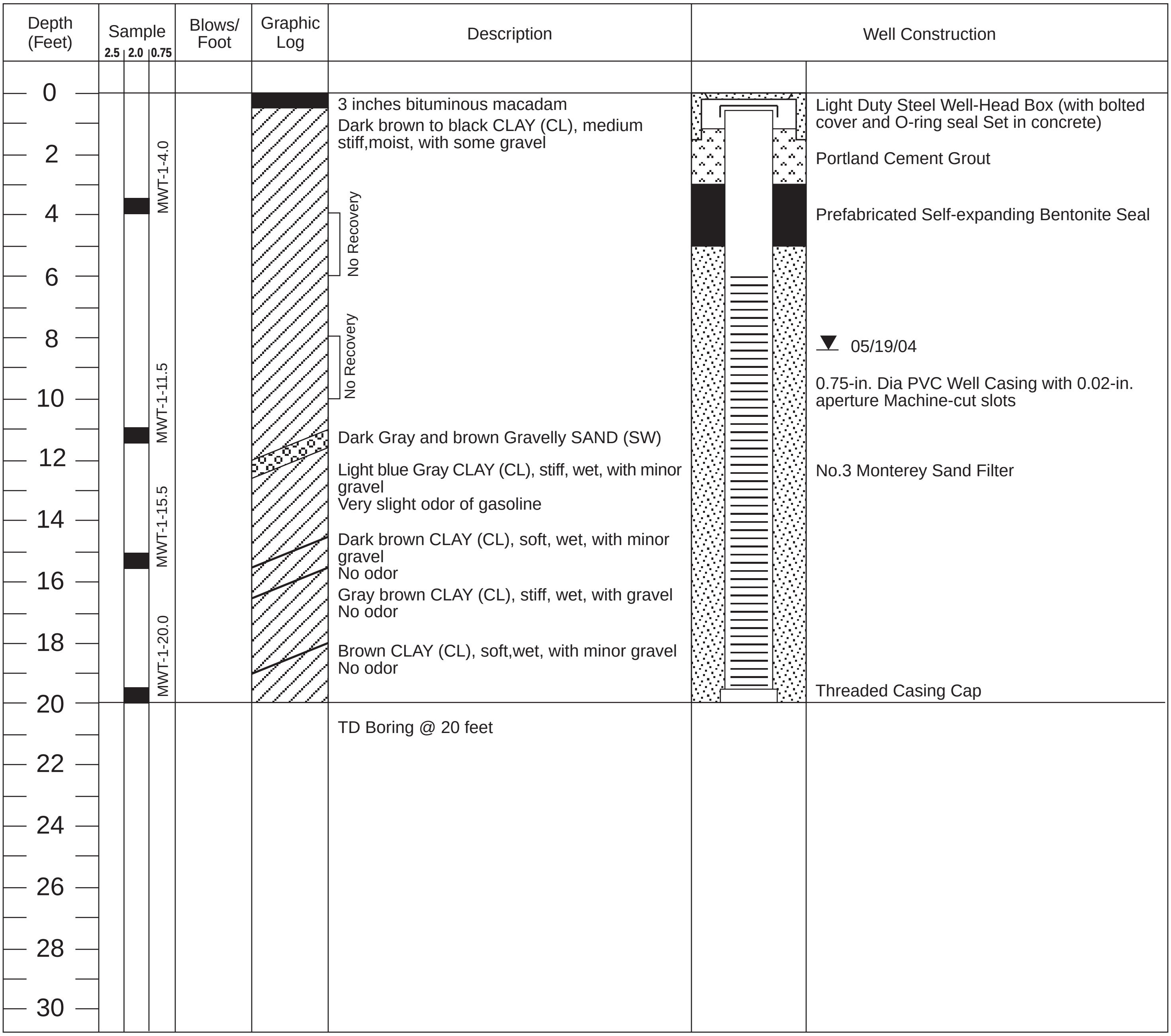
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Paul Rogers

Logged By: Steve Flexser



3 inches bituminous macadam

Dark brown to black CLAY (CL), medium stiff,moist, with some gravel

Dark Gray and brown Gravelly SAND (SW)

Light blue Gray CLAY (CL), stiff, wet, with minor gravel
Very slight odor of gasoline

Dark brown CLAY (CL), soft, wet, with minor gravel
No odor

Gray brown CLAY (CL), stiff, wet, with gravel
No odor

Brown CLAY (CL), soft,wet, with minor gravel
No odor

TD Boring @ 20 feet

Light Duty Steel Well-Head Box (with bolted cover and O-ring seal Set in concrete)

Portland Cement Grout

Prefabricated Self-expanding Bentonite Seal

▼ 05/19/04

0.75-in. Dia PVC Well Casing with 0.02-in. aperture Machine-cut slots

No.3 Monterey Sand Filter

Threaded Casing Cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MWT-2**

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 45.28 ft.

Surface Elevation: 45.70 ft.

Depth to Water: 7.69 ft.

Date Installed: 04/02/04

Total depth of Boring: 20 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20 ft.

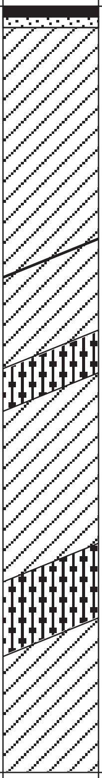
Casing Material: PVC

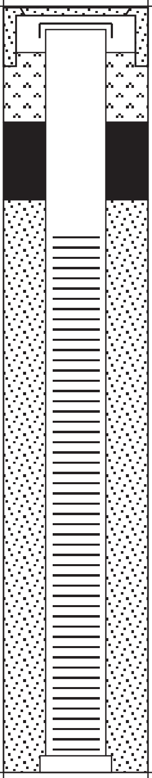
Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Paul Rogers

Logged By: Steve Flexser





Depth (Feet)	Sample 2.5 | 2.0 | 0.75	Blows/ Foot	Graphic Log	Description	Well Construction
0				2 inches bituminous macadam 2 inches loose sand Black CLAY (CL), medium stiff, moist No odor	Light Duty Steel Well-Head Box (with bolted cover and O-ring seal Set in concrete)
2					Portland Cement Grout
4	MWT-2-5.5			Stiffening No odor	Prefabricated Self-expanding Bentonite Seal
6				Gray CLAY (CL), medium stiff, with some gravel Slight odor of gasoline	
8				Increasing gravel with depth, strong odor of gasoline Gray Silty SAND (SM), medium dense, moist, with black clayey inclusions, gravel Little or no odor	▼ 05/19/04 0.75-in. Dia PVC Well Casing with 0.02-in. aperture Machine-cut slots
10	MWT-2-10.0			Light blue-Gray CLAY (CL), stiff, moist, with some fine gravel Slight odor	
12				Increasing odor of gasoline with depth	No.3 Monterey Sand Filter
14	MWT-2-15.0			Brown Silty SAND (SM), medium dense, moist, with inclusions of Gray Clay, yellow fine sand, gravel and shiny black grains or coatings. Moderate odor of gasoline	
16				Gray brown mottled CLAY (CL),stiff, moist, with sparse sand and gravel Moderate odor of gasoline	
18				No odor to very slight odor of gasoline	
20	MWT-2-20.0			TD Boring @ 20 feet	Threaded Casing Cap
22					
24					
26					
28					
30					

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: MWT-3

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 47.64 ft.

Surface Elevation: 47.93 ft.

Depth to Water: 7.64 ft.

Date Installed: 04/02/04

Total depth of Boring: 20 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20 ft.

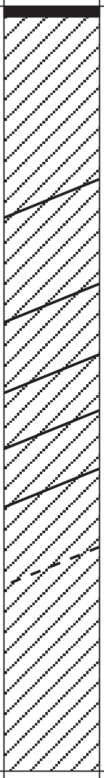
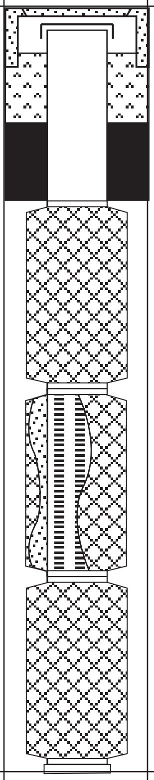
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Paul Rogers

Logged By: Steve Flexser

Depth (Feet)	Sample 2.5 | 2.0 | 0.75	Blows/ Foot	Graphic Log	Description	Well Construction
0 2 4 6 8 10 12 14 16 18 20	MWT-3-5.0 MWT-3-10.0 MWT-3-15.0 MWT-3-20.0			2 inches bituminous macadam Dark brown to black Silty CLAY (CL), soft, moist, with fine red fractures, minor sand and gravel No odor Light brown Silty CLAY (CL), soft, moist, with decreasing fractures, minor sand and gravel No odor Dark brown Silty CLAY (CL), medium stiff, moist, with decreasing fractures, minor sand and gravel No odor Gray Silty CLAY (CL), medium stiff, moist, with decreasing fractures, minor sand and gravel No odor Blue-Gray Silty CLAY (CL), medium stiff Very slight odor of petroleum hydrocarbons Brown Gravelly CLAY (CL), medium stiff, moist, with angular gravel and orange fine sand Moderate odor of petroleum hydrocarbons Brown-Gray mottled, with black staining, decreasing gravel No odor	 Light Duty Steel Well-Head Box (with bolted cover and O-ring seal Set in concrete) Portland Cement Grout Prefabricated Self-expanding Bentonite Seal ▼ 05/19/04 0.75 PVC Well Casing with 0.01in. aperture Machine-cut slots in Prefabricated Sand and Wire Mesh Filter Threaded Casing Cap
22 24 26 28 30				TD Boring @ 20 feet	

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: MWT-4

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 44.74 ft.

Surface Elevation: 45.15 ft.

Depth to Water: 8.43 ft.

Date Installed: 04/01/04

Total depth of Boring: 20 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20 ft.

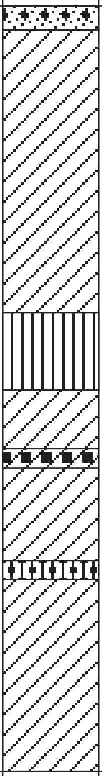
Casing Material: PVC

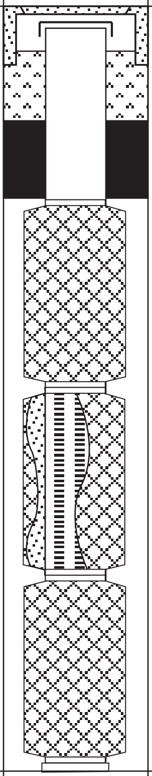
Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Paul Rogers

Logged By: Steve Flexser





Depth (Feet)	Sample 2.5 | 2.0 | 0.75	Blows/ Foot	Graphic Log	Description	Well Construction
0				4 inches GRAVEL (GP) road base Dark brown to black CLAY (CL), medium stiff, moist, with fine white and red cracks, some gravel No odor	Light Duty Steel Well-Head Box (with bolted cover and O-ring seal Set in concrete) Portland Cement Grout
2					
4	MWT-4-4.0				Prefabricated Self-expanding Bentonite Seal
6					
8				Dark brown SILT (ML), stiff, moist, with fine sand	▼ 05/19/04
10	MWT-4-10.0			Gray green Silty CLAY (CL), stiff, moist No odor	
12				Clayey GRAVEL (GC) Gray green Silty CLAY (CL), stiff, moist No odor	0.75 PVC Well Casing with 0.01in. aperture Machine-cut slots in Prefabricated Sand and Wire Mesh Filter
14	MWT-4-15.0			Slight solvent odor Gray Clayey SAND (SM)	
16				Gray and brown mottled CLAY (CL), stiff, moist, with orange sandy silty inclusions of gravel, and yellow sand Slight odor of petroleum hydrocarbons	
18					
20	MWT-4-20.0			No odor TD Boring @ 20 feet	Threaded Casing Cap
22					
24					
26					
28					
30					

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MWT-5**

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 47.10 ft.

Surface Elevation: 47.32 ft.

Depth to Water: 9.07 ft.

Date Installed: 04/02/04

Total depth of Boring: 20 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20 ft.

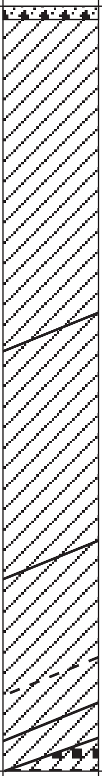
Casing Material: PVC

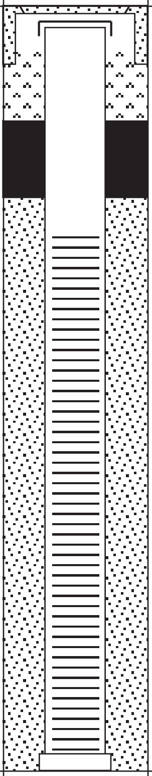
Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Paul Rogers

Logged By: Steve Flexser





Depth (Feet)	Sample 2.5 | 2.0 | 0.75	Blows/ Foot	Graphic Log	Description	Well Construction
0				2 inches GRAVEL (GP) road base	Light Duty Steel Well-Head Box (with bolted cover and O-ring seal Set in concrete)
				Dark brown to black Silty CLAY (CL), medium stiff, moist No odor	
2					Portland Cement Grout
4					Prefabricated Self-expanding Bentonite Seal
	MWT-5-5.0			Stiffening with depth	
6					
					0.75-in. Dia PVC Well Casing with 0.02-in. aperture Machine-cut slots
8				Light brown CLAY (CL), stiff, moist, with gravel and orange silt inclusions No odor	
					▼ 05/19/04
10	MWT-5-10.0				
					No.3 Monterey Sand Filter
12					
14				Gray and brown mottled CLAY (CL), stiff, moist, with minor gravel, root marks, interbedded gray sand and black clay No odor	
	MWT-5-15.0				
16					
				Soft, wet, with fine gravel No odor	
18				Brown CLAY (CL), soft, wet, decreasing gravel. No odor	
	MWT-5-20.0			Gravelly CLAY (GC)	Threaded Casing Cap
20				TD Boring @ 20 feet	
22					
24					
26					
28					
30					

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MWT-6**

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 45.16 ft.

Surface Elevation: 45.41 ft.

Depth to Water: 9.05 ft.

Date Installed: 04/01/04

Total depth of Boring: 19.5 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 19.5 ft.

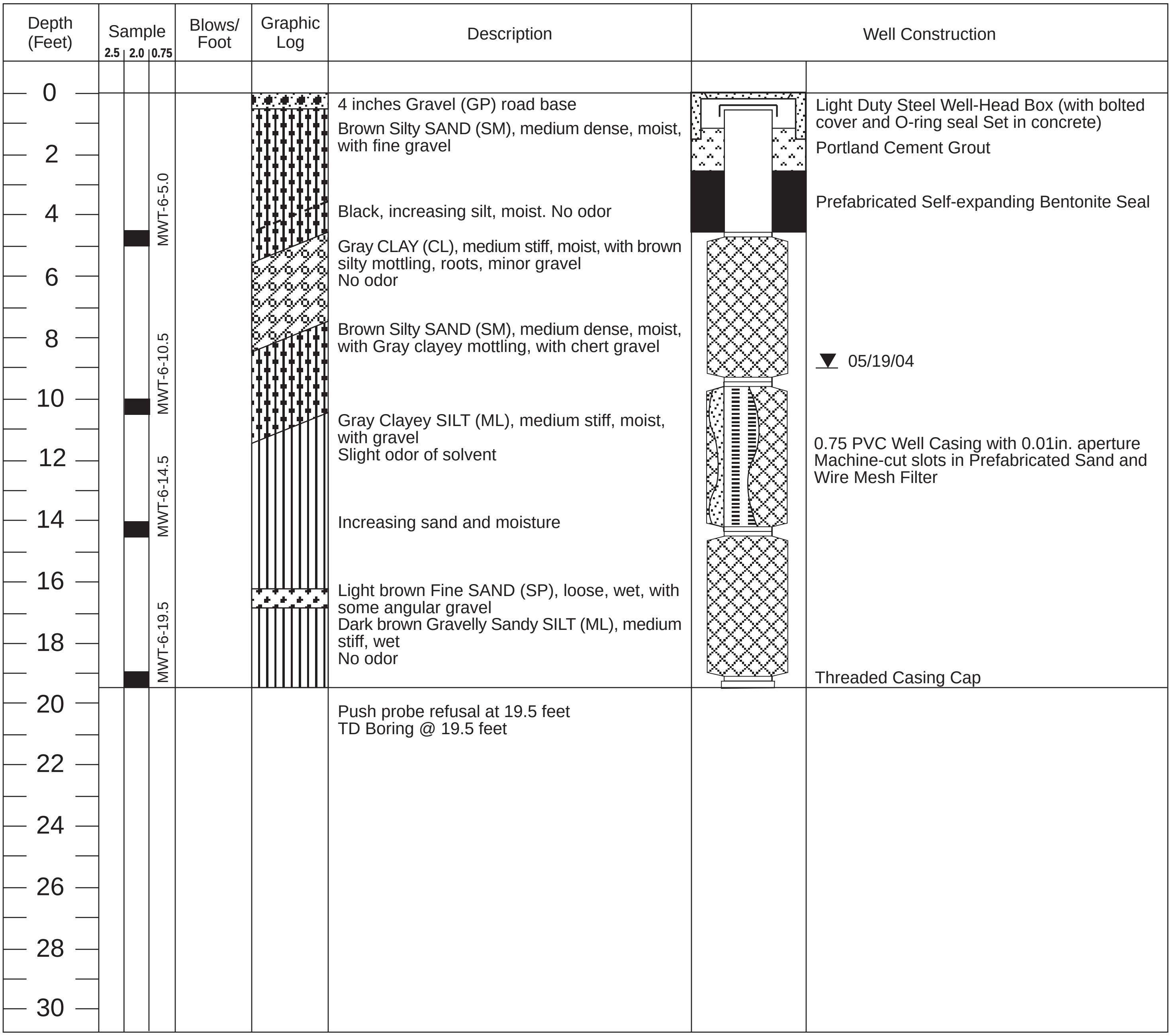
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Paul Rogers

Logged By: Steve Flexser



Description:

4 inches Gravel (GP) road base

Brown Silty SAND (SM), medium dense, moist, with fine gravel

Black, increasing silt, moist. No odor

Gray CLAY (CL), medium stiff, moist, with brown silty mottling, roots, minor gravel
No odor

Brown Silty SAND (SM), medium dense, moist, with Gray clayey mottling, with chert gravel

Gray Clayey SILT (ML), medium stiff, moist, with gravel
Slight odor of solvent

Increasing sand and moisture

Light brown Fine SAND (SP), loose, wet, with some angular gravel

Dark brown Gravelly Sandy SILT (ML), medium stiff, wet
No odor

Push probe refusal at 19.5 feet
TD Boring @ 19.5 feet

Well Construction:

Light Duty Steel Well-Head Box (with bolted cover and O-ring seal Set in concrete)

Portland Cement Grout

Prefabricated Self-expanding Bentonite Seal

▼ 05/19/04

0.75 PVC Well Casing with 0.01in. aperture Machine-cut slots in Prefabricated Sand and Wire Mesh Filter

Threaded Casing Cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MWT-7**

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 46.61 ft.

Surface Elevation: 45.43 ft.

Depth to Water: 9.90 ft.

Date Installed: 04/01/04

Total depth of Boring: 20 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20 ft.

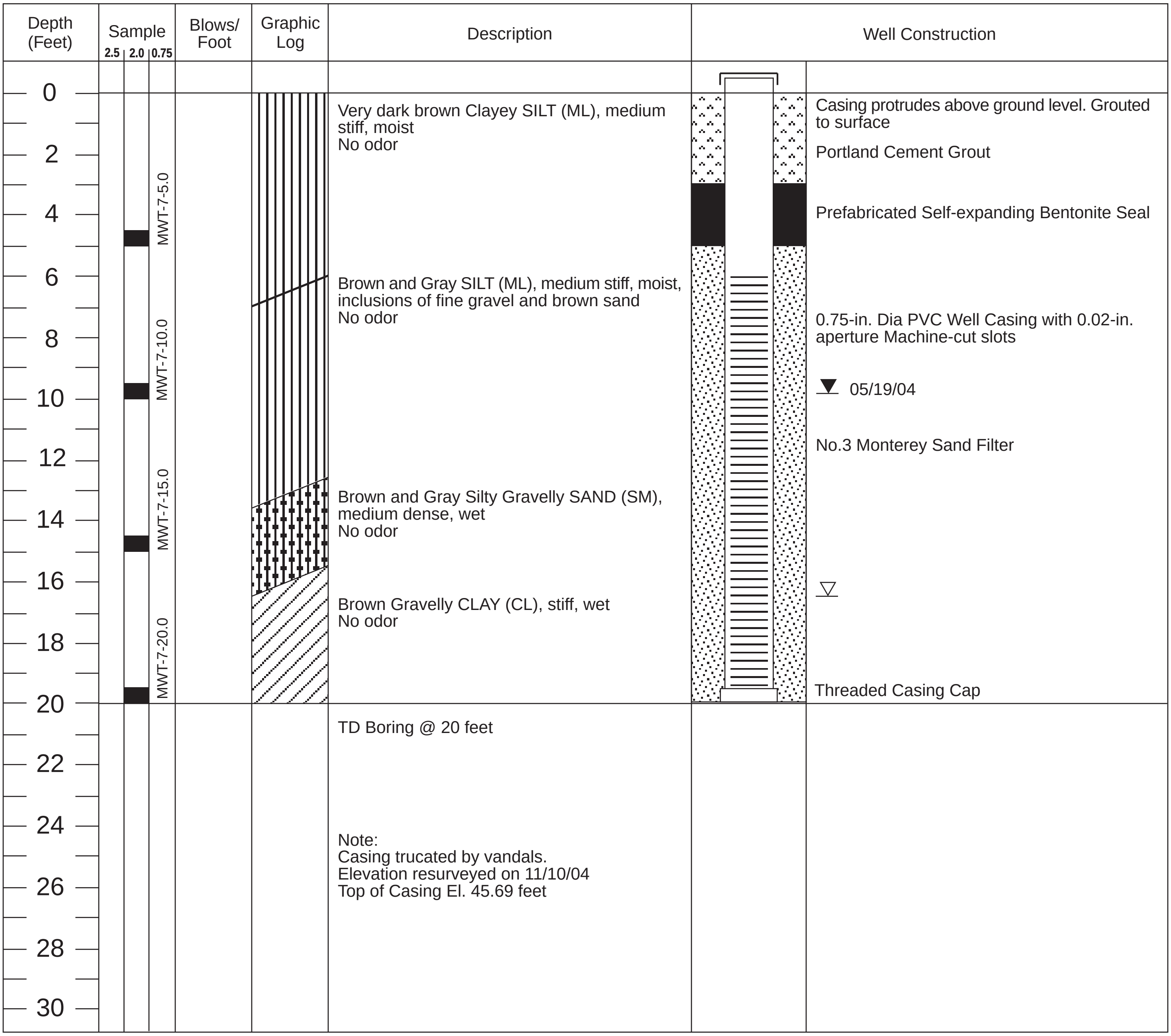
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Paul Rogers

Logged By: Steve Flexser



Depth (Feet)	Sample 2.5 | 2.0 | 0.75	Blows/ Foot	Graphic Log	Description	Well Construction
0				Very dark brown Clayey SILT (ML), medium stiff, moist No odor	Casing protrudes above ground level. Grouted to surface
2					Portland Cement Grout
4	MWT-7-5.0				Prefabricated Self-expanding Bentonite Seal
6				Brown and Gray SILT (ML), medium stiff, moist, inclusions of fine gravel and brown sand No odor	
8					0.75-in. Dia PVC Well Casing with 0.02-in. aperture Machine-cut slots
10	MWT-7-10.0				▼ 05/19/04
12					No.3 Monterey Sand Filter
14	MWT-7-15.0			Brown and Gray Silty Gravelly SAND (SM), medium dense, wet No odor	
16				Brown Gravelly CLAY (CL), stiff, wet No odor	▽
18					
20	MWT-7-20.0			TD Boring @ 20 feet	Threaded Casing Cap
22					
24				Note: Casing trucated by vandals. Elevation resurveyed on 11/10/04 Top of Casing El. 45.69 feet	
26					
28					
30					

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: MWT-8

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 47.23 ft.

Surface Elevation: 47.43 ft.

Depth to Water: 9.65 ft.

Date Installed: 04/02/04

Total depth of Boring: 18 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 18 ft.

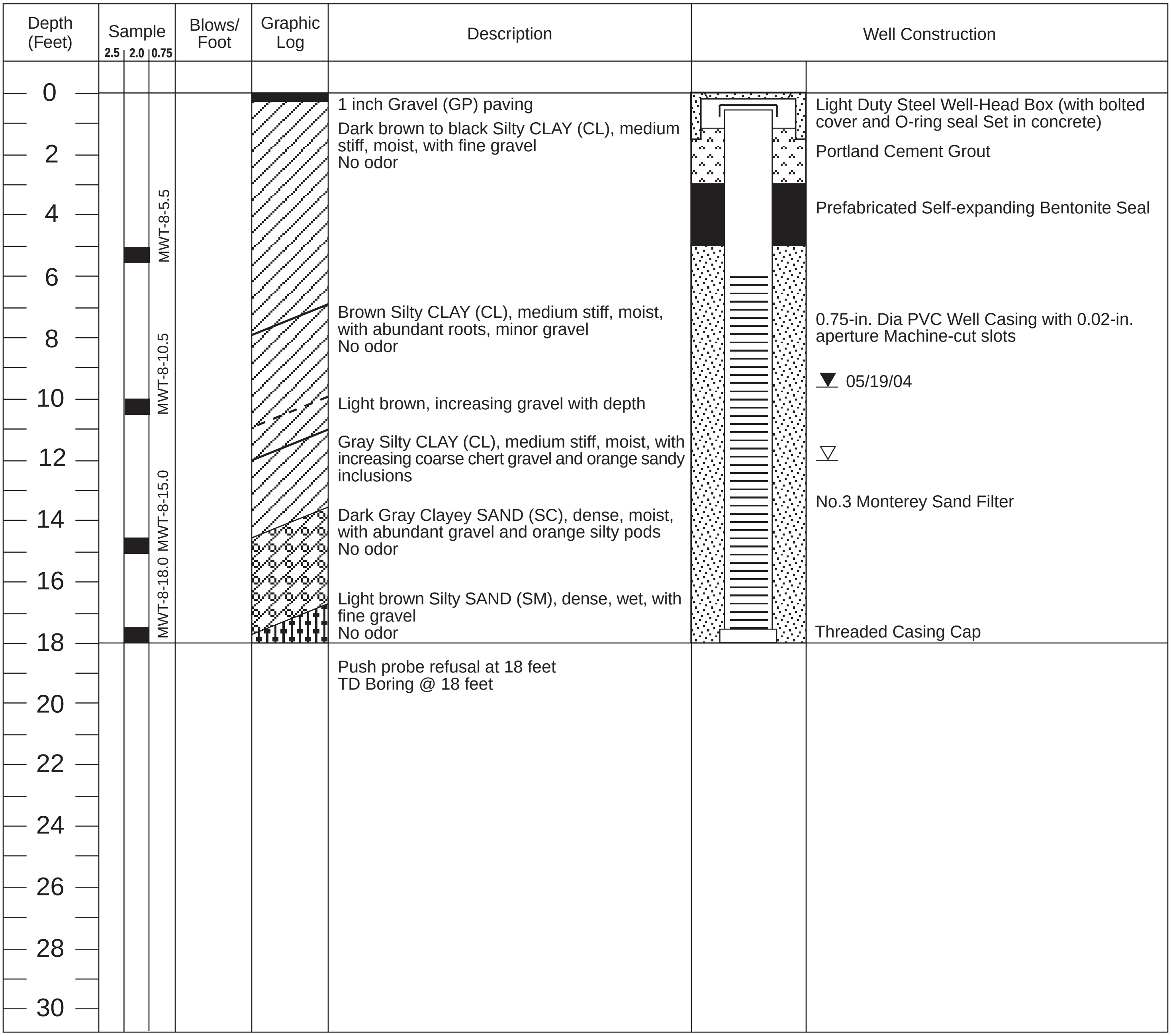
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Paul Rogers

Logged By: Steve Flexser



Description:

1 inch Gravel (GP) paving

Dark brown to black Silty CLAY (CL), medium stiff, moist, with fine gravel
No odor

Brown Silty CLAY (CL), medium stiff, moist, with abundant roots, minor gravel
No odor

Light brown, increasing gravel with depth

Gray Silty CLAY (CL), medium stiff, moist, with increasing coarse chert gravel and orange sandy inclusions

Dark Gray Clayey SAND (SC), dense, moist, with abundant gravel and orange silty pods
No odor

Light brown Silty SAND (SM), dense, wet, with fine gravel
No odor

Push probe refusal at 18 feet
TD Boring @ 18 feet

Well Construction:

Light Duty Steel Well-Head Box (with bolted cover and O-ring seal Set in concrete)

Portland Cement Grout

Prefabricated Self-expanding Bentonite Seal

0.75-in. Dia PVC Well Casing with 0.02-in. aperture Machine-cut slots

▼ 05/19/04

▽

No.3 Monterey Sand Filter

Threaded Casing Cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: MWT-9

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 45.78 ft.

Surface Elevation: 46.14 ft.

Depth to Water: 8.70 ft.

Date Installed: 04/01/04

Total depth of Boring: 20 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20 ft.

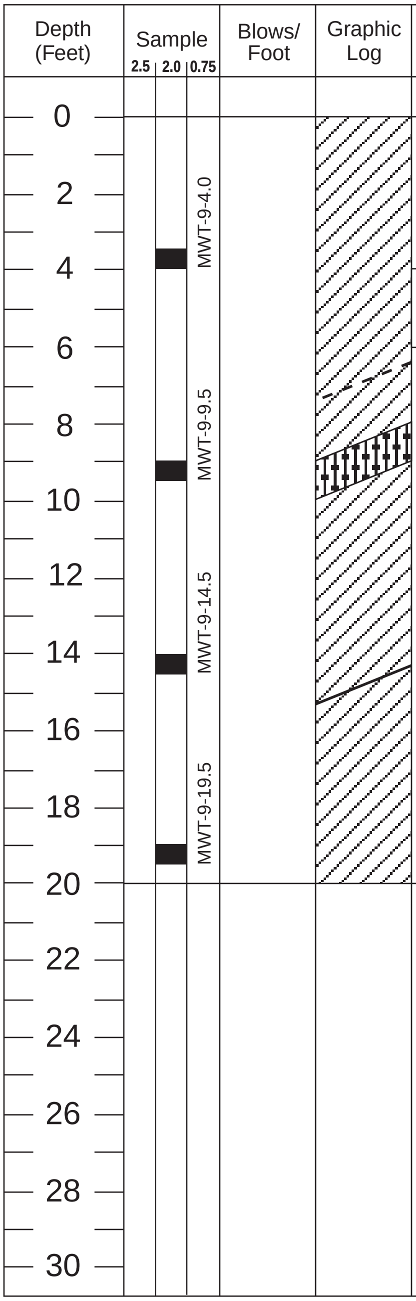
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Paul Rogers

Logged By: Steve Flexser



Description

Dark brown CLAY (CL), stiff, moist, with minor gravel, and thin sandy-gravelly intervals
No odor

Light brown mottling

Brown Silty SAND (SM), medium dense, moist
No odor

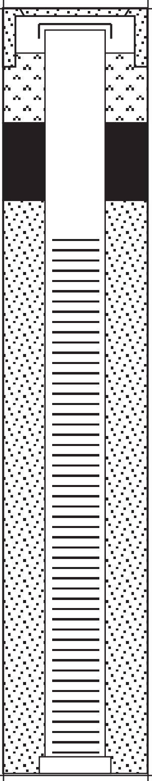
Light brown CLAY (CL), very stiff, moist, with gray mottling around roots
No odor

CLAY (CL), very stiff, moist, with coarse sand and gravel
No odor

CLAY (CL), very stiff, moist, with coarse sand and gravel
No odor

TD Boring @ 20 feet

Well Construction



Light Duty Steel Well-Head Box (with bolted cover and O-ring seal Set in concrete)

Portland Cement Grout

Prefabricated Self-expanding Bentonite Seal

▼ 05/19/04

0.75-in. Dia PVC Well Casing with 0.02-in. aperture Machine-cut slots

No.3 Monterey Sand Filter

Threaded Casing Cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MWT-10**

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 47.22 ft.

Surface Elevation: 47.38 ft.

Depth to Water: 9.53 ft.

Date Installed: 04/01/04

Total depth of Boring: 20 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20 ft.

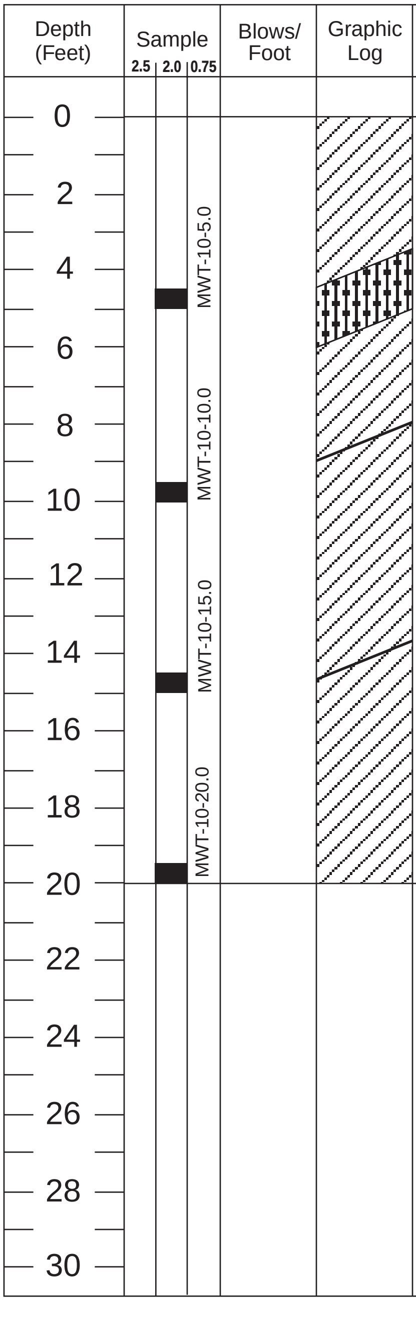
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Paul Rogers

Logged By: Steve Flexser



Description

Dark brown CLAY (CL), stiff, moist, with minor gravel (fill)
No odor

Dark brown Silty SAND (SM), medium dense, moist, with bottle glass (fill)
No odor

Brown CLAY (CL), very stiff, moist, with orange silty inclusions
No odor

Light brown CLAY (CL), very stiff, moist, abundant chert and black gravel
No odor

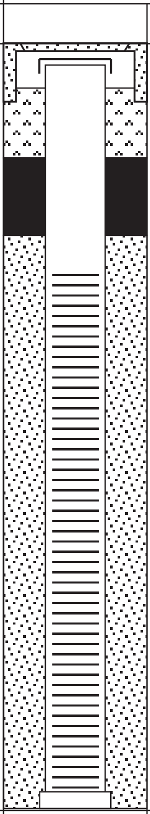
Decreasing gravel with depth

Dark brown CLAY (CL), very stiff, moist, with thin intervals of sandy gravelly clay
No odor

Color lightens with depth

TD Boring @ 20 feet

Well Construction



Light Duty Steel Well-Head Box (with bolted cover and O-ring seal Set in concrete)

Portland Cement Grout

Prefabricated Self-expanding Bentonite Seal

0.75-in. Dia PVC Well Casing with 0.02-in. aperture Machine-cut slots

▼ 05/19/04

No.3 Monterey Sand Filter

Threaded Casing Cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: MWT-11

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 46.63 ft.

