FEASIBILITY STUDY/CORRECTIVE ACTION PLAN (FS/CAP)

FORMER GROVE STREET WASH RACK SITE
3884 MARTIN LUTHER KING JUNIOR WAY
OAKLAND, CALIFORNIA

Prepared for:

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IDENTIFICATION FORM

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1.0 INTRODUCTION

This Feasibility Study/Corrective Action Plan (FS/CAP) analyses the remedial alternatives for the former Grove Street Wash Rack located at 3884 Martin Luther King Junior Way (Site) and presents the recommended remedial alternatives to be conducted prior to site redevelopment. The Site is to be redeveloped for residential and commercial use, and will have an underground garage that occupies the entire footprint of the Site. Soil will be excavated for off-site disposal to a depth of approximately 12 feet below existing grade across the entire site in order for the garage to be constructed.

Subsequent to remediation and construction, groundwater monitoring will continue to be conducted on a quarterly basis under the Alameda County Department of Environmental Health (ACDEH) in order to monitor the efficiency of the selected remedies. It is ultimately intended that the Site should be closed under the State Water Resources Control Board (SWRCB) Low Threat Closure Policy.

1.1 SITE DEVELOPMENT

The current development design will consist of a mixed-use facility, housing both retail and residential. The retail space will be located on the ground floor and is approximately 2,600 square feet. The habitable living space (inclusive of units, common spaces, and garage) is 42,995 square feet; roughly 8,000 square feet of this is taken up by parking. There will be approximately 50 residential units within the building which is six stories in total. The first floor is subterranean and will house the tenant parking. The ground floor will contain the commercial space, the commercial parking, and the community services for the apartment complex (lobby, manager's office, mail room). The upper four floors are placed on a concrete podium deck and will consist of residential units and tenant common use facilities such as courtyards, community rooms, and laundry rooms.

2.0 SITE BACKGROUND

2.1 SITE LOCATION AND HISTORICAL USES

The Site is in a mixed commercial and residential area in the City of Oakland, California. It occupies approximately 10,250 square feet, and is identified as Assessor's Parcel Number (APN) 012-0968-31. The property is zoned for residential use.

The Site is bordered by the following:

- North: 39th Street, followed by a retail business;
- East: the Highway 24 right-of-way, followed by the MacArthur BART station;
- South: a multi-story residential/commercial building; and
- West: Martin Luther King Junior Way (MLK Jr. Way), followed by residential and vacant properties.

The Site is the former location of the Grove Street Wash Rack and Lucky's Auto. Known historical Site uses include the following:

- A gas station operated on the Site in the 1950s and 1960s. Three underground storage tanks (USTs) from the gas station were removed on January 5, 1995.

- An auto body shop operated on the eastern portion of the Site until at least 2004.

A fuel and feed store and fuel yard operated at the adjacent parcel to the south (3860 MLK Jr. Way) from the 1930s to the 1950s. A lumber store and warehouse operated on the parcel in the 1960s, but the business closed and the buildings were demolished in 1971. The City of Oakland purchased the adjacent parcel in 1989, and it was redeveloped into a multi-story residential and commercial building in 2006.

2.2 CURRENT SITE CONDITIONS AND USE

The Site is currently not in use. The former Site buildings have been removed, and only concrete pads and paved areas remain on the Site, with the exception of a large advertising billboard located in the southwest corner of the parcel.

2.3 SUMMARY OF PREVIOUS INVESTIGATIONS

2.3.1 Summary of Site Historical Investigations

The following timeline summarizes the environmental activities and reporting at the Site:

- 01/05/95: Tanks #1 (650-gallon), #2 (650-gallon), and #3 (500-gallon) were removed from Site. Soil samples were collected under ACDEH observation.
- 01/17/95: Tank Removal Report prepared by Scott Environmental.
- 05/10/95: ACDEH issued a letter requiring additional work to be carried out at the Site to define the extent of contamination.
- 07/17/96: Letter by H_2O GEOL presents laboratory results of a stockpile sample.
- 09/10/02: State Water Resources Control Board (SWRCB) publishes a letter of Notice of Removal from the UST Clean-up Fund. No subsequent data in ACDEH files.
- 9/17/2004: URS issued an Environmental Investigation Report for the Site for Cal-EPA DTSC.
- 02/02/06: ACDEH approved the JCC Work Plan with technical comments.
- 03/10/06: JCC issued a Report of Soil and Groundwater Investigation summarizing the soil and grab groundwater results from eight boreholes for ACDEH.
- 11/12/2006: JCC Issued a Work Plan for Additional Investigation and Remediation at the Site to ACDEH.
- 04/2/2007: ACDEH issues a letter with technical comments on the JCC Work Plan.
- 04/27/2007: JCC sends plans and architect drawings for the development to ACDEH, in response to ACDEH's letter of 4/2/2007.
- 04/08/2008: ACDEH letter to Neil & Mary Cotter. Additional comments on the work plan and request for quarterly monitoring reports.
- 04/14/2008: ACDEH issues Notice of Responsibility. Lillie and Hillary Luckett are named as the primary RPs; Mary and Neil Cotter are named as RPs.

- 05/28/2008: ICES correspondence to ACDEH, informing SCDEH that ICES is the environmental consultant representing Neil Cotter for the 3884 MLK site.
- 07/24/2009: ACDEH sends letter to Neil and Mary Cotter notifying them of the change in groundwater monitoring requirements.
- 12/05/2012: ACDEH issues a request for a Site Investigation Work Plan to Neil & Mary Cotter and to Lillie and Hilary Luckett.
- 06/07/2013: CES letter to SCDEH requesting status of the work plan prepared by URS. CES is the environmental consultant retained by Meta/KKG. Meta Homes is the developer and KKG is responsible for construction management.
- 07/8/2013: ACDEH approved URS Work Plan for Additional Soil and Groundwater Investigation.
- 07/9/2013 – 7/12/13: URS conducts additional investigation.
- 09/6/2013: URS submits Draft FS/CAP to ACDEH.

Prior Site investigation findings are discussed in Sections below.

2.3.2 Scott Environmental, UST Removal Report, January 1995

A limited soil sampling was conducted by Scott Environmental during the removal of three USTs from the H&L Luckett property (Lucky's Auto Body Site) at 3884 MLK Jr. Way in Oakland. Tanks #1 and #2, both gasoline tanks with 650-gallon capacity, were located beneath the City sidewalk along MLK Jr. Way; and Tank #3 (a 500-gallon gasoline tank), was located within the subject property along 39th Street (Figure 2). Tanks #2 and #3 were found to have one or more holes caused by corrosion. Tank #1 split into two pieces at the welded seam during removal, but no holes were noted. Soil sample results are presented on Figure 2.

One soil sample was collected from each of the excavated UST pits, and analytical results indicated detectable concentrations of total petroleum hydrocarbons as gasoline (TPH-g), benzene, toluene, ethylbenzene, and xylenes (BTEX), and lead. The soil sample collected beneath the excavation of Tank #1 contained TPH-g (35 milligrams per kilogram [mg/kg]), benzene (590 micrograms per kilogram [µg/kg]), toluene (570 µg/kg), ethylbenzene (1,300 µg/kg), xylenes (5,400 µg/kg), and lead (2.6 mg/kg). The soil sample collected beneath the excavation of Tank #2 contained TPH-g (140 mg/kg), benzene (610 µg/kg), toluene (960 µg/kg), ethylbenzene (580 µg/kg), xylenes (9,700 µg/kg), and lead (7.9 mg/kg). The soil sample collected beneath the excavation of Tank #3 contained TPH-g (18 mg/kg), benzene

(340 µg/kg), toluene (400 µg/kg), ethylbenzene (850 µg/kg), xylenes (4,600 µg/kg), and lead (3.4 mg/kg). The excavated soil was returned to the pits after tank removal; no contaminated soil was off-hauled for disposal.

2.3.3 H_2O GEOL, 1996, Soil Stockpile Sampling

In August 1996, H_2O GEOL collected one random sample from a soil stockpile on the Site, and reported that no TPH-g or BTEX were detected in the sample. H_2O GEOL reported the findings to the ACDEH in a letter dated September 17, 1996 (H_2O GEOL, 1996). The nature or origin of the soil stockpile was not discussed in the letter.

2.3.4 URS, 2004, Environmental Investigation

In 2004, URS performed a soil and groundwater investigation at the Site under DTSC's Brownfield's Program. The investigation also included a geophysical survey to assess the presence of potential USTs and identify utility lines. No USTs were detected by the geophysical survey. The investigation included the collection and analysis of 19 surface soil samples, 57 subsurface soil samples, 10 grab groundwater samples, 3 off-site background surface soil samples, 6 duplicate soil samples, and 1 duplicate grab groundwater sample. URS submitted samples for analysis for volatile organic compounds (VOCs), TPH-g, semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), herbicides, pesticides, asbestos (in soil), lead (in water), TPH as motor oil (TPH-mo [in water]), and pH. The soil and grab groundwater analytical results are shown graphically on Figures 3 and 4.

Petroleum Hydrocarbons

In general, the soil analytical results indicate soil beneath the former USTs has been impacted with TPH in the gasoline range (C6-C12), diesel range (C9-C25), and motor-oil range (C24-C40); however, there are low levels of TPH concentrations throughout the Lucky's Auto Body site. Elevated concentrations of TPH–g were detected in the following locations:

- Former location of UST #3, adjacent to the office along 39th Street, at boring location S-2. TPH-g was detected in sample S2-168 (14 feet below ground surface [bgs]) at a concentration of 170 mg/kg.

- Former location of UST #1, on the sidewalk along MLK Jr. Way, at boring location S-11. TPH-g was detected in sample S11-120 (10 feet bgs) at a concentration of 220 mg/kg.

TPH-g was analyzed from nine grab groundwater sample locations, and TPH-mo was analyzed from one location (G-19). TPH-g was present in every grab groundwater sample from the Site, with the highest detection of 22,000 µg/L at location G2 (prior UST #3). Groundwater samples collected from the lot south of the Site did not contain TPH-g above the reporting limit. TPH-mo was not detected above the laboratory reporting limits.

VOCs

The analytical laboratory results for relevant VOCs in groundwater are shown graphically on Figure 4. VOCs were analyzed from subsurface soil samples at 1, 3.5, and 14 feet bgs at all boring locations. Elevated concentrations of benzene were detected in the following soil samples:

- Former location of UST #3, adjacent to the office along 39th Street, at boring location S2. Benzene was detected in sample S2-168 (14 feet bgs) at a concentration of 3,200 µg/kg.
- Former location of UST #2, on the sidewalk along MLK Jr. Way, at boring location S-9. Benzene was detected in sample S9-168 (14 feet bgs) at a concentration of 1,500 µg/kg.
- Former location of UST #1, on the sidewalk along MLK Jr. Way, at boring location S-11. Benzene was detected in sample S11-120 (10 feet bgs) at a concentration of 940 µg/kg.

VOCs were present in every grab groundwater sample collected from the Site, and one sample (G12) collected from the lot adjacent to the south.

The highest concentration of VOC contamination is in the area of former UST #3 (G2). Lower concentrations of benzene are associated with former UST #2 (G9), and low concentrations are associated with former UST #1 (G11). Elevated concentrations of benzene are present in the central portion of the Site (G4), and the southeastern portion of the Site (G7). The source of contamination in the vicinity of G4 and G7 is unknown.

2.3.5 John Carver Consulting, 2006a, Report of Soil and Groundwater Investigation

John Carver Consulting (JCC) advanced eight additional boreholes at the Site in 2006 to collect soil and grab groundwater samples. Soil samples were collected at 5, 10, and 14 feet bgs. Groundwater was encountered between 10.83 and 15.44 feet bgs; however, these are not considered stabilized groundwater levels. Samples were analyzed for TPH-g, fuel oxygenates, and BTEX. The JCC investigation results were generally consistent with the URS 2004 investigation results: elevated concentrations of TPH-g and benzene were present primarily on the northwestern portion of the Site adjacent to the former USTs; and lower concentrations were present across the western portion of the Site. The grab groundwater concentrations of TPH-g ranged from non-detect (below the laboratory reporting limit) to 79,800 µg/L. The benzene concentrations were generally consistent with the TPH-g concentrations, and ranged from non-detected to 17,600 µg/L. TPH-g concentrations in soil ranged from non-detect to 176 mg/kg in GP5 at 8 feet bgs. Other elevated TPH-g concentrations in soil were detected at GP2 (up to 23.6 mg/kg) and GP7 (up to 30.7 mg/kg) at 10 feet bgs. This depth is consistent with the approximate groundwater depth, and may represent a smear zone with elevated petroleum hydrocarbons.

2.3.6 John Carver Consulting, 2006b, Corrective Action Plan Work Plan for Subsurface Investigation

The Corrective Action Plan (CAP) proposed an excavation remedial alternative to address petroleum hydrocarbon contamination found at the Site. The excavation option was selected because the Site was slated for excavation in order to build an underground garage for a proposed development. In addition, the CAP proposed installation of three off-site groundwater monitoring wells to assess off-site groundwater migration. This CAP was not implemented, and the property was not developed.

2.3.7 URS Soil and Groundwater Investigation, 2013

This investigation focused on soil remaining on site at depths greater than 12 feet bgs, after construction excavation for the underground garage associated with proposed site redevelopment. The objectives of the investigation were to assess potential areas of concern that might warrant remediation after completion of the construction excavation.

Soil Analytical Results

Soil analytical results are summarized in Table 2-2 and shown on Figures 7 and 8. The highest TPH-g concentrations observed were in the vicinity of UST #3, at soil borings SB-6 (1,400,000 µg/kg) and SB-7 (77,000 µg/kg) at depths of 16 and 15 feet bgs, respectively. The soil sample collected from MW-4 at 16 feet bgs was found to have a TPH-g concentration of 2,700,000 µg/kg. These sample locations also coincided with the highest BTEX result found on the Site. It should be noted that groundwater is encountered at approximately 15 to 16 feet bgs at these locations, so that these soil samples were collected from the saturated zone. The deeper interval TPH-g sample concentrations from these locations at 20 feet bgs were either non-detect or significantly lower (Figures 7 and 8).

Soil samples collected from beneath the sidewalk in the vicinity of USTs #1 and 2 did not show elevated TPH-g or BTEX concentrations between 12 and 20 feet bgs. However, the sample collected at 7 feet bgs from the MW-1 boring was found to have a concentration of

750,000 µg/kg. This sample was collected based on elevated PID readings and odors observed at this depth interval.

Groundwater Analytical Results

Figure 9 shows the monitoring well locations and analytical results. Table 2-4 summarizes the analytical data from the monitoring well samples. The highest concentrations of contaminants in the groundwater monitoring wells were observed in MW-4, with TPH-g at 13,000 µg/l (duplicate sample) and benzene at 1,100 µg/l, also from the duplicate sample. The concentrations of toluene, ethyl benzene, and xylenes were also elevated at this location (Figure 9). Elevated TPH-g and benzene concentrations were also observed in the downgradient well MW-2 (560 µg/l and 220 µg/l, respectively). There were no detections of TPH-g or BTEX in monitoring wells MW-1, MW-3, and MW-5. Low concentrations (less than 5 µg/l) of 1,2-Dichloroethane (1,2-DOA) were detected in monitoring wells MW-1, MW-2, and MW-4.

Grab groundwater data (Figure 10, Table 2-3) is qualitative only, and tends to be biased high, as grab samples typically have a higher sediment loading than samples collected from a developed and purged monitoring well. The grab groundwater sample collected from SB-6, adjacent to MW-4, showed elevated TPH-g and BTEX levels—the TPH-g concentration (150,000 µg/l) being approximately ten times the TPH-g concentration observed in MW-4. The grab sample collected from SB-9 was found to have elevated TPH-g and BTEX concentrations with a TPH-g concentration of 19,000 µg/l.

Groundwater Gradient

Based on the groundwater elevation contour map (Figure 11) groundwater beneath the site flows to the west at an approximate gradient of 0.02.

It should be noted that the groundwater elevation from MW-5 was considered anomalous and was not included in generating the groundwater elevation contour map.

2.3.8 Well Search

A well search was conducted by Environmental Data Resources (EDR) in August 2013, and is included in Appendix B. Two industrial wells were identified within 1 mile of the Site:

- 0.5 miles NW: Well ID: CADW50000030634
- 0.8 miles W: Well ID: 01504W22J001M

The well to the northwest is approximately down gradient of the Site; the well to the west is cross-gradient. The distance to the nearest production well significantly exceeds the 1,000 feet criteria in the State Water Resources Control Board (SWRCB) Low Threat Closure Policy (Provision 2).

2.4 REGULATORY INVOLVEMENT

2.4.1 California Environmental Protection Agency, Department of Toxic Substances Control

The California Environmental Protection Agency (Cal-EPA), Department of Toxic Substances Control (DTSC) commissioned URS to perform a site investigation in 2004 using funds from the U.S. EPA Brownfields program. The URS site investigation is described in Section 2.3.4. Following the investigation, the DTSC referred the Site to the City of Oakland for environmental oversight.

2.4.2 State Water Resources Control Board

The Cal-EPA SWRCB, Division of Clean Water Programs, issued a *Notice of Intended Removal from Underground Storage Tank Cleanup Fund Priority List* on July 30, 2002, to the owners of the property at 3884 MLK Jr. Way (Lucky's Auto Body). On October 10, 2002, the SWRCB issued a *Notice of Removal from the Priority List* to the same property owners.

2.4.3 Regional Water Quality Control Board

The San Francisco Bay Regional Water Quality Control Board (RWQCB) lists the property at 3884 MLK Jr. Way in their Leaking Underground Storage Tank (LUST) Program database as having had a release of gasoline reported on January 5, 1995. The LUST database lists no records of enforcement or remedial history; the business at the property is listed as the Grove Street Wash Rack.

2.4.4 Alameda County Department of Environmental Health

The ACDEH (County) oversaw the removal of three USTs at the Lucky's Auto Body property on January 5, 1995. Two of the tanks had capacities of 650 gallons, and the third tank had a capacity of 500 gallons. All three contained gasoline. One of the 650-gallon tanks (Tank #1) split in two along the welded seam during the removal process. Holes were noted in the other two tanks, but none were observed in the split tank. The soil surrounding the tanks was stained green and had strong petroleum odors. Sampling of the surrounding soil detected TPH-g and BTEX. No groundwater sampling was performed.

In September 1996, the County received a letter from H_2O GEOL consultancy reporting that a random sample of a soil stockpile near the southern corner of the Lucky's property (in August

1996) did not detect TPH-g or BTEX above their respective reporting limits. The origins of the stockpile are unknown, because the excavated soil from the tank removal was reportedly placed back into the tank pits.

3.0 GEOLOGY AND HYDROGEOLOGY

The lithology encountered in the subsurface beneath the Site during drilling activities consists predominantly of a dark brown to yellow brown gravelly silty clay to greenish-gray and yellowish brown silty clay with sand and some gravel. The primary stratigraphic units at the Site are listed below, with the approximate ranges of depth (bgs) each unit was encountered across the Site. In addition, two cross sections are provided (Figures 14 and 15) using data generated by URS (2004 and 2013) and John Carver Consulting (2006). These cross sections present the interpreted subsurface lithology based upon available boring logs and also include relevant soil data.

- 0 to 4 feet bgs: the soil typically consisted of a stiff, very dark-brown silty clay.
- 4 to 15 feet bgs: yellowish brown silty clay and a mottled yellowish brown and greenish-gray silty clay.
- 15 to 20 feet bgs: Yellowish brown/greenish gray/dark reddish brown lithologies consisting of silty and clayey sands and silts. Some small (typically less than 6 inch) gravel layers were also encountered.

Groundwater was encountered in direct-push boreholes at an average depth approximately 15 feet. This groundwater depth is not considered a stabilized groundwater depth. Depth to groundwater in the five newly installed groundwater monitoring wells ranged from 14.41 to 16.89 feet below the top of the wall casings. This data was used in conjunction with top of well casing elevation data to generate a groundwater elevation contour map (Figure 11). Based on the groundwater elevation contour map, groundwater beneath the site flows to the west at an approximate gradient of 0.02.

4.0 CONCEPTUAL SITE MODEL

This section presents a Conceptual Site Model (CSM) based on the available soil and groundwater analytical data to date. The CSM is summarized in Table 4-1.

4.1 RELEASE SOURCE AND VOLUME

The USTs are considered the main source of the release of fuel hydrocarbons that have been detected in soil and groundwater beneath the Site. Tanks #1 and #2 were both observed to have one or more holes from corrosion at the time of removal. Although no holes were observed in Tank #3 during removal, the integrity of the tank was questionable as it split into two pieces along the weld during removal. Soil surrounding the tanks was stained green and was noted to have strong petroleum hydrocarbon odors. The release from the Tanks at the Site was discovered on January 5, 1995 during tank removal activities. The volume of the release is not known.

4.2 LIGHT NON-AQUEOUS PHASE LIQUID (LNAPL)

Five monitoring wells were installed, four on-site and one on the sidewalk of MLK immediately adjacent to the site in July 2013, in accordance with the URS work plan (July 2013). All five wells were gauged with an interface probe and no LNAPL was observed. During the low flow sampling of the monitoring wells, no sheen was present on any samples collected.

4.3 SOURCE REMOVAL ACTIVITIES

Soil that was excavated from the UST pits during tank removal activities was returned to the excavation after the collection of soil samples for chemical analysis. There is no information regarding the quality of the soil that was placed back in the UST excavations. As such, with the exception of the removal of the USTs themselves, there have been no other source removal activities conducted at the Site.

4.4 CONTAMINANT DISTRIBUTION IN GROUNDWATER

Based on the site investigations conducted in 2004, 2006, and 2013, the contaminants of concern (COCs) for the Site are BTEX, and TPH-g. These COCs are present primarily in the northern corner of the Site, near the location of the former USTs. TPH-g was detected at 120 µg/l in off-site boring SB-1, located on the sidewalk on the far side of MLK. BTEX constituents were not detected at this location.

4.5 PETROLEUM HYDROCARBONS IN SOIL

The initial soil sampling at the Site was conducted after removal of the USTs in January 1995. One soil sample was collected from beneath each of the USTs and analyzed for petroleum hydrocarbons and related constituents. The results of the analyses are listed below and are shown graphically on Figure 2.

Tank #1 [9 feet bgs]		**Tank #2 [9 feet bgs]**		**Tank #3 [7.5 feet bgs]**	
TPH-g	35 mg/kg	TPH-g	140 mg/kg	TPH-g	18 mg/kg
Benzene	590 µg/kg	Benzene	610 µg/kg	Benzene	340 µg/kg
Toluene	570 µg/kg	Toluene	960 µg/kg	Toluene	400 µg/kg
Ethylbenzene	1,300 µg/kg	Ethylbenzene	580 µg/kg	Ethylbenzene	850 µg/kg
Xylenes	5,400 µg/kg	Xylenes	9,700 µg/kg	Xylenes	4,600 µg/kg
Lead	2.6 mg/kg	Lead	7.9 mg/kg	Lead	3.4 mg/kg

Since 2004 a total of 29 soil borings have been drilled at the Site (including 11 borings completed during the 2013 investigation). A total of 11 direct push borings (S-1 through S-11) were advanced in 2004 as part of the URS investigation of the Lucky's Auto Body site for the DTSC. An additional eight soil borings (GP1 through GP8) were advanced in 2006 by John Carver Consulting as indicated previously. With the exception of one boring (GP6), three soil samples from each of the boring, ranging in depth from 1.0 to 15.0 feet bgs, were submitted for analysis of TPH-g and BTEX. Samples from the 2004 and 2006 investigations were also analyzed for fuel oxygenates (including MTBE). No fuel oxygenates were detected at this site.

Of the 58 samples analyzed from the two earlier investigations, eight samples from seven borings exceeded their respective screening criteria. These samples were typically the deepest sample from the boring, ranging from 8.0 to 14.0 feet bgs. This is consistent with releases from a UST as opposed to a surface spill or release. The contaminants are present mainly in soil at the location of former Tanks #1 through #3, and to a lesser extent, near the former fuel pump island in the northern corner of the Site.

Soil results from the 2013 investigation are summarized in Table 2-1 and shown graphically on Figures 7 and 8. The highest TPH-g concentrations observed were in the vicinity of UST #3, in soil borings SB-6 (1,400,000 µg/kg) and SB-7 (77,000 µg/kg) at depths of 16 and 15 feet bgs respectively. The soil sample collected from MW-4 at 16 feet bgs was found to have a TPH-g concentration of 2,700,000 µg/kg. These sample locations also coincided with the highest BTEX result found on site. It should be noted that groundwater is encountered at approximately 15 to 16 feet bgs at these locations, so that these soil samples were collected from the saturated interval. The deeper interval TPH-g sample concentrations from these locations at 20 feet bgs were either non-detect or significantly lower (Figures 7 and 8).

Soil samples collected from beneath the sidewalk in the vicinity of USTs #1 and #2 did not show elevated TPH-g or BTEX concentrations between 12 and 20 feet bgs. However, the sample collected at 7 feet bgs from the soil boring for MW-1 was found to have a concentration of 750,000 µg/kg of TPH-g. This sample was collected based on elevated PID readings and odors observed at this depth interval.

The lateral extent of contamination exceeding the screening criteria appears to be limited to the area around the former USTs. There is no additional data from around former Tank #3. Given the nature of the petroleum hydrocarbon (mainly light fraction gasoline), the vertical extent of soil contamination beneath and in close proximity to the former tanks is likely limited to the lowest level of groundwater fluctuation.

4.6 PETROLEUM HYDROCARBONS IN GROUNDWATER

During the two prior subsurface investigations conducted at the Site, a total of 15 grab groundwater samples were collected and analyzed for TPH-g and BTEX. The results of the analyses are shown graphically on Figures 4 and 6. Similar to the soil sampling results, the highest concentrations were detected beneath or in close proximity to the former USTs.

Figure 9 shows the monitoring well locations and results of the 2013 investigation. The highest concentration of contaminants detected in groundwater were observed in monitoring well MW-4, with TPH-g at 13,000 µg/l [duplicate sample] and benzene at 1,100 µg/l, also from the duplicate sample. The concentrations of toluene, ethylbenzene, and xylenes were also elevated at this location (Figure 9). Elevated TPH-g and benzene concentrations were also observed in the downgradient well MW-2 (560 µg/l and 220 µg/l respectively).

Grab groundwater data (Figure 10, Table 2-1) is qualitative only, and tends to be biased high, as grab samples typically have a higher sediment loading than samples collected from a developed and purged monitoring well. The grab groundwater sample collected from SB-6, adjacent to MW-4 showed high TPH-g and BTEX concentrations, the TPH-g concentration (150,000 µg/l) being approximately ten times the TPH-g concentration observed in MW-4. The cross-gradient grab sample collected from SB-9 was found to have elevated TPH-g and BTEX concentrations with a TPH-g concentration of 19,000 µg/l.

TPH-g was detected in one off-site grab groundwater sample (SB-1) at 120 µg/l.