Surface Elevation: 45.50 ft.

Depth to Water: 9.71 ft.

Date Installed: 11/05/04

Total depth of Boring: 20.0 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20.0 ft.

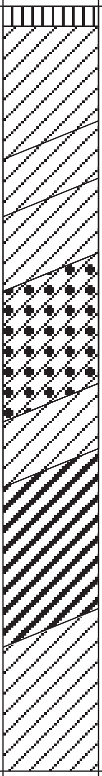
Casing Material: PVC

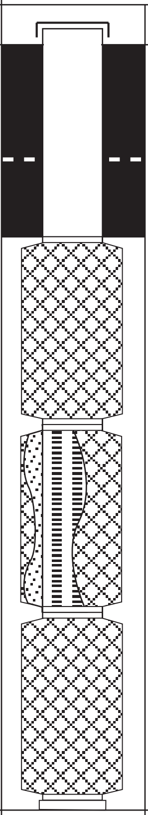
Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Jeramy Ness

Logged By: Dennis Alexander





Depth (Feet)	Sample 2.5 | 2.0 | 0.75	Blows/ Foot	Graphic Log	Description	Well Construction
0				Dark brown Sandy SILT (ML), very soft, moist, low plasticity. No odor Dark gray brown CLAY (CL), stiff, moist, high plasticity, with some fine sand, trace medium to coarse sand. No odor	Casing protrudes above ground level Bentonite Pellet Seal
2				Light gray and orange-brown mottled Gravelly CLAY (CL), very stiff, moist, medium plasticity, with some fine sand and angular to subrounded gravel to 3/4" dia. No odor	
4	MWT-11-5.0			Yellow-brown Gravelly CLAY (CL), very stiff, moist, medium plasticity, with increasing sand and gravel with depth. No odor	Prefabricated Self-expanding Bentonite Seal
6				Light gray to gray Clayey GRAVEL (GC), medium dense, moist, low plasticity, with little fine sand, poorly graded angular to rounded gravel to 1 in. dia. Odor of petroleum hydrocarbons	
8					
10	MWT-11-10.5			Gray Sandy CLAY (CL), stiff, moist, low to medium plasticity, with some fine sands, trace gravel to 1/2 in. dia. No odor	▼ 11/08/04
12				Olive brown and orange-brown mottled CLAY (CH), stiff to very stiff, moist, high plasticity, with little fine sand, trace medium to coarse sand No odor	0.75 PVC Well Casing with 0.01in. aperture Machine-cut slots in Prefabricated Sand and Wire Mesh Filter
14	MWT-11-14.5				
16				Odor of petroleum hydrocarbons Yellow brown, orange brown and dark brown mottled CLAY (CL), medium stiff to stiff, moist to wet, with little to some fine sand, trace angular to rounded gravel to 1/2 in. dia.	
18	MWT-11-19.5				Threaded Casing Cap
20				TD Boring @ 20 feet	
22					
24					
26					
28					
30					

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MWT-12**

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 47.97 ft.

Surface Elevation: 46.10 ft.

Depth to Water: 10.79 ft.

Date Installed: 11/05/04

Total depth of Boring: 20 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20 ft.

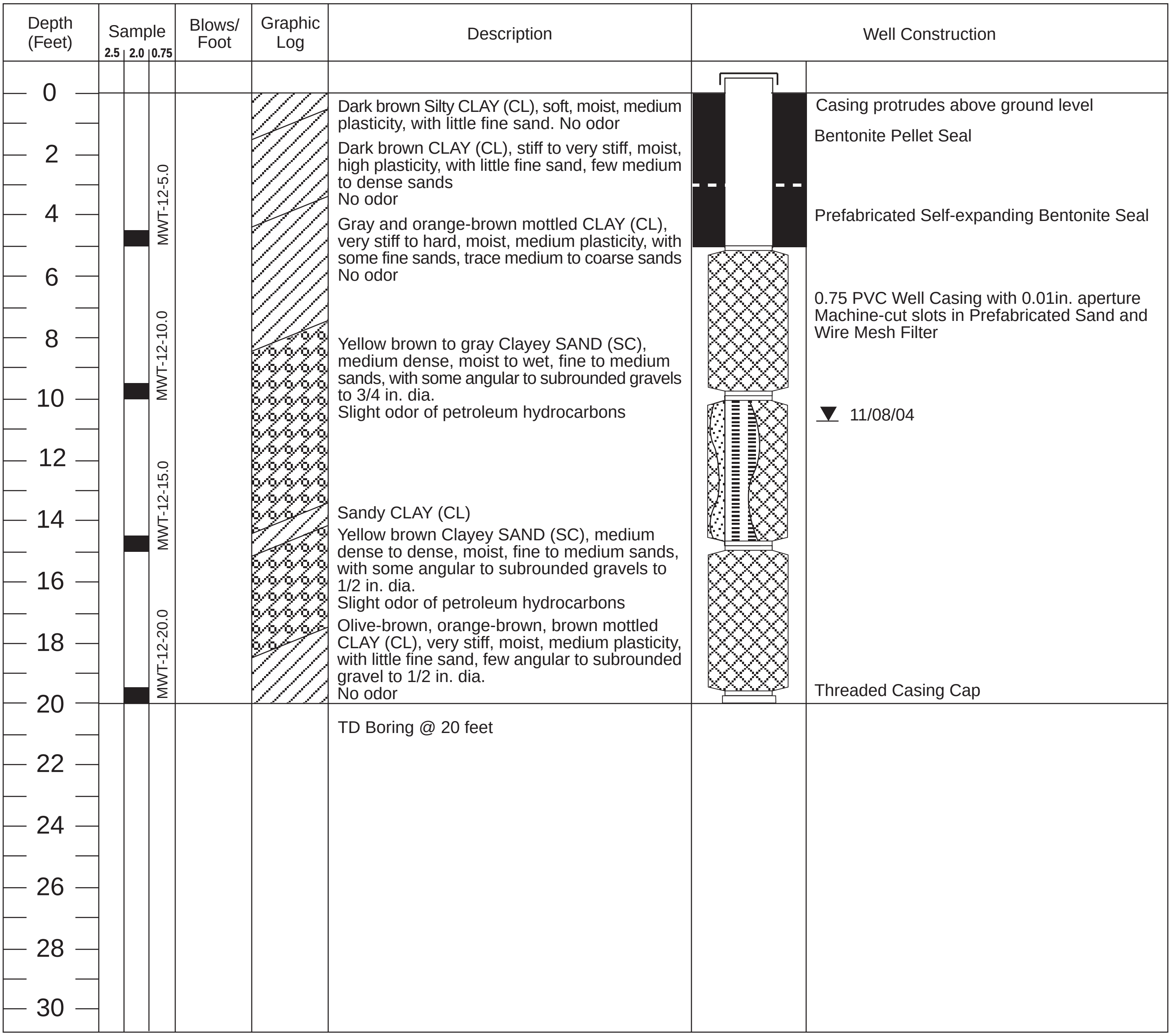
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Jeramy Ness

Logged By: Dennis Alexander



Dark brown Silty CLAY (CL), soft, moist, medium plasticity, with little fine sand. No odor

Dark brown CLAY (CL), stiff to very stiff, moist, high plasticity, with little fine sand, few medium to dense sands
No odor

Gray and orange-brown mottled CLAY (CL), very stiff to hard, moist, medium plasticity, with some fine sands, trace medium to coarse sands
No odor

Yellow brown to gray Clayey SAND (SC), medium dense, moist to wet, fine to medium sands, with some angular to subrounded gravels to 3/4 in. dia.
Slight odor of petroleum hydrocarbons

Sandy CLAY (CL)

Yellow brown Clayey SAND (SC), medium dense to dense, moist, fine to medium sands, with some angular to subrounded gravels to 1/2 in. dia.
Slight odor of petroleum hydrocarbons

Olive-brown, orange-brown, brown mottled CLAY (CL), very stiff, moist, medium plasticity, with little fine sand, few angular to subrounded gravel to 1/2 in. dia.
No odor

TD Boring @ 20 feet

Casing protrudes above ground level

Bentonite Pellet Seal

Prefabricated Self-expanding Bentonite Seal

0.75 PVC Well Casing with 0.01in. aperture Machine-cut slots in Prefabricated Sand and Wire Mesh Filter

▼ 11/08/04

Threaded Casing Cap

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MWT-13**

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 48.16 ft.

Surface Elevation: 46.30 ft.

Depth to Water: 10.65 ft.

Date Installed: 11/05/04

Total depth of Boring: 20 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20 ft.

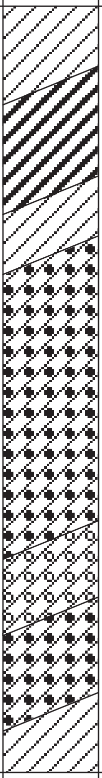
Casing Material: PVC

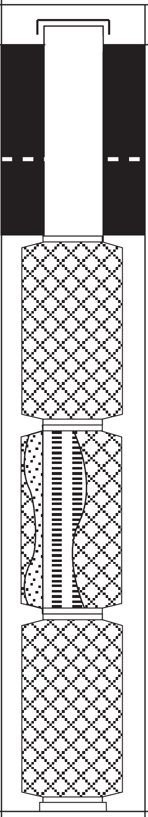
Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Jeramy Ness

Logged By: Dennis Alexander





Depth (Feet)	Sample 2.5 | 2.0 | 0.75	Blows/ Foot	Graphic Log	Description	Well Construction
0				Dark brown Silty CLAY (CL), soft to medium soft, moist, medium plasticity, little fine sand No odor	Casing protrudes above ground level Bentonite Pellet Seal
2 4	MWT-13-5.0			Dark brown CLAY (CH), stiff to very stiff, moist, high plasticity, with few to little fine sand, decreasing plasticity with depth No odor	Prefabricated Self-expanding Bentonite Seal
6				Gray and orange-brown mottled CLAY (CL), very stiff, moist, medium plasticity, with little to some fine sands No odor	
8 10 12	MWT-13-10.0			Yellow-brown to gray Clayey GRAVEL (GC), medium dense to dense, moist, low plasticity, with some fine sand, poorly graded angular to subrounded gravel to 1 in. dia. Slight odor of petroleum hydrocarbons	0.75 PVC Well Casing with 0.01in. aperture Machine-cut slots in Prefabricated Sand and Wire Mesh Filter ▼ 11/08/04
14	MWT-13-15.0			Gray to yellow brown Clayey SAND (SC), medium dense, wet, fine sands No odor	
16				Yellow-brown Clayey GRAVEL (GC), medium dense, wet, with some fine sands, poorly graded angular gravels to 1 in. dia. No odor	
18	MWT-13-20.0			Olive-brown, orange-brown mottled CLAY (CL), stiff, moist, medium plasticity, with little fine sand, trace angular to subrounded gravel to 1/2 in. dia. No odor	Threaded Casing Cap
20 22 24 26 28 30				TD Boring @ 20 feet	

The San Joaquin Company Inc.

Monitoring Well Log

WELL No.: **MWT-14**

Project: Oak Walk

Project No.: 0004.082

Owner: Bay Rock Residential LLC

Location: Emeryville, California

Top of Casing Elevation: 47.85 ft.

Surface Elevation: 47.80 ft.

Depth to Water: 9.63 ft.

Date Installed: 11/05/04

Total depth of Boring: 20.0 ft.

Boring Diameter: 2 in.

Well Casing Diameter: 0.75 in.

Total depth of Well: 20.0 ft.

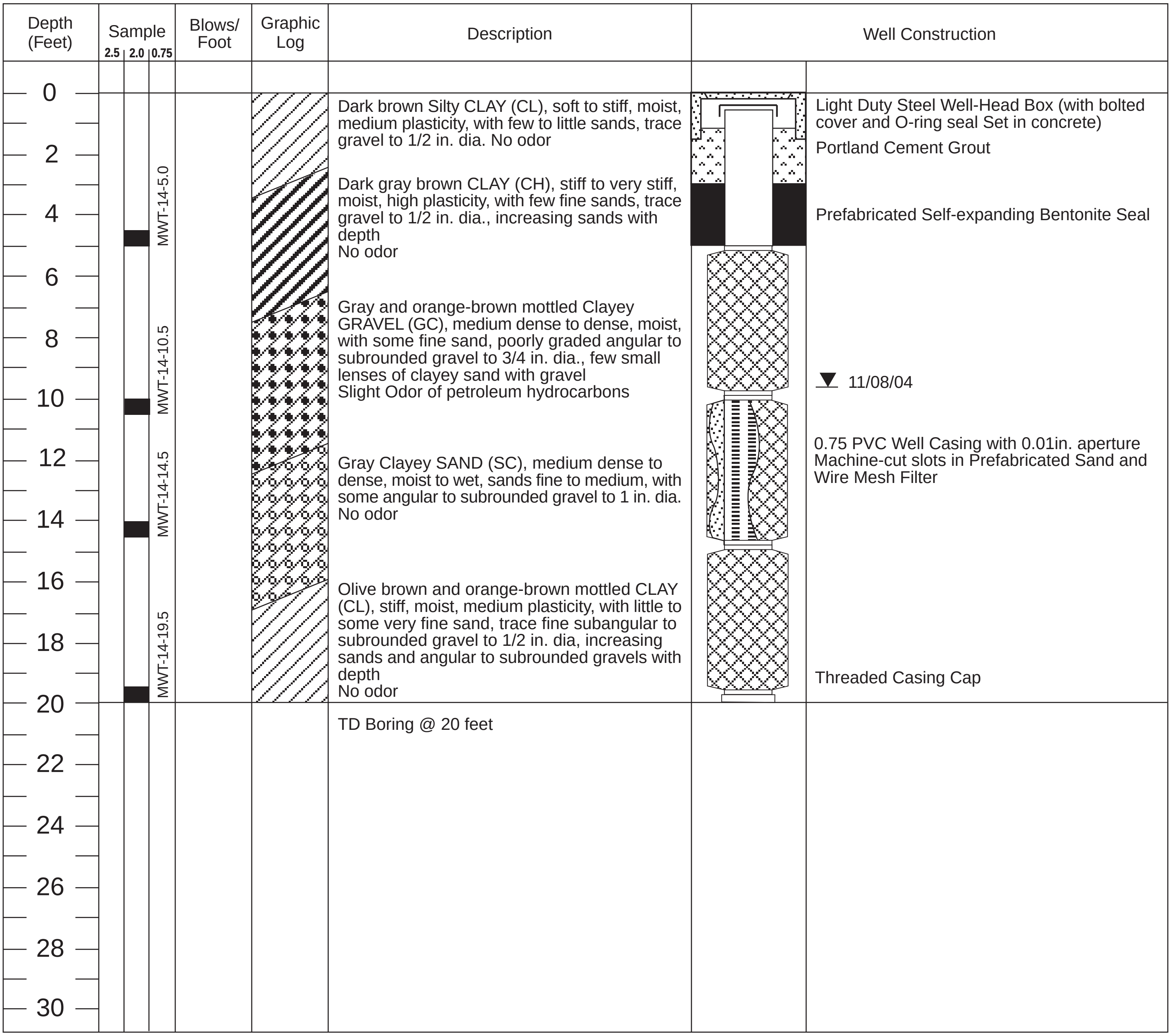
Casing Material: PVC

Drilling Company: Gregg Drilling & Testing

Drilling Method: Push Probe

Driller: Jeramy Ness

Logged By: Dennis Alexander



Dark brown Silty CLAY (CL), soft to stiff, moist, medium plasticity, with few to little sands, trace gravel to 1/2 in. dia. No odor

Dark gray brown CLAY (CH), stiff to very stiff, moist, high plasticity, with few fine sands, trace gravel to 1/2 in. dia., increasing sands with depth
No odor

Gray and orange-brown mottled Clayey GRAVEL (GC), medium dense to dense, moist, with some fine sand, poorly graded angular to subrounded gravel to 3/4 in. dia., few small lenses of clayey sand with gravel
Slight Odor of petroleum hydrocarbons

Gray Clayey SAND (SC), medium dense to dense, moist to wet, sands fine to medium, with some angular to subrounded gravel to 1 in. dia.
No odor

Olive brown and orange-brown mottled CLAY (CL), stiff, moist, medium plasticity, with little to some very fine sand, trace fine subangular to subrounded gravel to 1/2 in. dia, increasing sands and angular to subrounded gravels with depth
No odor

TD Boring @ 20 feet

The San Joaquin Company, Inc.

Boring Log

BORING No.: BG-1

Project: Oak Walk

Project No.: 0004.083

Location: Emeryville, California

Date Drilled: 04/06/04

Surface Elevation: 43.3 ft.

Boring Diameter: 8 in.

Drilling Method: Hollow Stem Auger

Groundwater Depth: 18 ft.

Hammer Weight: 140 lbs.

Logged By: Dennis Alexander

Total depth of Boring: 35.0 ft.

Hammer Drop: 30 in.

Depth (Feet)	Sampler Outside Dia. (in.) 3.0	2.5	2.0	Blows/ 6 In.	Water Content (%)	Dry Density (PCF)	Other Lab Data	Graphic Log	Description
0									3 inches Bituminous macadam Dark brown Silty Sandy GRAVEL (GM), dense, moist (fill)
1									Dark Gray-brown CLAY (CH), very stiff, moist, high plasticity, with few very fine to fine sands No odor
3	■			7 9 15	31.8	87.1			
4		■		6 9 11					Mottled Gray and brown CLAY (CH), very stiff, moist, with trace medium to coarse sands, and fine sands No odor
9	■			11 17 26	22.3	102.9	uc = 1.75ksf		Light Gray and brown CLAY (CH), very stiff, moist, hight plasticity, with few fine sands, some angular to subrounded medium to coarse sands and gravels to 3/4" diameter, trace shells Moderate gasoline odor
14	■			10 19 25	19.7	108.4	uc = 2.42ksf		Mottled yellow-brown and light blue Gray CLAY (CH), hard, moist, high plasticity, with vein of very fine to fine sands, trace of medium to coarse sands Slight gasoline odor
16									Gray-brown Sandy CLAY (CL), very stiff, moist, medium plasticity, with some fine sands, trace medium to coarse sands No odor
18									▽
19	■			10 13 16	23.8	101.7	<200 = 66.2% LL = 42% PI = 24%		
20									

The San Joaquin Company, Inc.

Boring Log

BORING No.: BG-1

Project: Oak Walk

Project No.: 0004.083

Location: Emeryville, California

Date Drilled: 04/06/04

Surface Elevation: 43.3 ft.

Boring Diameter: 8 in.

Drilling Method: Hollow Stem Auger

Groundwater Depth: 18 ft.

Hammer Weight: 140 lbs.

Logged By: Dennis Alexander

Total depth of Boring: 35.0 ft.

Hammer Drop: 30 in.

Depth (Feet)	Sampler Outside Dia. (in.) 3.0 | 2.5 | 2.0	Blows/ 6 In.	Water Content (%)	Dry Density (PCF)	Other Lab Data	Graphic Log	Description
20						▨	Gray-brown Sandy CLAY (CL), very stiff, moist, medium plasticity, with some fine sands, trace medium to coarse sand No odor
21						▨	
22						▨	
23						▨	Increasing sands and gravels to 23.5 feet
24	■	17 27 36	20.6	106.0	uc = 4.05ksf	▨	Mottled yellow-brown and light Gray CLAY (CL), hard, moist, medium plasticity, with little to some fine sands, small lenses of angular to round gravels to 3/4" diameter No odor
25						▨	
26						▨	
27						▥	Yellow-brown Clayey SILT (ML), hard, moist, low to medium plasticity, with little to some very fine sands No odor
28						▥	
29	■	17 24 36	23.1	104.4		○	Yellow-brown Gravelly SAND (SW), dense, wet, non-plastic, well graded, with some subangular to rounded gravels to 1" diameter No odor
30						○	
31						○	
32						▨	Yellow-brown CLAY (CL), very stiff, moist, medium plasticity, with little very fine to fine sands No odor
33						▨	
34	■	11 13 15	29.6	94.5		▨	
35							TD Boring at 35 feet
36							
37							
38							
39							
40							

The San Joaquin Company, Inc.

Boring Log

BORING No.: **BG-2**

Project: Oak Walk

Project No.: 0004.083

Location: Emeryville, California

Date Drilled: 04/06/04

Surface Elevation: 46.5 ft.

Boring Diameter: 8 in.

Drilling Method: Hollow Stem Auger

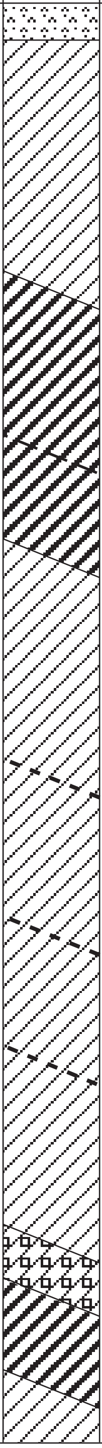
Groundwater Depth: 14.5 ft.

Hammer Weight: 140 lbs.

Logged By: Dennis Alexander

Total depth of Boring: 30.0 ft.

Hammer Drop: 30 in.



Depth (Feet)	Sampler Outside Dia. (in.) 3.0 | 2.5 | 2.0	Blows/ 6 In.	Water Content (%)	Dry Density (PCF)	Other Lab Data	Graphic Log	Description
0							6 inches concrete
1							Dark Gray brown Silty CLAY (CL), very stiff, moist, medium plasticity, with little fine sands, trace fine gravel to 1/2" diameter No odor
3	3.0	4 10 16	25.4	97.5			
4							Dark brown CLAY (CH), very stiff, moist, high plasticity, with little fine sands, few medium to coarse sands, trace angular to subrounded gravels to 3/4" diameter No odor
5	2.5	8 11 12					
6	3.0	9 22 28	18.7 25.7	109.0 97.7	uc = 1.23ksf perm = 2.51 E-9cm/sec		Dark brown CLAY (CH), hard, moist, high plasticity, with little fine sands, few medium to coarse sands, trace angular to subrounded gravels to 3/4" diameter No odor
8	Shelby 26"		21.0	96.5	Consol.		Gray Lean Sandy CLAY (CL), very stiff, moist, medium plasticity, with some fine sands, little medium to coarse sands, few fine gravels to 1/2" diameter Gasoline odor
11	2.5	14 19 25					Mottled light gray and brown Sandy CLAY (CL), hard, moist, medium plasticity, with some fine sands, increasing subangular gravels to few up to 1" diameter Gasoline odor
12	Shelby 15"		20.7	99.4	Consol.		
13							Mottled brown and gray Sandy CLAY (CL), hard, moist, medium plasticity, increasing sands with depth No odor
15	2.5	14 15 21					▽ Mottled brown and gray Sandy CLAY (CL), hard, moist, medium plasticity, with some fine sands, few medium to coarse sands, some fine angular to rounded gravels to 1/2" diameter No odor
18	3.0	7 8 9	24.1	101.2	<200 = 34.8% LL = 34% PI = 17%		Yellow-brown with light gray streaks CLAYEY SAND (SC), medium dense, moist, medium plasticity, with little subangular to rounded gravels to 3/4" diameter No odor Lens of (CH) at 18.5-19.5'
20							

The San Joaquin Company, Inc.

Boring Log

BORING No.: **BG-2**

Project: Oak Walk

Project No.: 0004.083

Location: Emeryville, California

Date Drilled: 04/06/04

Surface Elevation: 46.5 ft.

Boring Diameter: 8 in.

Drilling Method: Hollow Stem Auger

Groundwater Depth: 18 ft.

Hammer Weight: 140 lbs.

Logged By: Dennis Alexander

Total depth of Boring: 30.0 ft.

Hammer Drop: 30 in.

Depth (Feet)	Sampler Outside Dia. (in.) 3.0	2.5	2.0	Blows/ Foot	Water Content (%)	Dry Density (PCF)	Other Lab Data	Graphic Log	Description
20								▨	Interbedded lenses of yellow-brown CLAY (CH) and CLAY (CL), hard, moist, medium to high plasticity, with few to some fine sands, trace medium to coarse sand, trace to few angular to subrounded gravel up to 1/2" diameter No odor
21		■		8 13 17				▨	
22								▨	
23								▨	
24	■			17 20 33	26.3	98.3		▨	
25								▨	
26								▨	
27								▨	
28								▨	Yellow-brown CLAY (CH), hard, moist, high plasticity, with few very fine to fine sands No odor
29	■			10 17 26	24.4	100.7		▨	
30									TD Boring at 30 feet
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

The San Joaquin Company, Inc.

Boring Log

BORING No.: **BE-1**

Project: Oak Walk

Project No.: 0004.082

Location: Emeryville, California

Date Drilled: 04/02/04

Surface Elevation: 44.9 ft.

Boring Diameter: 2 in.

Drilling Method: Push Probe

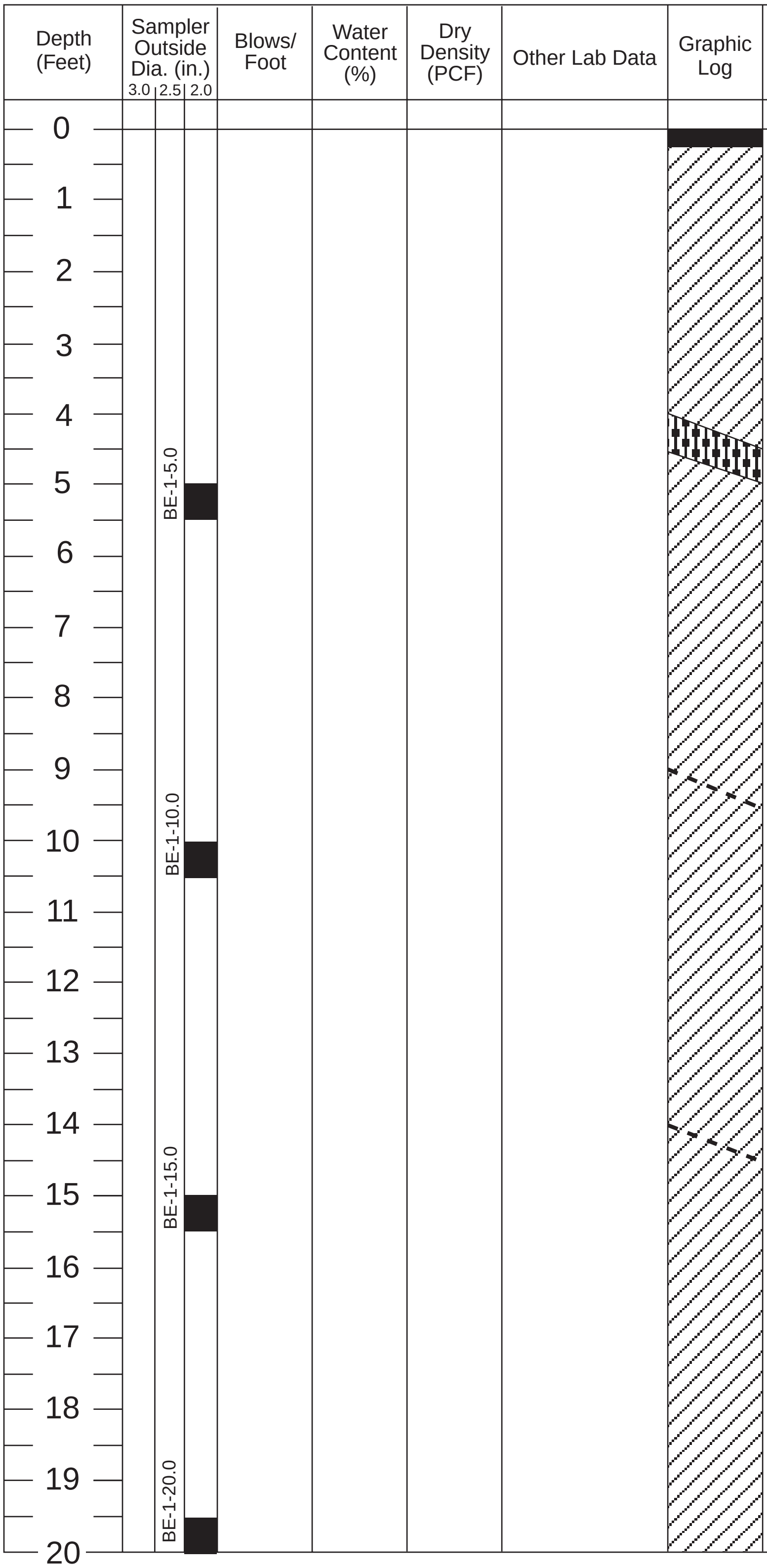
Groundwater Depth: n.a. ft.

Hammer Weight: n.a. lbs.

Logged By: Steve Flexser

Total depth of Boring: 25.0 ft.

Hammer Drop: n.a. in.



Description

3 inches bituminous macadam

Black CLAY (CL), medium stiff, moist, with little gravel
No odor

Dark Gray-brown Silty SAND (SM), loose, dry
No odor

Black CLAY (CL), medium stiff, moist, with little gravel
very slight odor of fuel hydrocarbons

Strong odor of fuel hydrocarbons

Black CLAY (CL), medium stiff, moist, with interbedded layers of Gray-green fine sand, gravel and weathered chert
No odor

Gray and light brown Gravelly CLAY (CL), very stiff, moist, with coarse gravel and inclusions of red sand
Very slight fuel odor

The San Joaquin Company, Inc.

Boring Log

BORING No.: **BE-1**

Project: Oak Walk

Project No.: 0004.083

Location: Emeryville, California

Date Drilled: 04/02/04

Surface Elevation: 44.9 ft.

Boring Diameter: 2 in.

Drilling Method: Push Probe

Groundwater Depth: n.a. ft.

Hammer Weight: n.a. lbs.

Logged By: Steve Flexser

Total depth of Boring: 25.0 ft.

Hammer Drop: n.a. in.

Depth (Feet)	Sampler Outside Dia. (in.) 3.0	2.5	2.0	Blows/ Foot	Water Content (%)	Dry Density (PCF)	Other Lab Data	Graphic Log	Description
20								▨	Gray and light brown Gravelly CLAY (CL), very stiff, moist, with coarse gravel and inclusions of red sand. With increasing gravel and sand with depth No odor
21								▨	
22								▨	
23								▨	
24		BE-1-25.0	■					▨	No odor
25									TD Boring at 25 feet
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

The San Joaquin Company, Inc.

Boring Log

BORING No.: **BE-2**

Project: Oak Walk

Project No.: 0004.082

Location: Emeryville, California

Date Drilled: 04/02/04

Surface Elevation: 46.6 ft.

Boring Diameter: 2 in.

Drilling Method: Push Probe

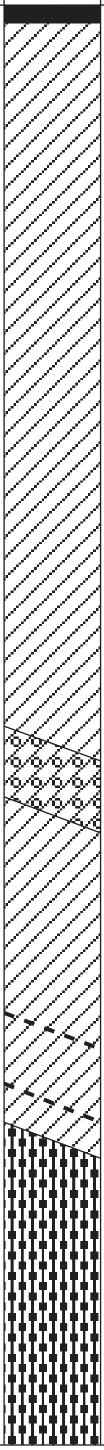
Groundwater Depth: n.a. ft.

Hammer Weight: n.a. lbs.

Logged By: Steve Flexser

Total depth of Boring: 25.0 ft.

Hammer Drop: n.a. in.

Depth (Feet)	Sampler Outside Dia. (in.) 3.0 | 2.5 | 2.0	Blows/ Foot	Water Content (%)	Dry Density (PCF)	Other Lab Data	Graphic Log	Description
0							3 inches bituminous macadam Black CLAY (CL), medium stiff, moist, with thin interbedded layers of coarse brown Sand and fine Gravel Very slight odor of fuel hydrocarbons
1							
2							
3							
4							Moderate odor of fuel hydrocarbons
5	BE-2-5.0						
6							
7							
8							
9							
10	BE-2-10.0						
11							Gray and orange Clayey SAND (SC), loose, wet
12							Gray and light brown CLAY (CL), soft, wet, with fine subrounded gravel Moderate odor of fuel hydrocarbons
13							
14							Gray-green CLAY (CL), medium stiff, wet, with interbedded layers of orange and black clay Slight odor of fuel hydrocarbons
15	BE-2-15.0						Gray-green CLAY (CL), stiff, wet, with abundant gravel Slight odor of fuel hydrocarbons
16							Silty SAND (SM), medium dense, wet, with interbedded layers of clay and multi-colored gravel Slight odor of fuel hydrocarbons
17							
18							
19							Moderate odor of fuel hydrocarbons
20	BE-2-20.0						

The San Joaquin Company, Inc.

Boring Log

BORING No.: BE-2

Project: Oak Walk

Project No.: 0004.083

Location: Emeryville, California

Date Drilled: 04/02/04

Surface Elevation: 46.6 ft.

Boring Diameter: 2 in.

Drilling Method: Push Probe

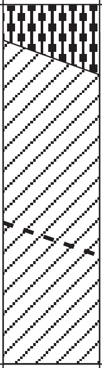
Groundwater Depth: n.a. ft.

Hammer Weight: n.a. lbs.

Logged By: Steve Flexser

Total depth of Boring: 25.0 ft.

Hammer Drop: n.a. in.

Depth (Feet)	Sampler Outside Dia. (in.)			Blows/ Foot	Water Content (%)	Dry Density (PCF)	Other Lab Data	Graphic Log	Description
	3.0	2.5	2.0						
20									
21									Light brown CLAY (CL), medium stiff, wet, with sandy inclusions Very slight odor of fuel hydrocarbons
22									
23									
24		BE-2-25.0	■						Light brown CLAY (CL), soft, wet, with rounded gravel, minor sand, and some black vitreous inclusions No Odor
25									TD Boring at 25 feet
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

The San Joaquin Company, Inc.