4.7 RISK EVALUATION

The Site is a former auto body and car wash facility. The Site is currently vacant, and with the exception of a billboard located in the northwest corner of the Site, has no structures and is covered with either asphalt or concrete foundations from former buildings located at the Site. The Site is zoned for residential and current plans are to redevelop the Site for commercial and residential use. The Site will be developed into a residential/commercial building with underground parking across the entire Site footprint. The construction of the underground parking garage will require the excavation and removal of the first 12 feet of soil below the existing ground surface. Consequently, much of the existing source area will be removed during construction.

Based on the investigations conducted at the Site, URS has identified two areas of concern (AOCs) which are discussed below.

4.7.1 Area of Concern 1 (AOC-1)

Area of Concern 1 (AOC-1) is shown as the yellow shaded area on Figure 16. This approximately 75 foot by 50 foot area encompasses the petroleum hydrocarbon contamination remaining in the subsurface after the proposed garage excavation to a depth of 12 feet bgs has been completed. This area includes the primary soil source of predominantly TPH-g and BTEX contamination that remains after the removal of UST #3 in 1995. A significant portion of remaining contamination will be removed when the garage excavation is completed. However, based on the URS investigation of July 2013 there will be significant deeper soil and groundwater contamination (in the vadose zone) remaining in this area (12 to 18 feet bgs).

Analytical data from AOC-1 clearly indicates that soil and groundwater in this this portion of the Site has been significantly impacted by releases from the former gasoline USTs. The majority of the vadose zone contamination will be removed during construction excavation for the underground garage. Deeper soil contamination was identified in the 2013 investigation at depths between 12 and 18 feet bgs. Remaining vadose zone contamination and groundwater contamination present a potential vapor intrusion risk to the garage area of the structure. The remaining soil contamination within the saturated zone also presents a continued source of groundwater contamination.

4.7.2 Area of Concern 2 (AOC-2)

AOC-2 is shown as the blue shaded area on Figure 16. This area includes subsurface petroleum hydrocarbon contamination between 7 and 14 feet bgs identified during the initial tank removal (1995), and in subsequent investigations (2004 and 2013). The soil sample collected from S-9 at

14 feet bgs (2004, Figure 3) was found to have a TPH-g concentration of 20,000 µg/kg. This sample was located on the Site boundary, in the vicinity of UST #2. Consequently, some of this contamination will be removed during the remediation of AOC-1.

AOC-2 includes vadose zone soils contaminated with TPH-g and BTEX generally identified within the depth interval 7 to 10 feet bgs. At one soil boring location (SB-9, 2004) elevated TPH-g was detected in soil at 14 feet bgs. No soil contamination was detected in the saturated zone (below 16 feet bgs). Groundwater TPH-g and BTEX detection in this downgradient part of the Site were at low concentrations, as discussed (670 µg/l TPH-g in the grab groundwater sample from SB-4 [2013]; non-detect [<50 µg/l] TPH-g from monitoring well MW-1, also in 2013]. A low concentration (120 µg/l) of TPH-g was detected in a grab groundwater sample (SB-1, 2013) across MLK from the Site, indicating TPH-g migration off-site. BTEX was not detected in the off-site groundwater samples.

Since contaminated soil in AOC-1 is in the vadose zone, and is mostly covered by the impermeable sidewalk and paved street, the potential for migration to groundwater is considered low. Groundwater contamination is believed to be primarily originating from AOC-1. However, the vadose zone soils in the 7 to 10 feet bgs interval do present a potential vapor intrusion threat to the underground garage, which will be considered in remedy selection.

5.0 AOC-1 CORRECTIVE ACTION ALTERNATIVES

5.1 ALTERNATIVE 1: CONSTRUCTION EXCAVATION AND VAPOR BARRIER

Alternative 1 is comprised of the construction excavation for the garage, with the installation of a Geo-Seal® (Regenesis) or equivalent vapor and moisture barrier system under the foundation slab. The garage excavation (to 12 feet bgs) will remove a significant quantity of the vadose zone hydrocarbon contamination. However, the URS 2013 site investigation determined that additional soil source material exists between 12 and 18 feet bgs, and would be left in place under this remedial alternative. Consequently a vapor barrier would be required to prevent vapor intrusion into the underground parking garage.

The cost estimate for this alternative is included as Table 5.1.

5.2 ALTERNATIVE 2: OVER EXCAVATION WITH VAPOR BARRIER

This alternative includes the garage excavation and combined GeoSeal® vapor/moisture barrier (or equivalent), as in Alternative 1. In addition, this alternative includes the over excavation of soil and saturated zone material for off-site disposal. The area of over-excavation is shown on Figure 16 (yellow shaded area).

This alternative requires the over-excavation of the yellow area (75 feet x 50 feet x 6 feet) on Figure 16 to a depth of 18 feet bgs (groundwater is encountered at approximately 16 feet bgs). In so doing, significant additional source material will be removed from the site, thus reducing contaminant mass transfer from soil to groundwater. The total volume to be excavated is approximately 830 cubic yards (cy) the majority of which would be expected to be shipped to a Class II licensed landfill for disposal as non-hazardous waste. The over-excavated area would then be backfilled with clean fill and compacted to 95 percent, prior to placement of the garage foundation mat. A Geo-Seal® system vapor and moisture barrier would be installed, to prevent vapor intrusion from remaining contaminated groundwater.

The cost estimate for this alternative is included as Table 5.2.

5.3 ALTERNATIVE 3A: OVER EXCAVATION WITH GROUNDWATER AND SOIL REMEDIATION [REGENOX™ AND ORC ADVANCED® PELLETS] AND VAPOR BARRIER

This alternative includes over-excavation and the GeoSeal vapor and moisture barrier, as described under Alternative 2. Since the excavated area extends approximately 2 feet into the saturated zone, there is an opportunity to conduct insitu groundwater and soil treatment.

This alternative uses a two-phase approach; in situ chemical oxidation (ISCO) using RegenOx™, a sodium percarbonate-based chemical oxidant and ORC Advanced® pellets, a controlled-release oxygen source for the enhanced aerobic biodegradation of petroleum hydrocarbons. The intent is to conduct short-duration ISCO to oxidize the majority of the material in the saturated zone over an approximately 7-day period, and then to enhance aerobic bioremediation of hydrocarbons in the groundwater. The ORC Advanced® is effective in the subsurface for approximately 1 year. ISCO only works in the saturated zone. Thus, after the ISCO reagent is exhausted, residual groundwater contamination, and any remaining vadose zone contamination that may desorb and migrate to the groundwater would still remain. Since it is clear from the historical data set collected since 1995 that naturally occurring biodegradation is occurring slowly at this site, ORC is proposed to stimulate this process.

ORC Advanced® Pellets are a pelletized version of Regenesis' widely used ORC Advanced® that are designed specifically for direct application into excavations, tank pits and trenches. This pelletized, dry application material minimizes airborne dust while eliminating the need for specialized equipment and spray water required for powder-slurry applications. The pellets are approximately 3-10 mm in size.

The primary function of ORC Advanced® pellets is to provide a controlled-release oxygen source for the enhanced aerobic bioremediation of petroleum hydrocarbons or other aerobically degradable compounds. This patented product is designed to slow the reaction that releases oxygen upon hydration, producing an optimized, controlled-release of oxygen over a period of up to 12 months. The pellets deliver up to 15 percent active oxygen by weight and contain micro-nutrients such as: nitrogen, phosphorous, and potassium which are beneficial to aerobic biodegradation processes.

RegenOx™ is a binary system consisting of a percarbonate oxidant (Part A) and an iron-containing activator (Part B). Once in the subsurface, RegenOx™ produces a cascade of efficient oxidation reactions via a number of mechanisms including: surface mediated oxidation, direct oxidation and free radical oxidation.

Application of the RegenOx™ and ORC Advanced® Pellets will be by mixing the amendments into the first 2 feet of backfill in the over-excavated area. 4,133 lbs of RegenOx™ Part A, 1,800 lbs of RegeneOx™ Part B and 1,157 lbs of ORC Advanced® Pellets will be mixed into the 2 feet of <= 1 inch gravel backfill and placed in the excavation. The excavation is expected to contain between 1 and 2 feet of water, since it extends below the water table. The RegenOx™ will treat the water in the pit. The ORC Advanced® Pellets will subsequently be distributed evenly throughout the excavation. Once all three products are in place, then the excavator bucket will be used to mix the products, prior to completion of backfilling. The excavation will subsequently be backfilled and compacted in preparation for construction of the garage foundation slab.

The cost summary for Alternative 3a is included as Table 5.3.

5.4 ALTERNATIVE 3B: OVER-EXCAVATION WITH GROUNDWATER AND SOIL REMEDIATION AND VAPOR BARRIER [MODIFIED FENTON'S REAGENT]/VAPOR BARRIER

The preferred application method for the Modified Fenton's Reagent is by DPT injection prior to the initial 12 feet bgs garage excavation. This enables the material to be injected over a greater depth interval (16 to 24 feet bgs). The injection method has the advantage that injection can be conducted over a greater footprint than just the over-excavation footprint.

Alternative 3b would require injection locations on 25-foot centers (assuming a 12.5-foot radius of influence), injecting 200 gallons of MFR per location. At each location, 100 gallons of 12 percent hydrogen peroxide would be injected with 100 gallons of catalyst. As has been previously stated, ISCO only treats the dissolved phase contaminants. A significant advantage of the MFR is that it is very effective in desorbing contaminant mass from soil so that aqueous phase oxidation can occur. As with any ISCO injection program, there is always uncertainty in how well distributed the material will be in the subsurface and whether there will be issues with the surfacing of material due to preferential pathways.

A total of three rounds of ISCO injections would be conducted over an 8-week period, prior to commencing excavation for the underground garage.

Subsequent to the peroxide injections, the garage excavation would be conducted, and the over-excavation of the AOC-1 area would be conducted, as in Alternative 3a.

The cost summary for Alternative 3a is included as Table 5.4.

6.0 AOC-2 CORRECTIVE ACTION ALTERNATIVES

6.1 ALTERNATIVE 1: VAPOR BARRIER

Alternative 1 proposes the installation of a Geo-Seal® vapor and moisture barrier on part or all of the garage wall to prevent vapor intrusion from the vadose zone hydrocarbon contamination beneath the sidewalk. The primary route of vapor intrusion would be from the blue-shaded area (50 feet in length) on Figure 16, corresponding to the vadose zone contamination in the vicinity of the prior USTs.

In order to isolate the substructure from vapor intrusion through the walls, the vapor barrier would need to be installed along the MLK wall of the garage and also along part or all of the 39th Street wall. Due to the difficulty in connecting disparate sealing systems (e.g., a combined vapor and moisture barrier system to a less-costly moisture only barrier for the site perimeter not bordered by vadose zone contamination) this alternate assumes that the combined vapor/moisture barrier system (e.g., Geo-Seal®) will be installed along the entire wall perimeter.

Geo-Seal® is an advanced composite gas vapor management technology designed to mitigate potential indoor air quality health risks associated with subsurface contaminant vapor intrusion. The triple-layer system is placed between the foundation of the building and the soil pad, or between the excavation face and the foundation wall to eliminate vapor exposure pathways and stop contaminated vapors from permeating through the slab.

The triple-layer system used in Geo-Seal® provides maximum redundancy and protection against the formation of vapor pathways both during and after installation. Such pathways can result from chemically induced materials breakdown, punctures, and seam weaknesses resulting from poor detail work and/or application installation imperfections around penetrations.

The base layer is a high density polyethylene/geotextile binary product, which is installed with the geotextile side facing down. The core layer is then sprayed on at 60 mils. This layer is an elastic co-polymer modified asphaltic membrane. Finally, the bond layer, which is similar to the base layer is applied. This is a proprietary protection layer which enhances curing of the membrane and increases puncture resistance.

The cost estimate for this alternative is included as Table 6.1.

6.2 ALTERNATIVE 2: EXCAVATION

The hydrocarbon contamination in the vadose zone beneath the sidewalk cannot be treated by ISCO, since ISCO treats only the dissolved-phase contamination. In some cases, ISCO can be used to treat vadose zone contamination if the reactant is sufficiently diluted so that a great enough volume of water is introduced to the formation, assuming that sufficient reactant can also be delivered to the subsurface. However, the vadose zone contamination in AOC-2 is too shallow for this approach (as shallow as 7 feet bgs) so that in the low hydraulic conductivity lithology prevailing at the Site, day-lighting of the ISCO material would occur.

Vadose zone contamination is mostly covered by the impermeable sidewalk and roadway, so that migration to groundwater would be minimal, but could still occur, especially as TPH-g contamination as deep as 14 feet bgs was found during the 2004 investigation.

Therefore the only way to remediate the contaminated soil in the vadose zone is by excavation.

This alternative proposes excavation of the AOC-2 to a depth of 16 feet bgs prior to completing the garage excavation. This would require shoring along the sidewalk at MLK. The excavation would then be sloped back onto the Site, so that shoring is only required along the sidewalk. This excavation would be backfilled prior to the installation of the shoring for the garage excavation.

The sidewalk excavation will require demolition of a section of the existing sidewalk and the removal of the mature magnolia tree. The utilities under the sidewalk (cable TV, phone lines and possibly other utilities) would need to be temporarily relocated to allow excavation. There may also be a sewer lateral under the sidewalk from the prior gas station building that would need to be abandoned.

The cost summary for Alternative 2 is included as Table 6.2.

7.0 EVALUATION AND SELECTION OF REMEDY

The proposed alternatives are evaluated in Table 7-0. Each alternative was evaluated against the following criteria:

- Overall Protection of Human Health and the Environment;
- Effectiveness (Long-Term and Short-Term);
- Implementability;
- Cost;
- Sustainability.

7.1 AOC-1

For AOC-1, Alternatives 3a and 3b were evaluated as superior as both included destruction of COCs by ISCO in addition to over-excavation of soil with high TPH-g and BTEX concentrations. Alternative 3a was selected as the optimal approach, as this alternative combines ISCO with enhanced biodegradation to give the remedy most protective of groundwater, in addition to mitigating vapor intrusion concerns. This alternative capitalizes on the open excavation below the water table which allows direct access to the groundwater and saturated soil for the ISCO and ORC amendments. ISCO takes place in solution, and this alternative provides the best contact between groundwater and the amendments in AOC-1.

Alternative 3b requires additional excavation and removal of approximately 833 cu of soil. The garage excavation requires a significantly larger excavation of approximately 4,890 cu. During excavation, 39th Street will be closed to traffic and will be used for staging and truck loading. The side walk and parking lane along MLK adjacent to the site will also be closed during excavation for equipment access. Dust generated during excavation will be minimized by engineering controls, primarily by dust suppression by spraying-down the area being excavated with water. Additional dust generation due to the over-excavation will be minimal since the remedial excavation will commence at the foot of the garage excavation, approximately 12 feet below street level. Dust suppression by water spraying will also be used during this excavation. In addition, approximately one-third of the 833 cu of soil excavated solely for remediation will be at or below the water table and therefore will be saturated and not generate dust. The additional impact due to equipment noise and dust generation due to the remedial excavation will be relatively small, since the 833 cu to be excavated represents only a 17 percent increase over the volume to be excavated for the construction of the garage. It is anticipated that construction activities will be conducted between the hours of 0700 and 1700 to minimize the inconvenience to the surrounding residents. The over-excavation work and backfill is expected to be completed within approximately 4 weeks.

Alternative 3b has the advantage that the ISCO reagent (in this case Modified Fenton's Reagent) can be injected across a deeper treatment interval (16 to 26 feet bgs). However, as with any injection-delivery scenario, there is uncertainty as to how effectively the oxidant will be able to reach subsurface contamination, given the relatively low hydraulic conductivity of on-site soils and the potential for migration along preferential pathways. URS has extensive experience in the application of ISCO in the local area, including the nearby Lane site at 2942 San Pablo Avenue. At the Lane site, problems were encountered in delivering the ISCO material effectively into the subsurface, and daylighting of the injected material occurred frequently.

After completion of the over-excavation, RegenOx™/ORC amendment addition and backfilling, the Geo-Seal® triple-layer vapor and moisture barrier system will installed prior to pouring the foundation slab.

Geo-Seal® is an advanced composite gas vapor management technology designed to eliminate potential indoor air quality health risks associated with subsurface contaminant vapor intrusion. The triple-layer system is placed between the foundation of the building and the soil pad, or between the excavation face and the foundation wall to eliminate vapor exposure pathways and stop contaminated vapors from permeating through the slab.

The triple-layer system used in Geo-Seal® provides maximum redundancy and protection against the formation of vapor pathways both during and after installation. Such pathways can result from chemically induced materials breakdown, punctures, and seam weaknesses resulting from poor detail work and/or application installation imperfections around penetrations.

The base layer is a high density polyethylene/geotextile binary product, which is installed with the geotextile side facing down. The core layer is then sprayed on at 60 mils. This layer is an elastic co-polymer modified asphaltic membrane. Finally, the bond layer, which is similar to the base layer is applied. This is a proprietary protection layer which enhances curing of the membrane and increases puncture resistance.

The Geo-Seal® system will be installed on the inner form wall prior to completing the form-work. The foundation wall will then be poured by the general contractor. Subsequent to the installation of the Geo-Seal® system, the vapor barrier will be smoke tested to ensure its integrity. Smoke will be pumped under the membrane for a specified time, at a specified pressure and any holes or breaches is the membrane will thus be identified. Any holes identified will be patched by the application of additional membrane.

7.2 AOC-2

For AOC-2 the selected alternative is Alternative 1 – the Geo-Seal® vapor and moisture barrier. Vadose zone contamination is mostly covered by the impermeable sidewalk and roadway, so that migration to groundwater would be expected to be minimal.

Alternative 2, which proposes excavation of the AOC-2 to a depth of 16 feet bgs prior to completing the garage excavation was not selected. Alternative 2 requires shoring along the sidewalk at MLK. The excavation would then be sloped back onto the Site, so that shoring is only required along the sidewalk. This excavation would present significant additional inconvenience to the local residents as it would require the closure of a traffic lane along MLK, in addition to the closure of the parking lane required for the remediation of AOC-1. The duration of the excavation phase of the project would be extended, and there would be additional noise associated with the installation of the extra shoring required along MLK and with the demolition of the sidewalk and removal of the magnolia tree. This alternative is also significantly more expensive than Alternative 1, and is not more protective of human health and the environment.

TPH-g at 750,000 µg/kg was detected in the boring for MW-1 at 7 feet bgs. TPH-g contamination as deep as 14 feet bgs was found during the 2004 investigation (20,000 µg/kg at soil boring S-9: Figure 3). Despite these vadose zone detections, TPH-g was not detected in the groundwater at MW-1. Contaminated soil in the vadose zone at AOC-2 has been in place for a number of years prior to the removal of UST #1 and #2 in 1995. In over 20 years this vadose zone TPH-g contamination does not appear to have impacted groundwater, based on the soil and groundwater data to date.

It does, however, represent a potential vapor intrusion threat to the structure. Therefore, this alternative proposes the installation of a vapor barrier/moisture barrier system on the garage wall. At a minimum the vapor barrier would be installed on the walls along MLK and 39th Street. It may be preferable to use this vapor barrier system for all four walls, rather than deal with joints between disparate systems.

The vadose zone TPH-g contamination does not appear to represent a threat to groundwater, but does pose a potential vapor intrusion threat. Alternative 2, which considers excavation of the vadose zone contamination under the sidewalk does not appear to be the best option to mitigate this potential for vapor intrusion. The excavation option is complicated by the need to relocate existing utilities beneath the sidewalk, and the need for the design, permitting and installation of additional shoring along the sidewalk. Implementation of this option is therefore more difficult and this option is necessarily more costly. This option also has a very much larger greenhouse gas footprint than Alternative 1. Given the very limited threat to groundwater posed by AOC-2 vadose contamination, Alternative 1 was selected.

The Geo-Seal® system is described in the preceding section (Section 7.1). The triple layer system will be installed on the inner form of the poured-in-place foundation wall.

8.0 CORRECTIVE ACTION PLAN

8.1 PRE-IMPLEMENTATION ACTIVIES

Prior to implementing the CAP remedial design documents will need to be prepared and approved by ACDEH and permits will need to be obtained from the City of Oakland and Alameda County Public Works Agency.

8.1.1 Design Documents

Engineering Design: The remediation design documents will include drawings and specifications for the excavation, ISCO and ORC Advanced® placement, backfilling and compaction, and the installation of the Geo-Seal® system for the foundation and garage walls. The engineering design will be submitted to ACDEH for review and approval.

Well Destruction and Well Installation Work Plan: This work plan will be submitted to ACDEH for review and approval.

Vapor Intrusion and Moisture Barrier Work Plan: This work plan will be submitted to ACDEH for review and approval.

Construction Quality Assurance (CQA) Plan: The CQA plan will provide procedures for the monitoring, compaction testing, smoke testing (Geo-Seal®) and documentation, to ensure that the remedy is implemented in accordance with the CAP.

8.1.2 Permitting

The following permits will be required for remedial construction. This list does not include permits to be obtained by the General Contractor for construction of the structure.

- Alameda County Public Works Agency: Well destruction and installation permits.
- City of Oakland: Encroachment permits (Monitoring Well Installation)

8.1.3 Health and Safety Plan

The existing HASP will be updated to include construction activities.

8.2 CORRECTIVE ACTION: AOC-1

After completion of the garage excavation, the 75 x 50 x 6-foot deep source removal excavation will be conducted. The General Contractor will leave an earthern access ramp with a suitable gradient for equipment to access the excavation. It is assumed that it will be possible for 9-cy end-dump trucks to access the excavation for loading. Due to lay-down constraints within the garage excavation, excavated soil will be loaded directly into 9-cy end-dump trucks for transport to a Class II disposal facility (based on prior drill-cutting profiling conducted by URS after the 2013 investigation). In order to facilitate this, it is anticipated that the soil will be sampled for profiling in place, assuming excavation in 2-foot lifts. Each 2-foot lift will be 277 cu; in-place sampling will be conducted by hand augering to collect one 4-point composite sample per lift. Sample frequency will be in accordance with the disposal facility permit. Samples will be analyzed for BTEX and TPH-g using a state-certified laboratory.

Upon completion of the excavation, the RegenOx™ and ORC Advanced® Pellets will be placed with the 277 cu of 1 inch minus gravel for placement into the first 2 feet of the excavation (the saturated zone). The excavation is expected to contain 1 to 2 feet of groundwater, as it will extend approximately 2 feet into the water table. Three grab samples of the groundwater in the pit will be collected using a surface water sampling pole with sample jar affixed. These will be analyzed for TPH-g and BTEX.

Application of the RegenOx™ and ORC Advanced® Pellets will be conducted by mixing the amendments into the first 2 feet of backfill in the over-excavated area. 4,133 lbs of RegenOx™ Part A, 1,800 lbs of RegeneOx™ Part B and 1,157 lbs of ORC Advanced® Pellets will be mixed into the 2 feet of 1-inch minus gravel backfill and placed in the excavation. The RegenOx™ will treat the water in the excavation. The ORC Advanced® Pellets will subsequently be distributed evenly throughout the excavation. Once all three products are in place, then the excavator bucket will be used to mix the products, prior to completion of backfilling.

The excavation will then be left open for 7 days, during which time the RegenOx™ will oxidize the petroleum hydrocarbons in the groundwater and adjacent saturated soil. In order to assess the efficiency of the RegenOx™ application, three grab groundwater samples will be collected for TPH-g and BTEX analysis. Based on the stoichiometric calculations used to derive the quantity of RegenOx™ added, concentrations of TPH-g and BTEX would be expected to have decreased by greater than 75 percent. The exact decrease will depend on the flux of contaminated groundwater into the excavation. Depending on the results of this sampling, additional RegenOx™ may be added to the excavation.

The balance of the excavation will then be backfield with clean fill per the design specifications. The backfill will meet DTSC’s guidance for clean, imported fill. Geofabric will be placed over the gravel prior to final backfilling and compaction so that 95 percent compaction can be obtained for the foundation matte.

Prior to pouring the foundation matte, the triple-layer Geo-Seal® vapor and moisture barrier system will be installed, as is described in Section 8.3.

8.3 CORRECTIVE ACTION: AOC-2

The Geo-Seal® system will be installed on the inner form wall prior to completing the form-work. The foundation wall will then be poured by the general contractor. Subsequent to the installation of the Geo-Seal® system, the vapor barrier will be smoke tested to ensure its integrity. Smoke will be pumped under the membrane for a specified time, at a specified pressure and any holes or breaches is the membrane will thus be identified. Any holes identified will be patched by the application of additional membrane.

The installation procedure and construction quality control measures will be included in the engineering design. A construction quality assurance plan will be developed to ensure correct installation of the vapor barrier. This will be included as an appendix to the remedial design.

After completion of construction, indoor air samples will be collected to confirm that the vapor barrier is functioning correctly (described in Section 9.0).

9.0 PERFORMANCE MONITORING

Quarterly groundwater performance monitoring will be conducted until ACDEH determines that groundwater contamination trends indicate that the remedy for AOC-1 is performing as intended. Monitoring will be conducted for a minimum of one year.

Based on the TPH-g and benzene isoconcentration maps, the contaminant plume migrating off site is attributed to the primary source area in AOC-1, the former location of UST #3 (Figures 12 and 13). Consequently, groundwater performance monitoring wells will be installed downgradient of MW-4 in the direction of the groundwater gradient, as shown in Figure 11. MW-6 and MW-7 will be installed on the sidewalk downgradient of the site, as shown on Figure 16, MW-8 will be installed on the sidewalk across MLK, adjacent to soil boring SB-1 (URS, 2013).

Prior to commencing remediation, the new off-site monitoring wells MW-6, MW-7 and MW-8 will be installed and developed as specified in the URS work plan (URS, 2013). The wells will be screened consistent with the existing groundwater monitoring wells. The new wells will be developed in accordance with the URS work plan (July, 2013).

Prior to any remediation, all groundwater monitoring wells will be sampled using the sampling methodology specified in the URS work plan (URS, 2013). All samples will be analyzed for TPH-g and BTEX. This sampling event will constitute the baseline sampling event in which subsequent groundwater performance monitoring will be compared. During excavation for the underground garage, groundwater monitoring wells MW-2, MW-3, MW-4, and MW-5 will be destroyed in accordance with Alameda County Public Works Agency regulations, as they fall within the excavation footprint. Performance monitoring will therefore be limited to MW-1, MW-6, MW-7, and MW-8. For each quarterly sampling event these four wells will be sampled and the samples analyzed for TPH-g and BTEX, in accordance with the URS work plan.

After completion of construction, two indoor air samples will be collected from the parking garage. These samples will be collected from the empty garage, taking care to ensure that no vehicles have been in the garage for a minimum of 24 hours prior to sampling, so that vehicle exhaust emissions will not impact sampling results. The samples will be collected over an 8-hour time period, using 6-liter SUMMA canisters with calibrated flow controllers, and will be analyzed by a State-certified laboratory using method TO-15. One SUMMA canister will be located in the northeastern corner of the garage, against the garage wall at the approximate location of former UST #2, at the intersection of Martine Luther King Junior Boulevard and 39th Street. The second sample will be collected from the northwestern corner of the garage. These air samples will be analyzed to confirm the effectiveness of the vapor barrier and ensure that vapor intrusion into the parking garage is not occurring.

10.0 FINANCIAL ASSURANCE

The owner will provide ACEHD an appropriate financial instrument to assure implementation and performance monitoring of the proposed corrective action.

11.0 COMPLETION OF CORRECTIVE ACTION

Upon completion of the corrective action, performance monitoring will commence, and groundwater monitoring results will be reported to ACDEH on a quarterly basis for a minimum of one year. Subject to ACDEH's review of the performance monitoring data and ACDEH's determination that the remedy is performing as anticipated, the site will ultimately be closed under the State Water Resources Control Board (SWRCB) Low Threat Closure Policy, subject to the submittal of the required documentation to ACDEH.

12.0 PROVISIONAL SCHEDULE

This schedule is subject to change based on permitting, regulatory approvals, funding approvals and other factors.

Submittal of Final FS/CAP to ACDEH:	October 8, 2013
Certification of Fact Sheet Distribution:	October 11, 2013
First Round GW Monitoring:	October 16, 2013
FS/CAP Final:	November 22, 2013
Commence Remedial Design (RD):	December, 2013*
Second Round GW Monitoring:	January, 2014
Submit Draft RD to ACDEH for Review:	February, 2014
Finalize RD:	March, 2014
Third Round of GW Sampling:	April, 2014
Fourth Round of GW Monitoring:	July, 2014
Commence Construction:	September/October, 2014**
Complete Construction:	February, 2016
Indoor Air Sampling – Parking Garage:	February, 2016
First Quarter GW Performance Monitoring:	March, 2016
Second Quarter GW Performance Monitoring:	June, 2016
Third Quarter GW Performance Monitoring:	September, 2016
Fourth Quarter GW Performance Monitoring:	December, 2016

* *Date subject to confirmation. No contract is currently in place for the Remedial Design phase of the project. The remedial design may be scheduled later depending upon the date of completion of the foundation design.*

** *Construction schedule to be determined.*

Performance monitoring of the four groundwater monitoring wells will be conducted quarterly under direction of the ACDEH.

13.0 REFERENCES

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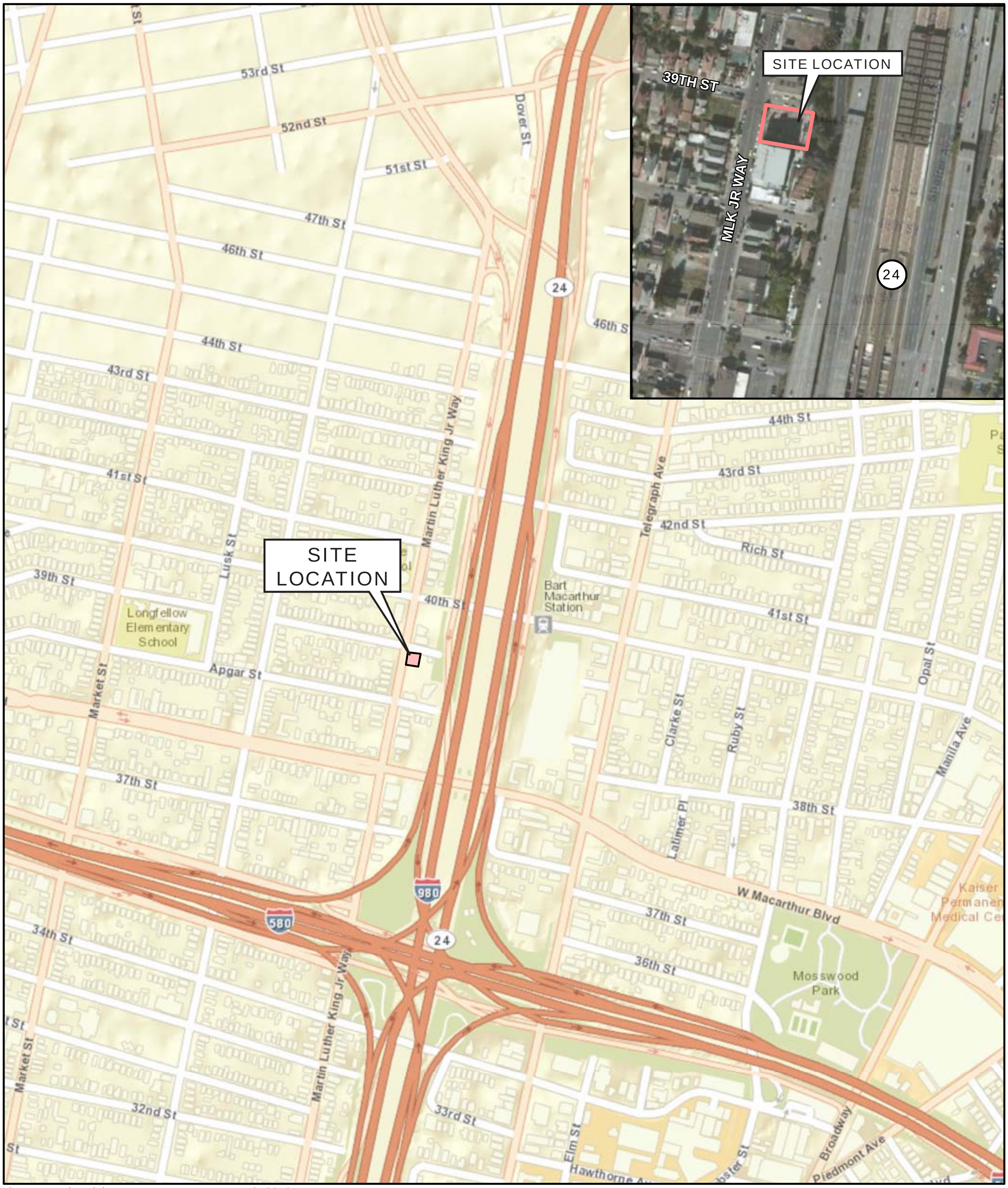
FIGURES

9/05/13 vsa ..T:\3884 MLK\SEPT_2013\Fig1_site_location.ai



Source: Esri Aerial Inagery, DeLorme, NAVTEC, 2012

SITE LOCATION MAP

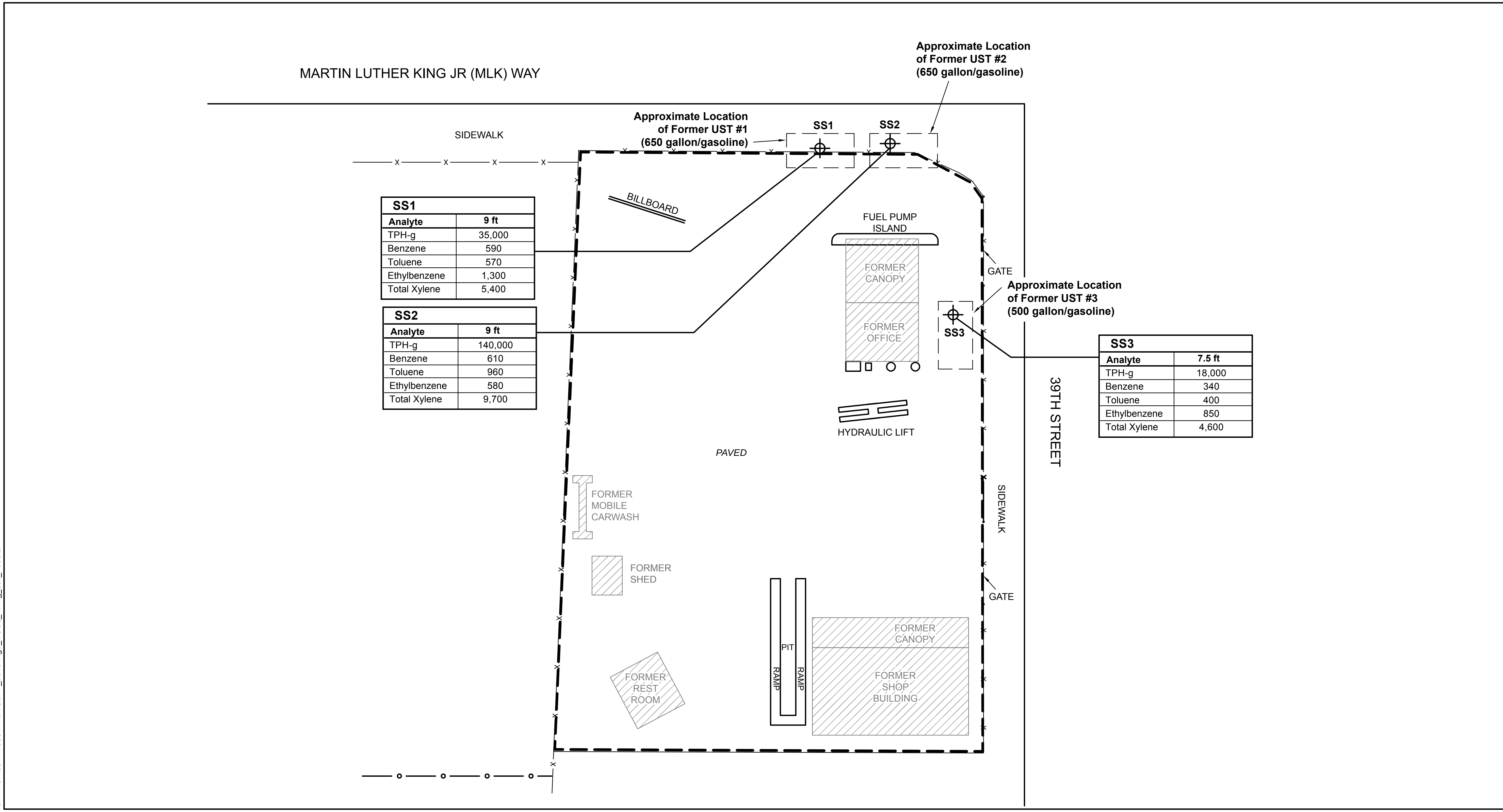
September 2013
28068161

3884 Martin Luther King, Jr. Way
Oakland, California

0 500 1000 FEET

URS

FIGURE 1



SS1

Analyte	9 ft
TPH-g	35,000
Benzene	590
Toluene	570
Ethylbenzene	1,300
Total Xylene	5,400

SS2

Analyte	9 ft
TPH-g	140,000
Benzene	610
Toluene	960
Ethylbenzene	580
Total Xylene	9,700

SS3

Analyte	7.5 ft
TPH-g	18,000
Benzene	340
Toluene	400
Ethylbenzene	850
Total Xylene	4,600

9/17/13 vsa ..T:\3884 MLK\SEPT_2013\Fig2_VOCs_TPHg_soil_1995.ai

SS1 Soil Boring Location, URS Geoprobe (2004)
Site Boundary
Chain Link Fence
Wood Fence

TPH-g Total Petroleum Hydrocarbon - Gasoline

Note:
All concentrations in micrgrams per kilogram (µg/kg)

0 10 20 FEET

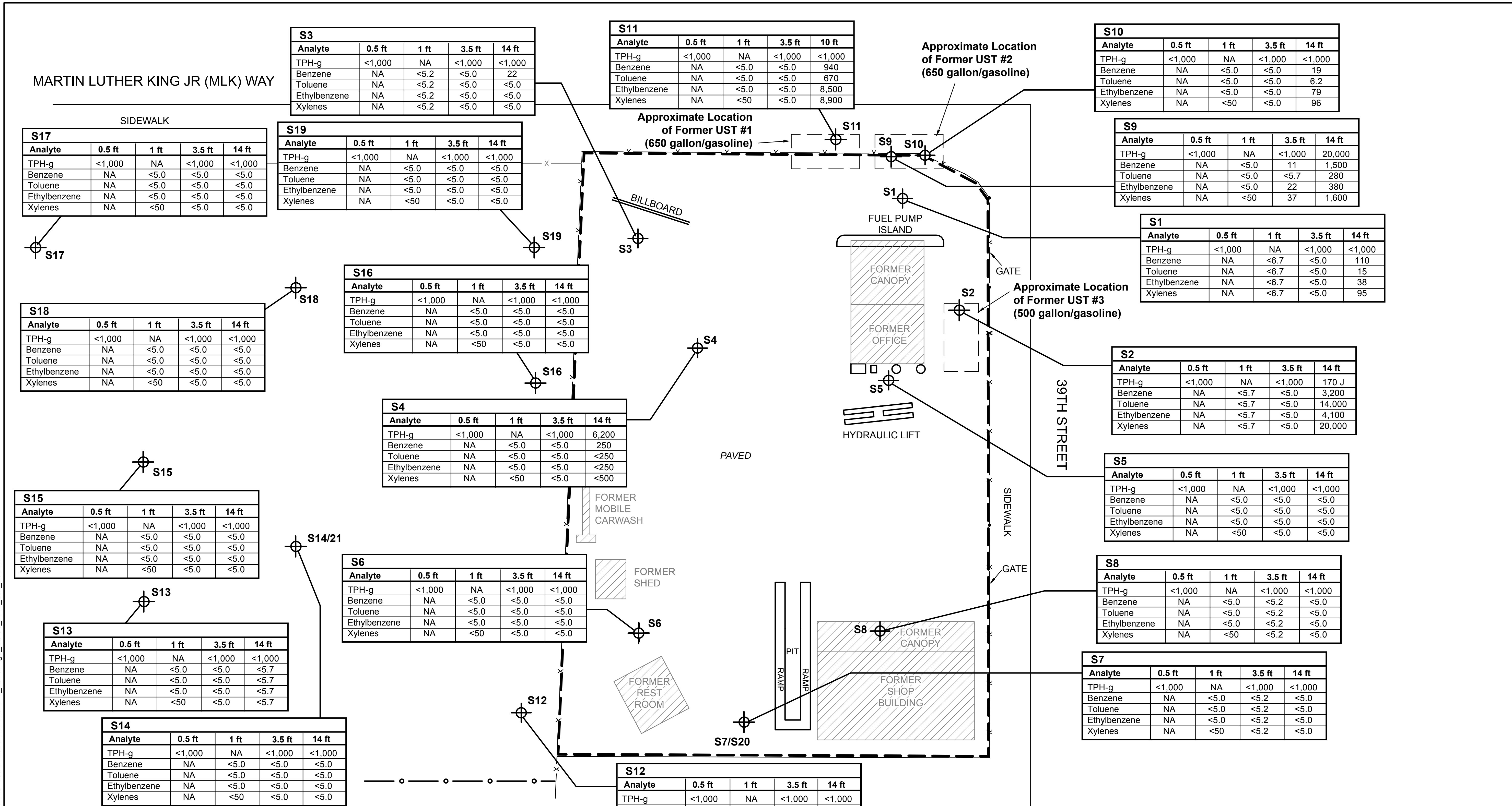
VOCs AND TPH-g IN SOIL (µg/kg) – 1995

September 2013
28068161

3884 Martin Luther King, Jr. Way
Oakland, California

URS

FIGURE 2



S3

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.2	<5.0	22
Toluene	NA	<5.2	<5.0	<5.0
Ethylbenzene	NA	<5.2	<5.0	<5.0
Xylenes	NA	<5.2	<5.0	<5.0

S11

Analyte	0.5 ft	1 ft	3.5 ft	10 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	940
Toluene	NA	<5.0	<5.0	670
Ethylbenzene	NA	<5.0	<5.0	8,500
Xylenes	NA	<50	<5.0	8,900

S10

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	19
Toluene	NA	<5.0	<5.0	6.2
Ethylbenzene	NA	<5.0	<5.0	79
Xylenes	NA	<50	<5.0	96

S17

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	<5.0
Toluene	NA	<5.0	<5.0	<5.0
Ethylbenzene	NA	<5.0	<5.0	<5.0
Xylenes	NA	<50	<5.0	<5.0

S19

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	<5.0
Toluene	NA	<5.0	<5.0	<5.0
Ethylbenzene	NA	<5.0	<5.0	<5.0
Xylenes	NA	<50	<5.0	<5.0

S9

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	20,000
Benzene	NA	<5.0	11	1,500
Toluene	NA	<5.0	<5.7	280
Ethylbenzene	NA	<5.0	22	380
Xylenes	NA	<50	37	1,600

S1

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<6.7	<5.0	110
Toluene	NA	<6.7	<5.0	15
Ethylbenzene	NA	<6.7	<5.0	38
Xylenes	NA	<6.7	<5.0	95

S16

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	<5.0
Toluene	NA	<5.0	<5.0	<5.0
Ethylbenzene	NA	<5.0	<5.0	<5.0
Xylenes	NA	<50	<5.0	<5.0

S18

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	<5.0
Toluene	NA	<5.0	<5.0	<5.0
Ethylbenzene	NA	<5.0	<5.0	<5.0
Xylenes	NA	<50	<5.0	<5.0

S2

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	170 J
Benzene	NA	<5.7	<5.0	3,200
Toluene	NA	<5.7	<5.0	14,000
Ethylbenzene	NA	<5.7	<5.0	4,100
Xylenes	NA	<5.7	<5.0	20,000

S4

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	6,200
Benzene	NA	<5.0	<5.0	250
Toluene	NA	<5.0	<5.0	<250
Ethylbenzene	NA	<5.0	<5.0	<250
Xylenes	NA	<50	<5.0	<500

S5

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	<5.0
Toluene	NA	<5.0	<5.0	<5.0
Ethylbenzene	NA	<5.0	<5.0	<5.0
Xylenes	NA	<50	<5.0	<5.0

S15

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	<5.0
Toluene	NA	<5.0	<5.0	<5.0
Ethylbenzene	NA	<5.0	<5.0	<5.0
Xylenes	NA	<50	<5.0	<5.0

S6

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	<5.0
Toluene	NA	<5.0	<5.0	<5.0
Ethylbenzene	NA	<5.0	<5.0	<5.0
Xylenes	NA	<50	<5.0	<5.0

S8

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.2	<5.0
Toluene	NA	<5.0	<5.2	<5.0
Ethylbenzene	NA	<5.0	<5.2	<5.0
Xylenes	NA	<50	<5.2	<5.0

S13

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	<5.7
Toluene	NA	<5.0	<5.0	<5.7
Ethylbenzene	NA	<5.0	<5.0	<5.7
Xylenes	NA	<50	<5.0	<5.7

S7

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.2	<5.0
Toluene	NA	<5.0	<5.2	<5.0
Ethylbenzene	NA	<5.0	<5.2	<5.0
Xylenes	NA	<50	<5.2	<5.0

S14

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	<5.0
Toluene	NA	<5.0	<5.0	<5.0
Ethylbenzene	NA	<5.0	<5.0	<5.0
Xylenes	NA	<50	<5.0	<5.0

S12

Analyte	0.5 ft	1 ft	3.5 ft	14 ft
TPH-g	<1,000	NA	<1,000	<1,000
Benzene	NA	<5.0	<5.0	<5.0
Toluene	NA	<5.0	<5.0	<5.0
Ethylbenzene	NA	<5.0	<5.0	<5.0
Xylenes	NA	<50	<5.0	<5.0

S1 Soil Boring Location, URS Geoprobe (2004)
S7/S20 Duplicate Sample
Site Boundary
Chain Link Fence
Wood Fence

TPH-g Total Petroleum Hydrocarbon - Gasoline

Note:
All concentrations in micrograms per kilogram (µg/kg)

9/17/13 vsa .. T:\3884 MLK\SEPT_2013\Fig3_VOCs_TPH_soil_2004.ai

VOCs AND TPH-g IN SOIL (µg/kg) – 2004

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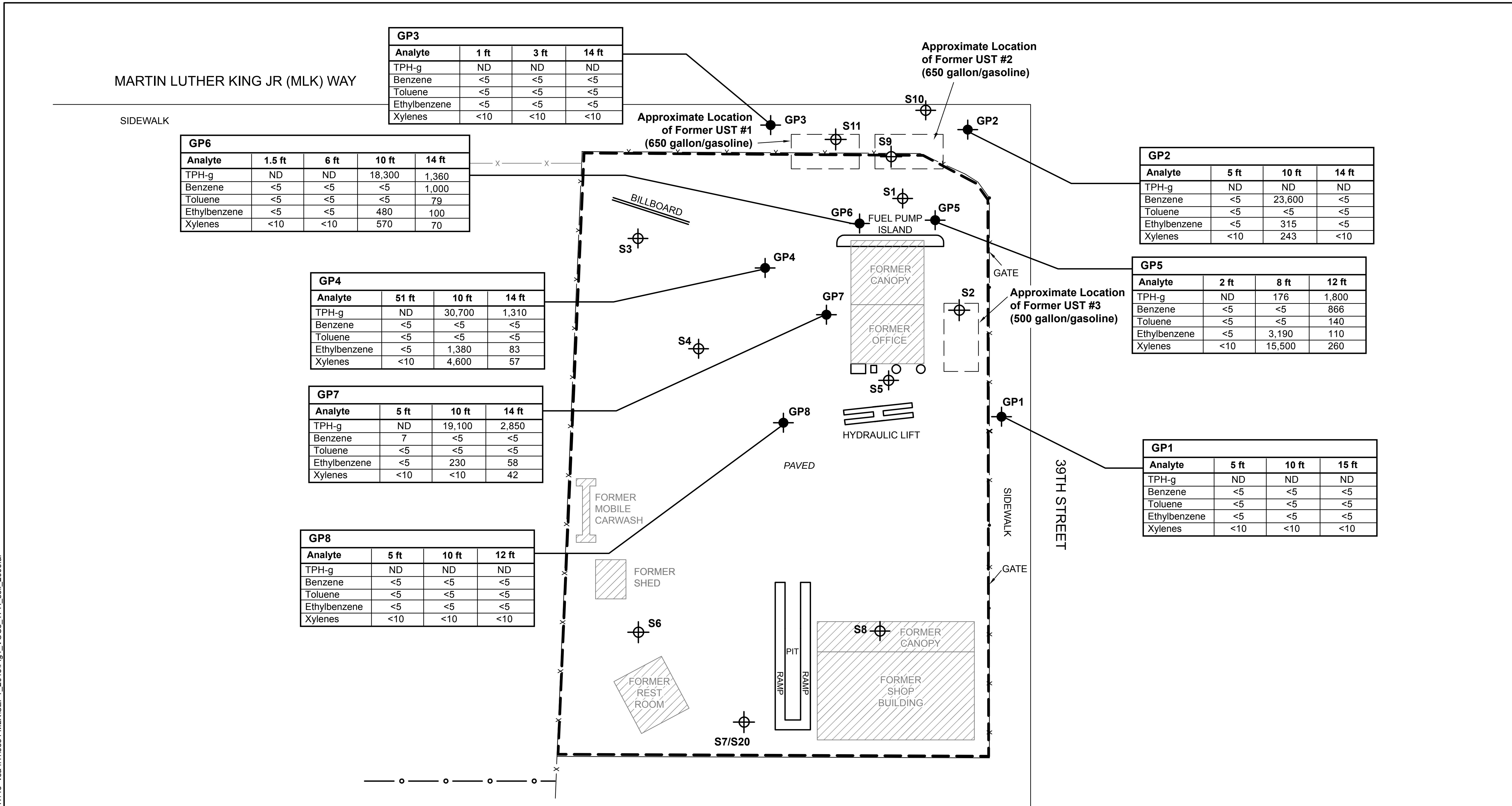
FIGURE 3



GP3

Analyte	1 ft	3 ft	14 ft
TPH-g	ND	ND	ND
Benzene	<5	<5	<5
Toluene	<5	<5	<5
Ethylbenzene	<5	<5	<5
Xylenes	<10	<10	<10

GP6

Analyte	1.5 ft	6 ft	10 ft	14 ft
TPH-g	ND	ND	18,300	1,360
Benzene	<5	<5	<5	1,000
Toluene	<5	<5	<5	79
Ethylbenzene	<5	<5	480	100
Xylenes	<10	<10	570	70

GP2

Analyte	5 ft	10 ft	14 ft
TPH-g	ND	ND	ND
Benzene	<5	23,600	<5
Toluene	<5	<5	<5
Ethylbenzene	<5	315	<5
Xylenes	<10	243	<10

GP4

Analyte	51 ft	10 ft	14 ft
TPH-g	ND	30,700	1,310
Benzene	<5	<5	<5
Toluene	<5	<5	<5
Ethylbenzene	<5	1,380	83
Xylenes	<10	4,600	57

GP5

Analyte	2 ft	8 ft	12 ft
TPH-g	ND	176	1,800
Benzene	<5	<5	866
Toluene	<5	<5	140
Ethylbenzene	<5	3,190	110
Xylenes	<10	15,500	260

GP7

Analyte	5 ft	10 ft	14 ft
TPH-g	ND	19,100	2,850
Benzene	7	<5	<5
Toluene	<5	<5	<5
Ethylbenzene	<5	230	58
Xylenes	<10	<10	42

GP1

Analyte	5 ft	10 ft	15 ft
TPH-g	ND	ND	ND
Benzene	<5	<5	<5
Toluene	<5	<5	<5
Ethylbenzene	<5	<5	<5
Xylenes	<10	<10	<10

GP8

Analyte	5 ft	10 ft	12 ft
TPH-g	ND	ND	ND
Benzene	<5	<5	<5
Toluene	<5	<5	<5
Ethylbenzene	<5	<5	<5
Xylenes	<10	<10	<10

9/17/13 vsa ..T:\3884 MLK\SEPT_2013\Fig4_VOCs_TPH_soil_2006.ai

S1 Soil Boring Location, URS Geoprobe (2004)
GP1 JCC Geoprobe (Feb 21, 2006)
S7/S20 Duplicate Sample
Site Boundary
Chain Link Fence
Wood Fence

TPH-g Total Petroleum Hydrocarbon - Gasoline

ND Non-detect (reporting limits not available); reporting limit expected to be between 500 μg/kg and 1,000 μg/kg.