Boring Log

BORING No.: BE-3

Project: Oak Walk

Project No.: 0004.082

Location: Emeryville, California

Date Drilled: 04/02/04

Surface Elevation: 48.5 ft.

Boring Diameter: 2 in.

Drilling Method: Push Probe

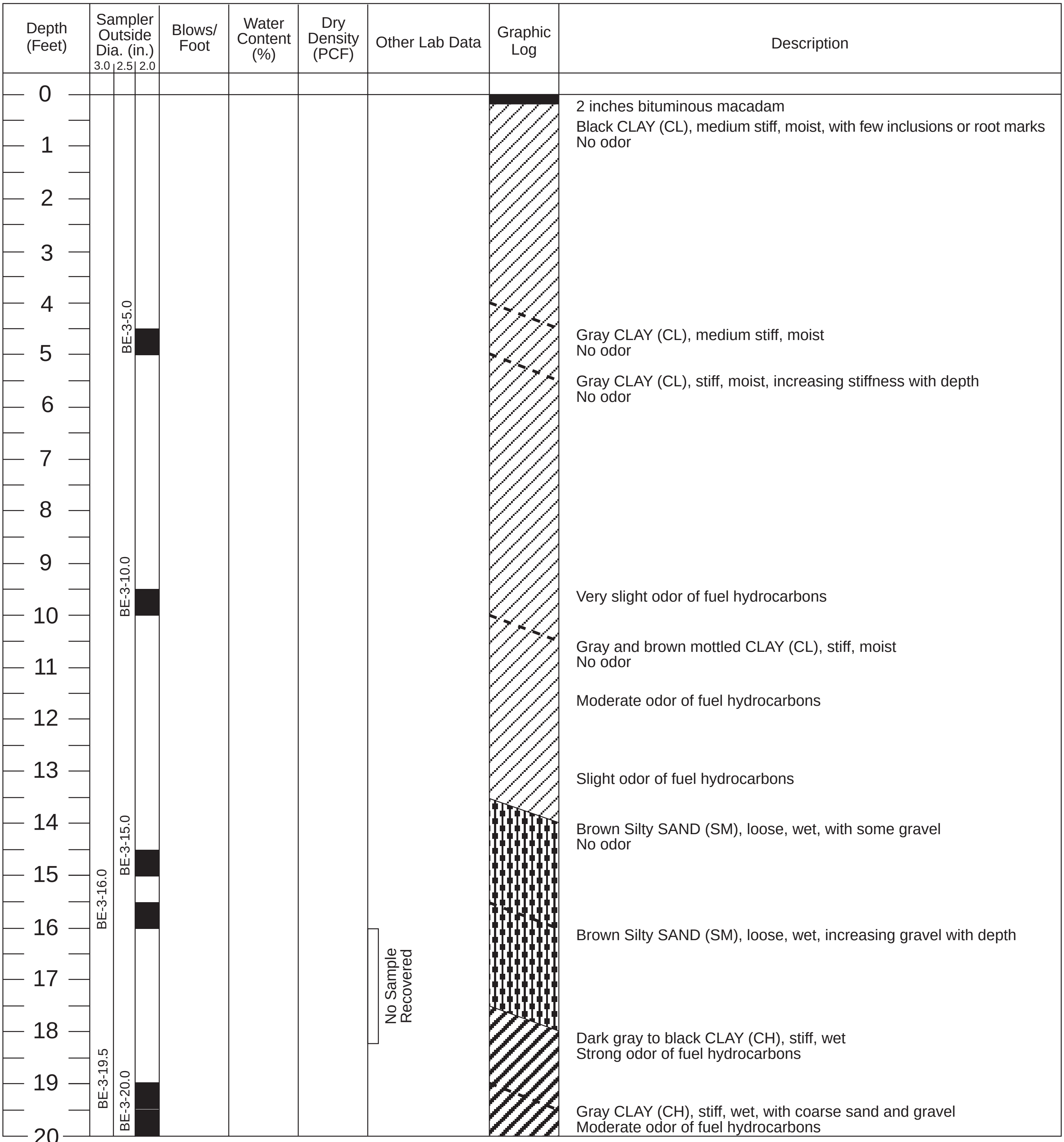
Groundwater Depth: n.a. ft.

Hammer Weight: n.a. lbs.

Logged By: Steve Flexser

Total depth of Boring: 20.0 ft.

Hammer Drop: n.a. in.



2 inches bituminous macadam

Black CLAY (CL), medium stiff, moist, with few inclusions or root marks
No odor

Gray CLAY (CL), medium stiff, moist
No odor

Gray CLAY (CL), stiff, moist, increasing stiffness with depth
No odor

Very slight odor of fuel hydrocarbons

Gray and brown mottled CLAY (CL), stiff, moist
No odor

Moderate odor of fuel hydrocarbons

Slight odor of fuel hydrocarbons

Brown Silty SAND (SM), loose, wet, with some gravel
No odor

Brown Silty SAND (SM), loose, wet, increasing gravel with depth

Dark gray to black CLAY (CH), stiff, wet
Strong odor of fuel hydrocarbons

Gray CLAY (CH), stiff, wet, with coarse sand and gravel
Moderate odor of fuel hydrocarbons

TD Boring @ 20 feet

The San Joaquin Company, Inc.

Boring Log

BORING No.: **BE-4**

Project: Oak Walk

Project No.: 0004.082

Location: Emeryville, California

Date Drilled: 04/01/04

Surface Elevation: 44.6 ft.

Boring Diameter: 2 in.

Drilling Method: Push Probe

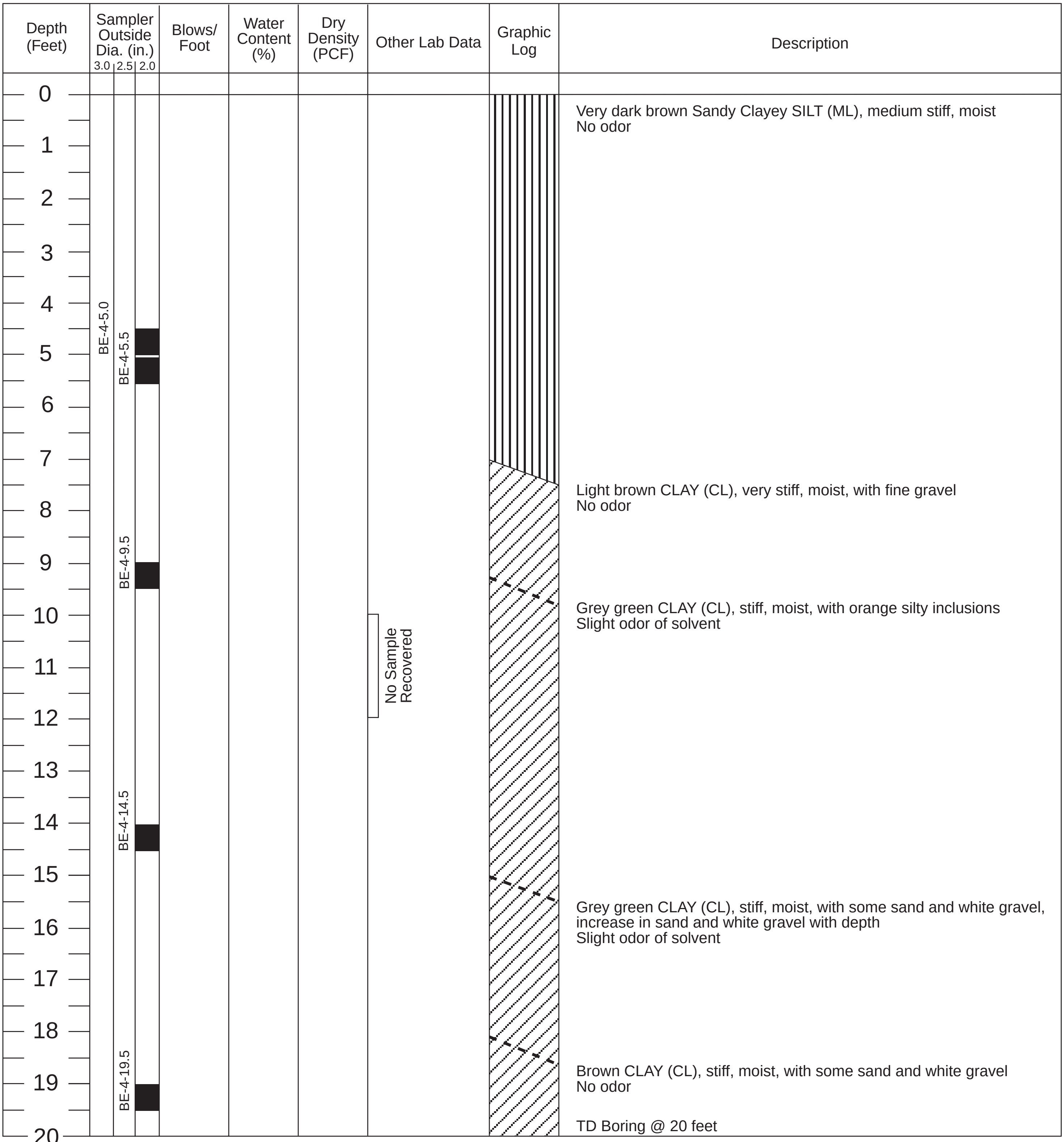
Groundwater Depth: n.a. ft.

Hammer Weight: n.a. lbs.

Logged By: Steve Flexser

Total depth of Boring: 20.0 ft.

Hammer Drop: n.a. in.



Very dark brown Sandy Clayey SILT (ML), medium stiff, moist
No odor

Light brown CLAY (CL), very stiff, moist, with fine gravel
No odor

Grey green CLAY (CL), stiff, moist, with orange silty inclusions
Slight odor of solvent

Grey green CLAY (CL), stiff, moist, with some sand and white gravel, increase in sand and white gravel with depth
Slight odor of solvent

Brown CLAY (CL), stiff, moist, with some sand and white gravel
No odor

TD Boring @ 20 feet

The San Joaquin Company, Inc.

Boring Log

BORING No.: BE-5

Project: Oak Walk

Project No.: 0004.082

Location: Emeryville, California

Date Drilled: 04/01/04

Surface Elevation: 43.8 ft.

Boring Diameter: 2 in.

Drilling Method: Push Probe

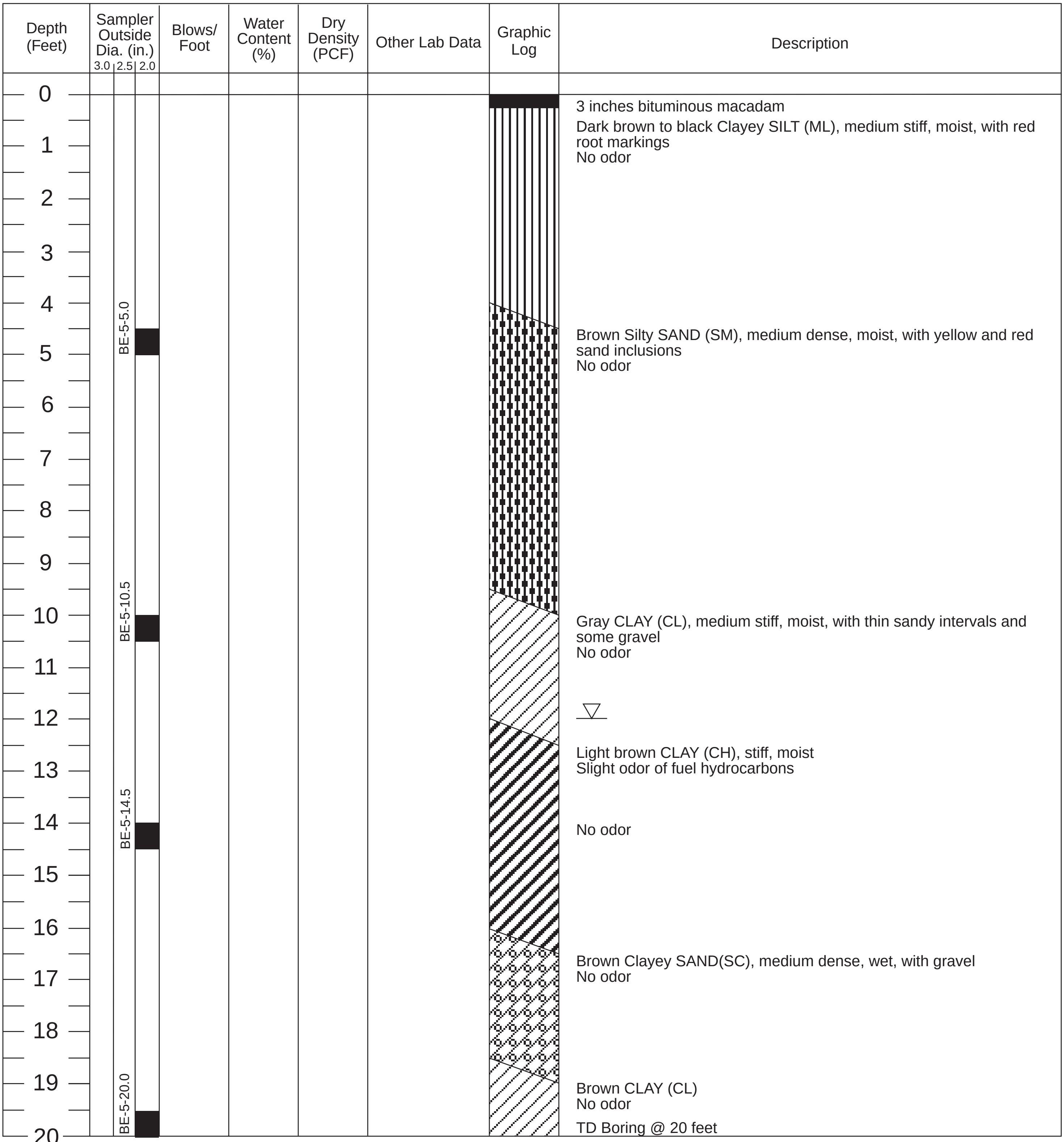
Groundwater Depth: 12 ft.

Hammer Weight: n.a. lbs.

Logged By: Steve Flexser

Total depth of Boring: 20.0 ft.

Hammer Drop: n.a. in.



3 inches bituminous macadam

Dark brown to black Clayey SILT (ML), medium stiff, moist, with red root markings
No odor

Brown Silty SAND (SM), medium dense, moist, with yellow and red sand inclusions
No odor

Gray CLAY (CL), medium stiff, moist, with thin sandy intervals and some gravel
No odor

▽

Light brown CLAY (CH), stiff, moist
Slight odor of fuel hydrocarbons

No odor

Brown Clayey SAND(SC), medium dense, wet, with gravel
No odor

Brown CLAY (CL)
No odor

TD Boring @ 20 feet

The San Joaquin Company, Inc.

Boring Log

BORING No.: BE-6

Project: Oak Walk

Project No.: 0004.082

Location: Emeryville, California

Date Drilled: 04/01/04

Surface Elevation: 43.9 ft.

Boring Diameter: 2 in.

Drilling Method: Push Probe

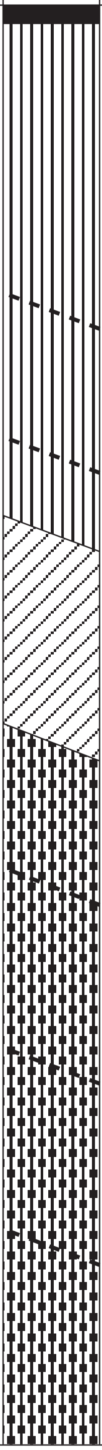
Groundwater Depth: 12 ft.

Hammer Weight: n.a. lbs.

Logged By: Steve Flexser

Total depth of Boring: 20.0 ft.

Hammer Drop: n.a. in.

Depth (Feet)	Sampler Outside Dia. (in.) 3.0 2.5 2.0	Blows/ Foot	Water Content (%)	Dry Density (PCF)	Other Lab Data	Graphic Log	Description
0							3 inches bituminous macadam Dark brown to black Sandy SILT (ML), medium stiff, moist No odor
1							
2							
3							
4	BE-6-4.0						
5							Dark brown to black Sandy SILT (ML), medium stiff, moist, with some sand, increasing sand with depth Very slight solvent odor
6							
7							Brown and gray mottled Sandy SILT (ML), medium stiff, moist, with orange root marks Very slight solvent odor
8							Black to dark brown CLAY (CL), stiff, moist Very slight solvent odor
9							
10	BE-6-10.0						
11							Brown Silty SAND (SM), medium dense, moist, with some angular weathered chert gravel, and roots Very slight solvent odor to no odor
12							▽
13							Black Silty SAND (SM), medium dense, moist, decreasing gravel with depth No odor
14							
15	BE-6-15.5						Gray Silty SAND (SM), medium dense, moist No odor
16							
17							
18							Gray and brown Silty SAND (SM), medium dense, moist No odor
19							
20	BE-6-20.0						

TD Boring @ 20 feet

The San Joaquin Company, Inc.

Boring Log

BORING No.: SG-1

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: Oak Walk, Emeryville, California

Date Drilled: 10/29/2007

Surface Elevation: 44.91 ft.

Total depth of Boring: 5 ft.

Boring Diameter: 2 in.

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Direct Push

Driller: Paul Rogers

Logged By: Dai Watkins

Depth (Feet)	Sample	Graphic Log	Description	Comments
0		▨	Dark grey Silty CLAY (CL) - FILL	
1		▨		
2		▨		
3		▨		
4		▨		
5	SG-1	■	TD Boring @ 5 feet	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

The San Joaquin Company, Inc. Boring Log

BORING No.: SG-2

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: Oak Walk, Emeryville, California

Date Drilled: 10/29/2007

Surface Elevation: 45.93 ft.

Total depth of Boring: 5 ft.

Boring Diameter: 2 in.

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Direct Push

Driller: Paul Rogers

Logged By: Dai Watkins

Depth (Feet)	Sample	Graphic Log	Description	Comments
0		▨	Dark grey Silty CLAY (CL) - FILL	
1		▨		
2		▨		
3		▨		
4		▨		
5	SG-2	■	TD Boring @ 5 feet	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

The San Joaquin Company, Inc.

Boring Log

BORING No.: SG-3

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: Oak Walk, Emeryville, California

Date Drilled: 10/29/2007

Surface Elevation: 46.86 ft.

Total depth of Boring: 5 ft.

Boring Diameter: 2 in.

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Direct Push

Driller: Paul Rogers

Logged By: Dai Watkins

Depth (Feet)	Sample	Graphic Log	Description	Comments
0		▨	Dark grey Silty CLAY (CL) - FILL	
1		▨		
2		▨		
3		▨		
4		▨		
5	SG-3	■	TD Boring @ 5 feet	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

The San Joaquin Company, Inc.

Boring Log

BORING No.: SG-4

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: Oak Walk, Emeryville, California

Date Drilled: 10/29/2007

Surface Elevation: 47.46 ft.

Total depth of Boring: 5 ft.

Boring Diameter: 2 in.

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Direct Push

Driller: Paul Rogers

Logged By: Dai Watkins

Depth (Feet)	Sample	Graphic Log	Description	Comments
0		▨	Dark grey Silty CLAY (CL) - FILL	
1		▨		
2		▨		
3		▨		
4		▨		
5	SG-4	■	TD Boring @ 5 feet	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

The San Joaquin Company, Inc.

Boring Log

BORING No.: SG-5

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: Oak Walk, Emeryville, California

Date Drilled: 10/29/2007

Surface Elevation: 43.76 ft.

Total depth of Boring: 5 ft.

Boring Diameter: 2 in.

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Direct Push

Driller: Paul Rogers

Logged By: Dai Watkins

Depth (Feet)	Sample	Graphic Log	Description	Comments
0		▨	Dark grey Silty CLAY (CL) - FILL	
1		▨		
2		▨		
3		▨		
4		▨		
5	SG-5	■	TD Boring @ 5 feet	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

The San Joaquin Company, Inc.

Boring Log

BORING No.: SG-6

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: Oak Walk, Emeryville, California

Date Drilled: 10/29/2007

Surface Elevation: 45.91 ft.

Total depth of Boring: 5 ft.

Boring Diameter: 2 in.

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Direct Push

Driller: Paul Rogers

Logged By: Dai Watkins

Depth (Feet)	Sample	Graphic Log	Description	Comments
0		▨	Dark grey Silty CLAY (CL) - FILL	
1				
2				
3				
4				
5	SG-6	■	TD Boring @ 5 feet	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

The San Joaquin Company, Inc.

Boring Log

BORING No.: SG-7

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: Oak Walk, Emeryville, California

Date Drilled: 9/24/2007

Surface Elevation: 45.84 ft.

Total depth of Boring: 5 ft.

Boring Diameter: 2 in.

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Direct Push

Driller: Paul Rogers

Logged By: Dai Watkins

Depth (Feet)	Sample	Graphic Log	Description	Comments
0		▨	Dark grey Silty CLAY (CL) - FILL	
1		▨		
2		▨		
3		▨		
4		▨		
5	SG-7	■	TD Boring @ 5 feet	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

The San Joaquin Company, Inc.

Boring Log

BORING No.: SG-8

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: Oak Walk, Emeryville, California

Date Drilled: 9/24/2007

Surface Elevation: 42.51 ft.

Total depth of Boring: 5 ft.

Boring Diameter: 2 in.

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Direct Push

Driller: Paul Rogers

Logged By: Dai Watkins

Depth (Feet)	Sample	Graphic Log	Description	Comments
0		▨	Dark grey Silty CLAY (CL) - FILL	
1		▨		
2		▨		
3		▨		
4		▨		
5	SG-8	■	TD Boring @ 5 feet	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

The San Joaquin Company, Inc.

Boring Log

BORING No.: SG-9

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: Oak Walk, Emeryville, California

Date Drilled: 9/24/2007

Surface Elevation: 45.98 ft.

Total depth of Boring: 5 ft.

Boring Diameter: 2 in.

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Direct Push

Driller: Paul Rogers

Logged By: Dai Watkins

Depth (Feet)	Sample	Graphic Log	Description	Comments
0		▨	Dark grey Silty CLAY (CL) - FILL	
1		▨		
2		▨		
3		▨		
4		▨		
5	SG-9	■	TD Boring @ 5 feet	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

The San Joaquin Company, Inc.

Boring Log

BORING No.: SG-10

Project: Oak Walk Project

Project No.: 0004.086

Owner: Bay Rock Oaks, LLC

Location: Oak Walk, Emeryville, California

Date Drilled: 9/24/2007

Surface Elevation: 47.31 ft.

Total depth of Boring: 5 ft.

Boring Diameter: 2 in.

Drilling Company: Gregg Drilling & Testing, Inc.

Drilling Method: Direct Push

Driller: Paul Rogers

Logged By: Dai Watkins

Depth (Feet)	Sample	Graphic Log	Description	Comments
0		▨	Dark grey Silty CLAY (CL) - FILL	
1		▨		
2		▨		
3		▨		
4		▨		
5	SG-10	■	TD Boring @ 5 feet	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

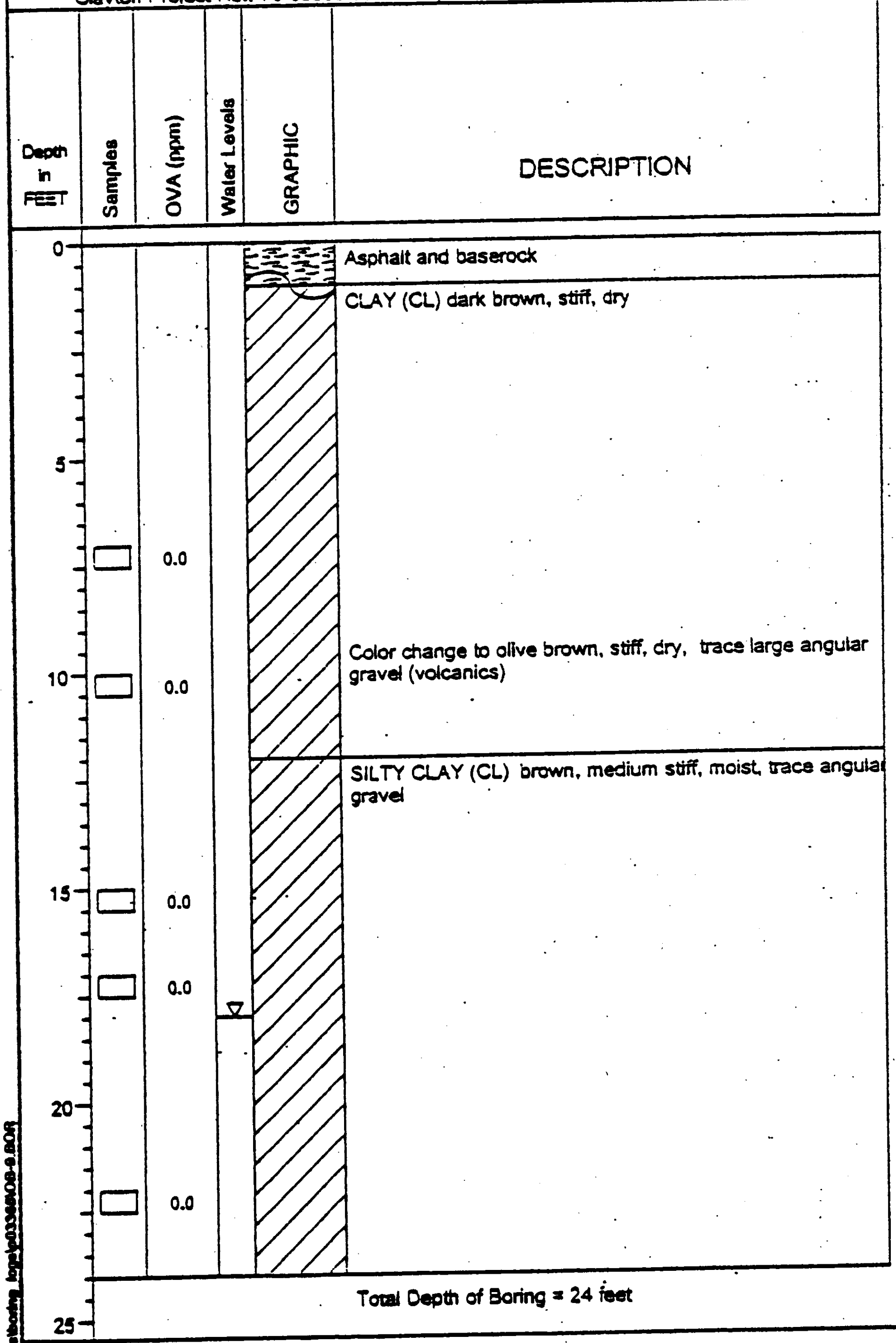
LOG OF BORING OB-9

(Page 1 of 1)

Green City Lofts LLC
Subsurface Investigation
1007 41st Street
Emeryville, California

Clayton Project No.: 70-03365.03

Date Started	: 06/27/03	Driller	: Gregg
Date Completed	: 06/27/03	Logged by	: Matt Reimer
Hole Diameter	: 2-inch		
Drilling Method	: Geoprobe		
Sampling Method	: Macrocore		



Asphalt and baserock

CLAY (CL) dark brown, stiff, dry

Color change to olive brown, stiff, dry, trace large angular gravel (volcanics)

SILTY CLAY (CL) brown, medium stiff, moist, trace angular gravel

Total Depth of Boring = 24 feet

Notes:
Borehole was initiated with hand auger to 4 feet bgs.
Static water level at 18 feet.
Grab groundwater sample taken at 11:20.
Borehole abandoned with neat cement grout.

Clayton GROUP SERVICES

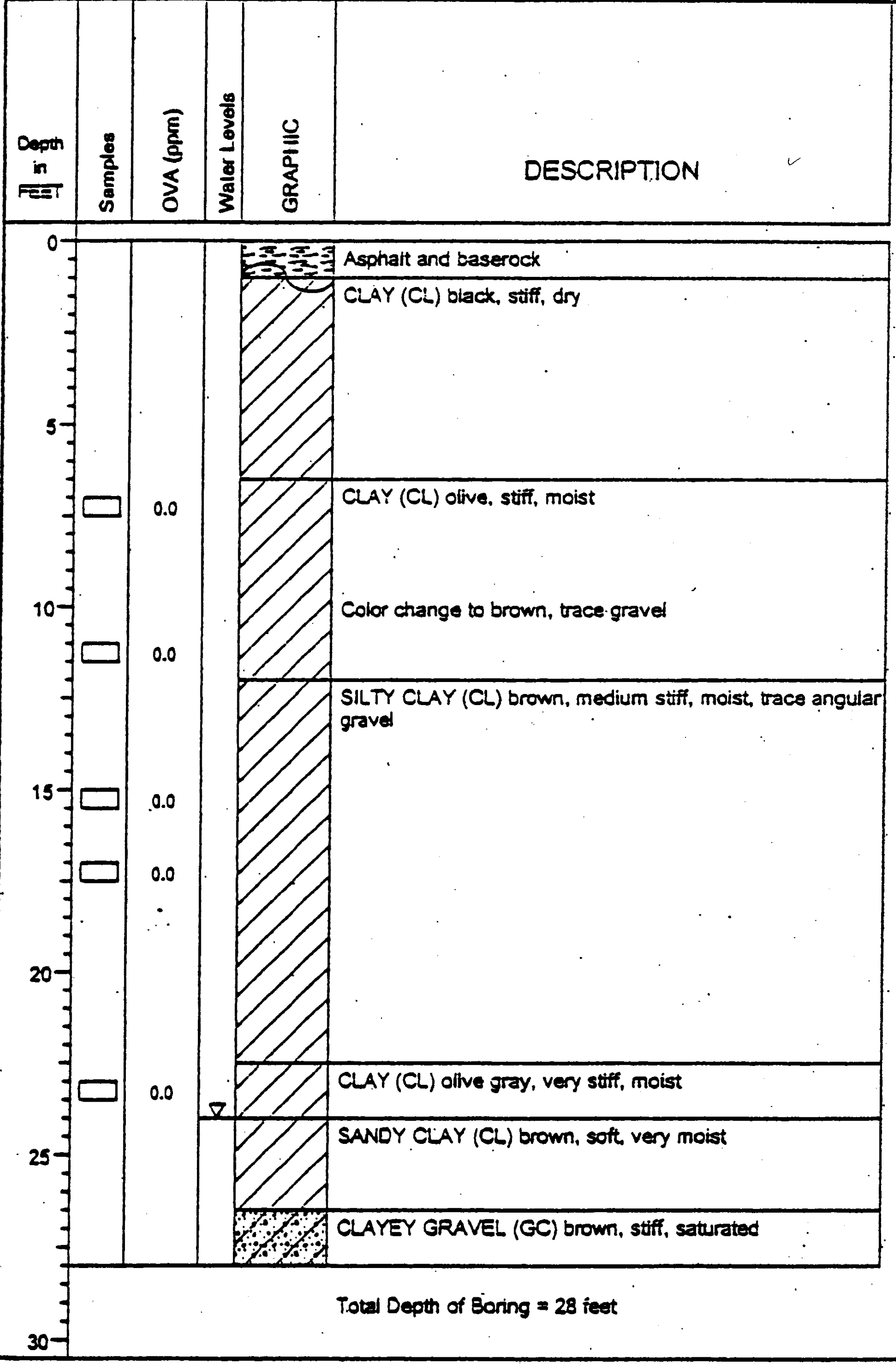
LOG OF BORING OB-6

(Page 1 of 1)

Green City Lofts LLC
Subsurface Investigation
1007 41st Street
Emeryville, California

Clayton Project No.: 70-03365.03

Date Started	: 06/27/03	Driller	: Gregg
Date Completed	: 06/27/03	Logged by	: Matt Reimer
Hole Diameter	: 2-inch		
Drilling Method	: Geoprobe		
Sampling Method	: Macrocore		



Asphalt and baserock

CLAY (CL) black, stiff, dry

CLAY (CL) olive, stiff, moist

Color change to brown, trace gravel

SILTY CLAY (CL) brown, medium stiff, moist, trace angular gravel

CLAY (CL) olive gray, very stiff, moist

SANDY CLAY (CL) brown, soft, very moist

CLAYEY GRAVEL (GC) brown, stiff, saturated

Total Depth of Boring = 28 feet

Notes:
Borehole was initiated with hand auger to 4 feet bgs.
Static water level at 24 feet. Grab groundwater sample taken at 15:40 p.m.
Borehole abandoned with neat cement grout.