Note:
All concentrations in micrgrams per kilogram (μg/kg)

0 10 20 FEET

VOCs AND TPHg IN SOIL (μg/kg) – 2006

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Oakland, California

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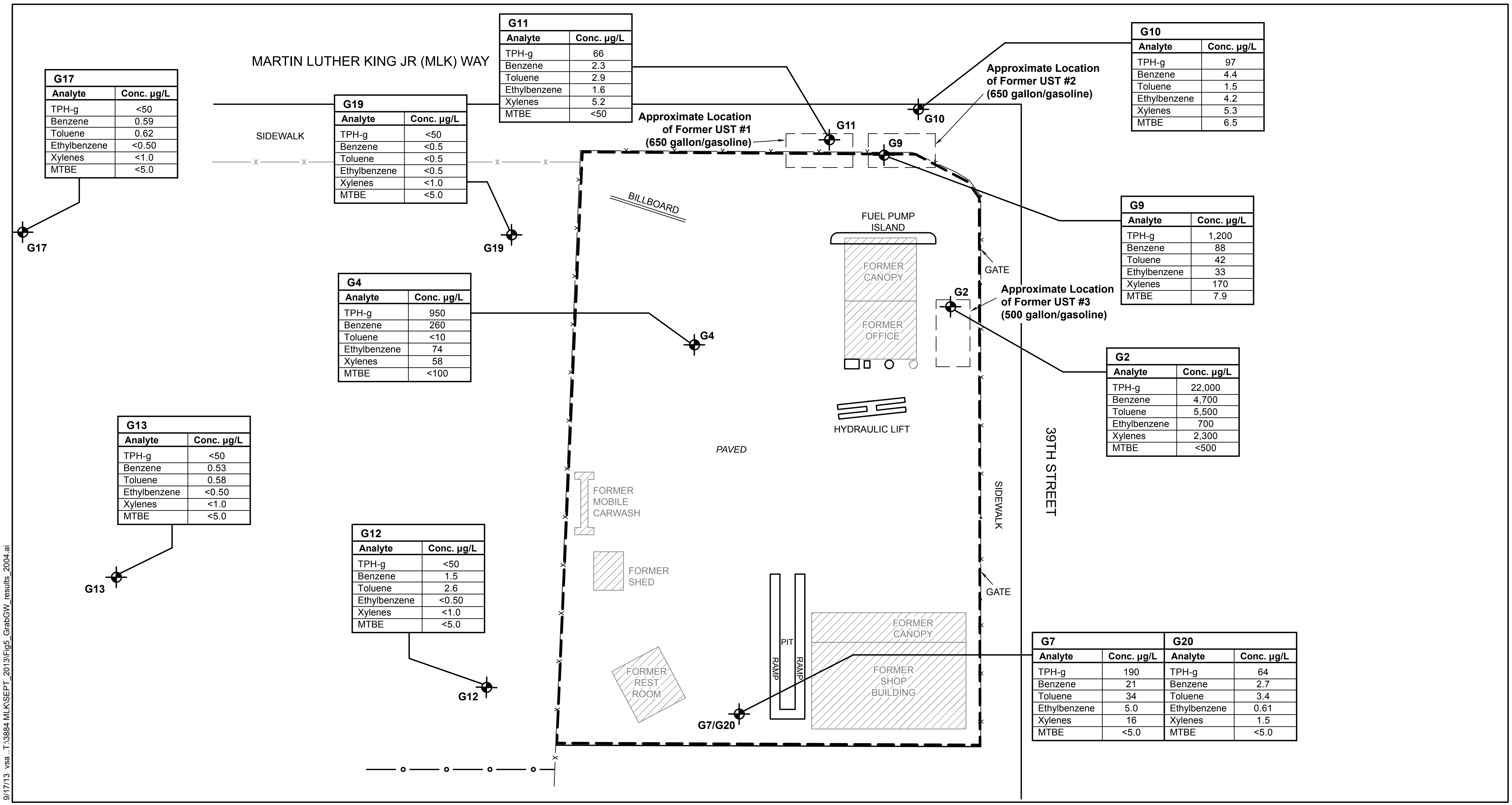
FIGURE 4



G17 Analyte	Conc. µg/L
TPH-g	<50
Benzene	0.59
Toluene	0.62
Ethylbenzene	<0.50
Xylenes	<1.0
MTBE	<5.0

G19 Analyte	Conc. µg/L
TPH-g	<50
Benzene	<0.5
Toluene	<0.5
Ethylbenzene	<0.5
Xylenes	<1.0
MTBE	<5.0

G11 Analyte	Conc. µg/L
TPH-g	66
Benzene	2.3
Toluene	2.9
Ethylbenzene	1.6
Xylenes	5.2
MTBE	<50

G10 Analyte	Conc. µg/L
TPH-g	97
Benzene	4.4
Toluene	1.5
Ethylbenzene	4.2
Xylenes	5.3
MTBE	6.5

G9 Analyte	Conc. µg/L
TPH-g	1,200
Benzene	88
Toluene	42
Ethylbenzene	33
Xylenes	170
MTBE	7.9

G4 Analyte	Conc. µg/L
TPH-g	950
Benzene	260
Toluene	<10
Ethylbenzene	74
Xylenes	58
MTBE	<100

G2 Analyte	Conc. µg/L
TPH-g	22,000
Benzene	4,700
Toluene	5,500
Ethylbenzene	700
Xylenes	2,300
MTBE	<500

G13 Analyte	Conc. µg/L
TPH-g	<50
Benzene	0.53
Toluene	0.58
Ethylbenzene	<0.50
Xylenes	<1.0
MTBE	<5.0

G12 Analyte	Conc. µg/L
TPH-g	<50
Benzene	1.5
Toluene	2.6
Ethylbenzene	<0.50
Xylenes	<1.0
MTBE	<5.0

G7 Analyte	Conc. µg/L	G20 Analyte	Conc. µg/L
TPH-g	190	TPH-g	64
Benzene	21	Benzene	2.7
Toluene	34	Toluene	3.4
Ethylbenzene	5.0	Ethylbenzene	0.61
Xylenes	16	Xylenes	1.5
MTBE	<5.0	MTBE	<5.0

G2 Grab Groundwater Sample Location, URS 2004
G7/G20 Duplicate Sample
Site Boundary
Chain Link Fence
Wood Fence

TPH-g Total Petroleum Hydrocarbon - Gasoline

Note:
All concentrations in micrograms per liter (µg/L)

GRAB GROUNDWATER SAMPLE RESULTS (µg/L) – 2004 (URS)

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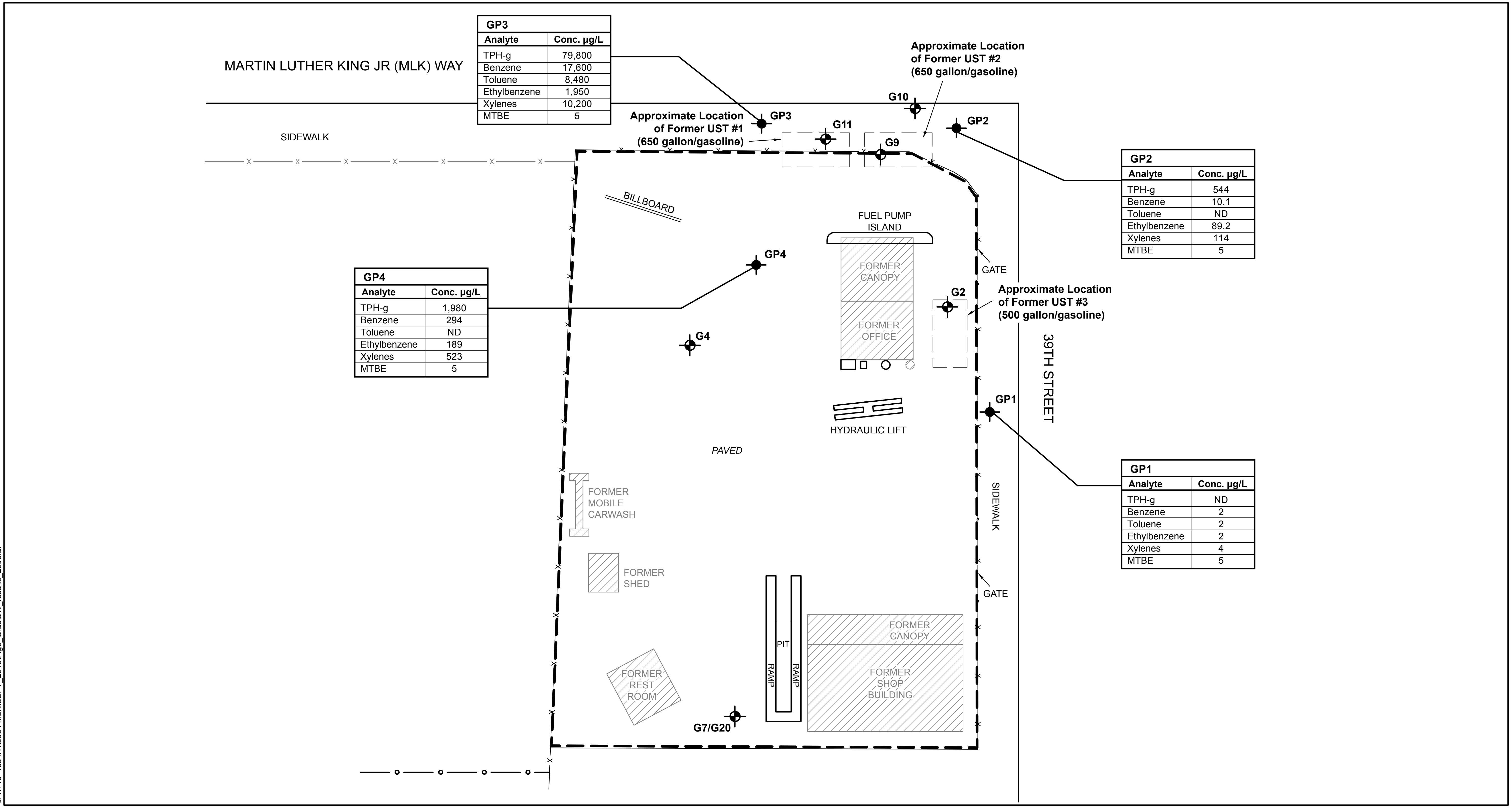
FIGURE 5



GP3	
Analyte	Conc. µg/L
TPH-g	79,800
Benzene	17,600
Toluene	8,480
Ethylbenzene	1,950
Xylenes	10,200
MTBE	5

GP2	
Analyte	Conc. µg/L
TPH-g	544
Benzene	10.1
Toluene	ND
Ethylbenzene	89.2
Xylenes	114
MTBE	5

GP4	
Analyte	Conc. µg/L
TPH-g	1,980
Benzene	294
Toluene	ND
Ethylbenzene	189
Xylenes	523
MTBE	5

GP1	
Analyte	Conc. µg/L
TPH-g	ND
Benzene	2
Toluene	2
Ethylbenzene	2
Xylenes	4
MTBE	5

9/17/13 vsa ..T:\3884 MLK\SEPT_2013\Fig6_GrabGW_results_2006.ai

G2 Grab Groundwater Sample Location, URS 2004
GP1 JCC Geoprobe (Feb 21, 2006)
G7/G20 Duplicate Sample
Site Boundary
Chain Link Fence
Wood Fence

TPH-g Total Petroleum Hydrocarbon - Gasoline
ND Non-detect. Reporting limits were not available for TPH-g. Reporting limit is assumed to be between 500 and 1,000 µg/L

Note:
All concentrations in micrograms per liter (µg/L)

GRAB GROUNDWATER SAMPLE RESULTS (µg/L) – 2006 (JCC)

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FIGURE 6

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
SB-4-12	<220	<4.3	<4.3	<4.3	<8.6	<8.6	<4.3	<4.3
SB-4-15	<200	<4.0	<4.0	<4.0	<7.9	<7.9	<4.0	<4.0
SB-4-20	680	<3.7	<3.7	<3.7	<7.4	<7.4	<3.7	<3.7

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
SB-5-12	2600	1000	13	560	<8.3	<8.3	<4.2	<4.2
SB-5-15	<200	<4.1	<4.1	<4.1	<8.1	<8.1	<4.1	<4.1
SB-5-20	<210	<4.2	<4.2	<4.2	<8.4	<8.4	<4.2	<4.2

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
SB-6-12	780	<4.3	<4.3	7.6	9.2	<8.7	<4.3	<4.3
SB-6-15	4800	180	7.6	330	29	13	<4.1	<4.1
SB-6-16	1,400,000	4600	70000	32000	180000	10000	<3900	<3900
SB-6-20	650	6.6	34	14	78	<7.6	<3.8	<3.8

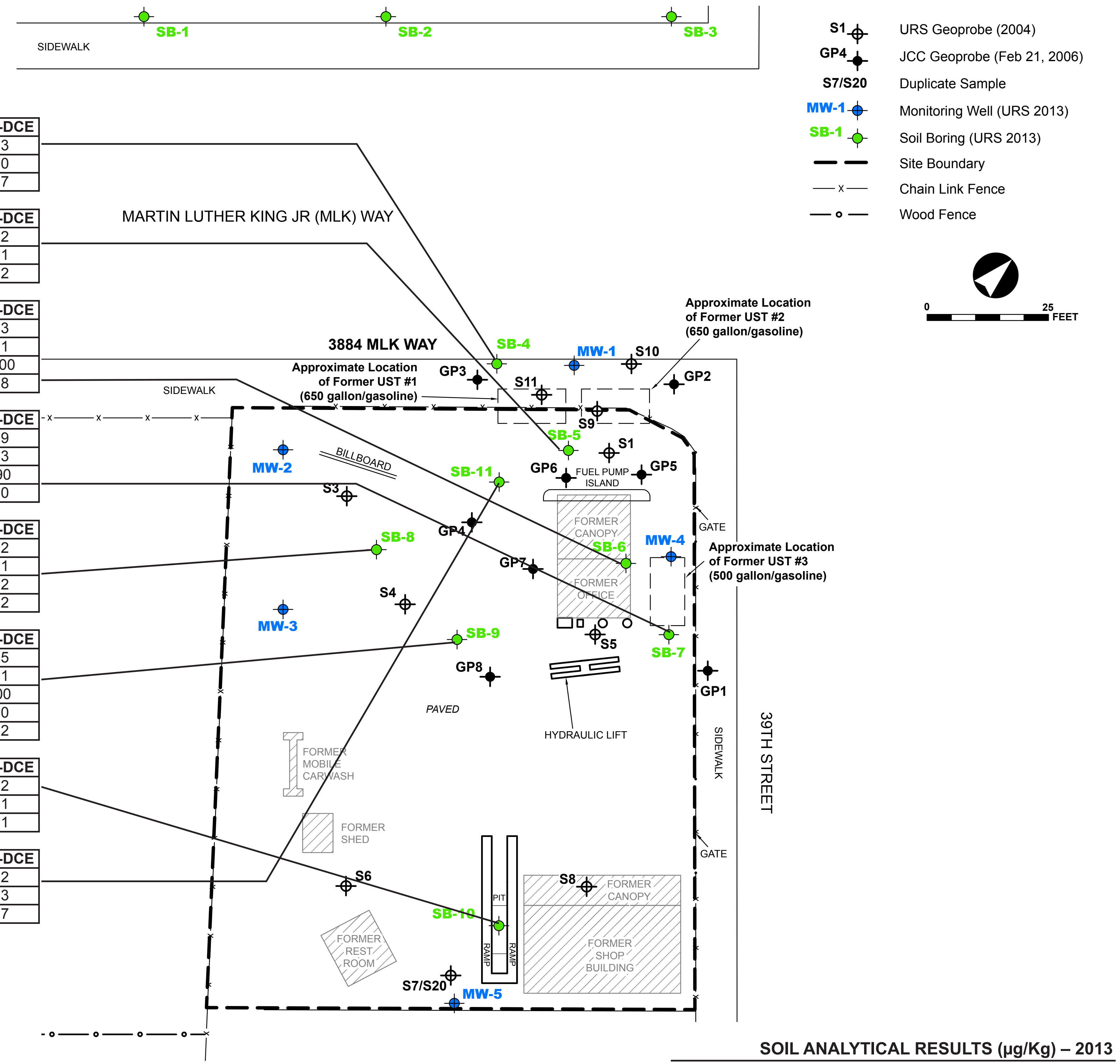
	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
SB-7-12	<190	<3.9	<3.9	<3.9	<7.8	<7.8	<3.9	<3.9
FD-1-12*	<210	<4.3	<4.3	<4.3	<8.6	<8.6	<4.3	<4.3
SB-7-15	77,000	420	<390	1300	2800	<790	<390	<390
SB-7-20	<200	<4.0	<4.0	<4.0	<8.1	<8.1	<4.0	<4.0

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
SB-8-12	<210	7.5	<4.2	<4.2	<8.4	11	<4.2	<4.2
SB-8-15	<200	<4.1	<4.1	<4.1	<8.2	<8.2	<4.1	<4.1
SB-8-20	<210	<4.2	<4.2	<4.2	<8.4	<8.4	<4.2	<4.2
FD-3-20**	<210	<4.2	<4.2	<4.2	<8.5	<8.5	<4.2	<4.2

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
SB-9-12	230	<4.5	<4.5	<4.5	<8.9	<8.9	<4.5	<4.5
SB-9-15	<21,000	130	7.6	48	340	110	<4.1	<4.1
SB-9-18	27000	1400	<400	790	<800	<800	<400	<400
SB-9-20	<200	<4.0	<4.0	<4.0	<8.0	<8.0	<4.0	<4.0
FD-2-20***	<210	<4.2	<4.2	<4.2	<8.4	<8.4	<4.2	<4.2

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
SB-10-12	<210	<4.2	<4.2	<4.2	<8.4	<8.4	<4.2	<4.2
SB-10-15	<200	<4.1	<4.1	<4.1	<8.1	<8.1	<4.1	<4.1
SB-10-20	<150	<3.1	<3.1	<3.1	<6.2	<6.2	<3.1	<3.1

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
SB-11-12	790	80	<4.2	55	<8.5	8.9	<4.2	<4.2
SB-11-15	<170	<3.3	<3.3	<3.3	<6.6	<6.6	<3.3	<3.3
SB-11-20	<180	<3.7	<3.7	<3.7	<7.4	<7.4	<3.7	<3.7



SOIL ANALYTICAL RESULTS (µg/Kg) – 2013

September 2013
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FIGURE 7

10/07/13 hk/vsa T:\3884 MLK\SEPT_2013\GW_Sample_Results Folder\GW_Sample_Results.indd

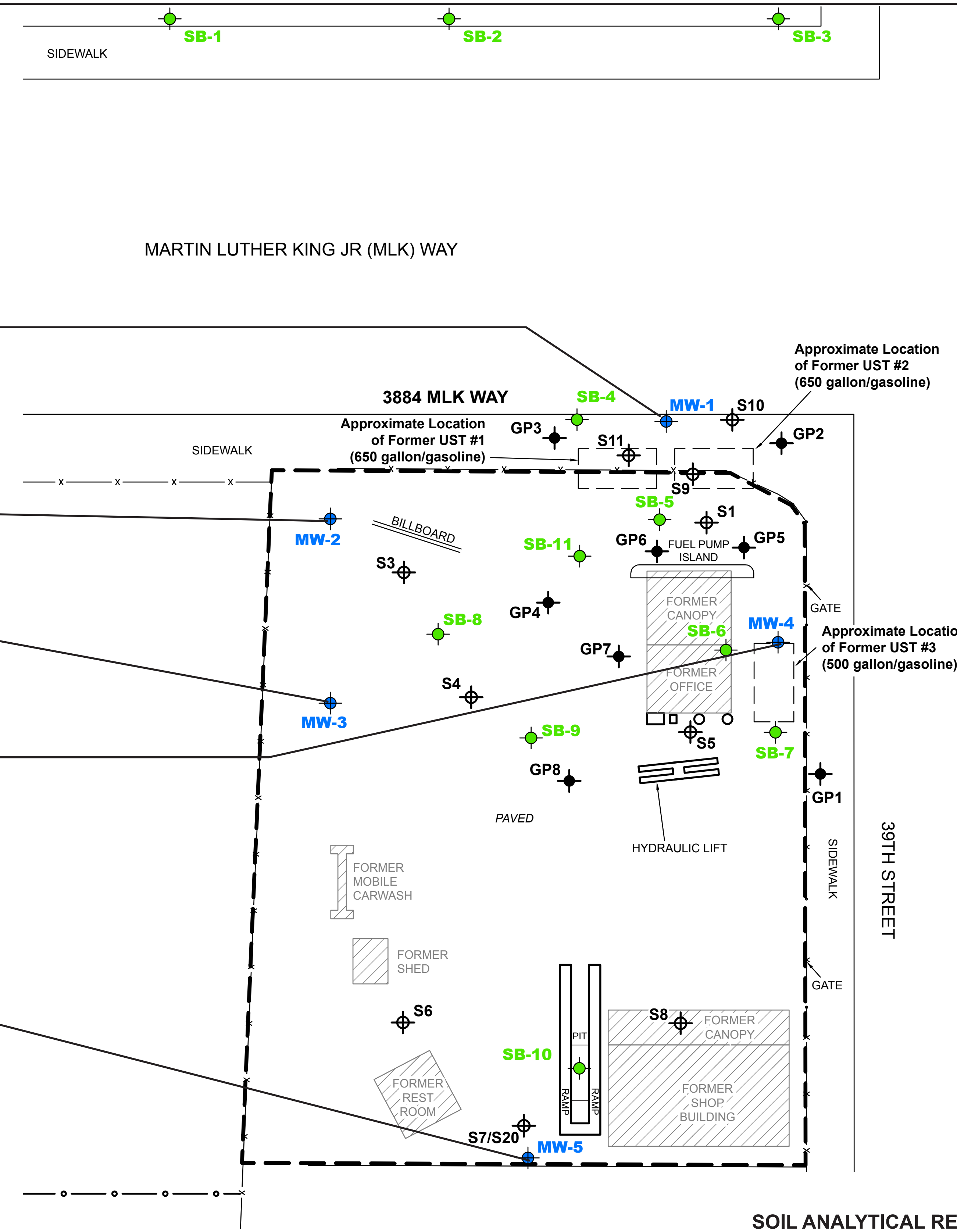
	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
MW-1-7	750,000	<460	<460	<460	<910	<910	<460	<460
MW-1-12	<230	<4.5	<4.5	<4.5	<9.1	<9.1	<4.5	<4.5
MW-1-15	<210	<4.1	<4.1	<4.1	<8.3	<8.3	<4.1	<4.1
MW-1-20	<210	<4.1	<4.1	<4.1	<8.2	<8.2	<4.1	<4.1
FD-5-20*	<240	<3.6	<3.6	<3.6	<7.1	<7.1	<3.6	<3.6

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
MW-2-12	<200	<3.6	<3.6	<3.6	<8.0	<7.1	<3.6	<3.6
MW-2-15	<190	<3.8	<3.8	<3.8	<8.1	<7.7	<3.8	<3.8
MW-2-18.5	<20000	1700	<400	<400	<800	<800	<400	<400
MW-2-20	<190	<3.8	<3.8	<3.8	<7.6	<7.6	<3.8	<3.8

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
MW-3-12	<210	<4.2	<4.2	<4.2	<8.4	<8.4	<4.2	<4.2
MW-3-15	<200	<4.1	<4.1	<4.1	<8.4	<8.4	<4.1	<4.1
MW-3-20	<210	<4.1	<4.1	<4.1	<8.3	<8.3	<4.1	<4.1

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
MW-4-12	2200	240	22	220	88	31	<5.0	<5.0
MW-4-15	400,000	1300	1800	9000	38000	2400	<800	<800
MW-4-16	2,700,000	2700	3900	48000	110000	12000	<380	<380
MW-4-20	<21000	<420	<420	<420	<830	<830	<420	<420

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
MW-5-12	<220	<4.5	<4.5	<4.5	<8.9	<8.9	<4.5	<4.5
MW-5-15	<200	<4.1	<4.1	<4.1	<8.2	<8.2	<4.1	<4.1
MW-5-20	<220	<4.3	<4.3	<4.3	<8.6	<8.6	<4.3	<4.3



S1 URS Geoprobe (2004)
GP4 JCC Geoprobe (Feb 21, 2006)
S7/S20 Duplicate Sample
MW-1 Monitoring Well (URS 2013)
SB-1 Soil Boring (URS 2013)
Site Boundary
Chain Link Fence
Wood Fence
* Field Duplicate Sample

0 25 FEET

MONITORING WELL SOIL ANALYTICAL RESULTS (µg/Kg) – 2013

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Oakland, California

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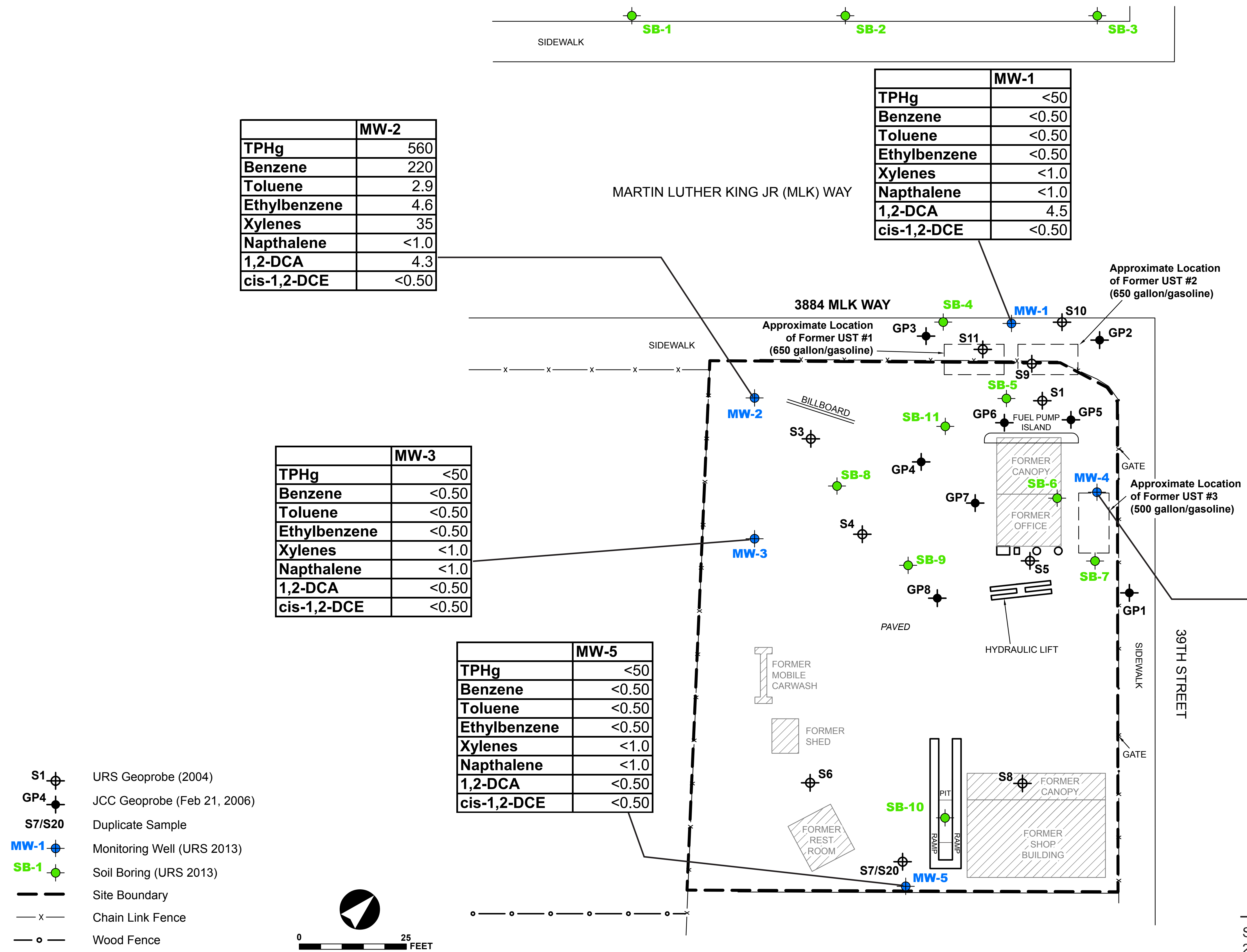
FIGURE 8