Clayton
GROUP SERVICES

LOG OF BORING OB-5

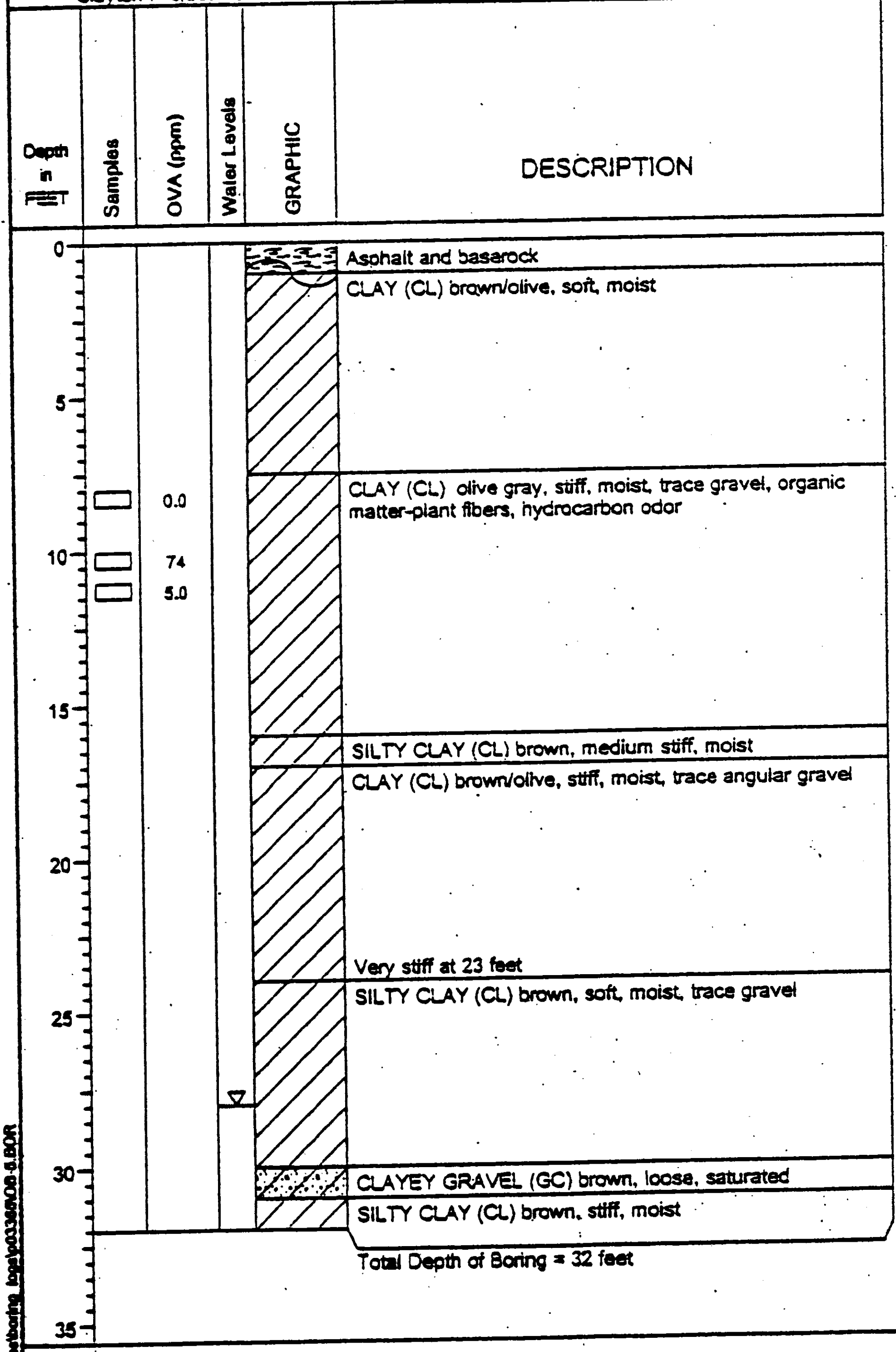
(Page 1 of 1)

Green City Lofts LLC
Subsurface Investigation
1007 41st Street
Emeryville, California

Clayton Project No.: 70-03365.03

Date Started : 06/27/03
Date Completed : 06/27/03
Hole Diameter : 2-inch
Drilling Method : Geoprobe
Sampling Method : Macrocore

Driller : Gregg
Logged by : Matt Reimer



Depth (feet)	Description
0	Asphalt and baserock
	CLAY (CL) brown/olive, soft, moist
	CLAY (CL) olive gray, stiff, moist, trace gravel, organic matter-plant fibers, hydrocarbon odor
	SILTY CLAY (CL) brown, medium stiff, moist
	CLAY (CL) brown/olive, stiff, moist, trace angular gravel Very stiff at 23 feet
	SILTY CLAY (CL) brown, soft, moist, trace gravel
	CLAYEY GRAVEL (GC) brown, loose, saturated
	SILTY CLAY (CL) brown, stiff, moist

Total Depth of Boring = 32 feet

Notes:
Borehole was initiated with hand auger to 4 feet bgs.
Static water level at 28 feet. Grab groundwater sample taken at 15:10 p.m.
Borehole abandoned with neat cement grout.

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Clayton
GROUP SERVICES

LOG OF BORING OB-4

(Page 1 of 1)

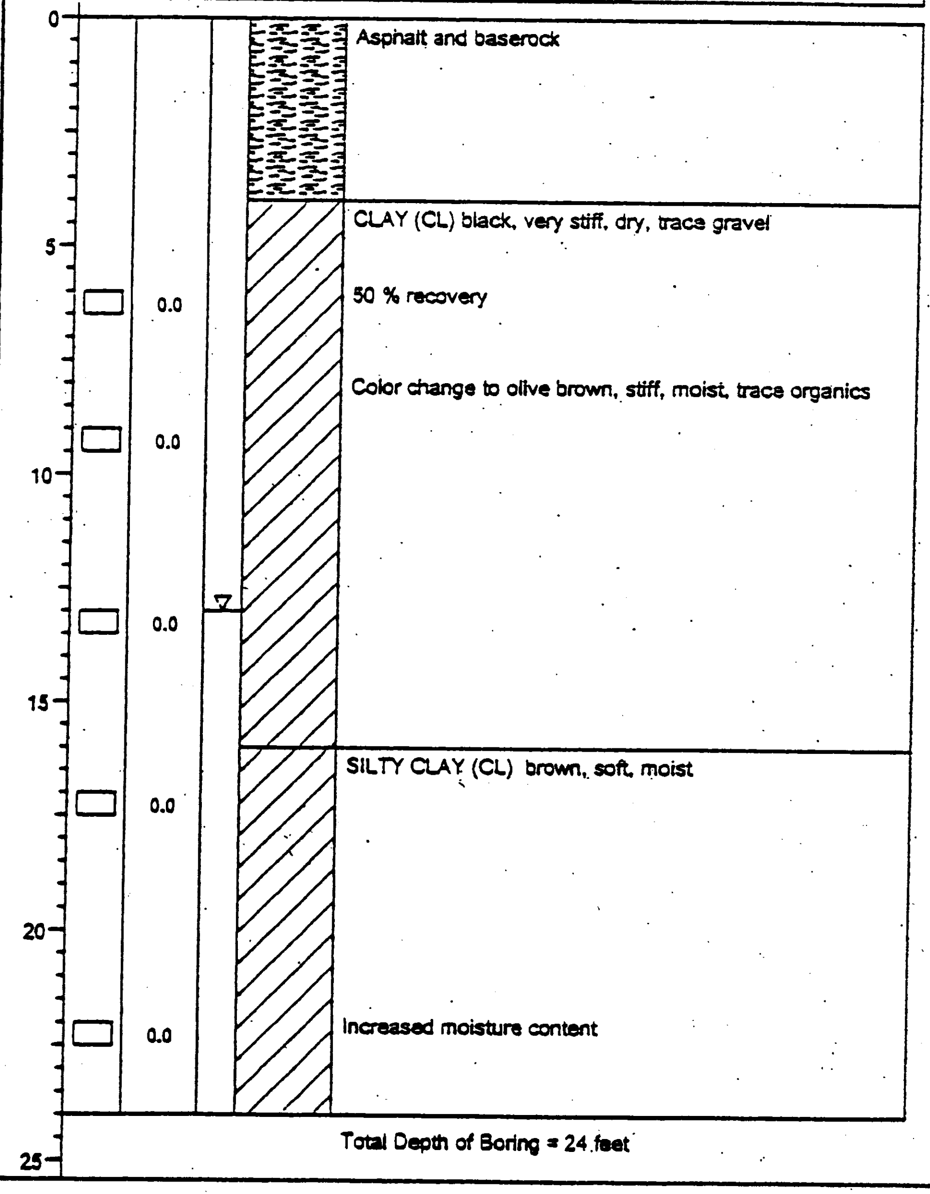
Green City Lofts LLC
Subsurface Investigation
1007 41st Street
Emeryville, California

Clayton Project No.: 70-03365.03

Date Started : 06/27/03
Date Completed : 06/27/03
Hole Diameter : 2-inch
Drilling Method : Geoprobe
Sampling Method : Macrocore

Driller : Gregg
Logged by : Matt Reimer

Depth in FEET	Samples	OVA (ppm)	Water Levels	GRAPHIC	DESCRIPTION



Asphalt and baserock

CLAY (CL) black, very stiff, dry, trace gravel

50 % recovery

Color change to olive brown, stiff, moist, trace organics

SILTY CLAY (CL) brown, soft, moist

Increased moisture content

Total Depth of Boring = 24 feet

Notes:
Borehole was initiated with hand auger to 4 feet bgs.
Grab groundwater sample taken at 10:50.
Borehole abandoned with neat cement grout.

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Clayton GROUP SERVICES

LOG OF BORING OB-3

(Page 1 of 1)

Green City Lofts LLC
Subsurface Investigation
1007 41st Street
Emeryville, California

Clayton Project No.: 70-03365.03

Date Started : 06/27/03
Date Completed : 06/27/03
Hole Diameter : 2-inch
Drilling Method : Geoprobe
Sampling Method : Macrocore

Driller : Gregg
Logged by : Matt Reimer

Depth in FEET	Samples	OVA (ppm)	Water Levels	GRAPHIC	DESCRIPTION
0					Asphalt and baseock
					CLAY (CL) brown, stiff, dry
5					
	☐	0.0			
					Color change to yellowish orange, moist, trace gravels, trace organics
10					
	☐	0.0			
					SILTY CLAY (CL) brownish olive, stiff, moist, trace organics
15	☐	0.0			
			▽		CLAY (CL) brown, medium stiff, moist, trace organics
	☐	0.0			SILTY GRAVELLY SAND (SM) brownish orange, loose, saturated
20					SILTY CLAY (CL) brown, moist, trace gravel
	☐	0.0			CLAYEY SILT (ML) brown, large angular gravel, moist
25					Total Depth of Boring = 24 feet

Notes:
Borehole was initiated with hand auger to 4 feet bgs.
Static water level at 16.7 feet. Grab groundwater sample taken at 8:50 a.m.
Borehole abandoned with neat cement grout.

Clayton GROUP SERVICES

LOG OF BORING CW-2

(Page 1 of 1)

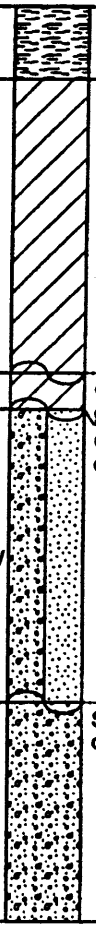
Former Dunne Paint Facility
1007 41st Street
Oakland, California

Clayton Project No.: 70-03365.05

Date Started	: 10/30/03	Driller	: Clear Heart Drilling
Date Completed	: 10/30/03	Logged by	: Mike Krzeminski
Hole Diameter	: 8-inch	Surveyor	: V. Chavez
Drilling Method	: Hollow Stem Auger	Top of Casing	: ft, msl
Sampling Method	: Cal Modified Split Spoon		

Depth in FEET: 0, 5, 10, 15, 20, 25, 30

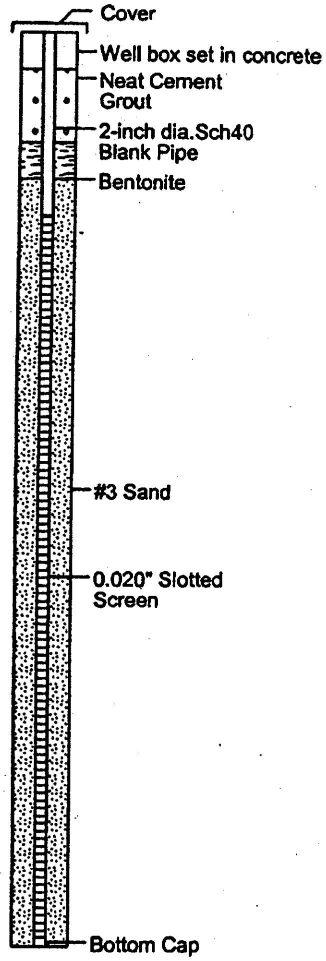
Samples	Blow Count	OVM (mg/kg)
☒	7 10 15	0.3
☒	6 9 13	0.3
☒	6 19 20	445
☒	7 13 17	762
☐	8 10 15	
☒	9 16 19	25.1
☐	8 15 17	0.9
☐	13 17 20	0.3



USCS	DESCRIPTION
	Asphalt and Baserock
CL	Silty Clay trace gravel (CL) (5,0,40,55), dark brown, very stiff, fine subangular gravel, dry, rootlets.
CL	Gravelly Clay trace sand (CL) (30,10,10,50), greenish gray, stiff, coarse gravel, moist, hydrocarbon odor present.
GW/SW	Gravelly Sand (GW/SW) (50,50,0,0), light brown, medium dense, coarse gravel, medium sands, saturated, no odor.
GW	Sandy Gravel (GW) (60,40,0,0) light brown, medium dense, coarse gravel, medium sands, saturated.

Total Depth of Boring = 25 feet

Well: CW-2
Elev.:



Notes:

Clayton
GROUP SERVICES

LOG OF BORING CW-3

(Page 1 of 1)

Former Dunne Paint Facility
1007 41st Street
Oakland, California

Clayton Project No.: 70-03365.05

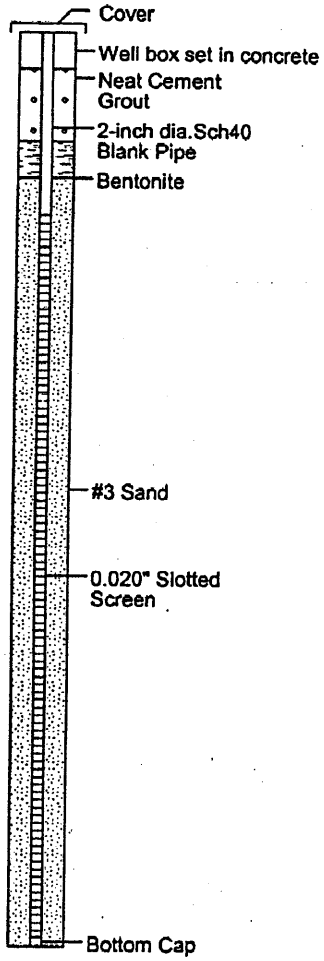
Date Started : 10/30/03
Date Completed : 10/30/03
Hole Diameter : 8-inch
Drilling Method : Hollow Stem Auger
Sampling Method : Cal Modified Split Spoon

Driller : Clear Heart Drilling
Logged by : Mike Krzeminski
Surveyor : V. Chavez
Top of Casing : ft, msl

Depth in FEET	Samples	Blow Count	OVM (mg/kg)	USCS	GRAPHIC	DESCRIPTION
0						Asphalt and Baserock
						Silty Clay (CL) (0,0,30,70), dark brown, stiff, dry, rootlets.
5	☒	11 18 22	0.3	CL		
						Gravelly Clay with trace sand (CL) (30,10,0,60), light brown, medium stiff, fine angular gravel, moist.
10	☒	10 15 17	0.3	CL		
						Silty Clay trace gravel (CL) (10,0,30,60), light brown, medium stiff, fine angular gravel, saturated.
15	☒	8 12 18	0.3			
20	☒	9 14 18	0.3	GW/SW		
25						
30						

Total Depth of Boring = 25 feet

Well: CW-3
Elev.:



Notes:

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SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-A

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 18, 2004

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 26'

Static Depth of Water in Well: NA

Total Depth of Boring: 28'

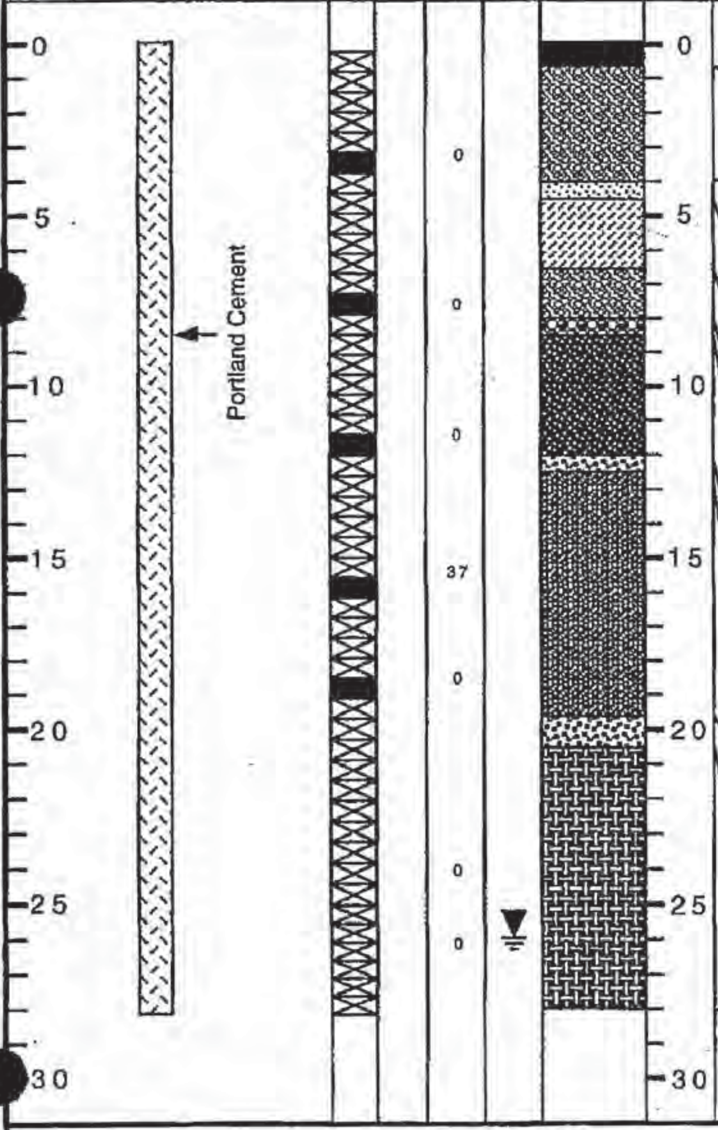
Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler

Depth in Feet | BORING DETAIL | Description | SOIL/ROCK SAMPLE DATA: Interval | Blow Counts | OVM (ppmv) | Water Level | Graphic Log | Depth in Feet



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Clayey SILT (ML); dark brown; stiff; moist; 90% silt; 10% clay; non-plastic; low estimated K; no odor

Silty SAND (SM); light brown; loose; wet; 80% sand; 20% silt; non-plastic; high estimated K; no odor

Sandy SILT (ML); brown; medium stiff; moist; 60% silt; 30% sand; 10% gravel; medium estimated K; no odor

Clayey SILT (ML); dark brown; stiff; moist; 90% silt; 10% clay; non-plastic; low estimated K; no odor

Clayey GRAVEL (GC); brown; dense; damp; 60% gravel; 40% clay; non-plastic; medium estimated K; no odor

CLAY (CH); dark brown; very stiff; damp; 100% clay; trace gravel; high plasticity; very low estimated K; no odor

Clayey SAND (SC); brown; loose; moist; 70% sand; 30% clay; non-plastic;. medium estimated K, no odor

Silty CLAY (CL); light olive; very stiff; moist; 90% clay 10% silt; moderate plasticity; low estimated K; no odor
slight hydrocarbon odor @ 16 feet
olive mottled yellow brown @ 18.5 feet

Clayey SAND (SC); yellow brown; very dense; damp; 60% sand; 20% clay; 20% gravel; non-plastic; medium estimated K; no odor

Gravelly CLAY (CL); dark brown; stiff; moist; 50% clay; 30% gravel 10% sand; 10% silt; non-plastic; medium estimated K; no odor
brown mottled black between 24 and 26 feet

End of boring

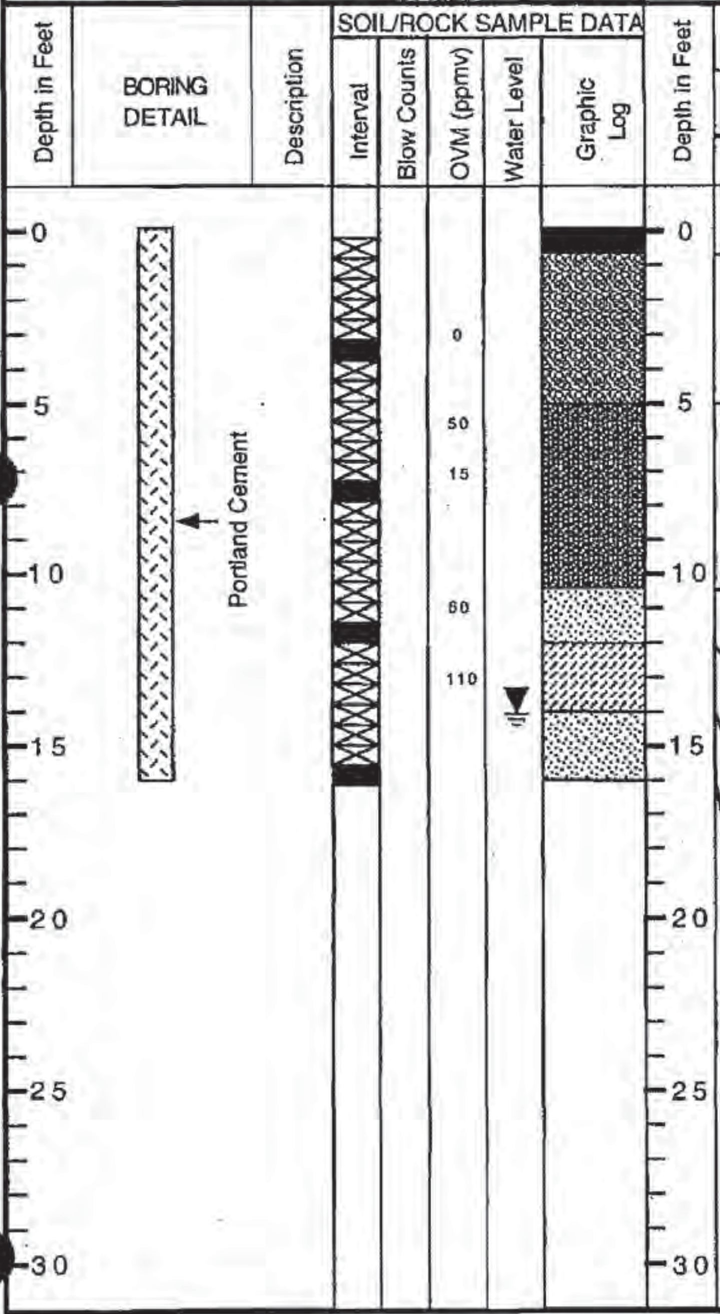
AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-B

Project Name: Kozel Property	Project Location: 1001 42nd St. Oakland, CA	Page 1 of 1
Driller: Vironex	Type of Rig: Geoprobe	Size of Drill: 2.0" Diameter
Logged By: Damian Hriciga	Date Drilled: October 18, 2004	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA	Total Depth of Well Completed: NA
Depth of Water First Encountered: 14.5'	Well Screen Type and Diameter: NA
Static Depth of Water in Well: NA	Well Screen Slot Size: NA
Total Depth of Boring: 16'	Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Depth in Feet	DESCRIPTION OF LITHOLOGY
0	Concrete/Base
	Clayey SILT (ML); brown mottled red; stiff; moist; 90% silt; 10% clay; non-plastic; low estimated K; no odor
5	Silty CLAY (CL); black; stiff; moist; 80% clay; 20% silt; moderate plasticity; very low estimated K; slight hydrocarbon odor black mottled olive; 90% clay; 10% silt; trace gravel
10	Silty SAND (SM); olive; medium dense; moist; 60% sand; 20% silt; 10% gravel; 10% clay; non-plastic; high estimated K; moderate hydrocarbon odor
	Sandy SILT (ML); olive; soft; moist; 60% silt; 30% sand; 10% clay; trace gravel; non-plastic; medium estimated K; moderate hydrocarbon odor
15	Silty SAND (SM); olive; medium dense; wet; 60% sand; 20% silt; 10% gravel; 10% clay; non-plastic; high estimated K; moderate hydrocarbon odor yellow brown below 15.5 feet
20	End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-C

Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 1

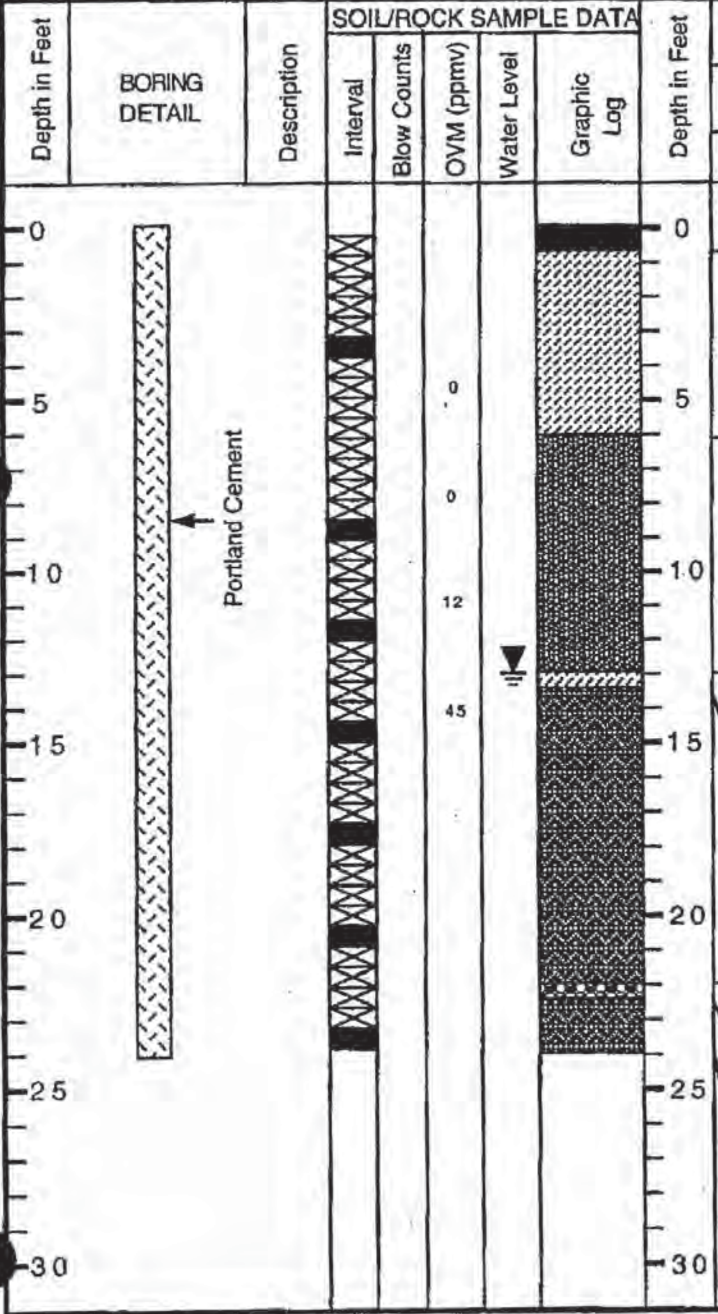
Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga
Date Drilled: October 18, 2004
Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 13.5'
Static Depth of Water in Well: NA
Total Depth of Boring: 24'

Total Depth of Well Completed: NA
Well Screen Type and Diameter: NA
Well Screen Slot Size: NA
Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; stiff; moist; 90% silt; 10% sand; non-plastic; low estimated K; no odor

Silty CLAY (CL); black; stiff; moist; 80% clay; 20% silt; moderate plasticity; very low estimated K; slight hydrocarbon odor

60% clay; 25% silt; 15% gravel

Sandy SILT (ML); brown; soft; wet; 80% silt; 20% sand; trace gravel; non-plastic; medium estimated K; moderate hydrocarbon odor

Sandy CLAY (CL); olive; stiff; damp; 60% clay; 20% sand; 20% silt; trace gravel; low plasticity; low estimated K; moderate hydrocarbon odor
single layer of gravel @16 feet

wet from 21 to 21.5 feet

Clayey GRAVEL (GC); olive; dense; damp; 60% gravel; 40% clay; non-plastic; medium estimated K; no odor

Sandy CLAY (CL); olive; stiff; damp; 60% clay; 20% sand; 20% silt; trace gravel; low plasticity; low estimated K; moderate hydrocarbon odor

End of boring

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-D

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 18, 2004

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: Dry

Static Depth of Water in Well: Dry

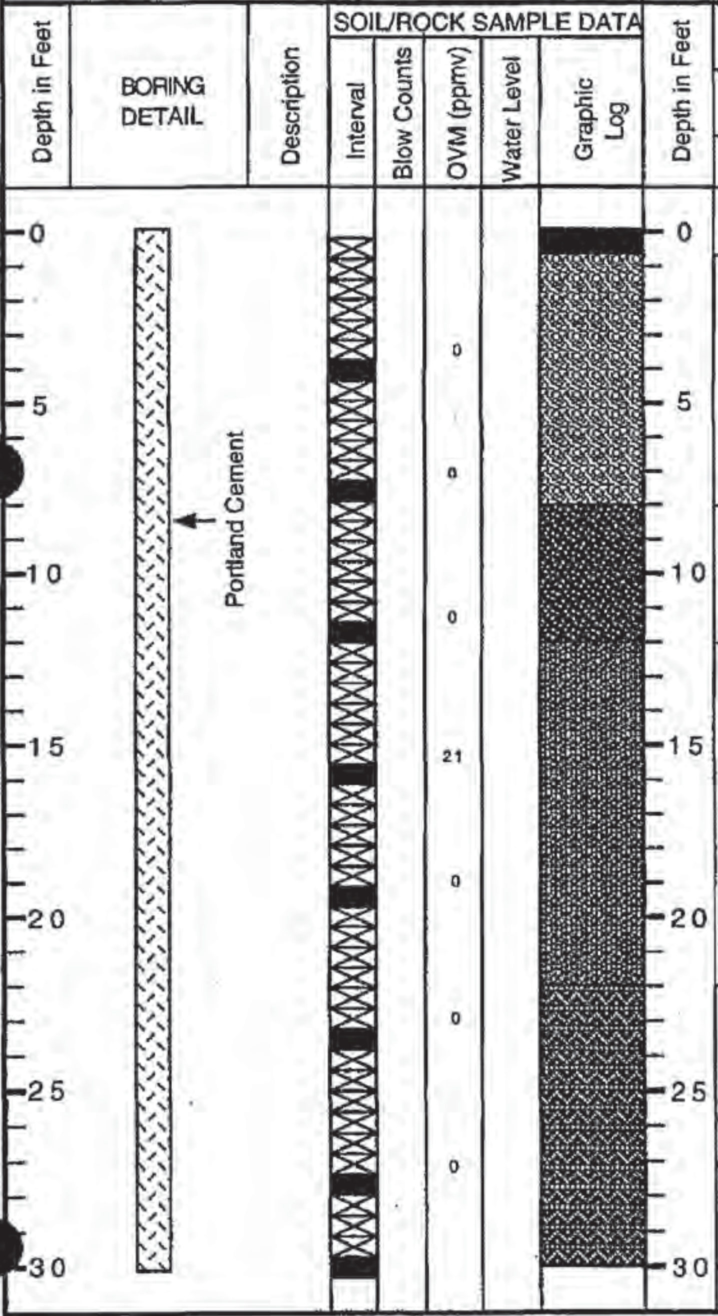
Total Depth of Boring: 30'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Depth in Feet	Description
0	Concrete/Base
	Clayey SILT (ML); brown; stiff; moist; 90% silt; 10% clay; non-plastic; low estimated K; no odor
5	
10	CLAY (CH); dark brown; very stiff; damp; 100% clay; trace gravel; high plasticity; very low estimated K; slight hydrocarbon odor
15	Silty CLAY (CH); light olive; very stiff; damp; 90% clay; 10% silt; high plasticity; very low estimated K; moderate hydrocarbon odor
20	
25	Sandy CLAY (CL); yellow brown; very stiff; damp; 70% clay; 20% sand; 10% gravel; low plasticity; low estimated K; no odor medium stiff; moist between 25.5 and 26 feet
30	End of boring

AQUA SCIENCE ENGINEERS, INC.

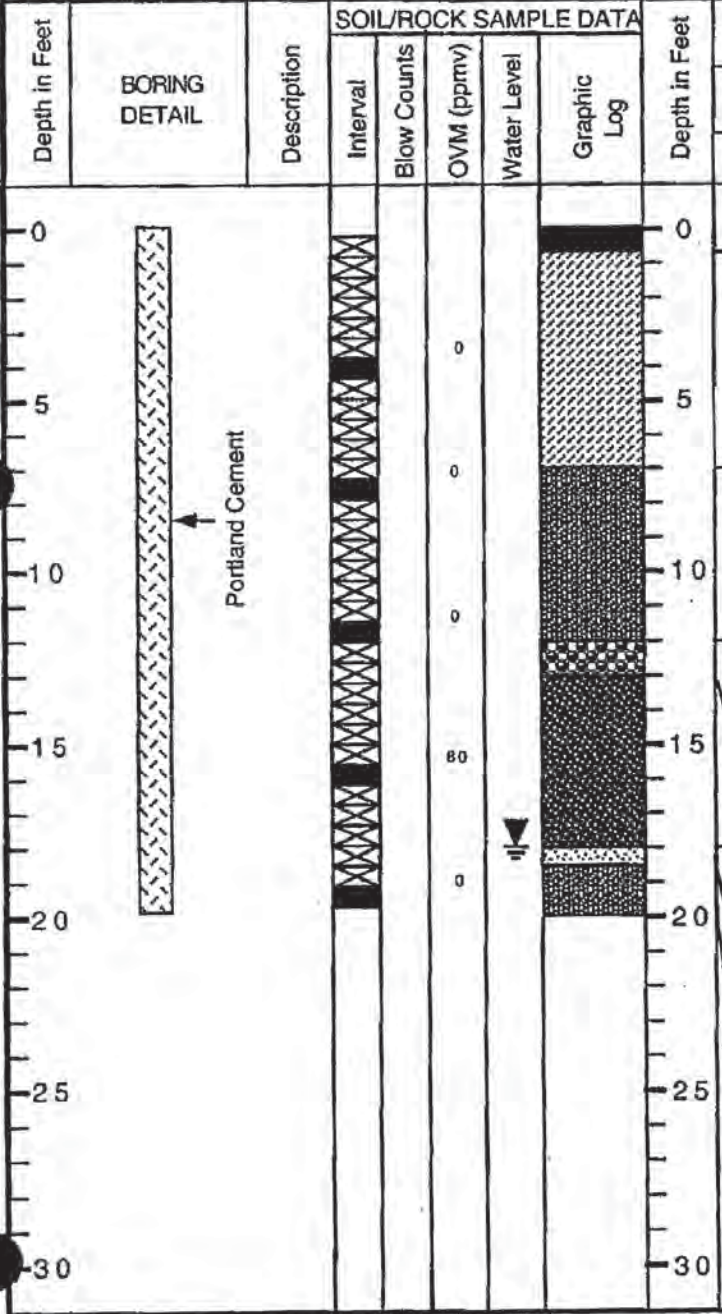
SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-E

Project Name: Kozel Property	Project Location: 1001 42nd St. Oakland, CA	Page 1 of 1
Driller: Vironex	Type of Rig: Geoprobe	Size of Drill: 2.0" Diameter
Logged By: Damian Hriciga	Date Drilled: October 19, 2004	Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: 18'	Total Depth of Well Completed: NA
Static Depth of Water in Well: NA	Well Screen Type and Diameter: NA
Total Depth of Boring: 20'	Well Screen Slot Size: NA
	Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; medium stiff; damp; 95% silt; 5% sand; non-plastic; low estimated K; no odor

Silty CLAY (CH); black; very stiff; moist; 80% clay; 20% silt; high plasticity; low estimated K; no odor

Clayey GRAVEL (GC); yellow brown; loose; damp; 60% gravel; 30% clay; 10% sand; non-plastic; high estimated K; no odor

CLAY (CH); olive; very stiff; damp; 100% clay; high plasticity; very low estimated K; slight hydrocarbon odor

Silty SAND (SM); olive; medium dense; damp; 70% sand; 25% silt; 5% clay; non-plastic; high estimated K; moderate hydrocarbon odor

Silty CLAY (CL); yellow brown; very stiff; damp; 80% clay; 15% silt; 5% sand; trace gravel; moderate plasticity; low estimated K; no odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-F

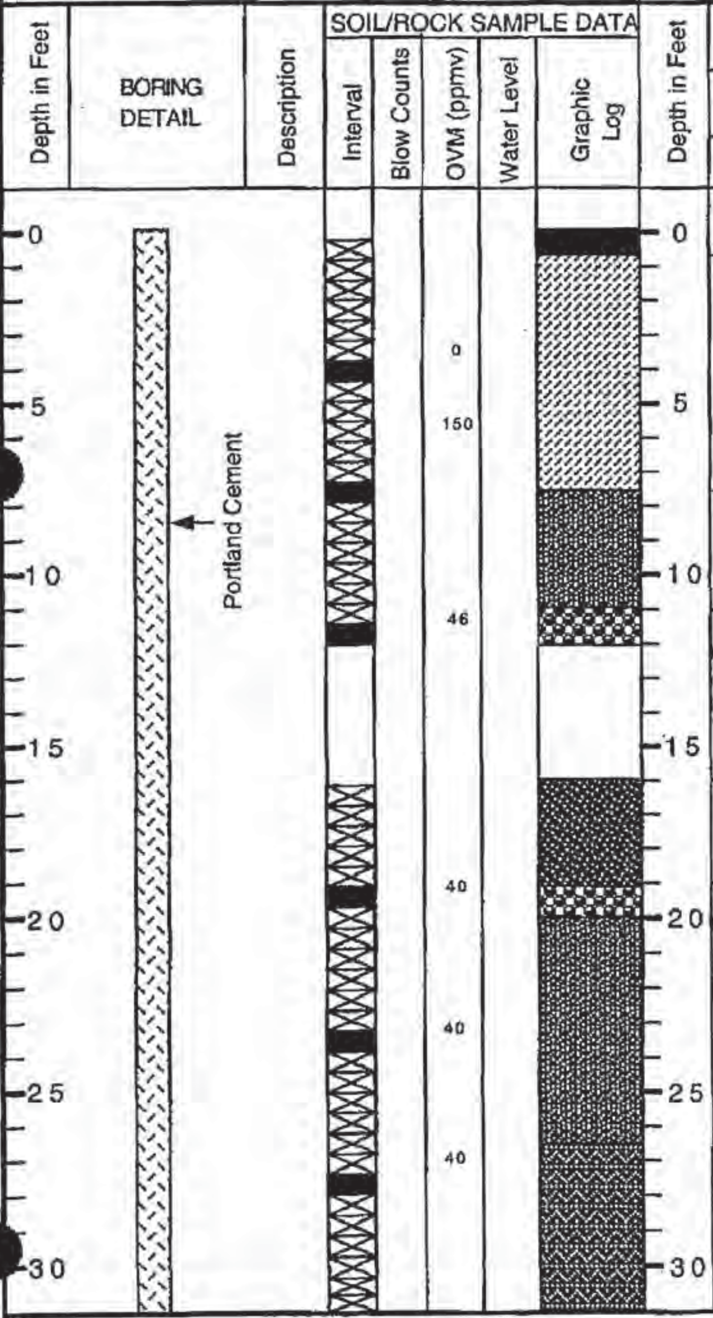
Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 2

Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga
Date Drilled: October 19, 2004
Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: Dry
Static Depth of Water in Well: Dry
Total Depth of Boring: 32'
Total Depth of Well Completed: NA
Well Screen Type and Diameter: NA
Well Screen Slot Size: NA
Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; medium stiff; damp; 95% silt; 5% sand; non-plastic; low estimated K; no odor

soft; wet

dark olive; strong hydrocarbon odor

Silty CLAY (CL); black; medium stiff; moist; 80% clay; 20% silt; moderate plasticity; low estimated K; no odor
stiff; damp below 8 feet

Clayey GRAVEL (GC); olive; medium dense; damp; 55% gravel; 45% clay; low plasticity; low estimated K; no odor

No recovery

CLAY (CH); olive; very stiff; damp; 100% clay, high plasticity; very low estimated K; slight hydrocarbon odor

Clayey GRAVEL (GC); yellow brown; medium dense; damp; 55% gravel; 45% clay; low plasticity; low estimated K; slight hydrocarbon odor

Silty CLAY (CL); yellow brown; very stiff; damp; 80% clay; 20% silt; moderate plasticity; low estimated K; no odor

Sandy CLAY (CL); yellow brown; very stiff; damp; 80% clay; 20% sand; moderate plasticity; low estimated K; no odor

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

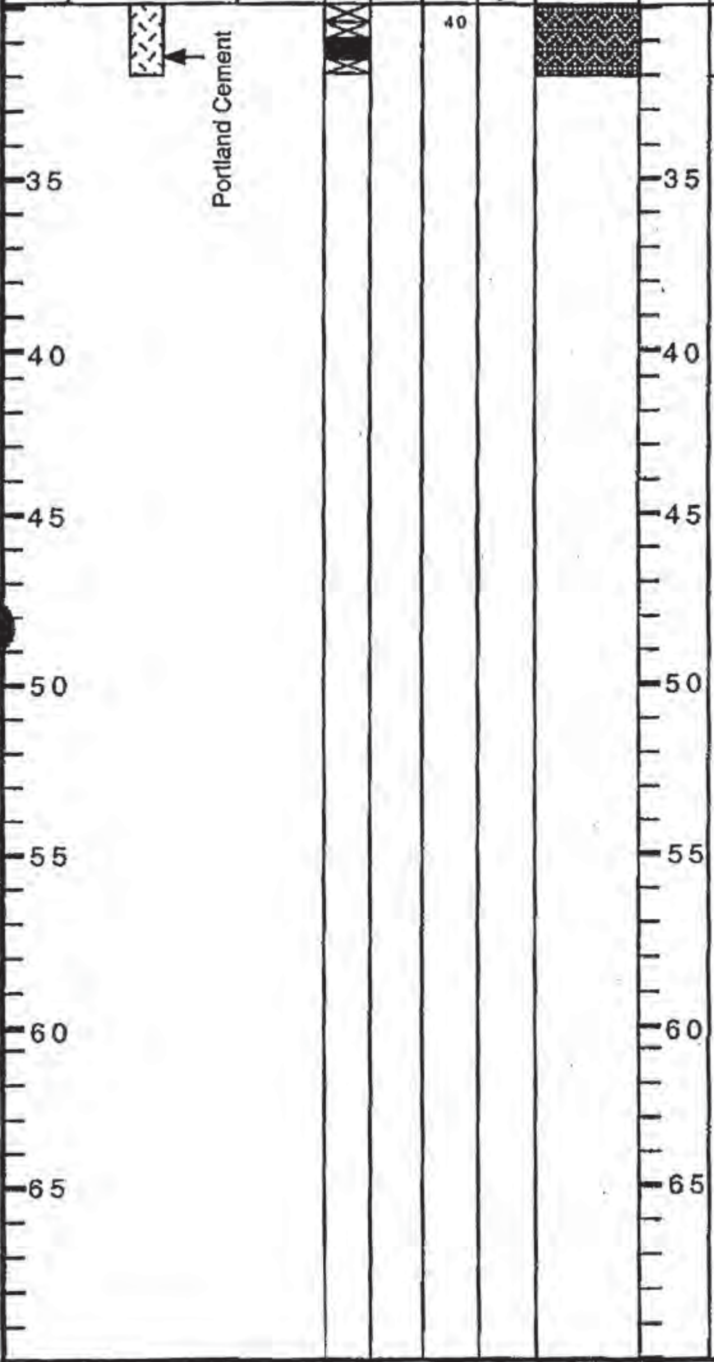
BORING: BH-F

Project Name: Kozel Property

Project Location: 1001 42nd St., Oakland, CA

Page 2 of 2

Depth in Feet	BORING DETAIL	Description	SOIL/ROCK SAMPLE DATA					Depth in Feet	DESCRIPTION OF LITHOLOGY
			Interval	Blow Counts	OVM (ppmv)	Water Level	Graphic Log		standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.
					40				Coninuation from above
									End of boring



SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-G

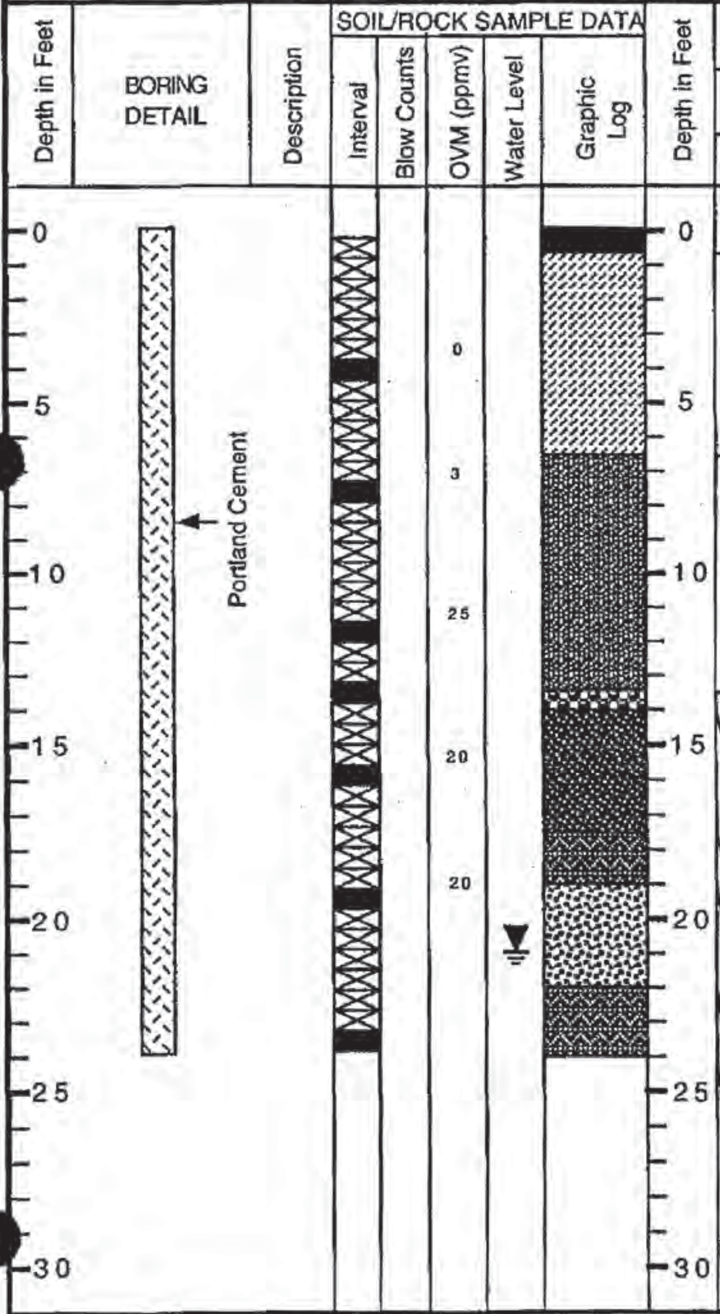
Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 1

Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga
Date Drilled: October 19, 2004
Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: 21'
Total Depth of Well Completed: NA
Well Screen Type and Diameter: NA
Static Depth of Water in Well: NA
Well Screen Slot Size: NA
Total Depth of Boring: 24'
Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; medium stiff; damp; 75% silt; 25% sand; non-plastic; low estimated K; no odor

moist, soft

Silty CLAY (CL); dark brown; medium stiff; moist; 70% clay; 30% silt; trace gravel; moderate plasticity; low estimated K; no odor
black; stiff; damp; 95% clay; 5% silt

Clayey GRAVEL (GC); olive; medium dense; damp; 55% gravel; 45% clay; low plasticity; low estimated K; slight hydrocarbon odor

CLAY (CH); olive; stiff; moist; 100% clay; trace gravel; high plasticity; very low estimated K; slight hydrocarbon odor

Sandy CLAY (CL); olive; stiff; damp; 75% clay; 25% sand; moderate plasticity; low estimated K; slight hydrocarbon odor

Clayey SAND (SC); olive; dense; damp; 60% sand; 25% clay; 15% gravel; non-plastic; medium estimated K; no odor
wet between 21 and 22 feet

Sandy CLAY (CL); yellow brown; very stiff; damp; 65% clay; 20% sand; 15% gravel; moderate plasticity; low estimated K; no odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-H

Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 1

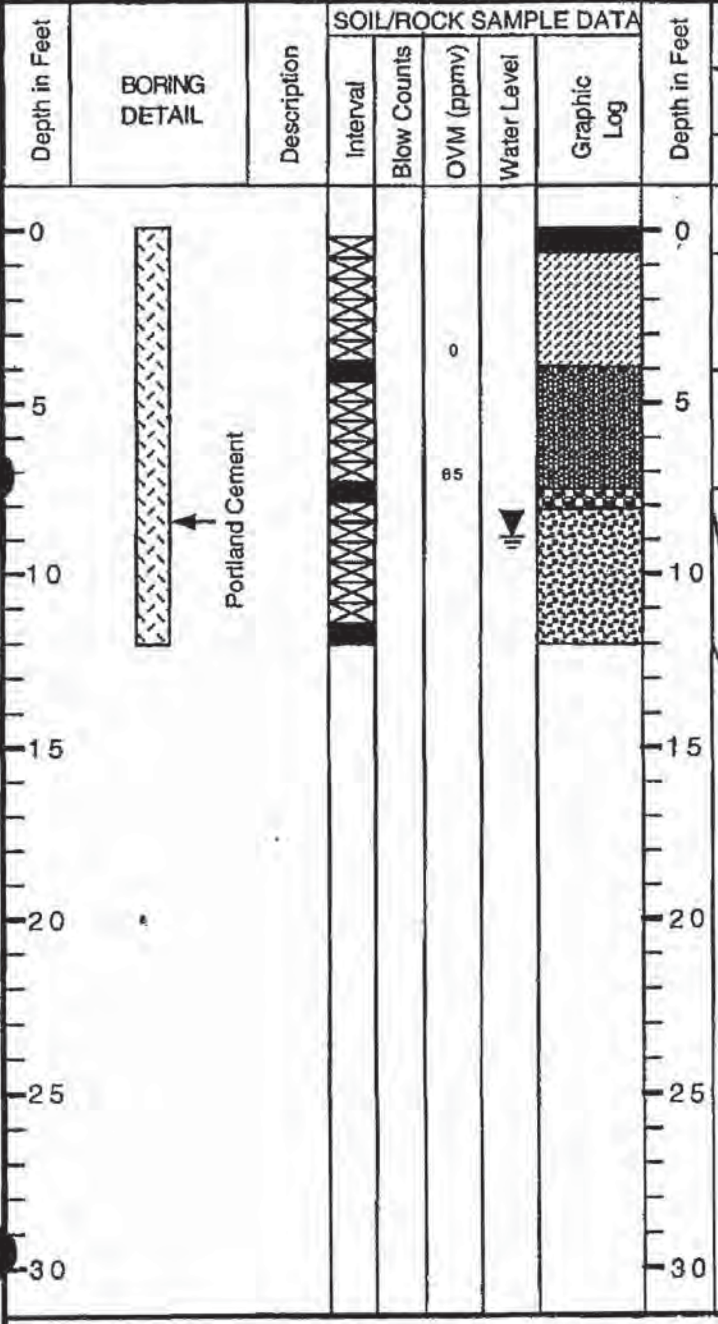
Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga
Date Drilled: October 20, 2004
Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 9'
Static Depth of Water in Well: NA
Total Depth of Boring: 12'

Total Depth of Well Completed: NA
Well Screen Type and Diameter: NA
Well Screen Slot Size: NA
Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Depth in Feet	Description
0	Concrete/Base
	Sandy SILT (ML); brown mottled orange; soft; moist; 90% silt; 10% sand; non-plastic; low estimated K; no odor
5	Silty CLAY (CL); dark brown; stiff; damp; 90% clay; 10% silt; moderate plasticity; very low estimated K; slight hydrocarbon odor
	Clayey GRAVEL (GC); olive; medium dense; damp; 55% gravel; 45% clay; low plasticity; low estimated K; slight hydrocarbon odor
10	Clayey SAND (SC); olive; loose; wet; 70% sand; 25% gravel; 5% clay; non-plastic; high estimated K; strong hydrocarbon odor
	End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-I

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 20, 2004

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: ~6'

Static Depth of Water in Well: NA

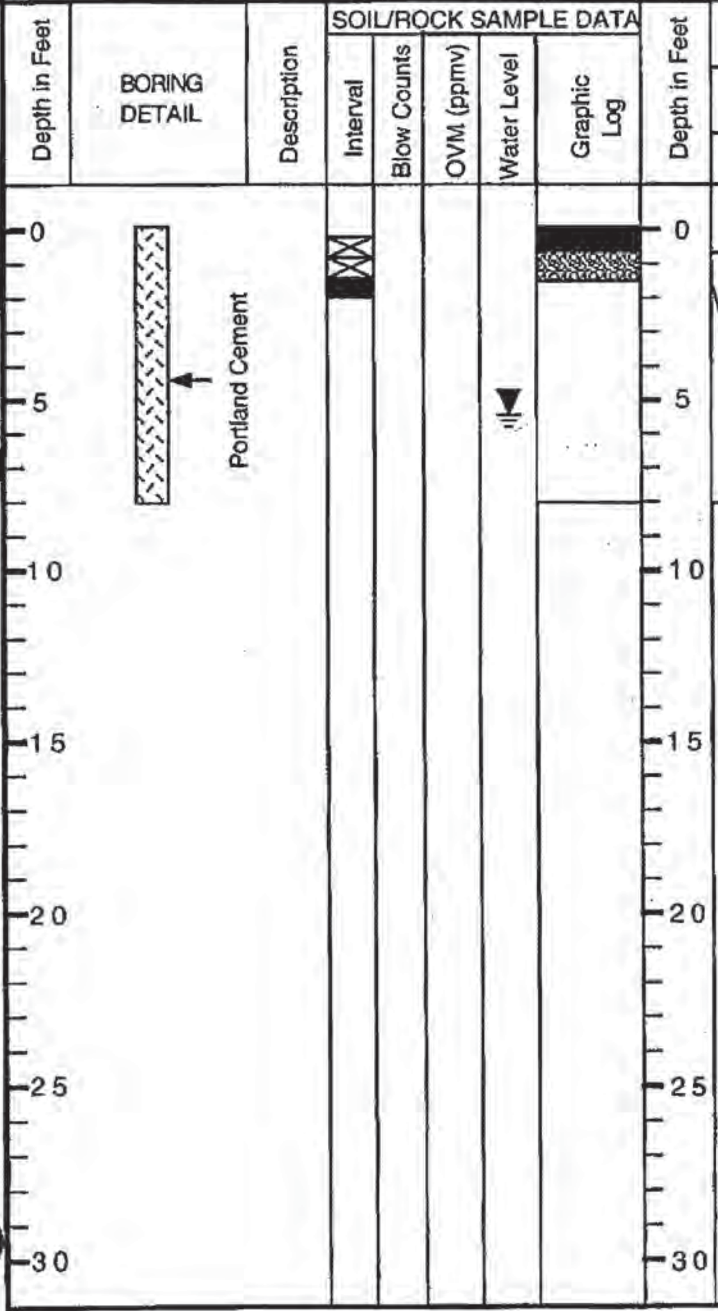
Total Depth of Boring: 8'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

0 Concrete/Base

Clayey SILT (ML); olive; soft; wet; 90% silt; 10% sand; non-plastic; low estimated K; strong hydrocarbon odor

no recovery

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-J

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 20, 2004

Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: 19'

Static Depth of Water in Well: NA

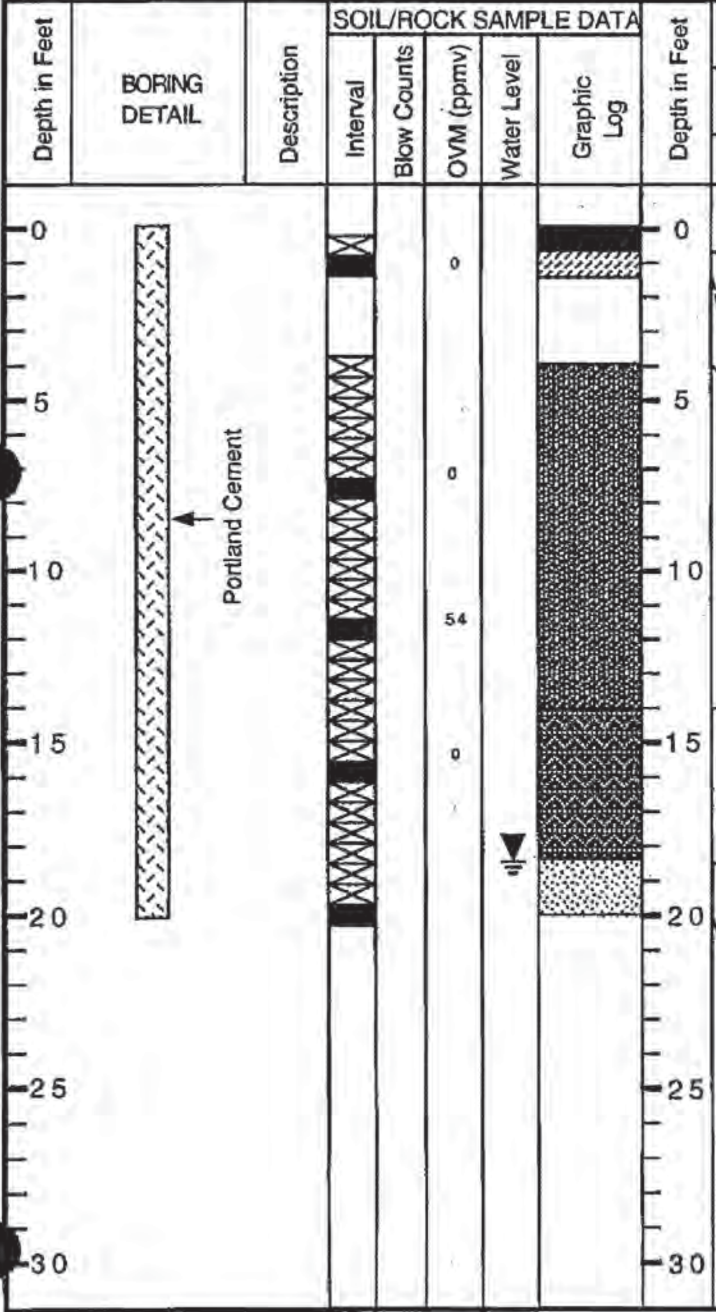
Total Depth of Boring: 20'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

0	Concrete/Base
	Clayey SILT (ML); brown mottled orange; soft; moist; 90% silt; 10% sand; non-plastic; low estimated K; no odor
	no recovery
5	Silty CLAY (CH); dark brown; stiff; damp; 90% clay; 10% silt; high plasticity; very low estimated K; slight hydrocarbon odor
	olive; trace gravel and sand; slight odor
15	Sandy CLAY (CH); olive mottled yellow brown; very stiff; wet; 85% clay; 15% sand; high plasticity; low estimated K; slight hydrocarbon odor
20	Silty SAND (SM); olive; medium dense; wet; 70% sand; 25% silt; 5% clay; non-plastic; high estimated K; strong hydrocarbon odor
	End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-K

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 20, 2004

Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: 18.5'

Static Depth of Water in Well: NA

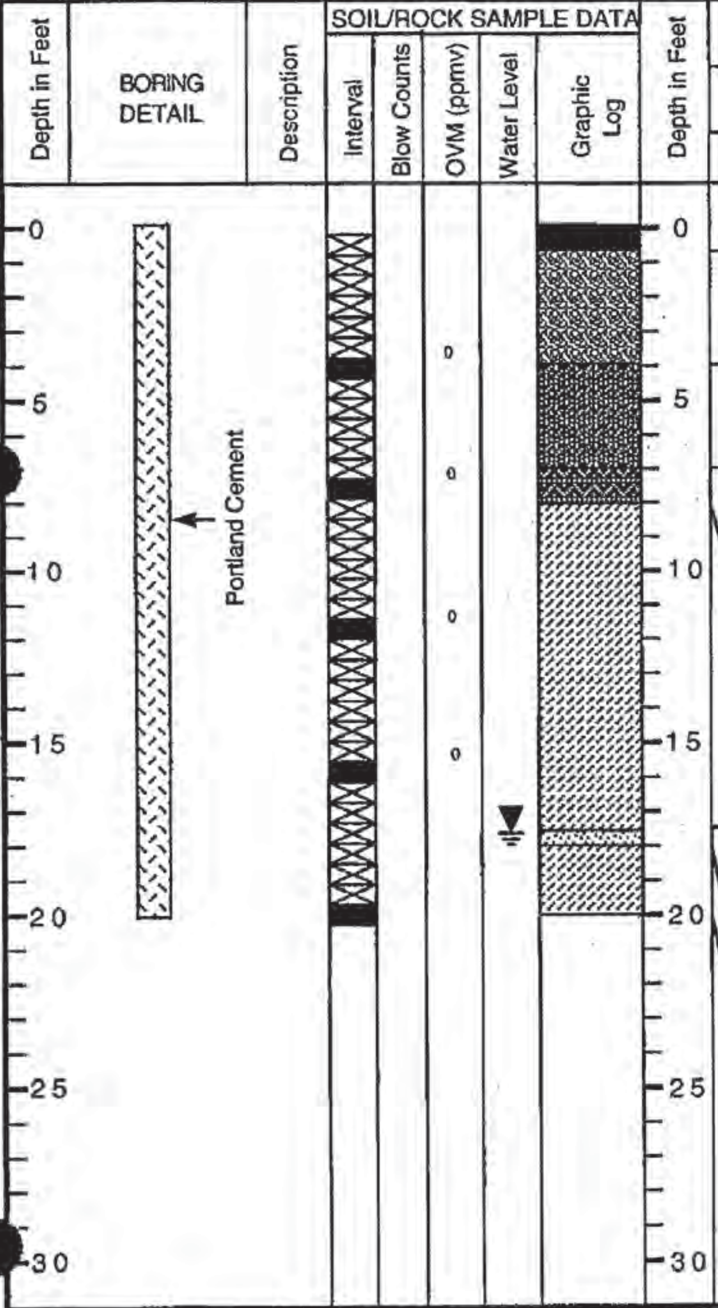
Total Depth of Boring: 20'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Asphalt/Base

Clayey SILT (ML); dark brown; stiff; damp; 70% silt; 20% clay; 10% sand; low plasticity; low estimated K; no odor

Silty CLAY (CL); dark brown; very stiff; damp; 70% clay; 20% silt; 10% sand; high plasticity; very low estimated K; no odor

Sandy CLAY (CL); brown; very stiff; damp; 50% clay; 40% sand; 10% silt; low plasticity; low estimated K; no odor

Sandy SILT (ML); yellow brown; stiff; dry; 60% silt; 30% sand; 10% clay; medium estimated K; non-plastic; no odor

80% silt; 10% sand; 10% clay

Silty SAND (SM); yellow brown; loose; wet; 85% sand; 10% silt; 5% clay; non-plastic; high estimated K; slight hydrocarbon odor

Sandy SILT (ML); yellow brown; stiff; moist; 80% silt; 10% sand; 10% clay; medium estimated K; non-plastic; no odor

End of boring

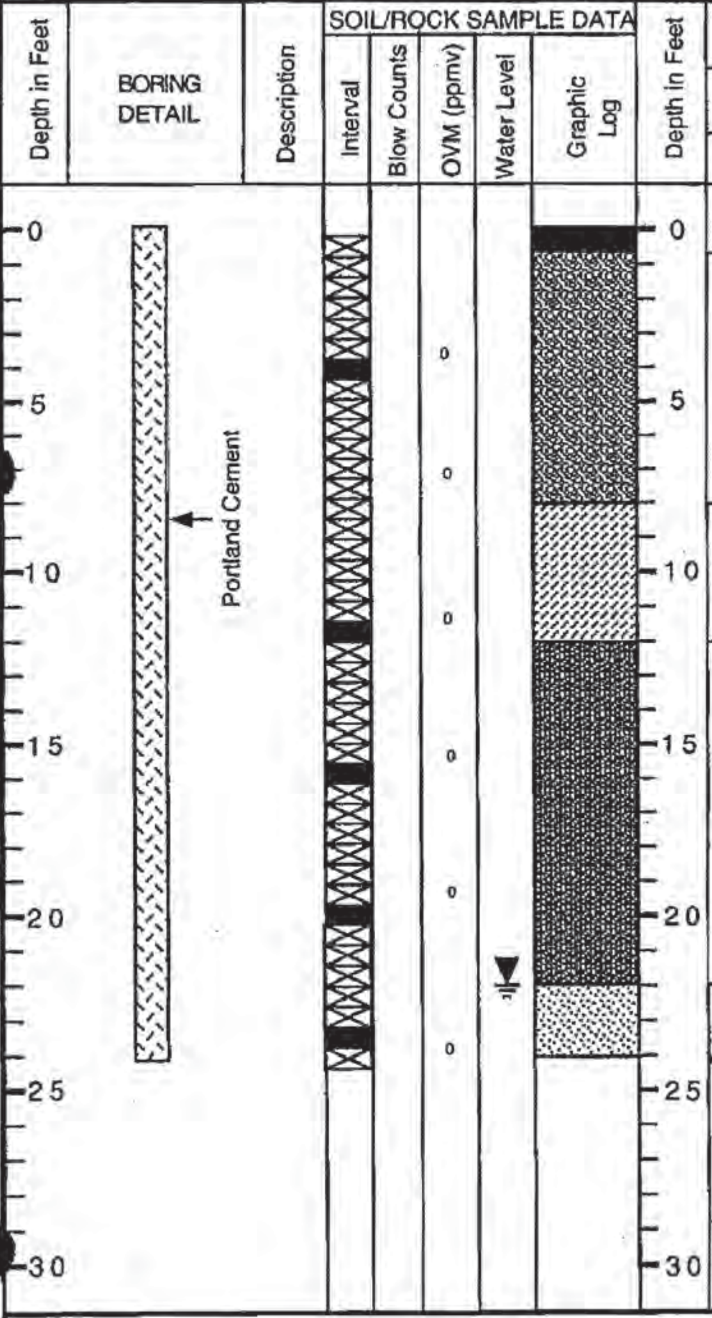
SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-L

Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 1
Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter
Logged By: Damian HricIga
Date Drilled: October 20, 2004
Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 22'
Static Depth of Water in Well: NA
Total Depth of Boring: 24'
Total Depth of Well Completed: NA
Well Screen Type and Diameter: NA
Well Screen Slot Size: NA
Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Asphalt/Base

Clayey SILT (ML); dark brown; stiff; damp; 75% silt; 20% clay; 5% sand; low plasticity; low estimated K; no odor

Sandy SILT (ML); yellow brown; stiff; moist; 60% silt; 40% sand; non-plastic; medium estimated K; no odor

Silty CLAY (CL); yellow brown; stiff; moist; 60% clay; 30% silt; 10% sand; moderate plasticity; low estimated K; no odor

Silty SAND (SM); brown; dense; wet; 60% sand; 20% silt; 10% gravel; 10% clay; non-plastic; high estimated K; no odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-M

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 20, 2004

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 15'

Static Depth of Water in Well: NA

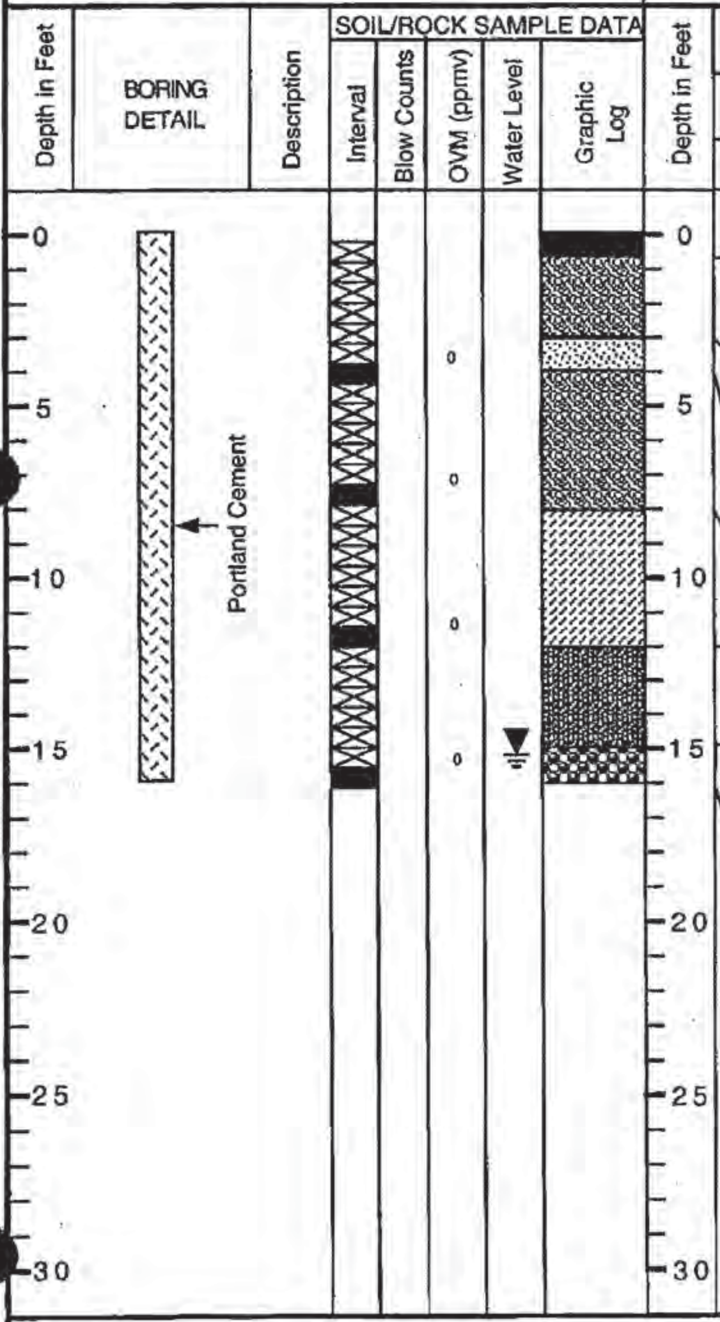
Total Depth of Boring: 16'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Asphalt/Base