	MW-1
TPHg	<50
Benzene	<0.50
Toluene	<0.50
Ethylbenzene	<0.50
Xylenes	<1.0
Napthalene	<1.0
1,2-DCA	4.5
cis-1,2-DCE	<0.50

	MW-2
TPHg	560
Benzene	220
Toluene	2.9
Ethylbenzene	4.6
Xylenes	35
Napthalene	<1.0
1,2-DCA	4.3
cis-1,2-DCE	<0.50

	MW-3
TPHg	<50
Benzene	<0.50
Toluene	<0.50
Ethylbenzene	<0.50
Xylenes	<1.0
Napthalene	<1.0
1,2-DCA	<0.50
cis-1,2-DCE	<0.50

	MW-4	MW-40*
TPHg	9500	13000
Benzene	980	1100
Toluene	510	930
Ethylbenzene	270	800
Xylenes	2600	3500
Napthalene	180	180
1,2-DCA	0.71	0.61
cis-1,2-DCE	<0.50	<0.50

	MW-5
TPHg	<50
Benzene	<0.50
Toluene	<0.50
Ethylbenzene	<0.50
Xylenes	<1.0
Napthalene	<1.0
1,2-DCA	<0.50
cis-1,2-DCE	<0.50

GROUNDWATER RESULTS – MONITORING WELLS (μg/L) – 2013

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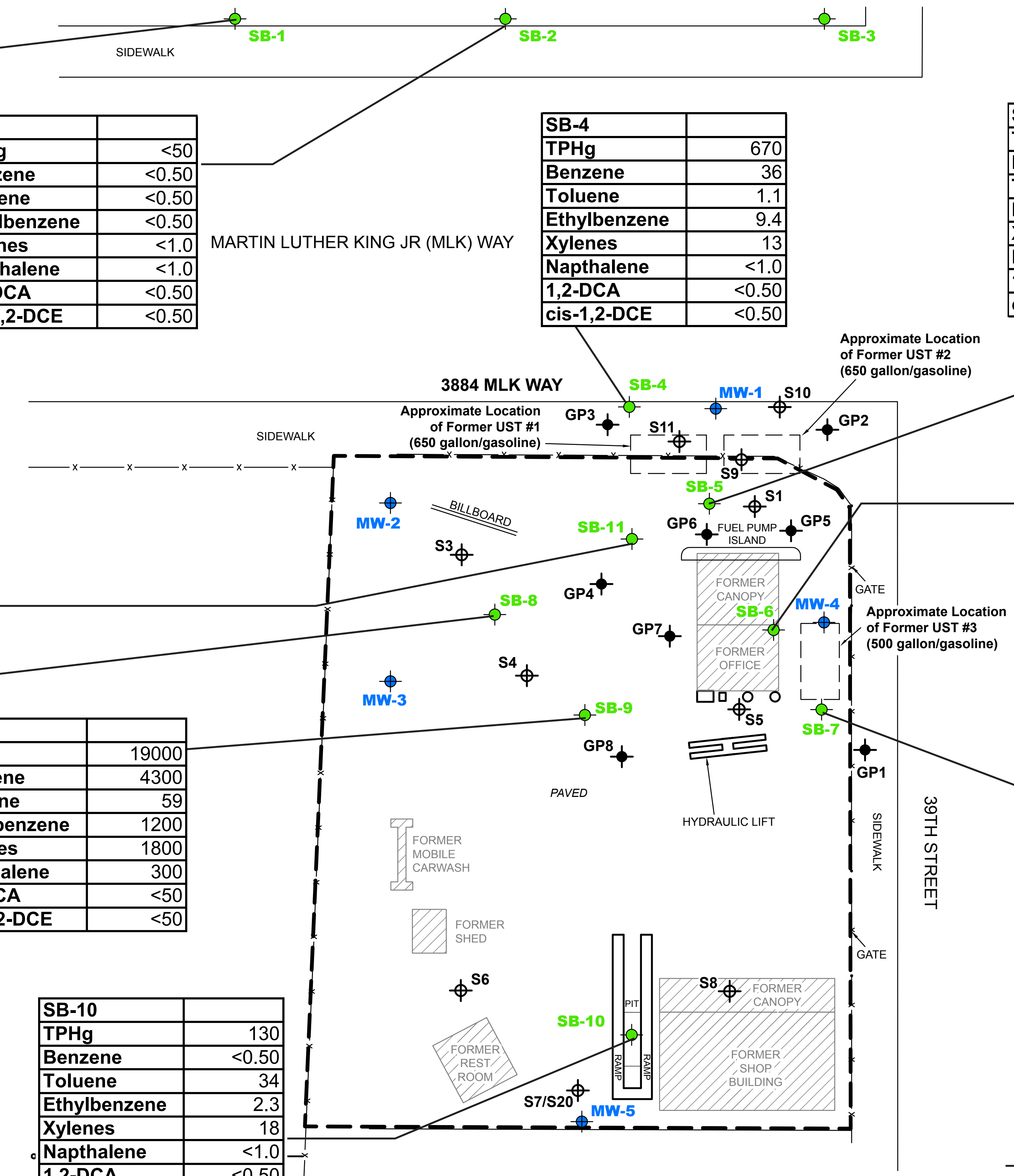
FIGURE 9

10/07/13 hk/vsa T:\3884 MLK\SEPT_2013\GW_Sample_Results Folder\GW_Sample_Results.indd



SB-1	
TPHg	120
Benzene	<0.50
Toluene	<0.50
Ethylbenzene	<0.50
Xylenes	<1.0
Napthalene	<1.0
1,2-DCA	<0.50
cis-1,2-DCE	<0.50

SB-2	
TPHg	<50
Benzene	<0.50
Toluene	<0.50
Ethylbenzene	<0.50
Xylenes	<1.0
Napthalene	<1.0
1,2-DCA	<0.50
cis-1,2-DCE	<0.50

SB-4	
TPHg	670
Benzene	36
Toluene	1.1
Ethylbenzene	9.4
Xylenes	13
Napthalene	<1.0
1,2-DCA	<0.50
cis-1,2-DCE	<0.50

SB-5	
TPHg	200
Benzene	13
Toluene	4.7
Ethylbenzene	13
Xylenes	38
Napthalene	1.7
1,2-DCA	1.3
cis-1,2-DCE	<0.50

SB-11	
TPHg	260
Benzene	3.6
Toluene	8
Ethylbenzene	9.9
Xylenes	30
Napthalene	2.6
1,2-DCA	2
cis-1,2-DCE	<0.50

SB-6		SB-90*
TPHg	150000	120000
Benzene	5100	5300
Toluene	17000	18000
Ethylbenzene	2600	2500
Xylenes	23000	22000
Napthalene	980	820
1,2-DCA	<50	<50
cis-1,2-DCE	<50	<50

SB-8	
TPHg	<50
Benzene	<0.50
Toluene	<0.50
Ethylbenzene	<0.50
Xylenes	<1.0
Napthalene	<1.0
1,2-DCA	<0.50
cis-1,2-DCE	<0.50

SB-9	
TPHg	19000
Benzene	4300
Toluene	59
Ethylbenzene	1200
Xylenes	1800
Napthalene	300
1,2-DCA	<50
cis-1,2-DCE	<50

SB-7		SB-91*
TPHg	620	110
Benzene	14	5.2
Toluene	4.1	2.4
Ethylbenzene	24	6.8
Xylenes	37	11
Napthalene	9.3	2.5
1,2-DCA	0.78	<0.50
cis-1,2-DCE	<0.50	<0.50

SB-10	
TPHg	130
Benzene	<0.50
Toluene	34
Ethylbenzene	2.3
Xylenes	18
Napthalene	<1.0
1,2-DCA	<0.50
cis-1,2-DCE	<0.50

S1 — URS Geoprobe (2004)
GP4 — JCC Geoprobe (Feb 21, 2006)
S7/S20 — Duplicate Sample
MW-1 — Monitoring Well (URS 2013)
SB-1 — Soil Boring (URS 2013)
Site Boundary
Chain Link Fence
Wood Fence

Note: SB-3 not sampled/did not produce water

0 25 FEET

GRAB GROUNDWATER ANALYTICAL RESULTS (µg/L) – 2013

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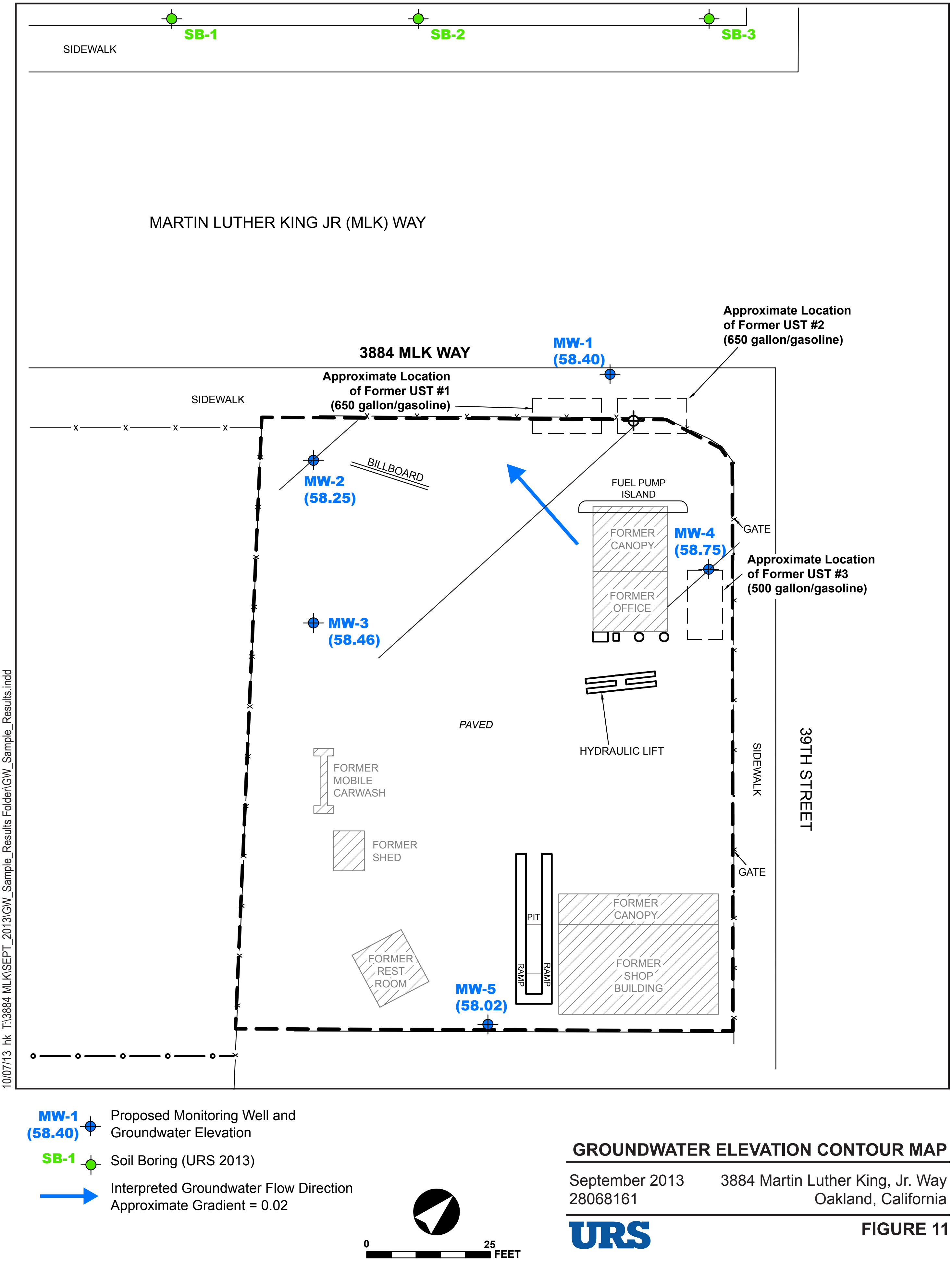
Oakland, California

URS

FIGURE 10

10/07/13 hk/vsa T:\3884 MLK\SEPT_2013\GW_Sample_Results Folder\GW_Sample_Results.indd



GROUNDWATER ELEVATION CONTOUR MAP

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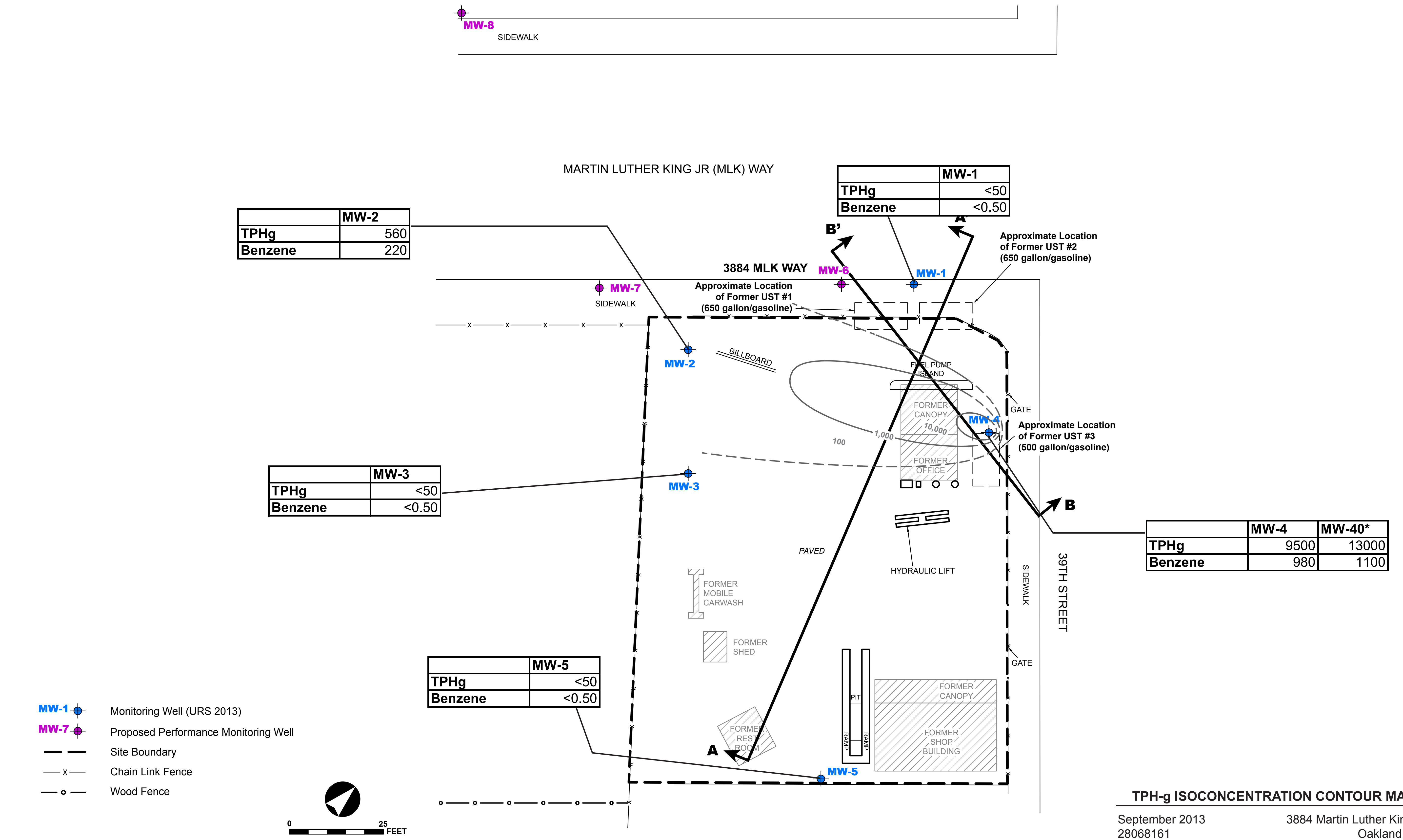
FIGURE 11



	MW-1
TPHg	<50
Benzene	<0.50

	MW-2
TPHg	560
Benzene	220

	MW-3
TPHg	<50
Benzene	<0.50

	MW-4	MW-40*
TPHg	9500	13000
Benzene	980	1100

	MW-5
TPHg	<50
Benzene	<0.50

TPH-g ISOCONCENTRATION CONTOUR MAP – 2013

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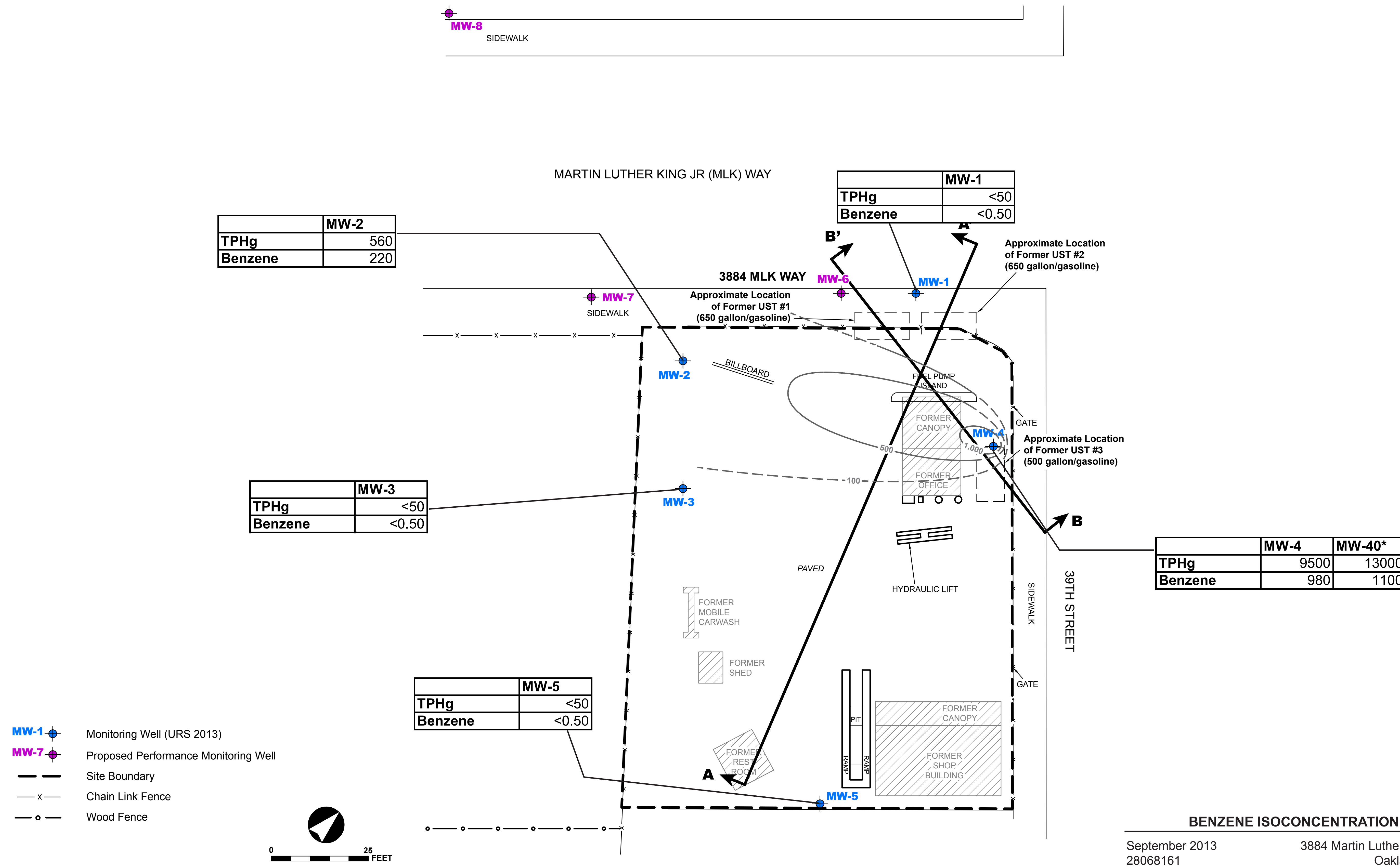
FIGURE 12



	MW-2
TPHg	560
Benzene	220

	MW-1
TPHg	<50
Benzene	<0.50

	MW-3
TPHg	<50
Benzene	<0.50

	MW-4	MW-40*
TPHg	9500	13000
Benzene	980	1100

	MW-5
TPHg	<50
Benzene	<0.50

10/07/13 hk/vsa T:\3884 MLK\SEPT_2013\GW_Sample_Results Folder\GW_Sample_Results.indd

BENZENE ISOCONCENTRATION MAP – 2013

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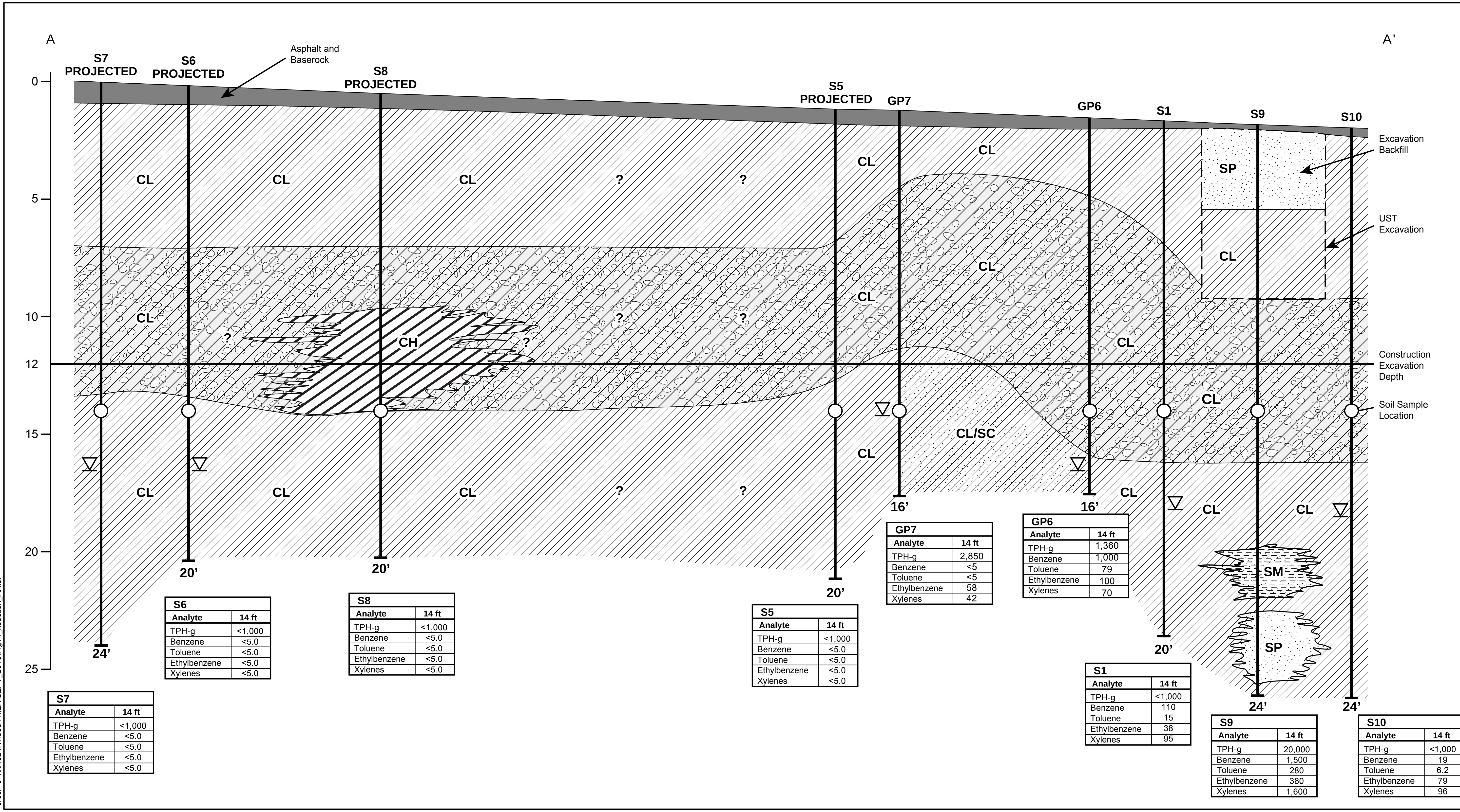
Oakland, California

URS

FIGURE 13



S7 Analyte	14 ft
TPH-g	<1,000
Benzene	<5.0
Toluene	<5.0
Ethylbenzene	<5.0
Xylenes	<5.0

S6 Analyte	14 ft
TPH-g	<1,000
Benzene	<5.0
Toluene	<5.0
Ethylbenzene	<5.0
Xylenes	<5.0

S8 Analyte	14 ft
TPH-g	<1,000
Benzene	<5.0
Toluene	<5.0
Ethylbenzene	<5.0
Xylenes	<5.0

S5 Analyte	14 ft
TPH-g	<1,000
Benzene	<5.0
Toluene	<5.0
Ethylbenzene	<5.0
Xylenes	<5.0

GP7 Analyte	14 ft
TPH-g	2,850
Benzene	<5
Toluene	<5
Ethylbenzene	58
Xylenes	42

GP6 Analyte	14 ft
TPH-g	1,360
Benzene	1,000
Toluene	79
Ethylbenzene	100
Xylenes	70

S1 Analyte	14 ft
TPH-g	<1,000
Benzene	110
Toluene	15
Ethylbenzene	38
Xylenes	95

S9 Analyte	14 ft
TPH-g	20,000
Benzene	1,500
Toluene	280
Ethylbenzene	380
Xylenes	1,600

S10 Analyte	14 ft
TPH-g	<1,000
Benzene	19
Toluene	6.2
Ethylbenzene	79
Xylenes	96

9/06/13 hk/vsa ..T:\3884 MLK\SEPT_2013\Fig14_xsection_AA.ai

Asphalt and Baserock
Clay (CL)
Gravelly Clay (CL)
Silty Clay (CH)
Clay/Clayey Sand (CL/SC)
Sand (SM)
Sand (SP)
Soil Sample Location
First Encountered Groundwater

Note:
All concentrations in micrgrams per kilogram (µg/kg)

CROSS SECTION A–A'