Clayey SILT (ML); dark brown; stiff; damp; 75% silt; 20% clay; 5% sand; low plasticity; low estimated K; no odor

Silty SAND (SM); brown; medium dense; wet; 70% sand; 20% silt; 10% clay; non-plastic; high estimated K; no odor

Clayey SILT (ML); dark brown; stiff; damp; 75% silt; 20% clay; 5% sand; low plasticity; low estimated K; no odor

Sandy SILT (ML); yellow brown; stiff; moist; 60% silt; 40% sand; medium estimated K; non-plastic; no odor

Silty CLAY (CL); yellow brown; stiff; moist; 60% clay; 30% silt; 10% sand; moderate plasticity; low estimated K; no odor

Clayey GRAVEL (GC); brown; dense; wet; 60% gravel; 20% clay; 20% sand; non-plastic; high estimated K; no odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-N

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 21, 2004

Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: 10'

Static Depth of Water in Well: NA

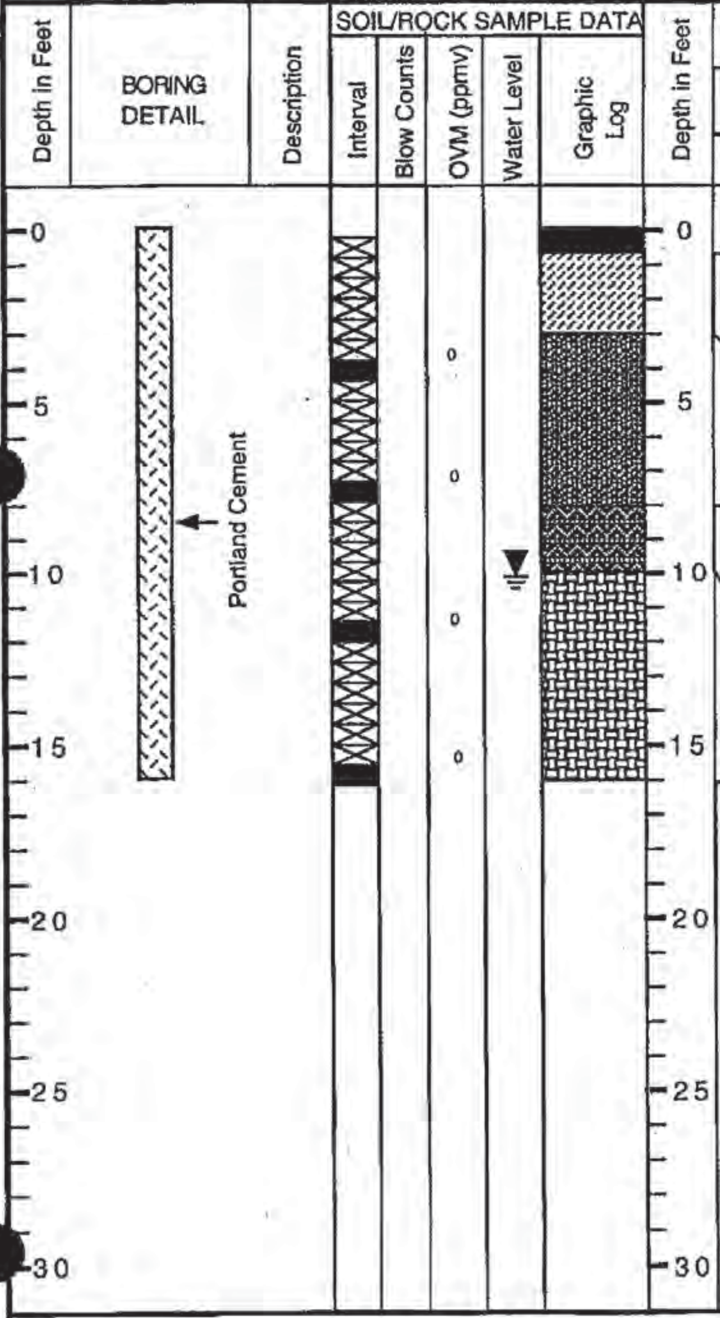
Total Depth of Boring: 16'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Asphalt/Base

Sandy SILT (ML); brown; stiff; dry; 90% silt; 10% sand; non-plastic; low estimated K; no odor

Silty CLAY (CH); brown; stiff; damp; 80% clay; 20%; silt; high plasticity; very low estimated K; no odor

Sandy CLAY (CL); olive; soft; damp; 60% clay; 30% sand; 10% gravel; low plasticity; medium estimated K; moderate hydrocarbon odor

Gravelly SAND (SW); brown; wet; loose; 60% sand; 30% gravel; 10% clay; non-plastic; high estimated K; no odor

End of boring

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS | BORING: BH-O

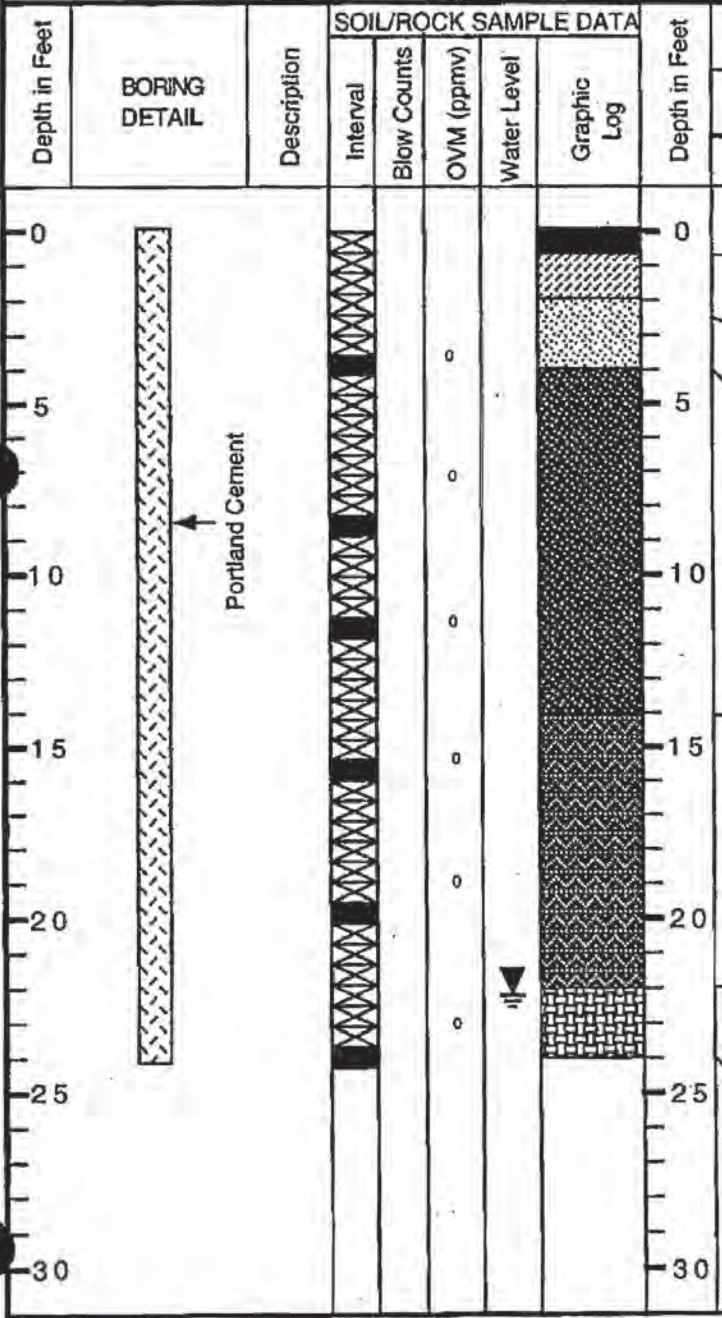
Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 1

Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga
Date Drilled: October 21, 2004
Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 22'
Static Depth of Water in Well: NA
Total Depth of Boring: 24'
Total Depth of Well Completed: NA
Well Screen Type and Diameter: NA
Well Screen Slot Size: NA
Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; medium stiff; moist; 90% silt; 10% sand; non-plastic; low estimated K; no odor

Silty SAND (SM); brown; wet; loose; 85% sand; 15% silt; non-plastic; high estimated K; no odor

CLAY (CH); dark brown; stiff; moist; 100% clay; high plasticity; very low estimated K; no odor

olive

Sandy CLAY (CL); olive; stiff; moist; 80% clay; 20% sand; trace gravel; moderate plasticity; low estimated K; no odor

Gravelly SAND (SW); yellow brown; wet; medium dense; 60% sand; 30% gravel; 10% clay; non-plastic; medium estimated K; no odor

End of boring

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-P

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 21, 2004

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 13.5'

Static Depth of Water in Well: NA

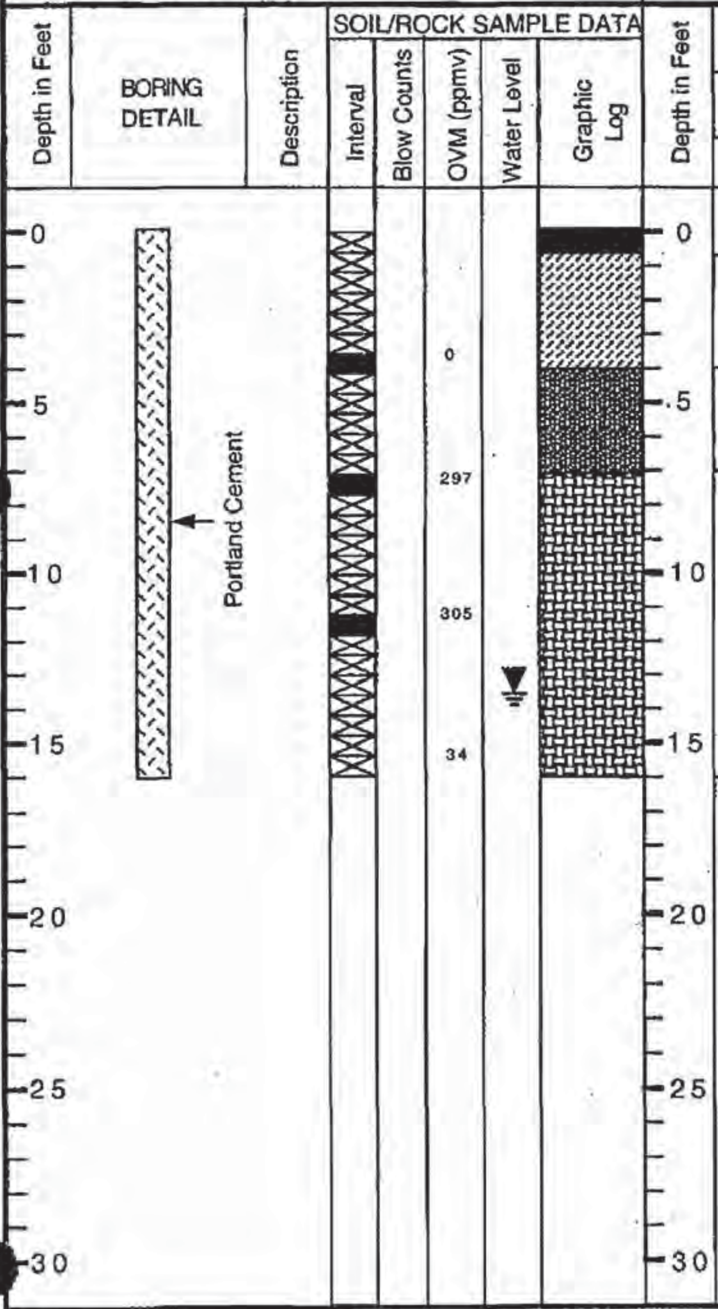
Total Depth of Boring: 16'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

0 — Asphalt/Base

Sandy SILT (ML); dark brown; stiff; damp; 95% silt; 5% sand; non-plastic; low estimated K; no odor

5 — Silty CLAY (CL); dark brown; stiff; damp; 80% clay; 20% silt; moderate plasticity; low estimated K; slight hydrocarbon odor

Gravelly SAND (SW); olive; moist; loose; 60% sand; 30% gravel; 10% clay; non-plastic; medium estimated K; strong hydrocarbon odor

yellow brown; wet; no odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-Q

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 21, 2004

Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: 13.5'

Static Depth of Water in Well: NA

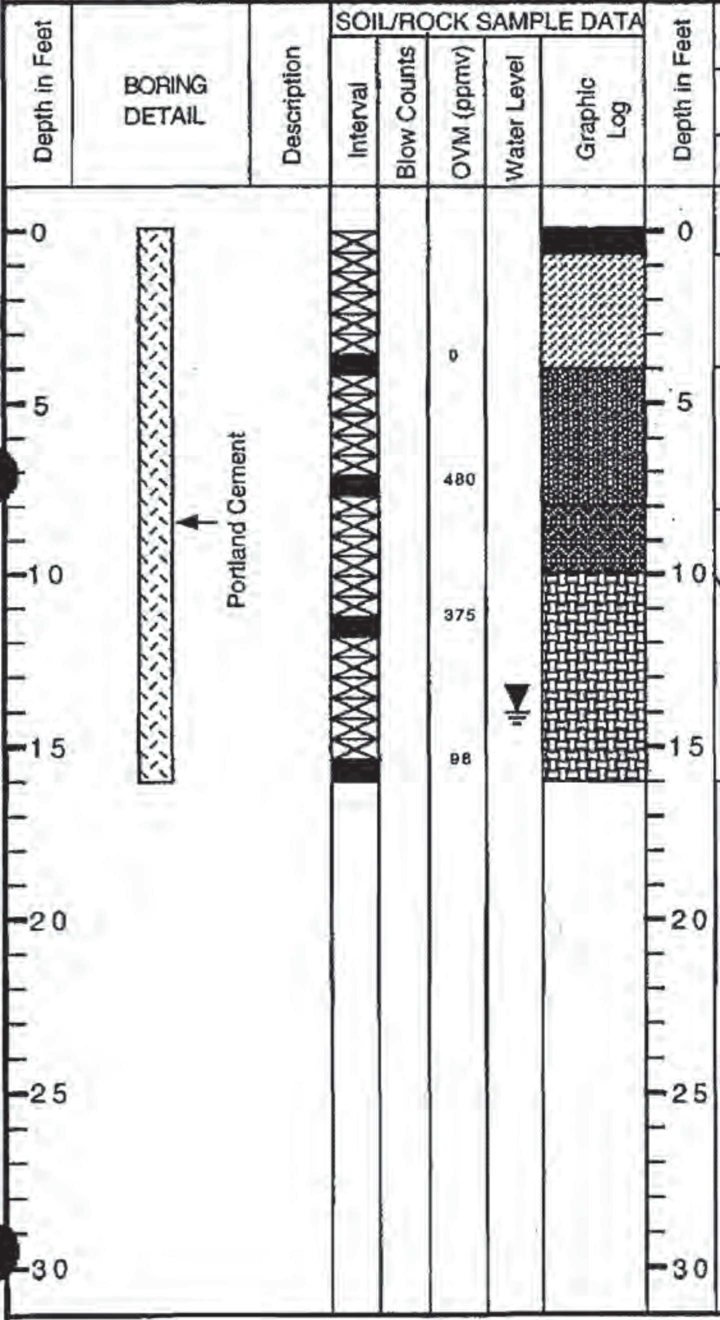
Total Depth of Boring: 16'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Asphalt/Base

Sandy SILT (ML); brown mottled orange; stiff; damp; 90% silt; 10% sand; non-plastic; low estimated K; no odor

Silty CLAY (CL); dark brown; stiff; damp; 80% clay; 20% silt; moderate plasticity; low estimated K; slight hydrocarbon odor

Sandy CLAY (CL); olive; stiff; damp; 80% clay; 20% sand; moderate plasticity; low estimated K; slight hydrocarbon odor

Gravelly SAND (SW); olive; moist; loose; 60% sand; 30% gravel; 10% clay; non-plastic; high estimated K; moderate hydrocarbon odor

yellow brown; wet; slight hydrocarbon odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-R

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 21, 2004

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 13.5'

Static Depth of Water in Well: NA

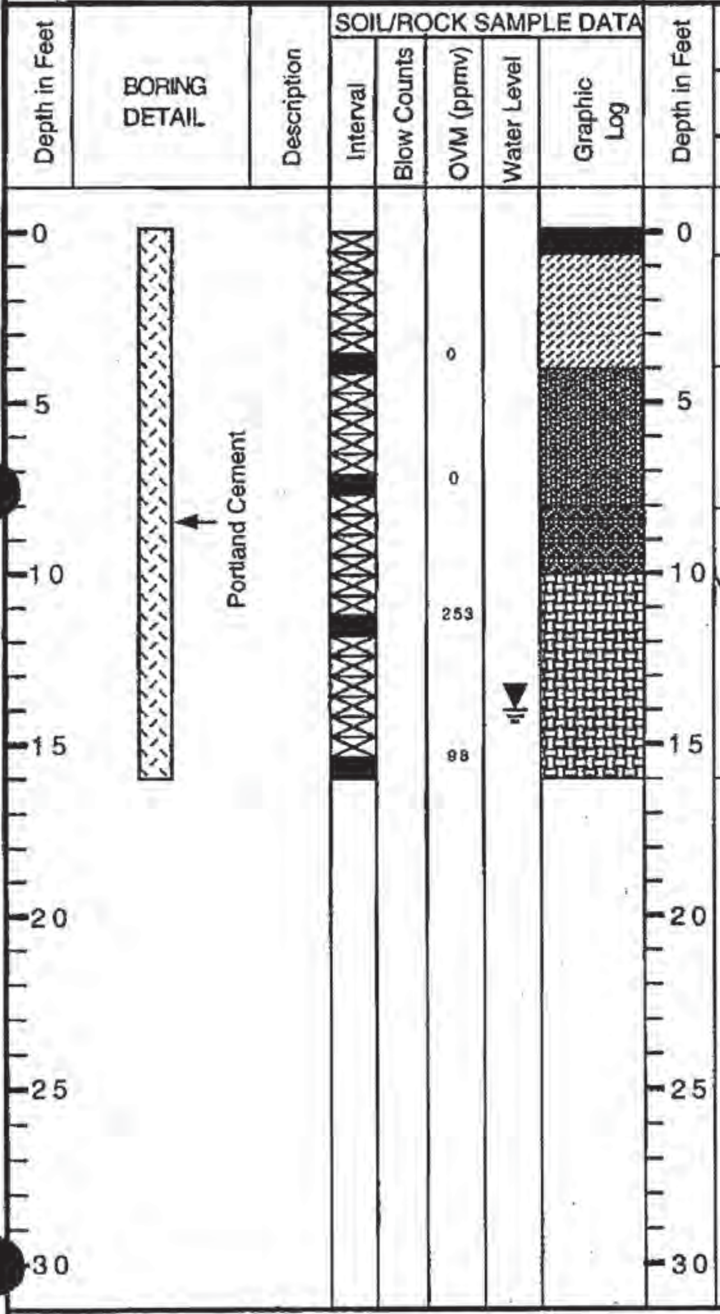
Total Depth of Boring: 16'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown mottled orange; stiff; damp; 90% silt; 10% sand; non-plastic; low estimated K; no odor

Silty CLAY (CL); dark brown; stiff; damp; 80% clay; 20% silt; moderate plasticity; low estimated K; no odor

Sandy CLAY (CL); olive; stiff; damp; 80% clay; 20% silt; moderate plasticity; low estimated K; slight hydrocarbon odor

Gravelly SAND (SW); olive; moist; loose; 60% sand; 30% gravel; 10% clay; non-plastic; high estimated K; moderate hydrocarbon oder

yellow brown; wet; slight hydrocarbon odor

End of boring

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-S

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 21, 2004

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 19'

Static Depth of Water in Well: NA

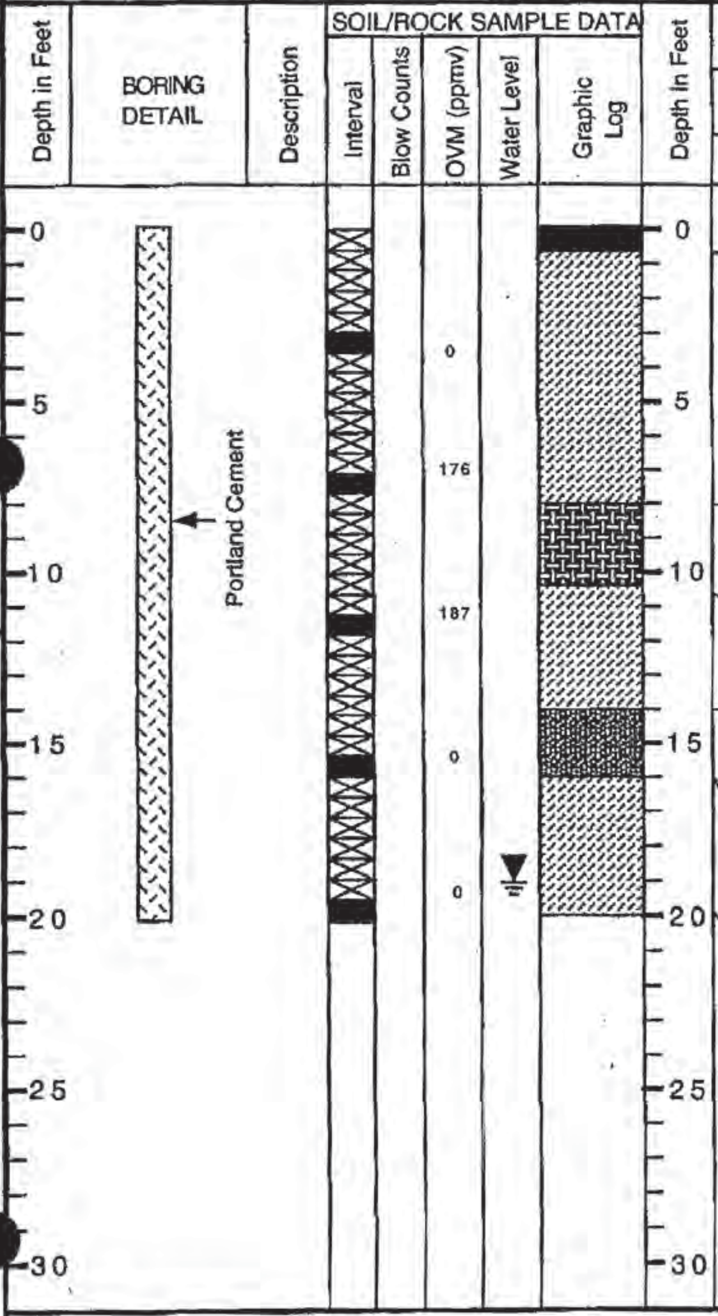
Total Depth of Boring: 20'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Asphalt/Base

Sandy SILT (ML); brown mottled orange; stiff; damp; 90% silt; 10% sand; non-plastic; low estimated K; no odor

moderate hydrocarbon odor

Gravelly CLAY (CL); olive; stiff; damp; 60% clay; 30% gravel; 10% sand; moderate plasticity; medium estimated K; strong hydrocarbon odor

Sandy SILT (ML); olive; medium stiff; moist; 60% silt; 40% sand; non-plastic; medium estimated K; strong hydrocarbon odor

Silty CLAY (CL); yellow brown; very stiff; damp; 80% clay; 20% silt; moderate plasticity; low estimated K; no odor

Sandy SILT (ML); yellow brown; soft; moist; 60% silt; 40% sand; trace gravel; non-plastic; medium estimated K; no odor

wet @19 feet

End of boring

AQUA SCIENCE ENGINEERS, INC.

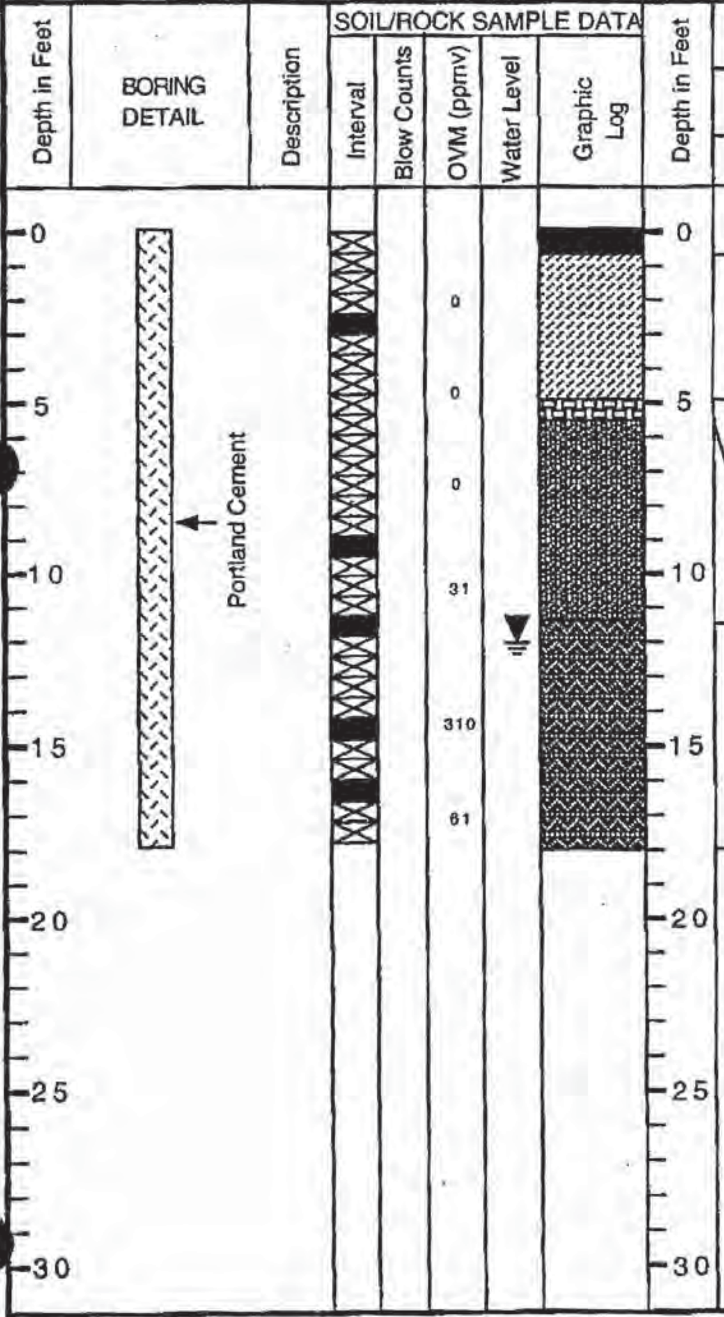
SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-T

Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 1
Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter
Logged By: Damian Hriciga
Date Drilled: October 21, 2004
Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 12'
Static Depth of Water in Well: NA
Total Depth of Boring: 18'
Total Depth of Well Completed: NA
Well Screen Type and Diameter: NA
Well Screen Slot Size: NA
Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); dark brown; medium stiff; moist; 85% silt; 15% sand; non-plastic; low estimated K; no odor
olive mottled brown below 3 feet

Gravelly SAND (SW); olive mottled brown; moist; loose; 60% sand; 40% gravel; non-plastic; high estimated K; no odor

Silty CLAY (CL); dark brown; stiff; moist; 80% clay; 20% silt; moderate plasticity; low estimated K; no odor

Sandy CLAY (CL); olive; medium stiff; moist; 70% clay; 15% sand; 15% gravel; non-plastic; medium estimated K; no odor
wet between 12 and 13 feet
75% clay; 25% sand below 13 feet
wet between 16 and 16.5 feet

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-U

Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 1

Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga
Date Drilled: October 21, 2004
Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: 9.5'

Static Depth of Water in Well: NA

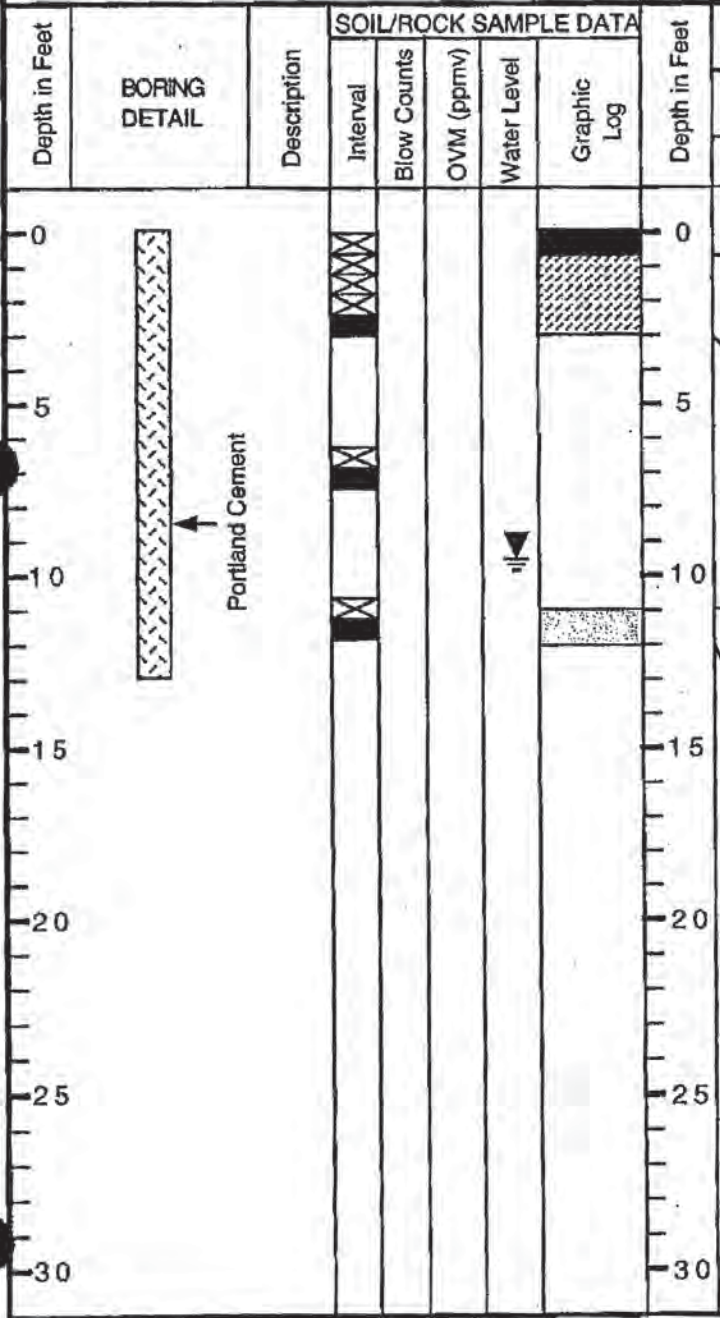
Total Depth of Boring: 12'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); yellow brown; medium stiff; moist; 70% silt; 20% sand; 10% gravel; non-plastic; medium estimated K; no odor

No recovery - Pea Gravel

SAND (SP); olive; loose; wet; 100% sand; non-plastic; high estimated K; strong hydrocarbon odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-V

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: October 21 and 22, 2004

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: Dry

Static Depth of Water in Well: Dry

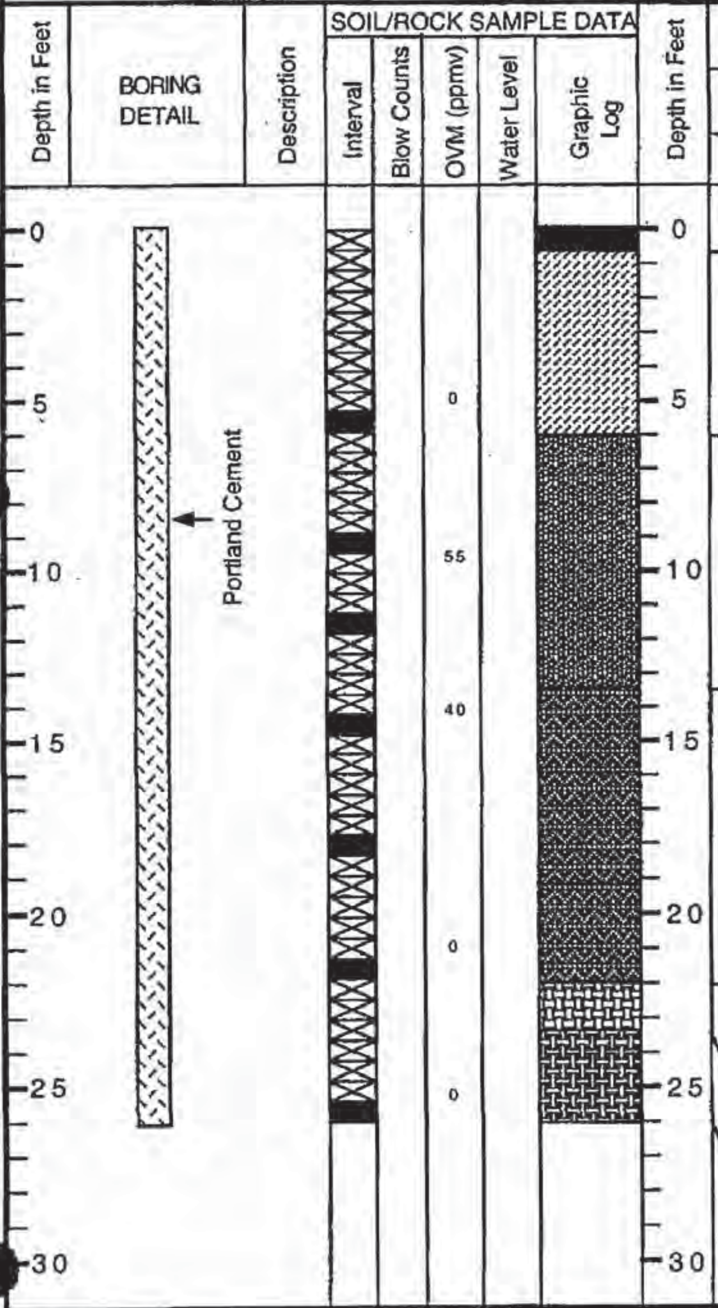
Total Depth of Boring: 26'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; medium stiff; moist; 85% silt; 15% sand; non-plastic; low estimated K; no odor

Silty CLAY (CL); dark brown; stiff; moist; 70% clay; 30% silt; low plasticity; low estimated K; no odor

Sandy CLAY (CL); olive; stiff; moist; 60% clay; 40% sand; low plasticity; low estimated K; no odor
90% clay; 10% sand below 13.5 feet

Gravelly SAND (SW); brown; medium dense; moist; 70% sand; 20% gravel; 10% clay; non-plastic; high estimated K; no odor

Gravelly CLAY (CL); olive; stiff; moist; 80% clay; 15% gravel; 5% sand; low plasticity; low estimated K; no odor

End of boring

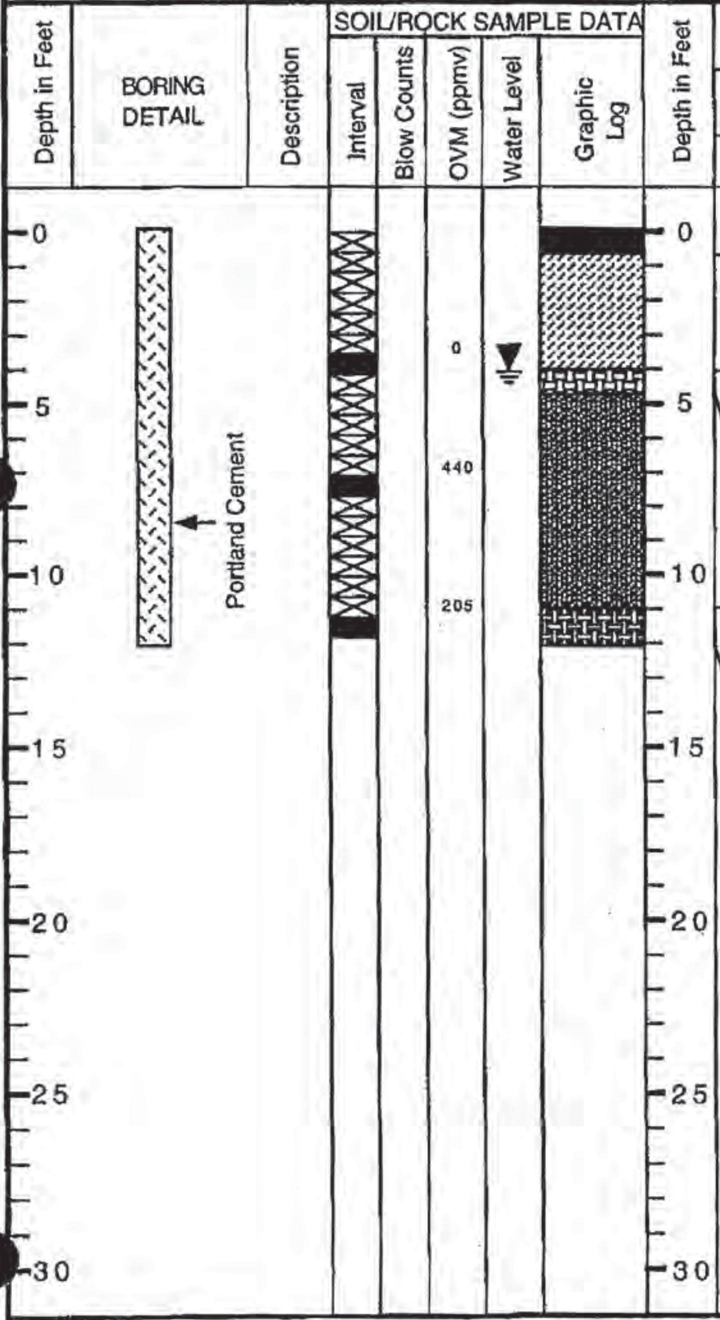
AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-W

Project Name: Kozel Property	Project Location: 1001 42nd St. Oakland, CA	Page 1 of 1
Driller: Vironex	Type of Rig: Geoprobe	Size of Drill: 2.0" Diameter
Logged By: Damian Hriciga	Date Drilled: October 22, 2004	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA	Total Depth of Well Completed: NA
Depth of Water First Encountered: 4'	Well Screen Type and Diameter: NA
Static Depth of Water in Well: NA	Well Screen Slot Size: NA
Total Depth of Boring: 12'	Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; medium stiff; moist; 90% silt; 10% sand; non-plastic; low estimated K; no odor

Gravelly SAND (SW); brown; loose; wet; 50% sand; 40% gravel; 10% clay; non-plastic; high estimated K; no odor

Silty CLAY (CL); dark brown; stiff; damp; 80% clay; 20% silt; low plasticity; low estimated K; slight hydrocarbon odor

Gravelly CLAY (CL); olive; stiff; damp; 80% clay; 20% gravel; low plasticity; low estimated K; slight hydrocarbon odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-X

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: November 9, 2004

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: NA

Static Depth of Water in Well: NA

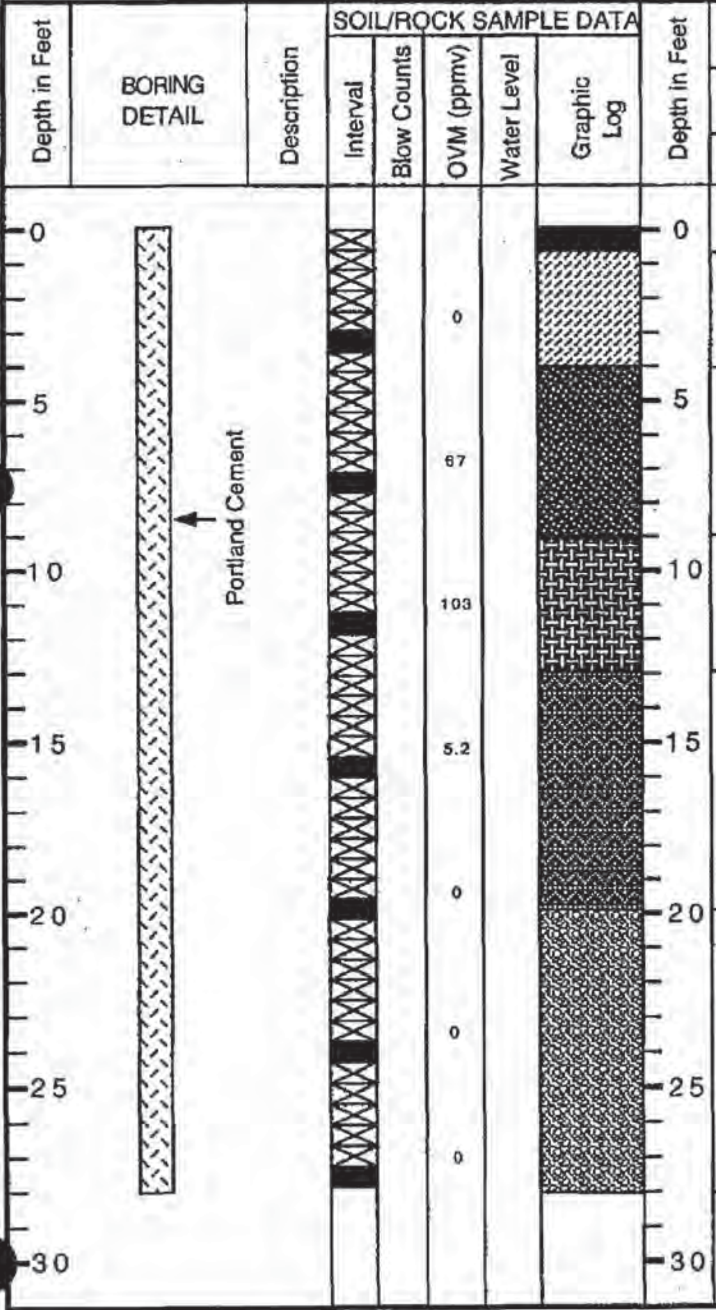
Total Depth of Boring: 28'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



Depth in Feet	DESCRIPTION OF LITHOLOGY standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.
0	Concrete/Base
	Sandy SILT (ML); brown; soft; moist; 80% silt; 20% sand; non-plastic; low estimated K; no odor
5	CLAY (CH); black; stiff; damp; 100% clay; high plasticity; very low estimated K; no odor moderate hydrocarbon odor below 6 feet
10	Gravelly CLAY (CL); olive; stiff; moist; 50% clay; 35% gravel; 15% sand; non-plastic; medium estimated K; moderate hydrocarbon odor
15	Sandy CLAY (CH); olive; medium stiff; moist; 95% clay; 5% sand; trace gravel; high plasticity; very low estimated K; no odor
	yellow brown; 60% clay; 20% sand; 20% gravel
20	Clayey SILT (ML); yellow brown; soft; moist; 60% silt; 20% clay; 20% gravel; moderate plasticity; low estimated K; no odor
25	
	End of boring
30	

AQUA SCIENCE ENGINEERS, INC.

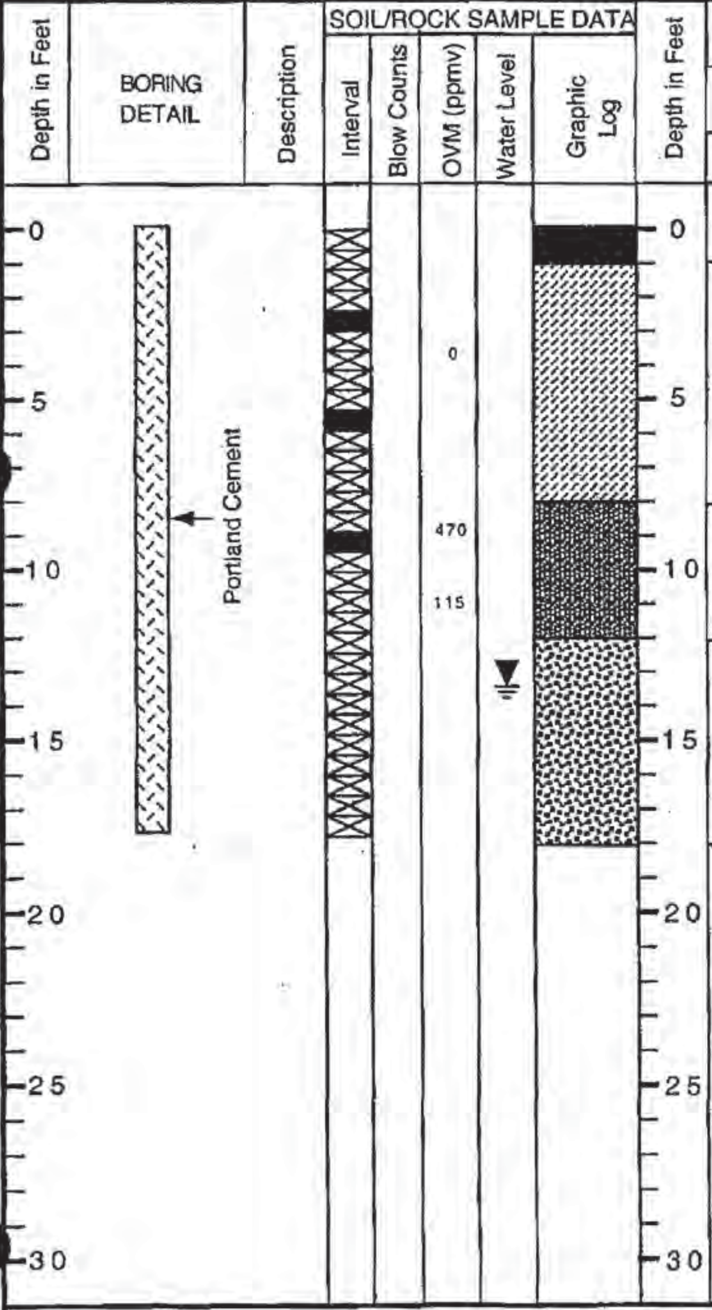
SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-Y

Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 1
Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter
Logged By: Damian Hriciga
Date Drilled: November 9, 2004
Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: 13.5'
Static Depth of Water in Well: NA
Total Depth of Boring: 18'
Total Depth of Well Completed: NA
Well Screen Type and Diameter: NA
Well Screen Slot Size: NA
Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; medium stiff; moist; 80% silt; 20% sand; non-plastic; low estimated K; no odor

soft

Sandy CLAY (CL); black; stiff; damp; 80% clay; 15% silt; 5% sand; moderate plasticity; low estimated K; moderate hydrocarbon odor

Clayey SAND (SC); olive; medium dense; wet; 60% sand; 30% clay; 10% gravel; non-plastic; medium estimated K; moderate hydrocarbon odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-Z

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: November 9, 2004

Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: 13.5'

Static Depth of Water in Well: NA

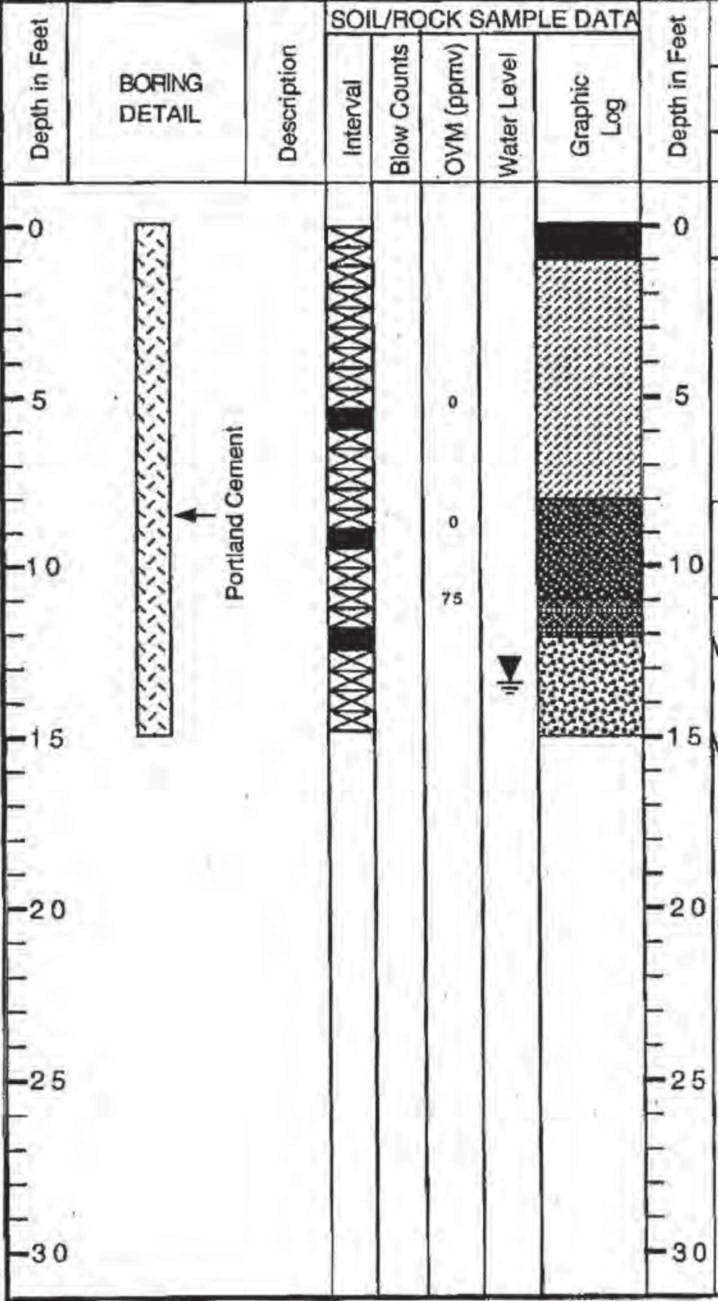
Total Depth of Boring: 15'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; medium stiff; moist; 90% silt; 10% sand; non-plastic; low estimated K; no odor

70% silt; 25% sand; 5% gravel

95% silt; 5% sand

CLAY (CH); black; stiff; moist; 100% clay; high plasticity; very low estimated K; no odor

moderate hydrocarbon odor below 10 feet

Sandy CLAY (CL); black; stiff; moist; 80% clay; 20% sand; trace gravel; moderate plasticity; low estimated K; strong hydrocarbon odor

Clayey SAND (SC); olive; medium dense; wet; 60% sand; 30% clay; 10% gravel; non-plastic; medium estimated K; moderate hydrocarbon odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

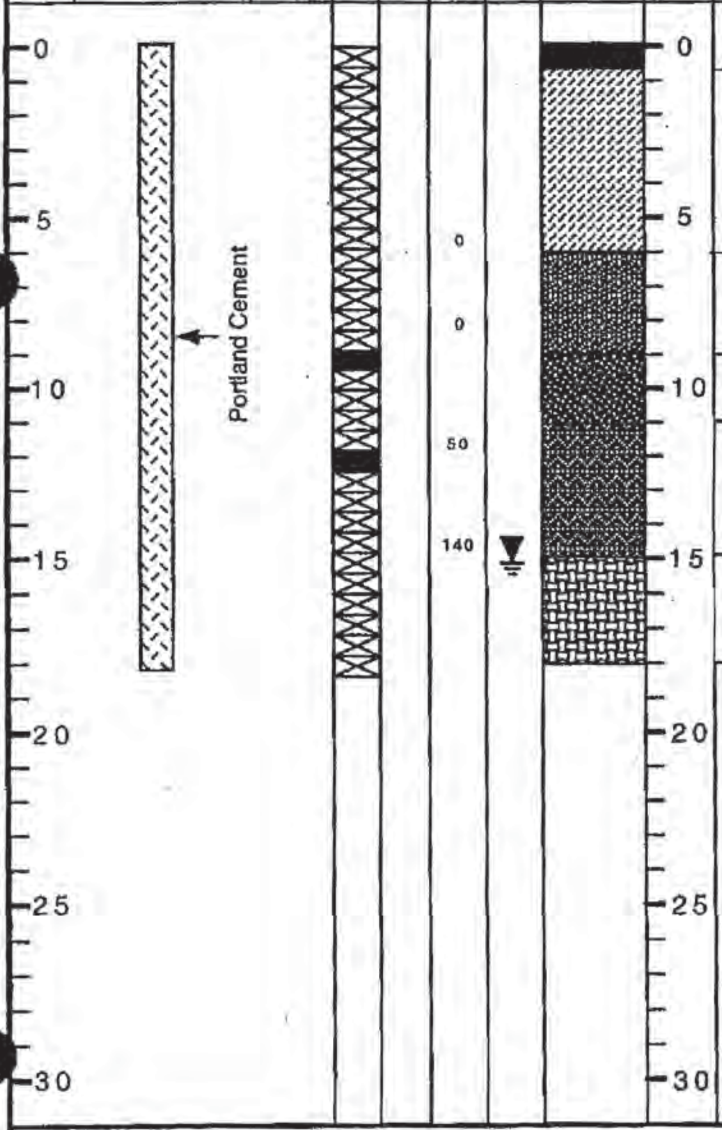
SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-AA

Project Name: Kozel Property	Project Location: 1001 42nd St. Oakland, CA	Page 1 of 1
Driller: Vironex	Type of Rig: Geoprobe	Size of Drill: 2.0" Diameter
Logged By: Damian Hriciga	Date Drilled: December 14, 2004	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA	Total Depth of Well Completed: NA
Depth of Water First Encountered: 15'	Well Screen Type and Diameter: NA
Static Depth of Water in Well: NA	Well Screen Slot Size: NA
Total Depth of Boring: 18'	Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler

Depth in Feet | BORING DETAIL | Description | SOIL/ROCK SAMPLE DATA: Interval, Blow Counts, OVM (ppmv), Water Level, Graphic Log | Depth in Feet



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; soft; dry; 80% silt; 20% sand; non-plastic; low estimated K; no odor

Silty CLAY (CL); dark brown; medium stiff; moist; 80% clay; 15% silt; 5% sand; moderate plasticity; low estimated K; no odor

CLAY (CH); olive; stiff; moist; 95% clay; 5% gravel; high plasticity; low estimated K; strong hydrocabon odor

Sandy CLAY (CH); olive; stiff; moist; 50% clay; 35% sand; 15% gravel; non-plastic; medium estimated K; strong hydrocarbon odor

Gravelly SAND (SW); yellow brown; medium dense; wet; 50% sand; 30% gravel; 20% clay; non-plastic; high estimated K; strong hydrocarbon odor

End of boring

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-BB

Project Name: Kozel Property

Project Location: 1001 42nd St. Oakland, CA

Page 1 of 1

Driller: Vironex

Type of Rig: Geoprobe

Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga

Date Drilled: December 14, 2004

Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: 15'

Static Depth of Water in Well: NA

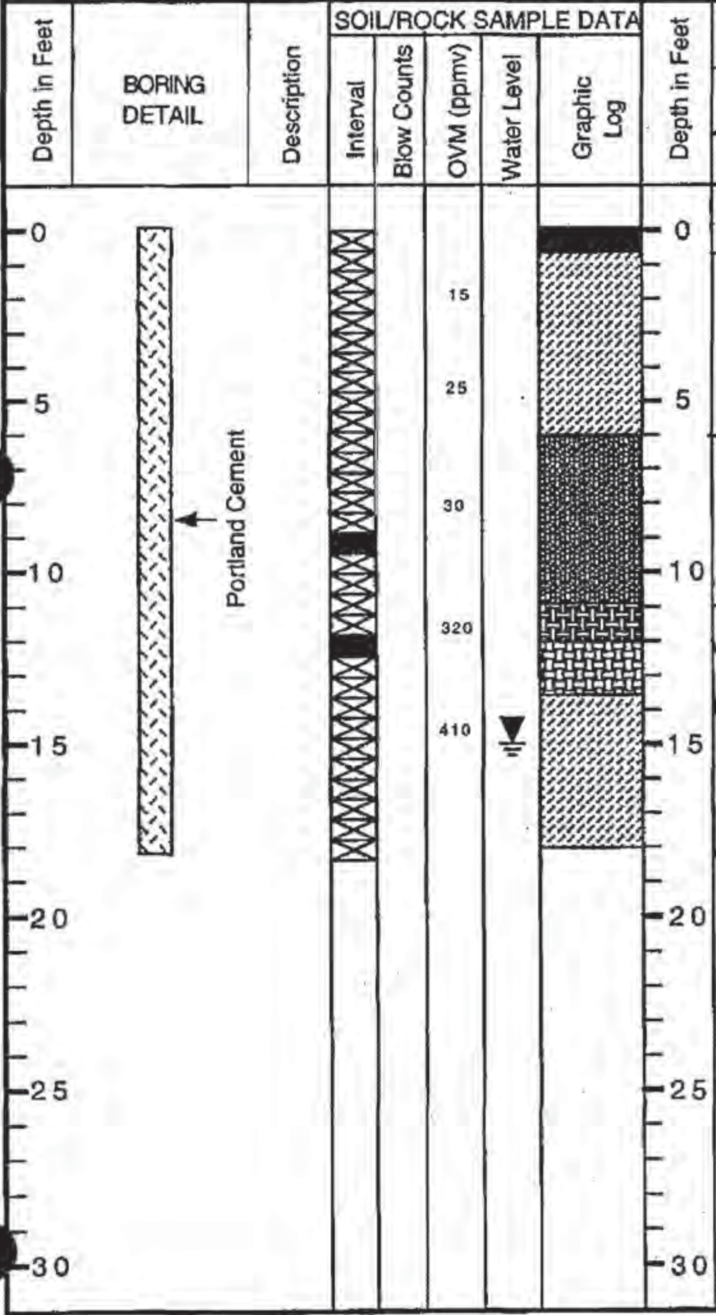
Total Depth of Boring: 18'

Total Depth of Well Completed: NA

Well Screen Type and Diameter: NA

Well Screen Slot Size: NA

Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Concrete/Base

Sandy SILT (ML); brown; medium stiff; moist; 80% silt; 20% sand; non-plastic; low estimated K; no odor

Silty CLAY (CL); black; stiff; moist; 90% clay; 10% silt; moderate plasticity; low estimated K; no odor

Gravelly CLAY (CL); olive; stiff; moist; 70% clay; 30% gravel; moderate plasticity; low estimated K; strong hydrocabon odor

Gravelly SAND (SW); olive; medium dense; damp; 50% sand; 30% gravel; 20% clay; non-plastic; high estimated K; strong hydrocarbon odor

Sandy SILT (ML); olive; soft; wet; 70% silt; 30% sand; non-plastic; medium estimated K; strong hydrocarbon odor

End of boring

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-CC

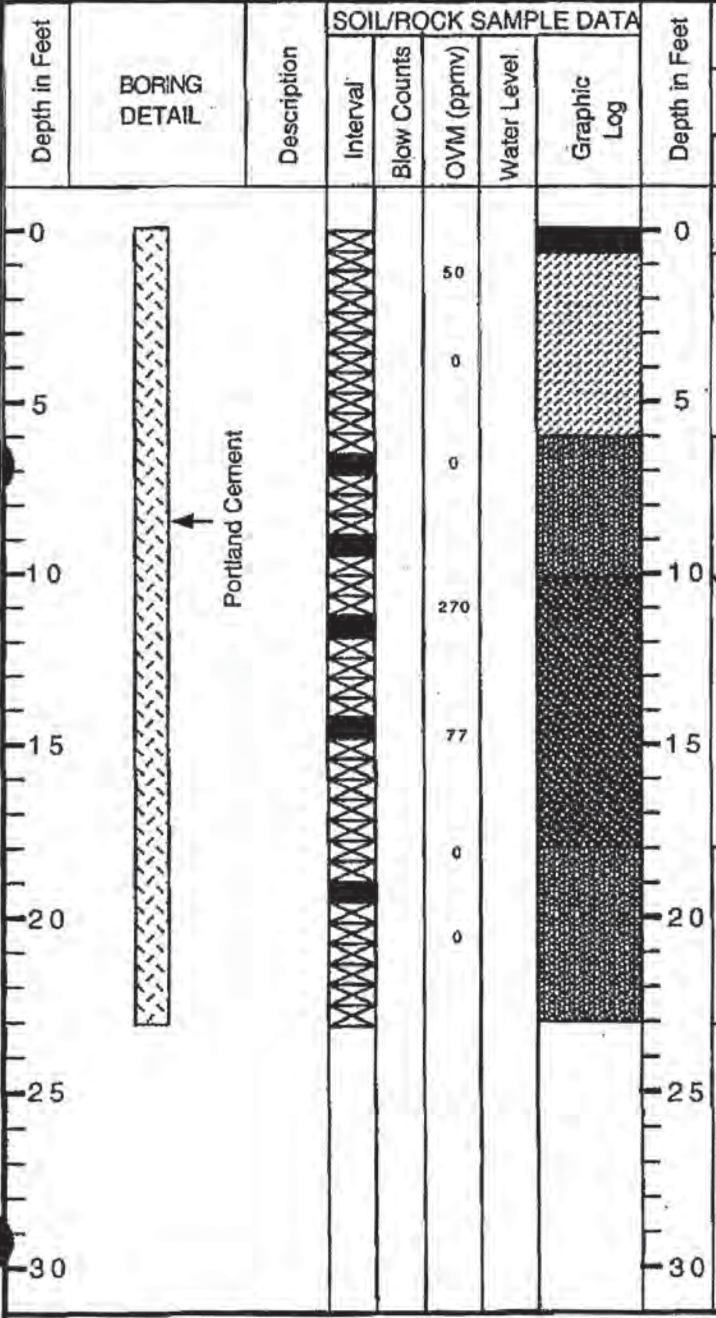
Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 1

Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga
Date Drilled: November 14, 2004
Checked By: Robert E. Kitay, R.G. RK

WATER AND WELL DATA

Depth of Water First Encountered: NA
Static Depth of Water in Well: NA
Total Depth of Boring: 23'
Total Depth of Well Completed: NA
Well Screen Type and Diameter: NA
Well Screen Slot Size: NA
Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Depth in Feet	Description
0	Concrete/Base
	Sandy SILT (ML); brown; medium stiff; moist; 80% silt; 20% sand; non-plastic; low estimated K; no odor
5	yellow brown; damp
	Silty CLAY (CH); dark brown mottled red; stiff; moist; 70% clay; 30% silt; low plasticity; low estimated K; no odor
10	90% clay; 10% silt; high plasticity; very low estimated K
	CLAY (CH); dark brown; stiff; moist; 100% clay; trace sand and gravel; high plasticity; very low estimated K; strong hydrocarbon odor olive below 13 feet
15	
20	Silty CLAY (CL); olive; stiff; damp; 50% clay; 25% silt; 15% sand; 10% gravel; non-plastic; low estimated K; no odor
	End of boring
25	
30	

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

BORING: BH-DD

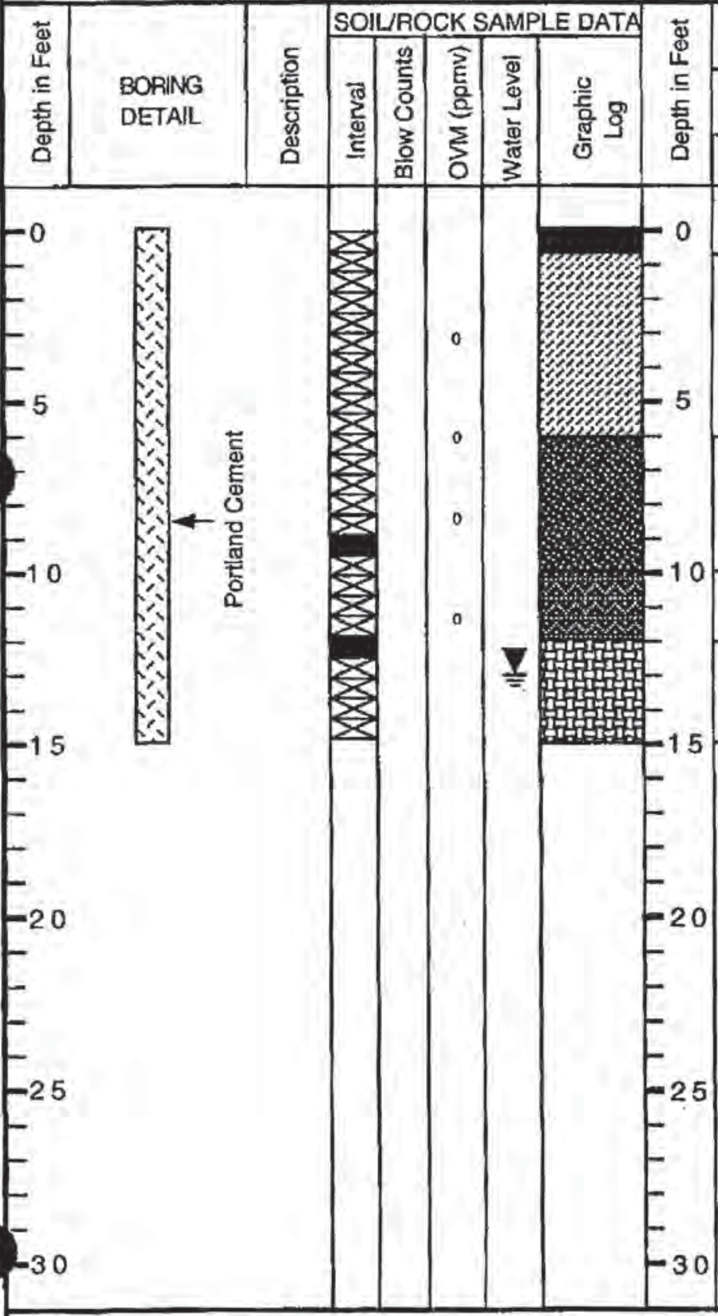
Project Name: Kozel Property
Project Location: 1001 42nd St. Oakland, CA
Page 1 of 1

Driller: Vironex
Type of Rig: Geoprobe
Size of Drill: 2.0" Diameter

Logged By: Damian Hriciga
Date Drilled: December 14, 2004
Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 13'
Static Depth of Water in Well: NA
Total Depth of Boring: 15'
Total Depth of Well Completed: NA
Well Screen Type and Diameter: NA
Well Screen Slot Size: NA
Type and Size of Soil Sampler: 2.0" I.D. Macro Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Depth in Feet	Description of Lithology
0	Concrete/Base
	Sandy SILT (ML); brown; soft; dry; 80% silt; 20% sand; non-plastic; low estimated K; no odor
5	CLAY (CH); dark brown; medium stiff; moist; 100% clay; high plasticity; very low estimated K; no odor
10	Sandy CLAY (CL); olive; stiff; moist; 60% clay; 40% sand; low plasticity; low estimated K; no odor
	Gravelly SAND (SW); yellow brown; medium dense; wet; 50% sand; 30% gravel; 20% clay; non-plastic; high estimated K; no odor
15	End of boring

AQUA SCIENCE ENGINEERS, INC.