September 2013
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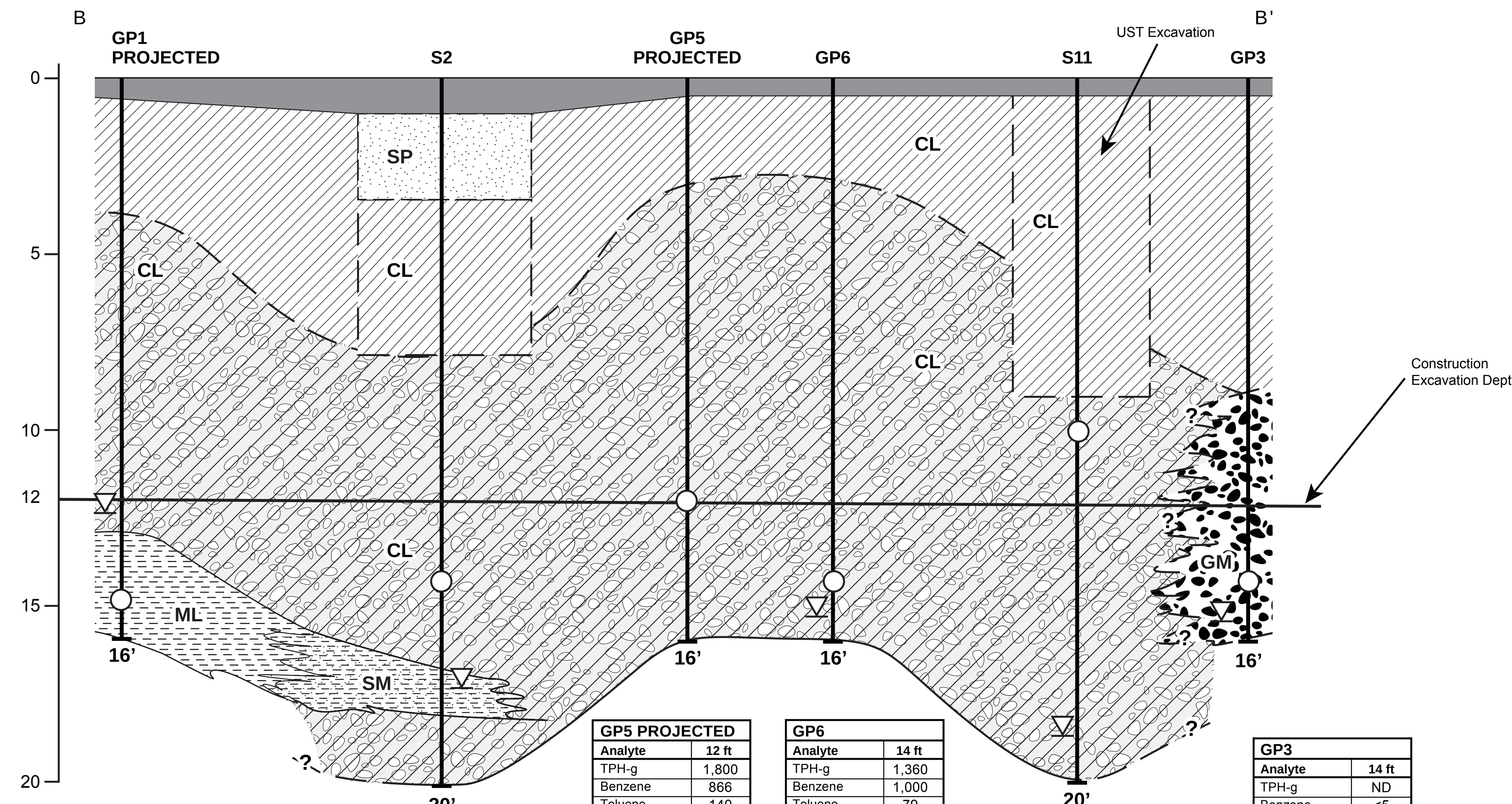
Oakland, California

URS

FIGURE 14



GP1 PROJECTED	
Analyte	15 ft
TPH-g	ND
Benzene	<5
Toluene	<5
Ethylbenzene	<5
Xylenes	<10

S2	
Analyte	14 ft
TPH-g	170 J
Benzene	3,200
Toluene	14,000
Ethylbenzene	4,100
Xylenes	20,000

GP5 PROJECTED	
Analyte	12 ft
TPH-g	1,800
Benzene	866
Toluene	140
Ethylbenzene	110
Xylenes	260

GP6	
Analyte	14 ft
TPH-g	1,360
Benzene	1,000
Toluene	79
Ethylbenzene	100
Xylenes	70

S11	
Analyte	10 ft
TPH-g	<1,000
Benzene	940
Toluene	670
Ethylbenzene	8,500
Xylenes	8,900

GP3	
Analyte	14 ft
TPH-g	ND
Benzene	<5
Toluene	<5
Ethylbenzene	<5
Xylenes	<10

9/06/13 hk/vsa ..T:\3884 MLK\SEPT_2013\Fig15_xsection_BB.ai

- Asphalt and Baserock
- Clay (CL)
- Gravelly Clay (CL)
- Silty Clay (CH)
- Clay/Clayey Sand (CL/SC)
- Sand (SM)
- Sand (SP)
- Soil Sample Location
- First Encountered Groundwater

Note:
All concentrations in micrgrams per kilogram (µg/kg)

CROSS SECTION B–B'

September 2013
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Oakland, California

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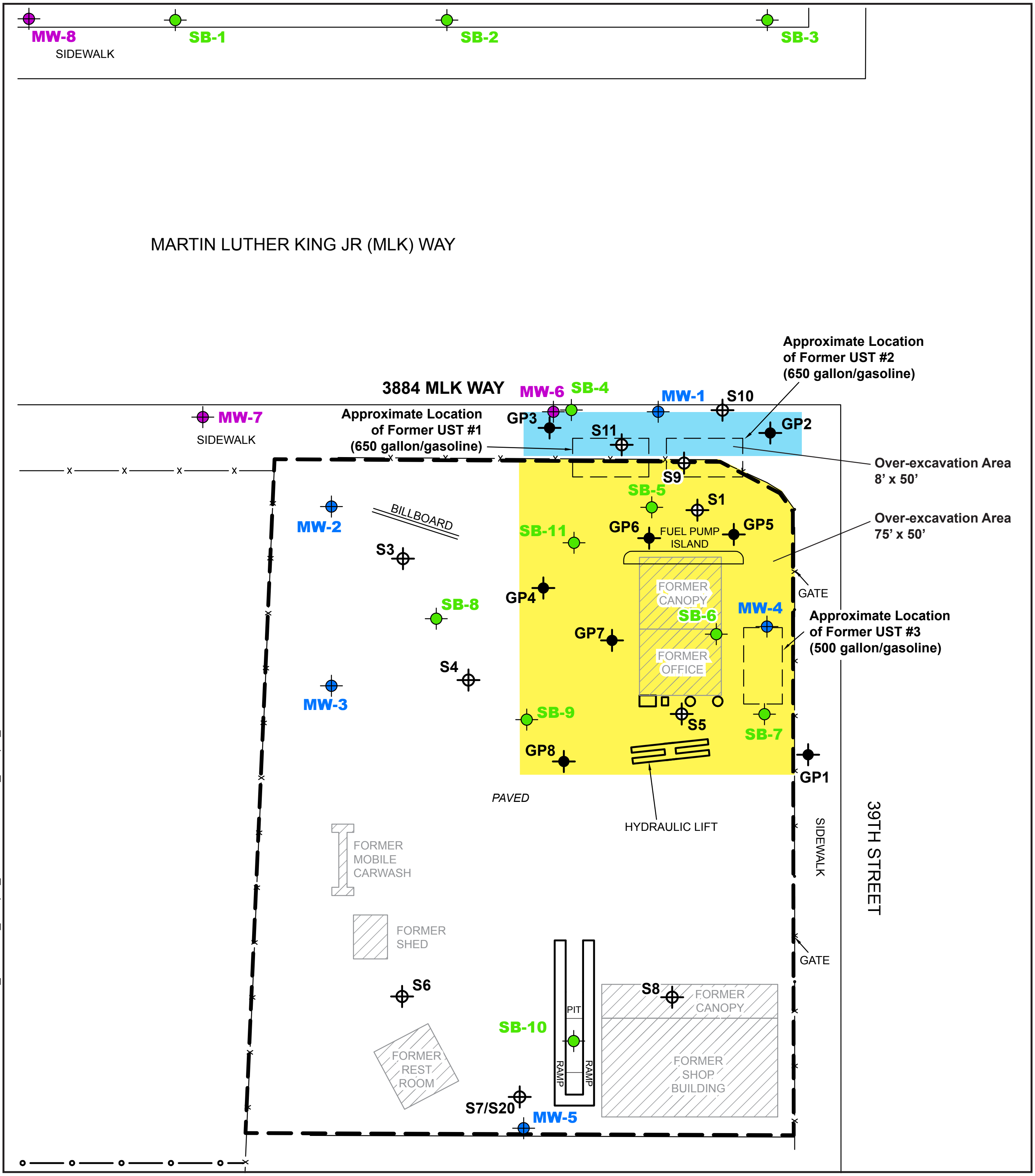
FIGURE 15



10/07/13 hk/vsa T:\3884 MLK\SEPT_2013\GW_Sample_Results\GW_Sample_Results Folder\GW_Sample_Results.indd

S1 URS Geoprobe (2004)
GP4 JCC Geoprobe (Feb 21, 2006)
S7/S20 Duplicate Sample
MW-1 Monitoring Well (URS 2013)
MW-7 Proposed Performance Monitorir
AOC-1 Over-Excavation Area to 18 feet bgs
AOC-2 Over-Excavation Area to 12 feet bgs

Site Boundary
Chain Link Fence
Wood Fence

0 25 FEET

AREAS OF CONCERN (AOCs) AND PROPOSED PERFORMANCE MONITORING WELL LOCATIONS

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Oakland, California

URS

FIGURE 16

TABLES

Table 2-1
Field Parameters
Groundwater Sampling - 2013

Well	Date	Temperature (^{o}Celsius)	Conductivity (mS/cm)	DO (mg/L)	pH	ORP (mV)
MW-1	7/18/2013	20.0	1.129	5.74	6.35	63.4
MW-2	7/18/2013	18.7	0.901	3.63	6.62	51.2
MW-3	7/18/2013	18.7	0.799	5.36	6.52	71.9
MW-4	7/18/2013	20.5	1.438	4.21	6.44	25.1
MW-5	7/18/2013	17.10	0.845	6.17	6.63	78.2

DO = Dissolved Oxygen
mg/L = milligrams per liter
mS/cm = milliSiemens per centimeter
mV = millivolt
ORP = Oxidation-Reduction Potential

Table 2-2
Soil Results - 2013

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	<460	cis-1,2-DCE
MW-1-7	750,000	<460	<460	<460	<910	<910	<460	<460
MW-1-12	<230	<4.5	<4.5	<4.5	<9.1	<9.1	<4.5	<4.5
MW-1-15	<210	<4.1	<4.1	<4.1	<8.3	<8.3	<4.1	<4.1
MW-1-20	<210	<4.1	<4.1	<4.1	<8.2	<8.2	<4.1	<4.1
FD-5-20** **	<240	<3.6	<3.6	<3.6	<7.1	<7.1	<3.6	<3.6
MW-2-12	<200	<3.6	<3.6	<3.6	<8.0	<7.1	<3.6	<3.6
MW-2-15	<190	<3.8	<3.8	<3.8	<8.1	<7.7	<3.8	<3.8
MW-2-18.5	<20000	1700	<400	<400	<800	<800	<400	<400
MW-2-20	<190	<3.8	<3.8	<3.8	<7.6	<7.6	<3.8	<3.8
MW-3-12	<210	<4.2	<4.2	<4.2	<8.4	<8.4	<4.2	<4.2
MW-3-15	<200	<4.1	<4.1	<4.1	<8.4	<8.4	<4.1	<4.1
MW-3-20	<210	<4.1	<4.1	<4.1	<8.3	<8.3	<4.1	<4.1
MW-4-12	2200	240	22	220	88	31	<5.0	<5.0
MW-4-15	400,000	1300	1800	9000	38000	2400	<800	<800
MW-4-16	2,700,000	2700	3900	48000	110000	12000	<380	<380
MW-4-20	<21000	<420	<420	<420	<830	<830	<420	<420
MW-5-12	<220	<4.5	<4.5	<4.5	<8.9	<8.9	<4.5	<4.5
MW-5-15	<200	<4.1	<4.1	<4.1	<8.2	<8.2	<4.1	<4.1
MW-5-20	<220	<4.3	<4.3	<4.3	<8.6	<8.6	<4.3	<4.3
SB-4-12	<220	<4.3	<4.3	<4.3	<8.6	<8.6	<4.3	<4.3
SB-4-15	<200	<4.0	<4.0	<4.0	<7.9	<7.9	<4.0	<4.0
SB-4-20	680	<3.7	<3.7	<3.7	<7.4	<7.4	<3.7	<3.7
SB-5-12	2600	1000	13	560	<8.3	<8.3	<4.2	<4.2
SB-5-15	<200	<4.1	<4.1	<4.1	<8.1	<8.1	<4.1	<4.1
SB-5-20	<210	<4.2	<4.2	<4.2	<8.4	<8.4	<4.2	<4.2
SB-6-12	780	<4.3	<4.3	7.6	9.2	<8.7	<4.3	<4.3
SB-6-15	4800	180	7.6	330	29	13	<4.1	<4.1
SB-6-16	1,400,000	4600	70000	32000	180000	10000	<3900	<3900
SB-6-20	650	6.6	34	14	78	<7.6	<3.8	<3.8
SB-7-12	<190	<3.9	<3.9	<3.9	<7.8	<7.8	<3.9	<3.9
FD-1-12*	<210	<4.3	<4.3	<4.3	<8.6	<8.6	<4.3	<4.3
SB-7-15	77,000	420	<390	1300	2800	<790	<390	<390
SB-7-20	<200	<4.0	<4.0	<4.0	<8.1	<8.1	<4.0	<4.0
SB-8-12	<210	7.5	<4.2	<4.2	<8.4	11	<4.2	<4.2
SB-8-15	<200	<4.1	<4.1	<4.1	<8.2	<8.2	<4.1	<4.1
SB-8-20	<210	<4.2	<4.2	<4.2	<8.4	<8.4	<4.2	<4.2
FD-3-20**	<210	<4.2	<4.2	<4.2	<8.5	<8.5	<4.2	<4.2
SB-9-12	230	<4.5	<4.5	<4.5	<8.9	<8.9	<4.5	<4.5
SB-9-15	<21,000	130	7.6	48	340	110	<4.1	<4.1
SB-9-18	27000	1400	<400	790	<800	<800	<400	<400
SB-9-20	<200	<4.0	<4.0	<4.0	<8.0	<8.0	<4.0	<4.0
FD-2-20***	<210	<4.2	<4.2	<4.2	<8.4	<8.4	<4.2	<4.2
SB-10-12	<210	<4.2	<4.2	<4.2	<8.4	<8.4	<4.2	<4.2
SB-10-15	<200	<4.1	<4.1	<4.1	<8.1	<8.1	<4.1	<4.1
SB-10-20	<150	<3.1	<3.1	<3.1	<6.2	<6.2	<3.1	<3.1
SB-11-12	790	80	<4.2	55	<8.5	8.9	<4.2	<4.2
SB-11-15	<170	<3.3	<3.3	<3.3	<6.6	<6.6	<3.3	<3.3
SB-11-20	<180	<3.7	<3.7	<3.7	<7.4	<7.4	<3.7	<3.7

TPH-g = Total Petroleum Hydrocarbons as Gasoline Range Organics (GRO)-C5-C12

*dup of SB-7-12
**dup of SB-8-20
*** dup of SB-9-20
****dup of MW-1-20

Table 2-3
Grab Groundwater Results - 2013

	TPH-g	Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE
	µg/L							
SB-1	120	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50
SB-2	<50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50
SB-3								
SB-4	670	36	1.1	9.4	13	<1.0	<0.50	<0.50
SB-5	200	13	4.7	13	38	1.7	1.3	<0.50
SB-6	150,000	5100	17,000	2600	23,000	980	<50	<50
SB-90*	120,000	5300	18,000	2500	22,000	820	<50	<50
SB-7	620	14	4.1	24	37	9.3	0.78	<0.50
SB-91**	110	5.2	2.4	6.8	11	2.5	<0.50	<0.50
SB-8	<50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50
SB-9	19000	4300	59	1200	1800	300	<50	<50
SB-10	130	<0.50	34	2.3	18	<1.0	<0.50	<0.50
SB-11	260	3.6	8.0	9.9	30	2.6	2	<0.50

* dup of SB-6

** dup of SB-7

not sampled, boring did not produce water

Table 2-4
Monitoring Well Results - 2013

	TPH-g	Benzene	Toluene	Ethyl-benzene	Xylenes	Napthalene	1,2-DCA	cis-1,2-DCE	Ethane	Ethylene	Methane	Nitrate as NO3	Nitrite as NO2	Sulfate	Ferrous Iron	Sulfide	TOC Dup
	µg/L																
MW-1	<50	<0.50	<0.50	<0.50	<1.0	<1.0	4.5	<0.50	<5.0	<5.0	<5.0	1.1	<10	40	<0.10	<1.0	4
MW-2	560	220	2.9	4.6	35	<1.0	4.3	<0.50	<5.0	<5.0	25	4.6	<10	64	<0.10	<1.0	7.8
MW-3	<50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-4	9500	980	510	270	2600	180	0.71	<0.50	<5.0	<5.0	180	<1.0	<10	51	2.0	<1.0	11
MW-40*	13000	1100	930	800	3500	180	0.61	<0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	<50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50	<5.0	<5.0	<5.0	33	<10	91	<0.10	<1.0	2.8

NA= Not Analyzed

* Field duplicate of MW-4

Table 4-1
Site Conceptual Model

CSM Element	CSM Sub-Element	Description	Data Gap	Resolution
Geology and Hydrogeology	Regional	The lithology encountered in the subsurface beneath the Site during drilling activities consists predominantly of a dark brown to yellow brown gravelly silty clay to greenish-gray and yellowish brown silty clay with sand and some gravel. The primary stratigraphic units at the Site are listed below, with the approximate ranges of depth (bgs) at which each unit was encountered across the Site. In addition, two cross sections are provided (Figures 14 and 15) using data generated by URS (2004 and 2013) and John Carver Consulting (2006). These cross sections present the interpreted subsurface lithology based upon available boring logs and also include relevant soil data. ▪ 0 to 4 feet bgs: the soil typically consisted of a stiff, very dark-brown silty clay. ▪ 4 to 15 feet bgs: yellowish brown silty clay and a mottled yellowish brown and greenish-gray silty clay. ▪ 15 to 20 feet bgs: Yellowish brown/greenish gray/dark reddish brown lithologies consisting of silty and clayey sands and silts. Some small (typically less than 6 inch) gravel layers were also encountered. Groundwater was encountered in direct-push boreholes at an average depth approximately 15 feet. This groundwater depth is not considered a stabilized groundwater depth. Depth to groundwater in the five newly installed groundwater monitoring wells ranged from 14.41 to 16.89 feet below the top of the wall casings. This data was used in conjunction with top of well casing elevation data to generate a groundwater elevation contour map Based on the groundwater elevation contour map, groundwater beneath the site flows to the west at an approximate gradient of 0.02.	Groundwater flow direction was not accurately defined as there no monitoring wells on site.	Five monitoring wells were installed and a groundwater elevation contour map was developed.

Table 4-1
Site Conceptual Model (Continued)

CSM Element	CSM Sub-Element	Description	Data Gap	Resolution
Geology and Hydrogeology	Site	Regional groundwater in the Oakland area generally follows topography, from areas of higher elevation in the east toward lower elevation in the west and southwest. The groundwater flow direction in the vicinity of the Site is to the west towards San Francisco Bay (Arcadis, 2012). URS reviewed groundwater investigation reports from the ARCO #4931 station at 731 West MacArthur Boulevard, approximately 1,000 feet southwest of the Site (Arcadis, 2012). The depth to water in the groundwater monitoring wells at the ARCO site ranged from approximately 3.2 to 10.8 feet bgs (approximately 52.2 to 43 feet elevation).	There are no monitoring wells on site so that the local groundwater flow direction and gradient is not known.	Five groundwater wells were installed at the site. The GW gradient was calculated.
Surface Water Bodies		The closest surface water body is the San Francisco Bay, which is 1.5 miles west of the site.		
Nearby Wells		The State Water Resource Quality Control Board (RWQCB) Geotracker GAMA website provides the locations of water supply wells proximal to the site. The nearest supply well is located approximately 2 miles southwest of the site. There are multiple monitoring wells in the vicinity of the site including those at the Arco services station at 781 West MacArthur Blvd., and Dollar Cleaners, 4860 – 4868 Telegraph Avenue, Oakland.	Need to conduct a well survey.	A well survey was conducted and the nearest water supply wells identified.
Release Source and Volume		The three prior gasoline USTs (two 650-gallon and one 500-gallon) are considered the main source of the release of fuel hydrocarbons that have been detected in soil and groundwater beneath the Site. Tanks #1 and #2 were both observed to have one or more holes from corrosion at the time of removal. Although no holes were observed in Tank #3 during removal, the integrity of the tank was questionable as it split into two pieces along the weld during removal. Soil surrounding the tanks was stained green and was	Additional soil and groundwater data is required in the source areas.	Additional soil borings were advanced in the source areas. Groundwater monitoring wells were installed.

Table 4-1
Site Conceptual Model (Continued)

CSM Element	CSM Sub-Element	Description	Data Gap	Resolution
		noted to have strong petroleum hydrocarbon odors. The release from the Tanks at the Site was discovered on January 5, 1995 during tank removal activities. The volume of the release is not known.		
LNAPL		There are currently no groundwater monitoring wells located at the Site. Although light non-aqueous phase liquids were not observed during grab groundwater sampling activities, concentrations of TPH-g in sample G2 (22,000 µg/L), located near former Tank #3, and sample GP3 (79,800 µg/L), located adjacent to former Tank #1 indicate the potential for the presence of light non-aqueous phase liquid (LNAPL) to be present.	Need monitoring wells at the site.	Monitoring wells (5) were installed. The wells were gauged with an interface probe which detected no LNAPL. No sheen was observed on any MW samples.
Source Removal Activities		Soil that was excavated from the UST pits during tank removal activities was returned to the excavation after the collection of soil samples for chemical analysis. There is no information regarding the quality of the soil that was placed back in the UST excavations. As such, with the exception of the removal of the USTs themselves, there have been no other source removal activities conducted at the Site.	Soil contamination at depth (12-foot bgs and deeper) is not well character-ized. Since the site is to be excavated to approximately 12 feet bgs for the construction of a parking garage, additional shallow soil sampling is not required.	Eleven soil borings were completed. Soil contamination between 12 and 20 feet bgs was investigated and the primary source area (UST #3) confirmed.

Table 4-1
Site Conceptual Model (Continued)

CSM Element	CSM Sub-Element	Description	Data Gap	Resolution
Contaminants of Concern		Based on the historical investigations conducted at the Site, BTEX, cis-1,2-dichloroethene (cis-1,2-DCE), 1,2-dichloroethane (1,2-DCA) and TPH-g are present in groundwater above their respective MCLs and/or ESLs. However, based on correspondence from the ACEHSD, the contaminants of concern (COCs) for the site are BTEX, and TPH-g. These COCs are present above the screening levels primarily in the northern corner of the Site, near the location of the former USTs. Benzene and TPH-g are also present in groundwater above their MCLs and ESLs in the southern portion of the Site in the vicinity of the truck ramp and pit adjacent to the former shop building, and in the northwestern area of the Site.		
Petroleum Hydrocarbons in Soil		Of the 58 samples analyzed from the two investigations, eight samples from seven borings exceeded their respective screening criteria. These samples were typically the deepest sample from the boring, ranging from 8.0 to 14.0 feet bgs. This is consistent with releases from a UST as opposed to a surface spill or release. Based on the historical investigation data, BTEX and TPH-g are the contaminants present in soil at concentrations exceeding their respective screening criteria. The contaminants are present mainly in soil at the location of former Tanks #1 through #3, and to a lesser extent, near the former fuel pump island in the northern corner of the Site. The lateral extent of contamination exceeding the screening criteria appears to be limited to the area around the former USTs. Soil concentration in all the samples from boring GP3 and S10, located in the sidewalk by Martin Luther King Jr. Way near former Tank #1 and Tank #2 are below their respective screening criteria. There is no additional data from around former Tank #3. Given the	Additional soil sampling is required to better define the vertical extent of contamination. Redevelopment will include excavation of the entire site to a depth of 12 feet bgs for the construction of an underground parking garage.	Additional soil borings were completed to close this data gap.

Table 4-1
Site Conceptual Model (Continued)

CSM Element	CSM Sub-Element	Description	Data Gap	Resolution
		nature of the petroleum hydrocarbon (mainly light fraction gasoline), the vertical extent of contamination beneath and in close proximity to the former tanks is likely limited to the lowest level of groundwater fluctuation.		
Petroleum Hydrocarbons in Groundwater		During the two subsurface investigations conducted at the Site, a total of 15 grab groundwater samples were collected and analyzed for TPH-g and BTEX, naphthalene, 1,2-DCA and cis-1,2-DCE.The results of the analyses are summarized in Table 2-2. Concentrations of TPH-g and/or BTEX exceeded their respective screening criteria in ten of the 15 samples analyzed. Similar to the soil sampling results, the highest concentrations were detected beneath or in close proximity to the former USTs. However, TPH-g and benzene were detected in one Site boring (G7) exceeding their respective screening criteria near the southern corner of the Site. There are no permanent monitoring wells located at the Site. As such, the groundwater flow direction across the Site cannot be evaluated. This has been defined as a significant data gap. The scope of work presented in this work plan includes the installation of four groundwater monitoring wells at the Site.	There are no monitoring wells on site.	Five monitoring wells were installed. A groundwater elevation map was developed. Data gap closed.
Risk Evaluation		The Site is a former auto body and car wash facility. The Site is currently vacant, and with the exception of a billboard located in the northwest corner of the Site, has no structures and is covered with either asphalt or concrete foundations from former buildings located at the Site. The Site is zoned for residential and current plans are to redevelop the Site for residential use. However, there may be some commercial use on the ground level. This preliminary CSM assumes that development would consist of an underground parking garage; store fronts and residential units at ground level; and second story residential units.		

Table 4-1
Site Conceptual Model (Continued)

CSM Element	CSM Sub-Element	Description	Data Gap	Resolution
		The CSM identifies the primary source; impacted media; release mechanism(s); secondary source(s); exposure route; potential receptors (residential, commercial/industrial worker, and construction worker), and an assessment of whether the exposure route/pathway is potentially complete, incomplete, or insignificant. Potential exposure routes that have been evaluated include incidental ingestion, dermal contact, dust inhalation, and vapor inhalation. For direct contact with contaminated soil, the exposure route for incidental ingestion, dermal contact, and dust inhalation for a residential and commercial/industrial worker are considered incomplete. These exposure routes for the construction worker are considered a potentially complete pathway, depending on the nature of the work. For volatilization from soil to outdoor air, vapor inhalation is the potential exposure pathway. Given dilution effects that take place outdoors, this exposure pathway is considered incomplete for all three potential receptors. For indoor air, this exposure pathway is considered potentially complete for all three potential receptors. For leaching of contaminants from soil to groundwater, the ingestion and dermal pathways for groundwater are considered incomplete, except for the construction worker, as shallow groundwater is not utilized as a drinking water source at the Site. For the construction worker, incidental ingestion and dermal contact is a potentially complete pathway. For volatilization from groundwater to outdoor air, the exposure pathway is considered insignificant due to dilution effects that take place outdoors. For indoor air, volatilization from groundwater to indoor air is considered a potentially complete pathway.		

Table 4-1
Site Conceptual Model (Continued)

CSM Element	CSM Sub-Element	Description	Data Gap	Resolution
Area of Concern 1 (AOC-1)		Area of Concern 1 (AOC-1) is shown as the yellow shaded area in Figure 16. This approximately 75 foot by 50 foot area encompasses the petroleum hydrocarbon contamination remaining on site after the garage excavation to a depth of 12 feet bgs has been completed. This area includes the primary soil source of predominantly TPH-g contamination that remains after the removal of UST # 3 in 1995. Vadose zone contamination will be removed when the garage excavation is completed. However, based on the URS investigation of July 2013 there will be significant deeper soil and groundwater location in this area. Analytical data from AOC-1 clearly indicates that soil and groundwater in this this portion of the site has been significantly impacted by releases from the prior gasoline USTs. The majority of the vadose zone contamination will be removed during construction excavation for the underground garage. Deeper soil contamination was identified in the 2013 investigation at depths between 12 and 18 feet bgs. Remaining vadose zone contamination and groundwater contamination presents a vapor intrusion risk to the garage area of the structure. The remaining soil contamination within the saturated zone also presents a continued source of groundwater contamination.	NA	
Area of Concern 2 (AOC-2)		AOC-2 is shown as the blue shaded area in Figure 16. This area includes subsurface petroleum hydrocarbon contamination between 7 and 14 feet bgs identified during the initial tank removal (1995), and in subsequent investigations (2004 and 2013). The soil sample collected from S-9 at 14 feet bgs (2004, Figure 3) was found to have a TPH-g concentration of 20,000 ug/kg. This sample was located on the site boundary, in the vicinity of UST #2. Consequently, some of this contamination will be removed during	NA	

Table 4-1
Site Conceptual Model (Continued)

CSM Element	CSM Sub-Element	Description	Data Gap	Resolution
		the remediation of AOC-1. AOC-2 includes vadose zone soils contaminated with TPH-g and BTEX generally identified within the depth interval 7 – 10 feet bgs. At one soil boring (S-9, 2004) elevated TPH-g was detected in soil at 14 feet bgs. No soil contamination was detected in the saturated zone (below 16 feet bgs). Groundwater TPH-g and BTEX detection in this downgradient part of the site were at low levels (670 µg/L TPH-g in the grab groundwater sample from SB-4 [2013]; non-detect [<50 µg/L] TPH-g from monitoring well MW-1, also in 2013]. A low level (120 µg/L) detection of TPH-g was found in a grab groundwater sample across MLK from the site [SB-1, 2013], indicating TPH migration off-site. BTEX was not detected in the off-site groundwater samples. Since contaminated soil in AOC-1 is in the vadose zone, and is mostly covered by the impermeable sidewalk and paved street, the potential for migration to groundwater is considered small. Groundwater contamination is believed to be primarily originating from AOC-1. However, the vadose zone soils in the 7 – 10 feet bgs interval do present a potential vapor intrusion threat to the underground garage, which must be considered in the remedy selection.		

Table 5-0

Engineering Design Cost Estimate - General

3884 MLK REMEDIAL DESIGN COST ESTIMATE

Summary Sheet		**Task 1 PM and Meetings**			**Task 2 Site Survey**			**Task 2 Drawings and Specifications**			**Total**		
Labor Category	**Labor Rate**	**Hours**		**Cost**	**Hours**		**Cost**	**Hours**		**Cost**	**Hours**		**Cost**
Principal Scientist/Geol./Risk Assessor	$170.00	2	$	340.00		$	-	2	$	340.00	**4**	**$**	**680.00**
Project Manager	$140.00	8	$	1,120.00	4	$	560.00	60	$	8,400.00	**72**	**$**	**10,080.00**
Senior Scientist/Geologist/Engineer II	$135.00		$	-		$	-		$	-		**$**	**-**
Senior Scientist/Geologist/Engineer I	$115.00		$	-		$	-		$	-		**$**	**-**
Project Scientist/Geologist/Engineer II	$95.00		$	-	10	$	950.00	120	$	11,400.00	**130**	**$**	**12,350.00**
Project Scientist/Geologist/Engineer I	$82.00		$	-		$	-		$	-		**$**	**-**
Staff Geologist/Scientist/Engineer	$75.00		$	-	10	$	750.00		$	-	**10**	**$**	**750.00**
Field technician	$55.00		$	-		$	-		$	-		**$**	**-**
CADD	$75.00		$	-	14	$	1,050.00	120	$	9,000.00	**134**	**$**	**10,050.00**
Graphics/GIS	$65.00		$	-		$	-		$	-		**$**	**-**
Technical Editor	$65.00		$	-		$	-	8	$	520.00	**8**	**$**	**520.00**
Word Processor	$55.00		$	-		$	-	8	$	440.00	**8**	**$**	**440.00**
Project Assistant	$55.00	4	$	220.00		$	-	4	$	220.00	**8**	**$**	**440.00**
Labor Subtotal		**14**		**$1,680.00**	**38**		**$3,310.00**	**322**		**$30,320.00**	**374**		**$35,310.00**
Subcontractors Description	**Unit Rate**												
Hwy Technologies (Traffic Plan)												**$**	**-**
Freight/Couriers												**$**	**-**
Fee	5%		$	-		$	-		$	-		**$**	**-**
Subcontractors Subtotal			**$**	**-**		**$**	**-**		**$**	**-**		**$**	**-**
Other Direct Costs (ODCs) Description	**Unit Rate**												
Permits and Agency Fees												**$**	**-**
Equipment Rental/Supplies												**$**	**-**
Fee	5%		$	-		$	-		$	-		**$**	**-**
Travel/Vehicles			$	150.00								**$**	**150.00**
ODCs Subtotal			**$**	**150.00**		**$**	**-**		**$**	**-**		**$**	**150.00**
TASK TOTAL COSTS			**$**	**1,830.00**		**$**	**3,310.00**		**$**	**30,320.00**		**$**	**35,460.00**

Drawings are anticipated to include the following sheets:
cover sheet
notes, abbreviations, legend
existing conditions/site survey
excavation plan
sidewalk demolition and restoration plan
details

Specification Sections are anticipated to include the following:
Summary of Work
Earthwork
Concrete

Drawings and Specifications will comply with City of Oakland standards and specifications.
Shoring design is not included in this estimate
Permitting is not included in this estimate
Traffic Control Plan is not included in this estimate

Table 5-1: AOC-1 - Alternative 1
Garage Excavation and Vapor Barrier
Planning Level Cost Estimate

SOW Item	Quantity	Unit Cost	Total	Notes
Remedial Design	1	$15,000	$15,000	URS
Health & Safety Plan	1	5,000	$5,000	URS
Mobe	0	$12,450	$0	Contractor Est
Permits	0			General Contractor Cost - Not Included
Excavation	0	$51,340	$0	Contractor Est
Transport & Disposal (tons)	0	$43	$0	URS - Assume all is Class II disposal
Backfill	0	$42,570	$0	Contractor Est
Vapor Barrier: Foundation	11,000	$5.00	$55,000	Land Science Technologies: GeoSeal/Drainage Layer
Vapor Barrier: Garage Walls	0	$7.50	$0	Land Science Technologies: GeoSeal/Drainage Layer
In Situ Treatment			$0	
Regenesis RegenOx ORC	0		$0	
Regenesis ORC	0		$0	
Injection Cost (per day)	0		$0	
IsoTec Mod. Fenton's	0		$0	
Post Remediation GW Mon	8	$3,750	$30,000	Assume GW monitoring will be required for 2 years as no soil/GW remediation has been conducted. Alameda County, based on GW concentration trends.
(Quarterly)				Actual duration to be determined by Alameda County, based on GW concentration trends.
Install Performance Mon. Wells	1	$21,500	$21,500.00	
Total			**$126,500**	

C:\Users\des_garner\Documents\MLK Site\FS_CAP\FS CAP Cpst Tables\Final Cost Tables\Table 5.1_AOC-1_Alternative 1.xlsx

Table 5-2: AOC-1 - Alternative 2
Over-Excavation and Vapor Barrier
Planning Level Cost Estimate

SOW Item	Quantity	Unit Cost	Total	Notes
Remedial Design	1	$35,460	$35,460	URS
Health & Safety Plan	1	5,000	$5,000	URS
Mobe	1	$12,450	$12,450	Contractor Est
Permits	0			General Contractor Cost - Not Included
Excavation	1	$51,340	$51,340	Contractor Est
Transport & Disposal (tons)	1,333	$43	$56,653	URS - Assume all is Class II disposal
Backfill	1	$36,570	$36,570	Contractor Est
Vapor Barrier: Foundation	11,000	$5.00	$55,000	Land Science Technologies: GeoSeal/Drainage Layer
Vapor Barrier: Garage Walls	0	$7.50	$0	Land Science Technologies: GeoSeal/Drainage Layer
In Situ Treatment			$0	
Regenesis RegenOx ORC	0		$0	
Regenesis ORC	0		$0	
Injection Cost (per day)	0		$0	
IsoTec Mod. Fenton's	0		$0	
Post Remediation GW Mon. (Quarterly)	8	$3,750	$30,000	Assume 2 years of GW monitoring. Actual duration to be determined by Alameda County, based on GW concentration trends.
Install Performance Mon. Wells (2 wells. Includes Development)	1	$21,500	$21,500	Includes work plan/permits
Total			**$303,973**	

Table 5-3: AOC-1 - Alternative 3a
Over-Excavation/Soil and Groundwater Treatment/Vapor Barrier/RegenOx and ORC
Planning Level Cost Estimate

SOW Item	Quantity	Unit Cost	Total	Notes
Remedial Design	1	$35,460	$35,460	Assume General Contractor responsible for vapor barrier design/spec
Health & Safety Plan	1	5,000	$5,000	URS
Mobe	1	$12,450	$12,450	Contractor Est
Permits	0			General Contractor Cost - Not Included
Excavation	1	$51,340	$51,340	Contractor Est
Transport & Disposal (tons)	1,333	$43	$56,653	URS - Assume all is Class II disposal
Backfill	1	$42,570	$42,570	Contractor Est
Vapor Barrier: Foundation	11,000	$5.00	$55,000	Land Science Technologies: GeoSeal/Drainage Layer
Vapor Barrier: Garage Walls	0	$7.50	$0	Land Science Technologies: GeoSeal/Drainage Layer
In Situ Treatment			$0	
Regenesis RegenOx (lbs)	5,933	$2.30	$13,646	Regenesis
Sales Tax & Shipping	1	$2,500	$2,500	
Regenesis ORC (lbs)	1,157	$8.50	$9,835	Regenesis
Sales Tax & Shipping	1.00	$3,600	$3,600	
Injection Cost (per day)	0		$0	No injection cost. Regenox and ORC pellets to be mixed into excavation backfill
IsoTec Mod. Fenton's	0		$0	
Post Remediation GW Mon.	8	$3,750	$30,000	Assume 2 years of quarterly GW monitoring [TPHg, BTEX].
(Quarters)				Actual duration to be determined by Alameda County, based on GW concentration trends.
Install Perf. Mon. Wells	1	$21,500	$21,500	
Total			**$318,053**	

Table 5-4: AOC-1 - Alternative 3b
Over- Excavation/Soil and GW Treatment/Vapor Barrier - Modified Fenton's Reagent
Planning Level Cost Estimate

SOW Item	Quantity	Unit Cost	Total	Notes
Remedial Design	1	$35,460	$35,460	URS
Health & Safety Plan	1	5,000	$5,000	URS
Mobe	1	$12,450	$12,450	Contractor Est
Permits	1	$0	$0	General Contractor Cost - Not Included
Excavation	1	$51,340	$51,340	Contractor Est
Transport & Disposal (tons)	1,333	$43	$56,653	URS - Assume all is Class II disposal
Backfill	1	$36,570	$36,570	Contractor Est
Vapor Barrier: Foundation	11,000	$5.00	$55,000	Land Science Technologies: GeoSeal/Drainage Layer
Vapor Barrier: Garage Walls	0	$7.50	$0	Land Science Technologies: GeoSeal/Drainage Layer
In Situ Treatment			$0	
Regenesis RegenOx (lbs)	0	$2.30	$0	Regenesis
Sales Tax & Shipping	0	$2,500	$0	
Regenesis ORC (lbs)	0	$8.50	$0	Regenesis
Sales Tax & Shipping	0	$3,600	$0	
Injection Cost (per day)	0		$0	No injection cost. Regenox and ORC pellets to be mixed into excavation backfill
IsoTec Mod. Fenton's (3 rounds of injection)	3	40,000	$120,000	IsoTec
Post Remediation GW Mon. (Quarters)	8	$3,750	$30,000	Assume 2 years of quarterly GW monitoring [TPHg, BTEX]. Actual duration to be determined by Alameda County, based on GW concentration trends.
Total			**$402,473**	

Table 6-1: AOC-2 - Alternative 1
Vapor Barrier
Planning Level Cost Estimate

SOW Item	Quantity	Unit Cost	Total	Notes
Remedial Design	1	$15,000	$15,000	URS
Health & Safety Plan	1	$5,000	$5,000	URS
Permits	0	$7,820	$0	Contractor Est
Traffic Plan/Implementation	0	$7,168	$0	Contractor Est
Shoring & Exc. Plan	0	$7,047	$0	Contractor Est
Mobe	0	$6,868	$0	Contractor Est
Utilities Relocation	0	$65,164	$0	General Contractor Cost - Not Included
Excavation & Shoring	0	$65,396	$0	**Contractor Est: Assumes General Contractor Shores site boundary for 15 ftt bgs exc.**
Transport & Disposal (tons)	0	$43	$0	URS - Assume all is Class II disposal
Backfill	0	$22,891	$0	Contractor Est
Sidewalk Replacement/ Tree Removal	0	$19,550	$0	Contractor Est
Vapor Barrier: Foundation	0	$5.00	$0	Land Science Technologies: GeoSeal/Drainage Layer
Vapor Barrier: Garage Walls	5,040	$7.50	$37,800	Land Science Technologies: GeoSeal/Drainage Layer
In Situ Treatment			$0	
Regenesis RegenOx (lbs)	0	$2.30	$0	Regenesis
Sales Tax & Shipping	0	$2,500	$0	
Regenesis ORC (lbs)	0	$8.50	$0	Regenesis
Sales Tax & Shipping	0	$3,600	$0	
Injection Cost (per day)	0		$0	No injection cost. Regenox and ORC pellets to be mixed into excavation backfill
IsoTec Mod. Fenton's (3 rounds of injection)	0	40,000	$0	IsoTec
Post Remediation GW Mon. (Quarters)	8	$3,750	$30,000	Assume 2 years of quarterly GW monitoring [TPHg, BTEX]. Actual duration to be determined by Alameda County, based on GW concentration trends.
Total			**$87,800**	

*This estimate asumes that for the sidewalk excavation, the GC will install deeper shoring along the fenceline to allow 15 foot bgs sidewalk exc. The balance of the GC-installed shoring will be for the 12 feet bgs garage excavation only.

Table 6-2: AOC-2 - Alternative 2
Excavation
Planning Level Cost Estimate

SOW Item	Quantity	Unit Cost	Total	Notes
Remedial Design	1	$35,460	$35,460	URS
Health & Safety Plan	1	$5,000	$5,000	URS
Permits	1	$7,820	$7,820	Contractor Est
Traffic Plan/Implementation	1	$7,168	$7,168	Contractor Est
Shoring & Exc. Plan	1	$7,047	$7,047	Contractor Est
Mobe	1	$6,868	$6,868	Contractor Est
Utilities Relocation	1	$65,164	$65,164	General Contractor Cost - Not Included
Excavation & Shoring	1	$65,396	$65,396	Contractor Est
Transport & Disposal (tons)	356	$43	$15,130	URS - Assume all is Class II disposal
Backfill	1	$22,891	$22,891	Contractor Est
Sidewalk Replacement/ Tree Removal	1	$19,550	$19,550	Contractor Est
Vapor Barrier: Foundation	0	$5.00	$0	Land Science Technologies: GeoSeal/Drainage Layer
Vapor Barrier: Garage Walls	0	$7.50	$0	Land Science Technologies: GeoSeal/Drainage Layer
In Situ Treatment			$0	
Regenesis RegenOx (lbs)	0	$2.30	$0	Regenesis
Sales Tax & Shipping	0	$2,500	$0	
Regenesis ORC (lbs)	0	$8.50	$0	Regenesis
Sales Tax & Shipping	0	$3,600	$0	
Injection Cost (per day)	0		$0	No injection cost. Regenox and ORC pellets to be mixed into excavation backfill
IsoTec Mod. Fenton's (3 rounds of injection)	0	40,000	$0	IsoTec
Post Remediation GW Mon. (Quarters)	8	$3,750	$30,000	Assume 2 years of quarterly GW monitoring [TPHg, BTEX]. Actual duration to be determined by Alameda County, based on GW concentration trends.
Total			**$287,494**	

*This estimate asumes that for the sidewalk excavation, the GC will install deeper shoring along the fenceline to allow 15 foot bgs sidewalk exc. The balance of the GC-installed shoring will be for the 12 feet bgs garage excavation only.

Table 7-0 Evaluation of Remedial Alternatives									
	Overall Protection of Human Health and the Environment			Effectiveness			Implementability		
Corrective Action Alternative	**Mitigate Vapor Intrusion Risk to Future Occupants**	**Mitigate Vapor Intrusion Risk to Future Construction and Maintenance Workers**	**Remediate Residual Source Material/Mitigate Groundwater Impact**	**Short-Term Effectiveness**	**Long-Term Effectiveness**	**Reduction in Toxicity, Mobility and Volume**	**Technical Feasibility, Materials, Approvals, Permits**	**Cost**	**Sustainability**
AOC-1 **Alternative-1** **Garage Excavation and Vapor Barrier**	**Yes.** Vapor barrier is installed beneath the garage foundation slab.	**Yes.** Source material within the first 12 feet will be excavated for offsite disposal.	**No.** Only source material 0 to 12 feet bgs is removed. Deeper contamination remains in the saturated zone.	**No.** Does not reduce impacts to GW. Vapor barrier mitigates vapor intrusion into structure.	**No.** Does not reduce extent and concentration of COCs in GW and deeper soil.	**Yes.** Removes source material from 0 to 12 feet bgs. Does not reduce COC concentrations in GW or deeper soil.	**Yes.**	\$126,500	Excavation and offsite disposal of soil results in substantial GHG footprint. Long-term monitoring.
AOC-1 **Alternative 2** **Over-Excavation and Vapor Barrier**	**Yes.** Deeper source material is removed (12 to 18 feet bgs). Vapor barrier is installed beneath the garage foundation slab.	**Yes.** Source material within the first 18 feet will be excavated for offsite disposal.	**Yes/No.** Source material is removed, but groundwater impact is only partially mitigated.	**Yes.** Primary source area is removed.	**Yes.** Removes source of GW contamination, but residual GW contamination remains. Natural bio-degradation is slow at this site.	**Yes.** Removes most of the source area contamination.	**Yes.**	\$303,973	Excavation and offsite disposal of soil results in substantial GHG footprint. Long-term monitoring.
AOC-1 **Alternative 3a** **Over-Excavation/ Soil and Groundwater Treatment/Vapor Barrier/RegenOx and ORC**	**Yes.** Deeper source material is removed (12 to 18 feet bgs). Additional soil and GW source material is removed by chemical oxidation. Vapor barrier is installed beneath the garage foundation slab.	**Yes.** Source material within the first 18 feet will be excavated for offsite disposal. Residual soil and GW contamination treated by chemical oxidation.	**Yes.** Source material is removed, and soil and GW contamination are treated by chemical oxidation. In addition, long-term biodegradation of GW COCs is facilitated by adding ORC to the excavation.	**Yes.** Primary source area is remediated.	**Yes.** Removes source of GW contamination, and treats GW and soil by chemical oxidation. Residual GW contamination is treated by enhanced biodegradation. The ORC pellets remain effective over a 12-month period.	**Yes.** Removes most of the source area contamination by excavation and chemical oxidation.	**Yes.** The addition of ISCO (RegenOx) and ORC pellets to excavations for the remediation of petroleum hydrocarbons has been demonstrated to be a successful remedial strategy.	\$339,553	Excavation and offsite disposal of soil results in substantial GHG footprint. In situ treatment of residual contamination is the most sustainable strategy, minimizing the GHG footprint. Long-term monitoring.

Table 7-0 Evaluation of Remedial Alternatives									
	Overall Protection of Human Health and the Environment			**Effectiveness**			**Implementability**		
Corrective Action Alternative	**Mitigate Vapor Intrusion Risk to Future Occupants**	**Mitigate Vapor Intrusion Risk to Future Construction and Maintenance Workers**	**Remediate Residual Source Material/Mitigate Groundwater Impact**	**Short-Term Effectiveness**	**Long-Term Effectiveness**	**Reduction in Toxicity, Mobility and Volume**	**Technical Feasibility, Materials, Approvals, Permits**	**Cost**	**Sustainability**
AOC-1 **Alternative 3b.** **Over-Excavation/ Soil and Groundwater Treatment/Vapor Barrier/Modified Fenon's Reagent**	**Yes.** Deeper source material is removed (12 to 18 feet bgs). Additional soil and GW source material is removed by chemical oxidation. Vapor barrier is installed beneath the garage foundation slab.	**Yes.** Source area will be treated by ISCO prior to the over-excavation. This will allow treatment over a wider area then just the excavation footprint. Source material within the first 18 feet will be excavated for offsite disposal.	**Yes.** Shallow source material is removed (0 to 18 feet bgs), and deeper soil and GW contamination are treated by chemical oxidation.	**Yes.** Primary source area is remediated.	**Yes.** Removes source of GW contamination, and treats GW and soil by chemical oxidation. Application of ISCO by DPT injection over a larger footprint than the excavation footprint.	**Yes.** Removes most of the source area contamination by excavation and chemical oxidation.	**Yes.** Injection of Modified Fenton's Reagent into the subsurface is a proven technology. The injection interval (16 to 26 feet bgs) is sufficiently deep that surfacing of the oxidant is not expected to be a problem, based on URS' experience with ISCO at other local sites.	$423,973	Excavation and offsite disposal of soil results in substantial GHG footprint. In situ treatment of residual contamination is the most sustainable strategy, minimizing the GHG footprint. Long-term monitoring.
AOC-2 **Alternative 1: Vapor Barrier**	**Yes.** Vapor barrier is installed beneath the garage foundation slab.	**Yes.** The vapor barrier will prevent vapor intrusion through the garage walls.	**No.** Source material under the sidewalk does not present a significant threat to GW as it is in the vadose zone and is covered by the sidewalk. This alternative would leave the source material in place.	**Yes.** Vapor barrier mitigates vapor intrusion into structure.	**No.** Does not reduce extent and concentration of COCs in GW and soil.	**No.** Does not remove source material from soil beneath sidewalk (7 to 14 feet bgs) Does not reduce COC concentrations in GW or deeper soil.	**Yes.**	$87,800	Sustainable, low GHG footprint alternative. No excavation.

Table 7-0 Evaluation of Remedial Alternatives									
	Overall Protection of Human Health and the Environment			**Effectiveness**			**Implementability**		
Corrective Action Alternative	**Mitigate Vapor Intrusion Risk to Future Occupants**	**Mitigate Vapor Intrusion Risk to Future Construction and Maintenance Workers**	**Remediate Residual Source Material/Mitigate Groundwater Impact**	**Short-Term Effectiveness**	**Long-Term Effectiveness**	**Reduction in Toxicity, Mobility and Volume**	**Technical Feasibility, Materials, Approvals, Permits**	**Cost**	**Sustainability**
AOC-2 **Alternative 2: Excavation**	**Yes.** Vadose zone soil beneath the sidewalk is removed.	**Yes.** Vadose zone soil contamination (7 – 14 feet bgs is removed).	**Yes.** Source material under the sidewalk will be removed.	**Yes.** Vadose material under sidewalk removed.	**Yes.** Removes the potential for COCs migration from soil to GW.	**Yes.** Removes source material from soil beneath sidewalk (7 to 14 feet bgs)	**Yes.** Excavation will be difficult due to utilities underneath the sidewalk. Significant permitting costs and time (excavation, encroachment, shoring). Requires deeper garage excavation shoring (additional construction costs) to enable the sidewalk excavation to be completed deeper than the garage floor.	$287,494	High GHG alternative, requires excavation, shoring installation and removal, demolition, disposal and restoration of sidewalk and removal of magnolia tree. Low sustainability option.