ERM

Drilling Log

Project Aegis Owner Aegis
Location 1001 42nd St. Project Number 0041534
Boring Number B-1 Total Depth of Auger 17.5 Auger Diameter 3"
Surface Elevation ______ Water Level: Initial ______ 24-hrs ______
Total Depth of Soil Sampler 17.5 Total Depth of Ground Water Sampler ______
Ground Water Sample Interval(s) N/A
Drilling Company Vironex Drilling Method Direct Push
Driller Sayphone Log By RLS Date Drilled 5/30/06

Sketch Map

Notes
Badger

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0					SANDY-SILT, dark brown. loose to moderately cohesive, root material in top 6", dry
1	ML				
2					
3					CLAYey-SILT, dark brown, moderately soft, high plasticity, dry. No odor or staining
4					As above, mottled dark brown/olive brown.
5			0		
6			0	X	CLAY, dark brown, moderately stiff, moderate plasticity, dry. No odor or staining B-1-7 (1205)
7			0		
			0		
8	CL		0		
9			0		CLAY, dark gray, stiff, moderate plasticity, dry, no odor or staining.
10			0		
11			351	X	B-1-11.5' (1213) Color change to green-gray, hydrocarbon-like odor. No staining, dry.
			165		
12			0		

ERM

Drilling Log

Project ________ Owner ________

Location ________ Project Number ________

Boring Number B-1 Total Depth of Auger ________ Auger Diameter ________

Surface Elevation ________ Water Level: Initial ________ 24-hrs ________

Total Depth of Soil Sampler ________ Total Depth of Ground Water Sampler ________

Ground Water Sample Interval(s) ________

Drilling Company ________ Drilling Method ________

Driller ________ Log By ________ Date Drilled ________

Sketch Map

Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
			271	X	As above, dry, hydrocarbon-like odor
14			507		B-1-14(1222) @14' trace fine to med. sands
			240		
15	CL		25		last 6" color change to dark brown.
16					
17					
18					Hit refusal at 17.5' bgs set temp.casing, 8 10' screen.
19					
20					

Page 2 of ________

ERM

Drilling Log

Project Aegis Owner Aegis
Location Oakland Project Number 0041534.00
Boring Number B-8 Total Depth of Auger 15 Auger Diameter 3'
Surface Elevation ____ Water Level: Initial 13.75' 24-hrs ____
Total Depth of Soil Sampler 15 Total Depth of Ground Water Sampler 15'
Ground Water Sample Interval(s) 15'
Drilling Company Vironex Drilling Method Direct Push
Driller Sayphone Log By RLS Date Drilled 5/30/06

Sketch Map

Notes
Badger

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0				HAND AUGER	SANDY-SILT, dark brown, loose to moderately cohesive, root material in top 6". dry.
1	ML				
2					As above with increasing fines.
3					CLAYEY-SILT, dark brown. Moderately soft, high plasticity, dry
4					
5			0		As above, olive-brown
6					CLAY, dark gray, moderately stiff, high plasticity, dry, slight hydrocarbon-like odor. sample B-8-7' (1010)
7			101	X	
8	CL		83		
			0		
9			0		CLAY, as above, no odor or staining B-2-10' (1020)
10			0	X	
11			0		CLAY, green-gray, stiff, moderate plasticity. trace, fine to med. sands, moist (liner wet) no odor or staining.
12			0		CLAY, light green grey. with trace fine to med. sands, stiff, moderate plasticity.
			165		

Page 1 of ____

ERM

Drilling Log

Project ________ Owner ________

Location ________ Project Number ________

Boring Number B-2 Total Depth of Auger ________ Auger Diameter ________

Surface Elevation ________ Water Level: Initial ________ 24-hrs ________

Total Depth of Soil Sampler ________ Total Depth of Ground Water Sampler ________

Ground Water Sample Interval(s) ________

Drilling Company ________ Drilling Method ________

Driller ________ Log By ________ Date Drilled ________

Sketch Map

Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
	∇				moist, liner saturated. Organic odor, no staining.
14	§		19		
	CL				
15			13.5		
					Tag 4" water in boring @ 12', push another run to 15', set temp casing collect gw sample B-2-15' (1050)
16					
17					Water level @ 13.75
18					
19					
20					

ERM

Drilling Log

Project Aegis Owner Aegis

Location 1001 42nd St. Project Number 5041534

Boring Number B-3 Total Depth of Auger 17.5 Auger Diameter 8"

Surface Elevation ____ Water Level: Initial ____ 24-hrs ____

Total Depth of Soil Sampler 17.5 Total Depth of Ground Water Sampler ____

Ground Water Sample Interval(s) ____

Drilling Company Vironex Drilling Method Direct Push

Driller Saypohone Log By RLS Date Drilled 5/30/06

Sketch Map

Notes

Badger

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0				HAND AUGER	SANDY-SILT, dark brown, soft, moderately cohesive; dry
1					
2	ML				As above, more fines becoming increasingly stiff
3					
4					
5			0		SILTY-CLAY, dark brown, moderately soft, high plastricity. dry, no odor or staining. As above, stiff, moderately plastic; dry. (B-3-7') 1433
6	CL		0		
7			0	X	
8			0		
9			0		SILTY-CLAY, dark brown. stiff, moderate plastiaity dry. No odor or staining. B-3-10(1440)
10			0	X	
11	CL		0		
12			0		SILTY-CLAY, as above. olive-brown, dry

Page 1 of ____

ERM

Drilling Log

Project ______ Owner ______

Location ______ Project Number ______

Boring Number B-3 Total Depth of Auger ______ Auger Diameter ______

Surface Elevation ______ Water Level: Initial ______ 24-hrs ______

Total Depth of Soil Sampler ______ Total Depth of Ground Water Sampler ______

Ground Water Sample Interval(s) ______

Drilling Company ______ Drilling Method ______

Driller ______ Log By ______ Date Drilled ______

Sketch Map

Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
14		0			
15	CL	0			CLAY. olive brown. very stiff, moderate plasticity. dry. No odor or staining.
16		0			
17		0			
18					Refusal at 17.5' - very hard drilling due to stiff clays. Set temp. casing
19					
20					

Page 2 of ______

ERM

Drilling Log

Project Aegis Owner Aegis
Location 1001 42nd St. Project Number 0041534
Boring Number B-4 Total Depth of Auger 18 Auger Diameter 3"
Surface Elevation ______ Water Level: Initial ______ 24-hrs ______
Total Depth of Soil Sampler 18 Total Depth of Ground Water Sampler ______
Ground Water Sample Interval(s) ______
Drilling Company Vironex Drilling Method Direct Push
Driller Sayphone Log By RLS Date Drilled 5/30/06

Sketch Map

Notes
Badger

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0				HAND AUGER	SANDY-SILT, dark brown. soft, moderately cohesive, dry
1					
2	ML				As above, trace coarse sands
3					
4					SILTY-CLAY. dark brown. moderatly stiff moderate plasticity, dry.
5	CL		0		As above.
6			0	X	CLAY. Dark brown, moderatly stiff, moderate plasticity. dry. No odor or staining B-4-7(1535)
7			0		
8			0		
9			0	X	As above B-4-10 (1541)
10	CL		0		
11			0		
12			0		CLAY, as above. Dark brown top 6" into olive-gray. Trace fine sands at color contact.

Page 1 of ______

ERM

Drilling Log

Project ______ Owner ______
Location ______ Project Number ______
Boring Number B-4 Total Depth of Auger ______ Auger Diameter ______
Surface Elevation ______ Water Level: Initial ______ 24-hrs ______
Total Depth of Soil Sampler ______ Total Depth of Ground Water Sampler ______
Ground Water Sample Interval(s) ______
Drilling Company ______ Drilling Method ______
Driller ______ Log By ______ Date Drilled ______

Sketch Map

Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
					CLAY, as above. olive-gray.
14			0		
15			0		
	CL				CLAY, olive-gray. stiff, moderate plasticity. dry. no odors or staining. Becoming increasingly stiff.
16			0		
17			0		
18			0		Very hard drilling. Set temp. casing to 18'
19					
20					

Page 2 of ______

ERM

Drilling Log

Project Aegis Owner Aegis
Location 1001 42nd St. Project Number 0041834.00
Boring Number B-5 Total Depth of Auger 18 Auger Diameter 8"
Surface Elevation Water Level: Initial 24-hrs
Total Depth of Soil Sampler 18 Total Depth of Ground Water Sampler
Ground Water Sample Interval(s)
Drilling Company Vironex Drilling Method Direct Push
Driller Sayphone Log By RLS Date Drilled 5/30/06

Sketch Map

Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0	ML			HAND AUGER	SANDY-SILT, olive-brown. Moderately cohesive, soft, dry
1					
2					
3					SILTY-CLAY, dark brown. Moderately stiff. High plastricity, dry.
4					
5	CL		0		As above
6			0		As above, no odors or staining B-5-7'(1626)
7			0	X	
8			0		
9			0		CLAY. Dark brown, moderately stiff, moderate plastiCity. dry, no odor or staining. B-5-10'(1635)
10			0	X	
11	CL		0		
12			0		As above

Page 1 of

ERM

Drilling Log

Project ____________ Owner ____________

Location ____________ Project Number ____________

Boring Number B-5 Total Depth of Auger ______ Auger Diameter ______

Surface Elevation ______ Water Level: Initial ______ 24-hrs ______

Total Depth of Soil Sampler ______ Total Depth of Ground Water Sampler ______

Ground Water Sample Interval(s) ____________

Drilling Company ____________ Drilling Method ____________

Driller ____________ Log By ____________ Date Drilled ______

Sketch Map

Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
14			0		CLAY. olive-gray. Stiff, moderately plastic. dry. No odor or staining.
15	CL		0		As above.
16			0		
17			0		
18			0		set temp. casing to 18' bgs w/10' screen
19					
20					

Page 2 of ______

URS

1333 Broadway, Suite 800
Oakland, California 94612

MONITORING WELL LOG

Well ID: URS-MW-1

Total Depth: 20 feet

PROJECT INFORMATION

Project: Celis - Emeryville

Site Location: 4000 San Pablo Avenue, Emeryville, CA

Site Name: Former Celis Alliance Service Station

Project Manager: George Muehleck

Geologist: Leonard Niles

Job/Cost Code Number: 26814847.06000

PG: Leonard Niles

DRILLING INFORMATION

Drilling Company: Gregg Drilling

Driller: Jesse

Type of Drilling Rig: Marl M5T (Rhino)

Drilling Method: Hollow Stem Auger, 8.25" OD

Sampling Method: 1.5" standard penetrometer

Hand Auger Depth: 5 feet bgs

Date(s) Drilled: 6/28, 7/2/07

WELL INFORMATION

Groundwater Depth (ft bgs): 15.13' (initial); 9.09' (7/10/07)

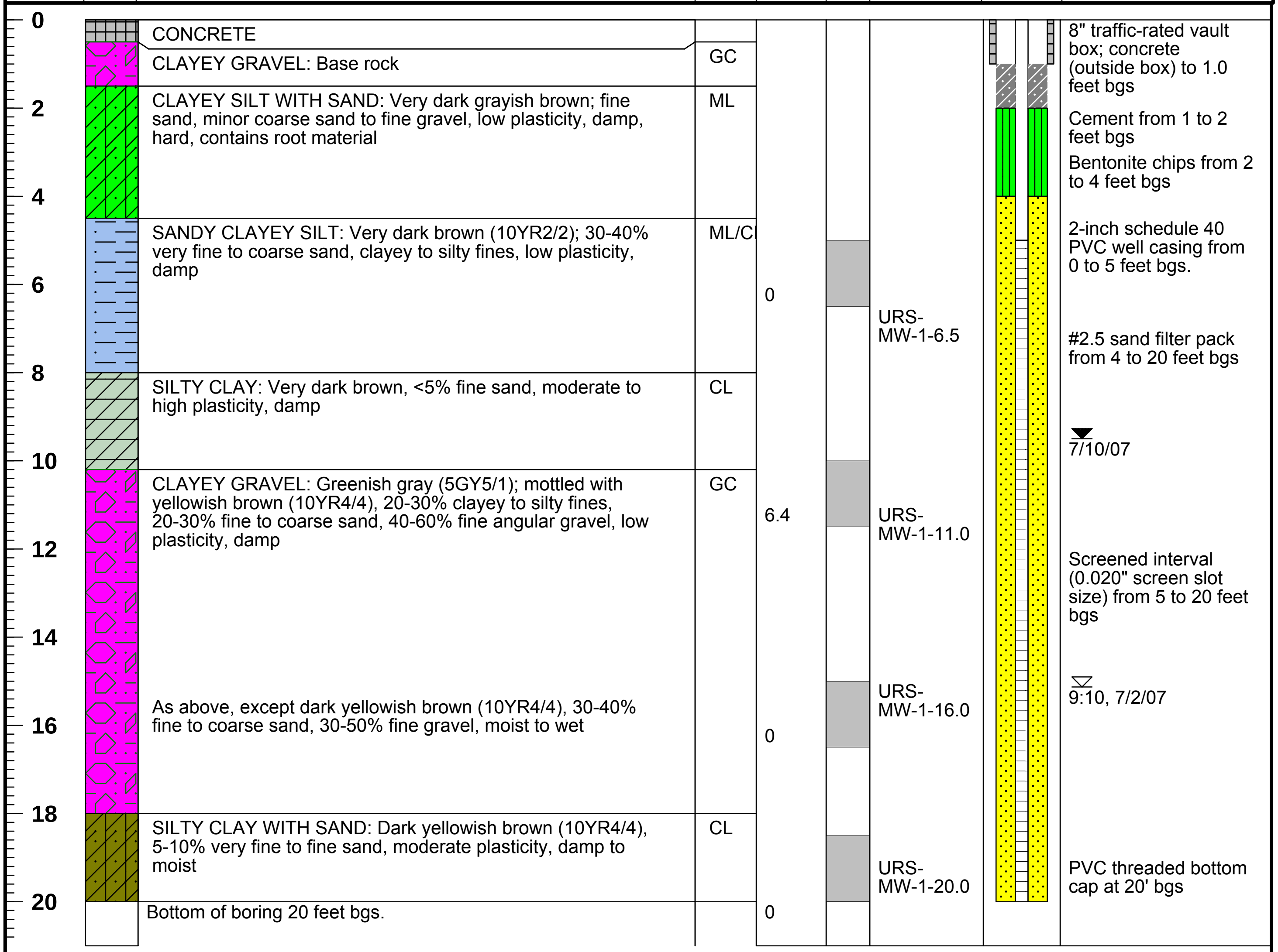
Top of Casing Elevation (ft msl): 42.21' msl

Coordinates: Latitude 37.83131172 **Longitude** 122.2801338

Well Location: 4051 West San Pablo Ave., sidewalk

Well Diameter: 2 inches

Screened Interval: 5-20 feet bgs



Depth (ft)	Lithologic Description	USCS	PID	Sample ID and Interval	Well Description/ Comments
0	CONCRETE				8" traffic-rated vault box; concrete (outside box) to 1.0 feet bgs
	CLAYEY GRAVEL: Base rock	GC			Cement from 1 to 2 feet bgs
2	CLAYEY SILT WITH SAND: Very dark grayish brown; fine sand, minor coarse sand to fine gravel, low plasticity, damp, hard, contains root material	ML			Bentonite chips from 2 to 4 feet bgs
4	SANDY CLAYEY SILT: Very dark brown (10YR2/2); 30-40% very fine to coarse sand, clayey to silty fines, low plasticity, damp	ML/C			2-inch schedule 40 PVC well casing from 0 to 5 feet bgs.
6			0	URS-MW-1-6.5	#2.5 sand filter pack from 4 to 20 feet bgs
8	SILTY CLAY: Very dark brown, <5% fine sand, moderate to high plasticity, damp	CL			▼ 7/10/07
10	CLAYEY GRAVEL: Greenish gray (5GY5/1); mottled with yellowish brown (10YR4/4), 20-30% clayey to silty fines, 20-30% fine to coarse sand, 40-60% fine angular gravel, low plasticity, damp	GC	6.4	URS-MW-1-11.0	
12					Screened interval (0.020" screen slot size) from 5 to 20 feet bgs
14					▽ 9:10, 7/2/07
16	As above, except dark yellowish brown (10YR4/4), 30-40% fine to coarse sand, 30-50% fine gravel, moist to wet		0	URS-MW-1-16.0	
18	SILTY CLAY WITH SAND: Dark yellowish brown (10YR4/4), 5-10% very fine to fine sand, moderate plasticity, damp to moist	CL			
20	Bottom of boring 20 feet bgs.		0	URS-MW-1-20.0	PVC threaded bottom cap at 20' bgs

1333 Broadway, Suite 800
Oakland, California 94612

MONITORING WELL LOG

Well ID: URS-MW-2

Total Depth: 20 feet

PROJECT INFORMATION

Project: Celis - Emeryville

Site Location: 4000 San Pablo Ave, Emeryville, CA

Site Number: Former Celis Alliance Service Station

Project Manager: George Muehleck

Geologist: Leonard Niles

Job/Cost Code Number: 26814847.06000

PG: Leonard Niles

DRILLING INFORMATION

Drilling Company: Gregg Drilling

Driller: Jesse

Type of Drilling Rig: Marl M5T (Rhino)

Drilling Method: Hollow Stem Auger, 8.25" OD

Sampling Method: 1.5" standard penetrometer

Hand Auger / Airknife Depth: 5 feet bgs

Date(s) Drilled: 6/28, 7/2/07

WELL INFORMATION

Groundwater Depth (ft bgs): 20' (1st), 8.24' (7/10/07)

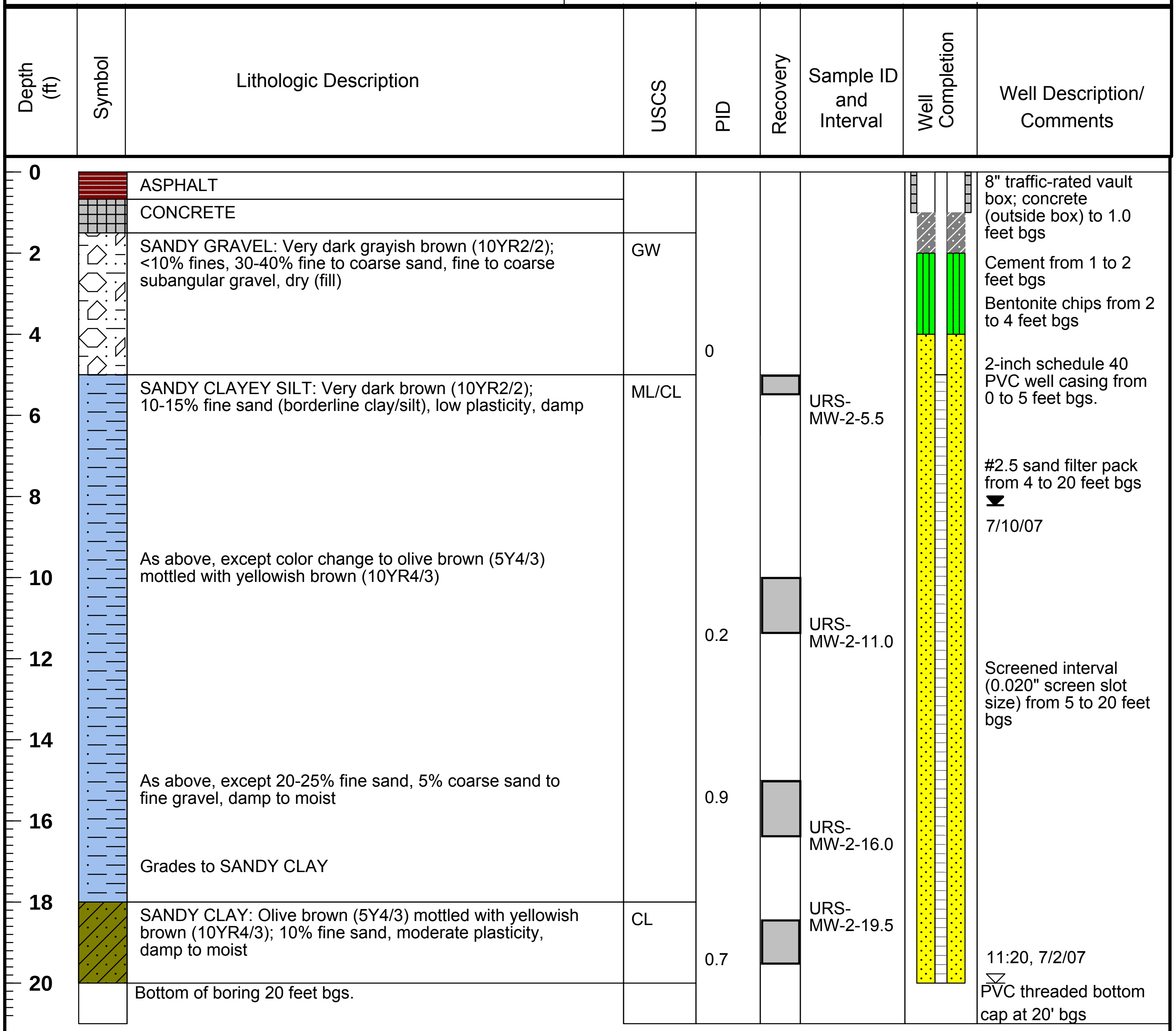
Well Location: SW corner of 40th Street and San Pablo Ave, in crosswalk

Top of Casing Elevation (ft msl): 40.83' msl

Well Diameter: 2 inches

Coordinates: Latitude 37.83090567 **Longitude** 122.2800391

Screened Interval: 5-20 feet bgs



Depth (ft)	Symbol	Lithologic Description	USCS	PID	Recovery	Sample ID and Interval	Well Completion	Well Description/ Comments
0		ASPHALT						8" traffic-rated vault box; concrete (outside box) to 1.0 feet bgs
		CONCRETE						
2		SANDY GRAVEL: Very dark grayish brown (10YR2/2); <10% fines, 30-40% fine to coarse sand, fine to coarse subangular gravel, dry (fill)	GW					Cement from 1 to 2 feet bgs Bentonite chips from 2 to 4 feet bgs
4				0				
6		SANDY CLAYEY SILT: Very dark brown (10YR2/2); 10-15% fine sand (borderline clay/silt), low plasticity, damp	ML/CL			URS-MW-2-5.5		2-inch schedule 40 PVC well casing from 0 to 5 feet bgs.
8								#2.5 sand filter pack from 4 to 20 feet bgs ▼ 7/10/07
10		As above, except color change to olive brown (5Y4/3) mottled with yellowish brown (10YR4/3)						
12				0.2		URS-MW-2-11.0		Screened interval (0.020" screen slot size) from 5 to 20 feet bgs
14								
16		As above, except 20-25% fine sand, 5% coarse sand to fine gravel, damp to moist		0.9		URS-MW-2-16.0		
		Grades to SANDY CLAY						
18		SANDY CLAY: Olive brown (5Y4/3) mottled with yellowish brown (10YR4/3); 10% fine sand, moderate plasticity, damp to moist	CL	0.7		URS-MW-2-19.5		11:20, 7/2/07 ▽
20		Bottom of boring 20 feet bgs.						PVC threaded bottom cap at 20' bgs

1333 Broadway, Suite 800
Oakland, California 94612

MONITORING WELL LOG

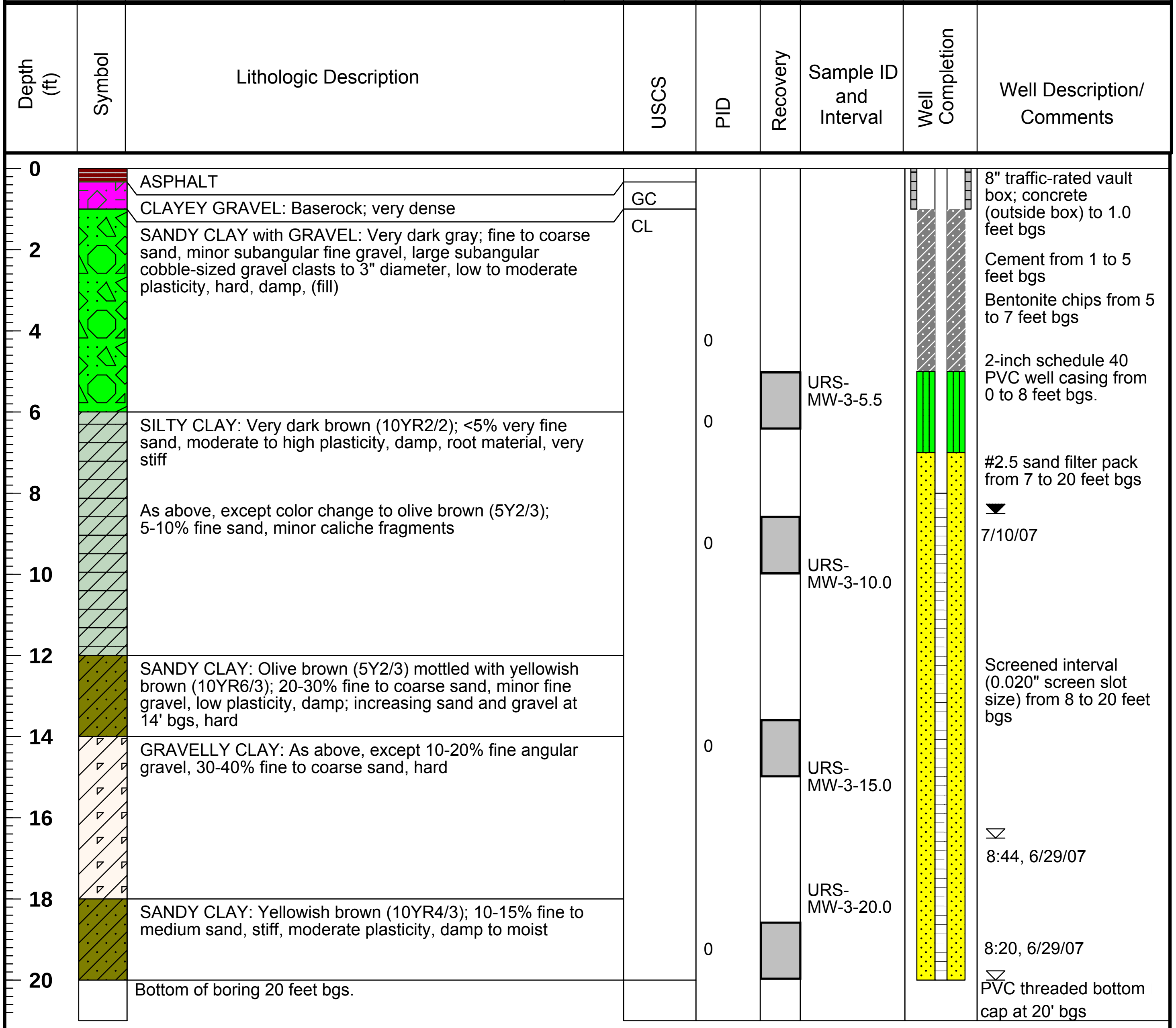
Well ID: URS-MW-3

Total Depth: 20 feet

PROJECT INFORMATION	DRILLING INFORMATION
Project: Celis - Emeryville	**Drilling Company:** Gregg Drilling
Site Location: 4000 San Pablo Ave, Emeryville, CA	**Driller:** Jeremy Neff
Site Number: Former Celis Alliance Service Station	**Type of Drilling Rig:** Mobil B-61
Project Manager: George Muehleck	**Drilling Method:** Hollow Stem Auger, 8.25" OD
Geologist: Leonard Niles	**Sampling Method:** 2" ID Split Spoon
Job/Cost Code Number: 26814847.06000	**Hand Auger / Airknife Depth:** 5 feet bgs
PG: Leonard Niles	**Date(s) Drilled:** 6/28, 6/29/07

WELL INFORMATION

Groundwater Depth (ft bgs): 20' (1st), 8.48' (7/10/07)	**Well Location:** 3999 San Pablo Ave., parking lot at 40th St. & San Pablo
Top of Casing Elevation (ft msl): 40.54' msl	**Well Diameter:** 2 inches
Coordinates: Latitude 37.83036066 **Longitude** 122.2800307	**Screened Interval:** 8-20 feet bgs



ASPHALT

CLAYEY GRAVEL: Baserock; very dense

SANDY CLAY with GRAVEL: Very dark gray; fine to coarse sand, minor subangular fine gravel, large subangular cobble-sized gravel clasts to 3" diameter, low to moderate plasticity, hard, damp, (fill)

SILTY CLAY: Very dark brown (10YR2/2); <5% very fine sand, moderate to high plasticity, damp, root material, very stiff

As above, except color change to olive brown (5Y2/3); 5-10% fine sand, minor caliche fragments

SANDY CLAY: Olive brown (5Y2/3) mottled with yellowish brown (10YR6/3); 20-30% fine to coarse sand, minor fine gravel, low plasticity, damp; increasing sand and gravel at 14' bgs, hard

GRAVELLY CLAY: As above, except 10-20% fine angular gravel, 30-40% fine to coarse sand, hard

SANDY CLAY: Yellowish brown (10YR4/3); 10-15% fine to medium sand, stiff, moderate plasticity, damp to moist

Bottom of boring 20 feet bgs.

8" traffic-rated vault box; concrete (outside box) to 1.0 feet bgs

Cement from 1 to 5 feet bgs

Bentonite chips from 5 to 7 feet bgs

2-inch schedule 40 PVC well casing from 0 to 8 feet bgs.

#2.5 sand filter pack from 7 to 20 feet bgs

7/10/07

Screened interval (0.020" screen slot size) from 8 to 20 feet bgs

8:44, 6/29/07

8:20, 6/29/07

PVC threaded bottom cap at 20' bgs

1333 Broadway, Suite 800
Oakland, California 94612

MONITORING WELL LOG

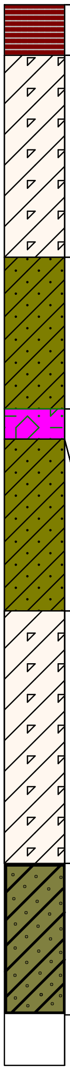
Well ID: URS-MW-4

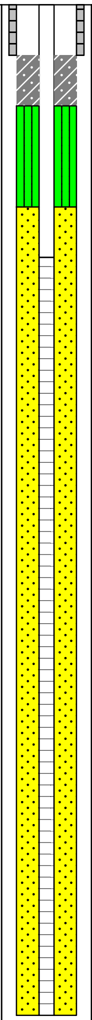
Total Depth: 20 feet

PROJECT INFORMATION	**DRILLING INFORMATION**
Project: Celis - Emeryville	**Drilling Company:** Gregg Drilling
Site Location: 4000 San Pablo Ave, Emeryville, CA	**Driller:** Jeremy Neff
Site Number: Former Celis Alliance Service Station	**Type of Drilling Rig:** Mobil B-61
Project Manager: George Muehleck	**Drilling Method:** Hollow Stem Auger, 8.25" OD
Geologist: Leonard Niles	**Sampling Method:** 2" Split Spoon
Job/Cost Code Number: 26814847.06000	**Hand Auger / Airknife Depth:** 5 feet bgs
PG: Leonard Niles	**Date(s) Drilled:** 6/28, 6/29/07

WELL INFORMATION

Groundwater Depth (ft bgs): 19.2' (1st), 8.89' (7/10/07)	**Well Location:** 1111 40th St., parking lot at 40th St. and San Pablo Ave.
Top of Casing Elevation (ft msl): 41.41' msl	**Well Diameter:** 2 inches
Coordinates: Latitude 37.83065511 **Longitude** 122.2802217	**Screened Interval:** 5-20 feet bgs





Depth (ft)	Lithologic Description	USCS	PID	Sample ID and Interval	Well Description/ Comments
0	ASPHALT				8" traffic-rated vault box; concrete (outside box) to 1.0 feet bgs
2 4	GRAVELLY CLAY: Fill; asphalt chunks at 1.8' bgs	CL			Cement from 1 to 2 feet bgs Bentonite chips from 2 to 4 feet bgs 2-inch schedule 40 PVC well casing from 0 to 5 feet bgs.
6	SANDY CLAY with GRAVEL: Black (N2.5/); 20-30% fine to coarse sand, 5% fine angular gravel, moderate plasticity, very stiff, damp		0	URS-MW-4-5.5	#2.5 sand filter pack from 4 to 20 feet bgs
8	CLAYEY GRAVEL: Very dark brown (10YR2/2); 20-30% clayey to silty fines, fine to coarse sand, fine subangular gravel, loose, low plasticity, moist to wet	GC	0.6	URS-MW-4-9.0	7/10/07
10	SANDY CLAY: Black (N2.5/); 20-30% fine to coarse sand, moderate plasticity, stiff, moist	CL			
12 14 16	GRAVELLY CLAY: Greenish gray (5GY5/1); 20-30% fine to coarse sand, 10-20% fine angular gravel, stiff, low plasticity, damp		7.8	URS-MW-4-14.5	Screened interval (0.020" screen slot size) from 5 to 20 feet bgs
18	SANDY CLAY WITH GRAVEL: Yellow brown (10YR6/8); 20-30% fine to coarse sand, 10% subangular fine gravel, Fe/Mn staining, hard, moist		0.8		12:34, 6/29/07
20	Bottom of boring 20 feet bgs.			URS-MW-2-20.0	PVC threaded bottom cap at 20' bgs

1333 Broadway, Suite 800
Oakland, California 94612

MONITORING WELL LOG

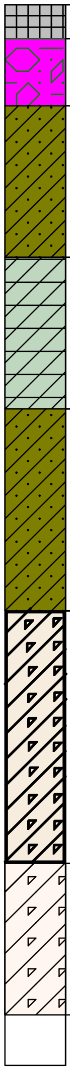
Well ID: URS-MW-5

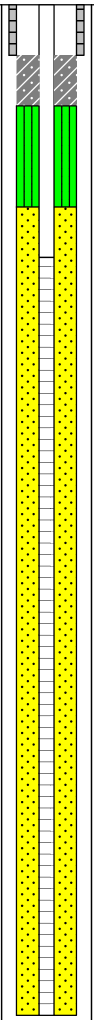
Total Depth: 20 feet

PROJECT INFORMATION	DRILLING INFORMATION
Project: Celis - Emeryville	**Drilling Company:** Gregg Drilling
Site Location: 4000 San Pablo Ave, Emeryville, CA	**Driller:** Jeremy Neff
Site Number: Former Celis Alliance Service Station	**Type of Drilling Rig:** Mobil B-61
Project Manager: George Muehleck	**Drilling Method:** Hollow Stem Auger
Geologist: Leonard Niles	**Sampling Method:** 2" Split Spoon
Job/Cost Code Number: 26814847.06000	**Hand Auger / Airknife Depth:** 5 feet bgs
PG: Leonard Niles	**Date(s) Drilled:** 6/28, 6/29/07

WELL INFORMATION

Groundwater Depth (ft bgs): 18.5' (1st), 6.37 (7/10/07)	**Well Location:** South side of 40th St., 206' East of San Pablo Ave.
Top of Casing Elevation (ft msl): 43.93' msl	**Well Diameter:** 2 inches
Coordinates: Latitude 37.83109836 **Longitude** 122.2790285	**Screened Interval:** 5-20 feet bgs





Depth (ft)	Lithologic Description	USCS	PID	Recovery	Sample ID and Interval	Well Description/ Comments
0	CONCRETE					12" traffic-rated vault box; concrete (outside box) to 1.0 feet bgs
	CLAYEY GRAVEL: Dark gray; base rock	GC				
2	SANDY CLAY: Dark grayish brown; fine to coarse sand, fine gravel, moderate plasticity, moist (fill)	CL				Cement from 1 to 2 feet bgs Bentonite chips from 2 to 4 feet bgs
4						2-inch schedule 40 PVC well casing from 0 to 5 feet bgs.
6	SILTY CLAY: Very dark brown (10YR2/2); 5-10% fine sand, minor (<5%) coarse sand to fine gravel, black asphalt-like fragments, moderate plasticity, damp, faint HC odor, very stiff (fill?)		9.1	▨	URS-MW-5-6.5	▼ 7/10/07
			1.5			#2.5 sand filter pack from 4 to 20 feet bgs
8	SANDY CLAY: Greenish gray (5G5/1); 10-20% fine to coarse sand, minor angular fine gravel, moderate plasticity, very stiff, damp, faint HC odor		62.5	▨	URS-MW-5-10.0	▽ 11:38, 6/29/07
12	SANDY TO GRAVELLY CLAY: Olive brown (5Y2/3) mottled with yellowish brown (10YR6/8); 20-30% fine to coarse sand, 10-20% fine angular gravel, hard, low plasticity					Screened interval (0.020" screen slot size) from 5 to 20 feet bgs
14			3.5	▨	URS-MW-5-15.0	
18	GRAVELLY CLAY: As above, except yellowish brown (10YR4/3), moderate plasticity, moist to wet		1.3	▨	URS-MW-5-20.0	▽ 10:25, 6/29/07
20	Bottom of boring 20 feet bgs.					PVC threaded bottom cap at 20' bgs