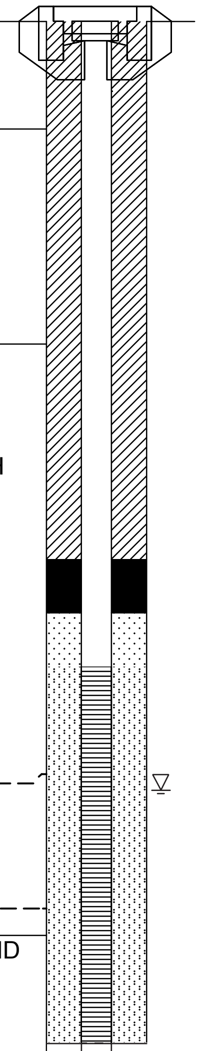
Notes:

AOC= Area of Concern
COC = Contaminant of Concern
DPT = Direct Push Technology
GHG = Greenhouse Gas
GW = Groundwater
ISCO = In Situ Chemical Oxidation
ORC = Oxygen Release Compound

Appendix A
Boring and Well Construction Logs – 2013

BORING MW- 1

DEPTH IN FEET	SAMPLING: INCHES DRIVEN / RECOVERED	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	SYMBOL		DESCRIPTION
0							Hand Auger to 6 ft. Top Soil
2						SW	Yellowish Brown (10YR 5/6) WELL GRADED SAND WITH GRAVEL, dry [FILL]
4							
6						CL	Dark Yellowish Brown (10YR 4/6) SILTY CLAY, stiff, moist
8							Grades to Greenish Gray (5GY 5/1), GRAVELLY CLAY WITH SILT, stiff, moist, hydrocarbon odor
10							Grades to Yellowish Brown (10YR 5/4)
12							Grades to Brownish Yellow (10YR 6/6) SILTY CLAY, medium stiff, moist Grades with gravel at 13.5 ft.
14						SC	Light Yellowish Brown (10YR 6/4) CLAYEY SAND, loose, wet
16						SM	Grades to SILTY SAND WITH CLAY
						SM	Dark Reddish Brown (5YR 3/4) SILTY SAND WITH CLAY AND GRAVEL, loose, wet
18							
20							
22							
24							

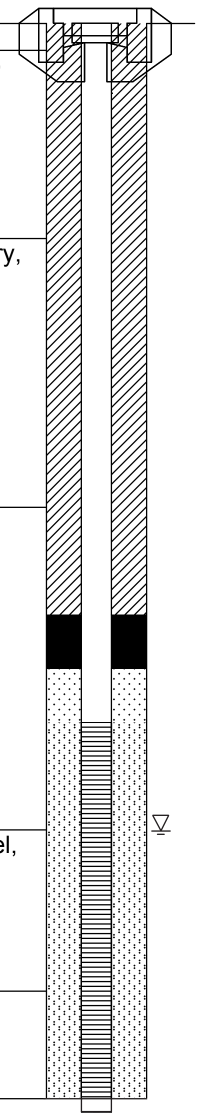


Note:
1. End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS 3884 MLK	Log of Boring
Date Completed: 7/11/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA
Top of Casing Elev: ft. Casing Depth: ft.	Casing Type: Casing Diam: in. Screened Interval: - ft.	Slot Size: in. Sand Pack:

BORING MW- 2

DEPTH IN FEET	SAMPLING: INCHES DRIVEN / RECOVERED	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
0						Soil at surface
					CL	Very Dark Brown (7YR 2.5/2) SILTY CLAY, very stiff, moist to dry
2						
4					CL	Brownish Yellow (10YR 6/6) SILTY CAY, very stiff, moist to dry, trace gravel Grades Light Yellowish Brown (10YR 6/2)
6						
8						Grades with gravel at 8.5 ft.
					CL	Mottled Yellowish Brown (10YR 5/6) and Light Gray (N 7/1) SILTY CLAY, trace gravel, medium stiff, moist
10						
12						Grades soft
14						
					SC	Dark Reddish Brown (2.5YR 3/3) CLAYEY SAND, trace gravel, loose, wet
16						Grades to GRAVELLY CLAYEY SAND
18					SC	Grades to Greenish Gray (5G 6/1) CLAYEY SAND, soft, wet, slight hydrocarbon odor Grades to GRAVELLY CLAY
20						
22						
24						



Note:
1. End of boring at 20 ft. bgs.

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Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS 3884 MLK	Log of Boring
Date Completed: 7/11/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA
Top of Casing Elev: ft. Casing Depth: ft.	Casing Type: Casing Diam: in. Screened Interval: - ft.	Slot Size: in. Sand Pack:

BORING MW- 3

DEPTH IN FEET	INCHES DRIVEN / RECOVERED	RESISTANCE (blows per foot)	PID READING (parts per million)	SAMPLES	SYMBOL		DESCRIPTION
0							FILL consisting of gravels, sand, and silt
						CL	Very Dark Brown (7YR 2.5/2) SILTY CLAY, very stiff, moist
2							Grades to Brown (10YR 4/3), medium, stiff
4							
						CL	Mottled Yellowish Brown (10YR 5/6) and Light Gray (N 7/1) SILTY CLAY, stiff to very stiff, moist, trace gravel and sand
6							
8							Grades with gravel at 8.5 ft.
						CL	Grades to Brownish Yellow (10YR 6/6) SILTY CLAY, stiff to very stiff, moist
10							
12						CL	Grades to Yellowish Brown (10YR 5/6) and Light Gray (N 7/1), medium stiff to stiff
14							Grades to GRAVELLY CLAY from 14 to 14.5 ft.
						SC	Dark Reddish Brown (2.5YR 3/3) CLAYEY SAND, loose, wet
16							
							Grades to GRAVELLY CLAYEY SAND
18							
20							
22							
24							

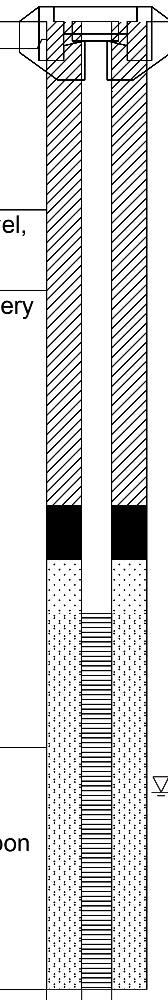
Note:
1. End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS	3884 MLK	**Log of Boring**
Date Completed: 7/11/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology		Location: Oakland, CA
Top of Casing Elev: ft. Casing Depth: ft.	Casing Type: Casing Diam: in.	Screened Interval: - ft.	Slot Size: in. Sand Pack:

BORING MW- 4

DEPTH IN FEET	INCHES DRIVEN / RECOVERED	RESISTANCE (blows per foot)	PID READING (parts per million)	SAMPLES
0				
2				
4				
6				
8				
10				
12				
14				
16				
18				
20				
22				
24				

SYMBOL	DESCRIPTION
	Concrete 4 inches
CL	Very Dark Brown (7.5YR 2.5/2) SILTY CLAY, very stiff, moist
CL	Dark Brown (10YR 3/3) SILTY CLAY WITH SAND, trace gravel, stiff, moist
CL	Greenish Gray (10GY 5.1) GRAVELLY SILTY CLAY, stiff to very stiff, moist Slight hydrocarbon odor at 6.5 ft. Grades to Dark Yellowish Bronw (10YR 3/6)
CL	Mottled Brownish Yellow (10YR 6/6) and Light Gray (N 7/1) SILTY CLAY, trace fine sand, soft, moist to wet Small lens of GRAVELLY CLAY from 15.5 to 16 ft., hydrocarbon (gasoline) odor
SM	Dark Yellowish Brown (10YR 3/4) SILTY SAND WITH CLAY, loose, wet
CL	Mottled Brownish Yellow (10YR 6/6) and Light Gray (N 7/1) SILTY CLAY, stiff to medium stiff, moist to wet

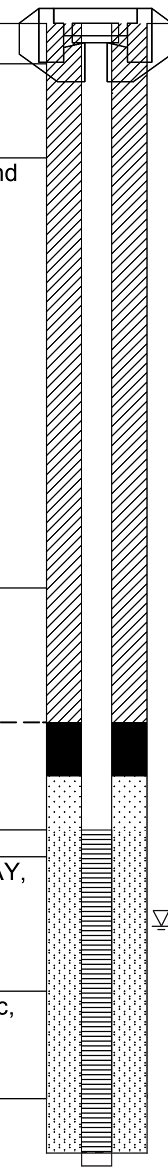


Note:
1. End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS 3884 MLK	Log of Boring
Date Completed: 7/10/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA
Top of Casing Elev: ft. Casing Depth: ft.	Casing Type: Casing Diam: in. Screened Interval: - ft.	Slot Size: in. Sand Pack:

BORING MW- 5

DEPTH IN FEET	SAMPLING: INCHES DRIVEN / RECOVERED	SAMPLING: RESISTANCE (blows per foot)	SAMPLING: PID READING (parts per million)	SAMPLES	SYMBOL	DESCRIPTION
0						FILL consisting of gravel and brick
					CL	Very Dark Grayish Brown (10YR 3/2) SILTY CLAY, stiff, dry
2					CL	Light Yellowish Brown (10YR 6/4) SILTY CLAY, trace sand and gravel, very stiff, dry to moist
4						
6						
8						Grades to GRAVELLY CLAY at 9 ft., gravels up to 1/2-inch
10					CL	Yellowish Brown (10YR 5/6) SILTY CLAY, stiff, moist
12					ML	Yellowish Brown (10YR 5/6) SILT WITH TRACE CLAY, slight plasticity, moist
14					CL	GRAVELLY CLAY lens from 15 to 15.5 ft.
					SM	Yellowish Brown (10YR 5/6) SILTY SAND WITH TRACE CLAY, loose, wet
16						
18					ML	Grades to Light Gray (N 7/1) SILT WITH CLAY, slightly plastic, moist to wet
20						
22						
24						



Job No: 28068161
Pt. ID: 3884_MLK_JUL13.GPJ

URS

3884 MLK

Log of Boring

Date Completed: 7/10/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA
Top of Casing Elev: ft. Casing Depth: ft.	Casing Type: Casing Diam: in.	Screened Interval: - ft. / Slot Size: in. Sand Pack:

BORING SB- 1

DEPTH IN FEET	TYPE OF SAMPLER	PID READING (parts per million)	INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL		DESCRIPTION
0							Hand Auger 0-6 ft. Top 6 ft. not logged.
5			48/48			ML	Greenish Gray (10GY 5/1) SILT WITH GRAVEL AND CLAY, slightly plastic, moist
							Grades to Dark Yellowish Brown (10YR 4/6) GRAVELLY SILT, moist
10			42/42			CL	Mottled Yellowish Brown (10YR 5/6) and Light Gray (N 7/1) SILTY CLAY, soft, moist to wet
				∇			Grades to Gravelly Clay, wet
15			42/42			SC	Grades to Mottled Yellowish Brown (10YR 5/6) and Light Gray (N 7/1) SILTY CLAY, soft, wet
			36/36			SM	Grades to SILTY SAND at 17.5 ft.
						SM	Grades to Dark Reddish Brown (5YR 3/4) SILTY SAND WITH GRAVEL AND CLAY
20							
25							

Note:
End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS — 3884 MLK	Log of Boring
Date Completed: 7/12/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA

BORING SB- 2

DEPTH IN FEET	TYPE OF SAMPLER	PID READING (parts per million)	INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL	DESCRIPTION
0						Hand Auger 0-6 ft. Top 6 ft. not logged.
5						
			48/48		ML	Dark Yellowish Brown (10YR 4/6) SILT WITH GRAVEL AND CLAY, slightly plastic, moist
10						
			42/42		SM	Mottled Yellowish Brown (10YR 5/6) and Light Gray (N 7/1) SILTY SAND, loose to medium dense, moist to wet
			42/42	∇		
					SC	Grades to CLAYEY SAND, soft, wet
15						
						Grades to CLAYEY SAND WITH GRAVEL
			36/36		SM	Mottled Yellowish Brown (10YR 5/6) and Light Gray (N 7/1) SILTY SAND WITH CLAY, soft, wet, trace gravel
20						
25						

Note:
End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS 3884 MLK	Log of Boring
Date Completed: 7/12/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA

BORING SB- 3

DEPTH IN FEET	TYPE OF SAMPLER	PID READING (parts per million)	INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL		DESCRIPTION
0							Hand Auger 0-6 ft. Top 6 ft. not logged.
5							
			48/48			ML	Dark Yellowish Brown (10YR 4/6) CLAYEY SILT WITH GRAVEL, slightly plastic, moist
10			42/42			CL	Grades to Mottled Yellowish Brown (10YR 5/6) and Light Gray (N 7/1) SILTY CLAY, medium stiff, moist
						ML	Grades to CLAYEY SILT, stiff
			42/42			CL	Grades to SILTY CLAY, medium stiff
15							
			36/36				Grades to GRAVELLY CLAY, very stiff, moist to dry
20							
25							

Note:
End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS — 3884 MLK	Log of Boring
Date Completed: 7/12/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA

BORING SB- 4

DEPTH IN FEET	TYPE OF SAMPLER	PID READING (parts per million)	INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL		DESCRIPTION
0							Hand Auger 0-6 ft. Top Soil to 2 ft.
						SW	Yellowish Brown (10YR 5/6) WELL GRADED SAND WITH GRAVEL, dry
5			48/48				
						ML	Light Brownish Gray (10YR 6/2) SILT, very low plasticity, moist Grades Greenish Gray (10GY 6/1), with CLAY AND GRAVEL
						CL	Dark Yellowish Brown (10YR 4/6) SILTY CLAY WITH GRAVEL, stiff, moist Grades to Brownish Yellow (10YR 6/6) SILTY CLAY, medium stiff, moist
10			42/42				
			42/42				Grades to Mottle Yellowish Brown (10YR 5/6) and Light Gray (N 7/1), SILTY CLAY, meium stiff, moist
15							
				∇			Grades to GRAVELLY CLAY, moist to wet Grades to SILTY CLAY, wet
			36/36			CL	Brown (10YR 4/3) GRAVELLY CLAY, medium stiff, wet, gravels up to 1-inch
20							
25							

Note:
End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS 3884 MLK	Log of Boring
Date Completed: 7/11/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA

BORING SB- 5

DEPTH IN FEET	TYPE OF SAMPLER	PID READING (parts per million)	INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL	DESCRIPTION
0			60/36			Concrete 4"
					CL	Very Dark Brown (7.5YR 2.5/2) SILTY CLAY, stiff, dry
					CL	Yellowish Brown (10YR 5/8) SILTY CLAY, trace very fine sand, stiff, dry
5			48/48			Grades to GRAVELLY SANDY CLAY, gravels are angular to subangular Hydrocarbon odor at 6.5 ft. Grades Greenish Gray (Gley 5/1)
10			36/36		CL	Grades to Mottled Yellowish Brown (10YR 5/6) and Gley (7/1) SILTY CLAY, medium stiff, moist
		0	36/36			Grades Yellowish Brown (10YR 5/8)
15		0		∇	GC	Small 6-inch CLAYEY GRAVEL lens at 15 ft., wet
					SC	Yellowish Brown (10YR 5/8) CLAYEY SAND, medium dense, wet
						Grades GLEY (5/1)
20		0				
25						

Note:
End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS — 3884 MLK	Log of Boring
Date Completed: 7/9/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA

BORING SB- 6

DEPTH IN FEET	TYPE OF SAMPLER	PID READING (parts per million)	INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL	DESCRIPTION
0			60/36			Concrete 4"
					CL	Very Dark Brown (7.5YR 2.5/2) SILTY CLAY, stiff, dry
					CL	Yellowish Brown (10YR 5/8) SILTY CLAY WITH SAND, stiff, moist
5			48/48		CL	Grades to GRAVELLY CLAY WITH SAND, Greenish Gray Gley (5/1), hydrocarbon odor Gravels are angular to subangular Grades to Yellowish Brown (10YR 5/6)
10			36/36			
			36/36		CL	Grades to Mottled Yellowish Brown (10YR 5/6) and GLEY (7/1) SILTY CLAY, soft, moist
15		0				
		600	36/36	▽	GC	Small 6-inch CLAYEY GRAVEL lens at 15.5 ft.
					SC	Yellowish Brown (10YR 5/6) and Greenish Gray (GLEY 4/1) CLAYEY SAND WITH SILT, loose, wet
					SM	Strong hydrocarbon odor (gasoline) at 16 ft. Grades to SILTY SAND at 17 ft.
			24/24		ML	Grades to CLAYEY SILT at 19 ft.
20		0				
25						

Note:
End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS — 3884 MLK	Log of Boring
Date Completed: 7/9/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA

BORING SB- 7

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	PID READING (parts per million)	INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL		DESCRIPTION
0			60/36				Concrete 4"
						CL	Very Dark Brown (7.5YR 2.5/2) SILTY CLAY, stiff, dry
						CL	Yellowish Brown (10YR 5/8) GRAVELLY SILTY CLAY, stiff, moist Gravels up to 1/2-inch
5			48/48			CL	Hydrocarbon odor at 6.5 ft. Grades Greenish Gray (5BG 5/1)
		80					
10			36/36				
			36/36			CL	Grades to Mottled Yellowish Brown (10YR 5/6) and Light Greenish Gray (N 7/1) SILTY CLAY, medium stiff, moist Grades stiff at 14 ft.
15			36/36	∇		SM	Yellowish Brown (10YR 5/6) and Greenish Gray (N 4/1) SILTY SAND WITH CLAY, medium dense, moist to wet
			24/24			SC	Grades to CLAYEY SAND
20							
25							

Note:
End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS	3884 MLK	Log of Boring
Date Completed: 7/9/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology		Location: Oakland, CA

BORING SB- 8

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	PID READING (parts per million)	INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL		DESCRIPTION
0							Concrete 5"
			60/36			CL	Very Dark Brown (7.5YR 2.5/2) SILTY CLAY, soft, moist
						CL	Brown (7.5YR 5/3) SILTY CLAY, medium stiff to stiff, moist
5			48/48				
							Slight hydrocarbon odor at 6.5 ft.
						CL	Grades to Mottled Yellowish Brown (10YR 5/6) and Greenish Gray (5GY 6/1) SILTY CLAY, stiff to very stiff, moist, trace gravel
							Small lens of GRAVELLY CLAY from 9-9.5 ft.
10			36/36				
						CL	Grades to Yellowish Brown (10YR 6/6) SILTY CLAY, stiff, moist
		0					
			48/48			CL	Grades to Mottled Yellowish Brown (10YR 5/6) and Light Greenish Gray (N 7/1) SILTY CLAY, medium stiff, moist
							Small lens of GRAVELLY CLAY from 14 to 14.25 ft.
15		0					
			48/48				
		327				CL	Grades to SANDY CLAY, soft, wet. Sand is very fine grained.
				∇			
20		0					
25							

Note:
End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS 3884 MLK	Log of Boring
Date Completed: 7/10/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA

BORING SB- 9

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: PID READING (parts per million)	SAMPLING: INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL	DESCRIPTION
0						Concrete 3"
			60/36		CL	Very Dark Brown (7.5YR 2.5/2) SILTY CLAY, stiff to very stiff, moist
					CL	Yellowish Brown (10YR 5/6) SILTY CLAY, trace fine sand, stiff to very stiff, moist
5			48/48			
						Grades with slight hydrocarbon odor at 7.0 ft. Greenish Gray (5GUY 5/1), trace gravel
						Grades to GRAVELLY CLAY at 9 ft.
10			48/48			
					CL	Grades to Dark Yellowish Brown (10YR 4/6) at 10.5 ft.
			48/48			
					CL	Grades to Mottled Yellowish Brown (10YR 5/6) and Light Greenish Gray (N 7/1) SILTY CLAY, medium stiff, moist
15						
					GC	Small 6-inch Clayey Gravel lens at 15.5 ft.
				∇	SM	Grades to SILTY SAND, wet at 16.5 ft.
		8	36/36			
					ML	Grades to SILT WITH CLAY at 18.5 ft.
20						
25						

Note:
End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS — 3884 MLK	Log of Boring
Date Completed: 7/9/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA

BORING SB-10

DEPTH IN FEET	TYPE OF SAMPLER	PID READING (parts per million)	INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL	DESCRIPTION
0			60/48		CL	Very Dark Brown (7.5YR 2.5/2) SITLY CLAY, very stiff, moist
					CL	Yellowish Brown (10YR 5/6) SILTY CLAY, trace sand and gravel, very stiff, moist
5			48/48		CL	
			48/48			Grades to GRAVELLY CLAY at 9 ft.
10						
			48/48			
15						
			36/36		CL	Grades to Mottled Yellowish Brown (10YR 5/6) and Light Greenish Gray (N 7/1) SILTY CLAY WITH SAND, stiff, moist
					SM	Grades to SILTY SAND at 17 ft.
					ML	Grades to SILT WITH CLAY at 18.5 ft.
20						
25						

Note:
End of boring at 20 ft. bgs.

Job No: 28068161
Pt. ID: 3884_MLK_JUL13.GPJ

URS

3884 MLK

Log of Boring

Date Completed: 7/9/13
Boring Depth: 20 ft.

Driller: Vapor Tech Services
Drilling Method: Direct Push Technology

Location:
Oakland, CA

BORING SB-11

DEPTH IN FEET	TYPE OF SAMPLER	PID READING (parts per million)	INCHES DRIVEN/ RECOVERED	SAMPLES	SYMBOL		DESCRIPTION
0							Asphalt
			60/42			CL	Very Dark Brown (7.5YR 2.5/2) SITLY CLAY, stiff, dry to moist
						CL	Yellowish Brown (10YR 5/8) SILTY CLAY WITH FINE SAND, stiff, dry
5			48/48				Grades to Greenish Gray (GLEY 5/1) at 6.5 ft., hydrocarbon odor
						SW	Greenish Gray (GLEY 5/1) GRAVELLY SAND WITH SILT AND CLAY, medium dense, moist
10			36/36			CL	Grades to Mottled Yellowish Brown (10YR 5/6) and GLEY (7/1) SILTY CLAY, trace gravel, medium stiff, moist
			36/36			CL	
15				∇			Grades wet at 15 ft.
			36/36			SC	Yellowish Brown (10YR 5/8) CLAYEY SAND, loose, wet
			24/24			SM	Grades to Brown (10YR 4/3) SILTY SAND WITH CLAY
20							
25							

Note:
End of boring at 20 ft. bgs.

Job No: 28068161 Pt. ID: 3884_MLK_JUL13.GPJ	URS 3884 MLK	Log of Boring
Date Completed: 7/9/13 Boring Depth: 20 ft.	Driller: Vapor Tech Services Drilling Method: Direct Push Technology	Location: Oakland, CA

Appendix B
Well Search Report

3884 Martin Luther King Jr Way
3884 Martin Luther King Jr Way
Oakland, CA 94609

Inquiry Number: 3685707.1s
August 05, 2013

The EDR GeoCheck® Report

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

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SECTION **PAGE**

GEOCHECK ADDENDUM

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

GEOCHECK® - PHYSICAL SETTING SOURCE REPORT

TARGET PROPERTY ADDRESS

3884 MARTIN LUTHER KING JR WAY
3884 MARTIN LUTHER KING JR WAY
OAKLAND, CA 94609

TARGET PROPERTY COORDINATES

Latitude (North):	37.8288 - 37˚ 49’ 43.68’’
Longitude (West):	122.2687 - 122˚ 16’ 7.32’’
Universal Tranverse Mercator:	Zone 10
UTM X (Meters):	564357.2
UTM Y (Meters):	4186867.0
Elevation:	73 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	37122-G3 OAKLAND WEST, CA
Most Recent Revision:	1980

EDR’s GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principal investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

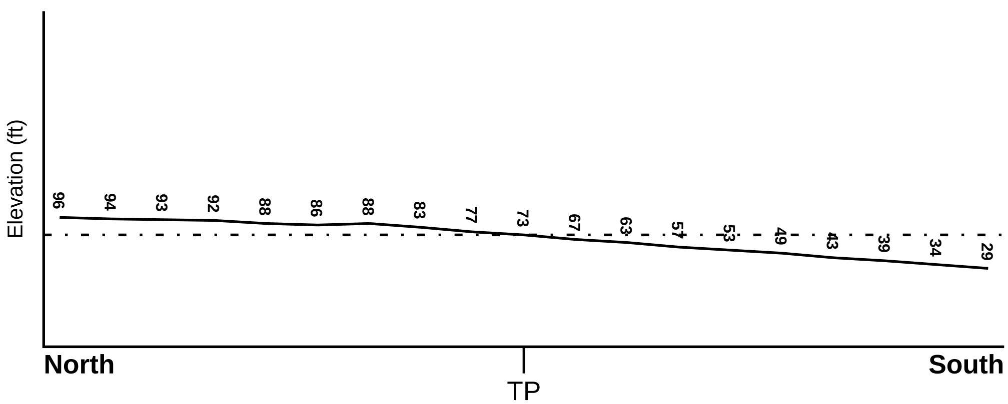
TOPOGRAPHIC INFORMATION

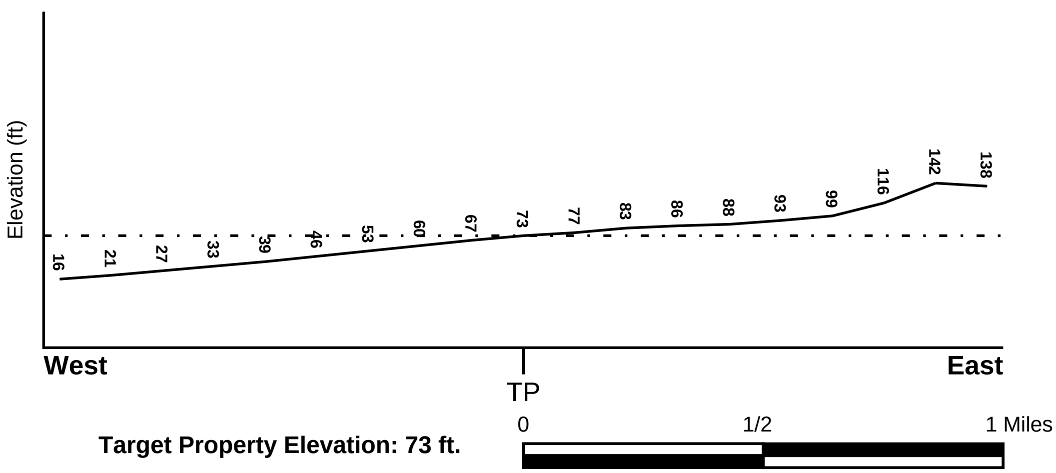
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General SW

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES





Target Property Elevation: 73 ft.

Source: Topography has been determined from the USGS 7.5’ Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
ALAMEDA, CA	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property: 06001C - FEMA DFIRM Flood data

Additional Panels in search area: Not Reported

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
OAKLAND WEST	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Site-Specific Hydrogeological Data*:

Search Radius: 1.25 miles
Status: Not found

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
A1	1/8 - 1/4 Mile SW	NW
A2	1/8 - 1/4 Mile SW	NW
3	1/4 - 1/2 Mile SSE	N
4	1/4 - 1/2 Mile ESE	NE
6	1/2 - 1 Mile SW	S
B7	1/2 - 1 Mile ESE	NW
B8	1/2 - 1 Mile ESE	W
9	1/2 - 1 Mile ESE	NW
10	1/2 - 1 Mile West	WSW

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
11	1/2 - 1 Mile South	SW
12	1/2 - 1 Mile ESE	SW
13	1/2 - 1 Mile NNE	E
C14	1/2 - 1 Mile North	N
D15	1/2 - 1 Mile WNW	Varies
D16	1/2 - 1 Mile WNW	W
C17	1/2 - 1 Mile North	NE
D18	1/2 - 1 Mile WNW	SW
D19	1/2 - 1 Mile WNW	SW
20	1/2 - 1 Mile South	SE
21	1/2 - 1 Mile SSW	Varies
22	1/2 - 1 Mile SSE	Varies
E24	1/2 - 1 Mile WNW	W
E25	1/2 - 1 Mile WNW	W
26	1/2 - 1 Mile NW	SW
27	1/2 - 1 Mile SSE	S
28	1/2 - 1 Mile South	Not Reported
29	1/2 - 1 Mile East	NNW
F31	1/2 - 1 Mile West	Varies
F32	1/2 - 1 Mile West	WSW
F33	1/2 - 1 Mile West	W

For additional site information, refer to Physical Setting Source Map Findings.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

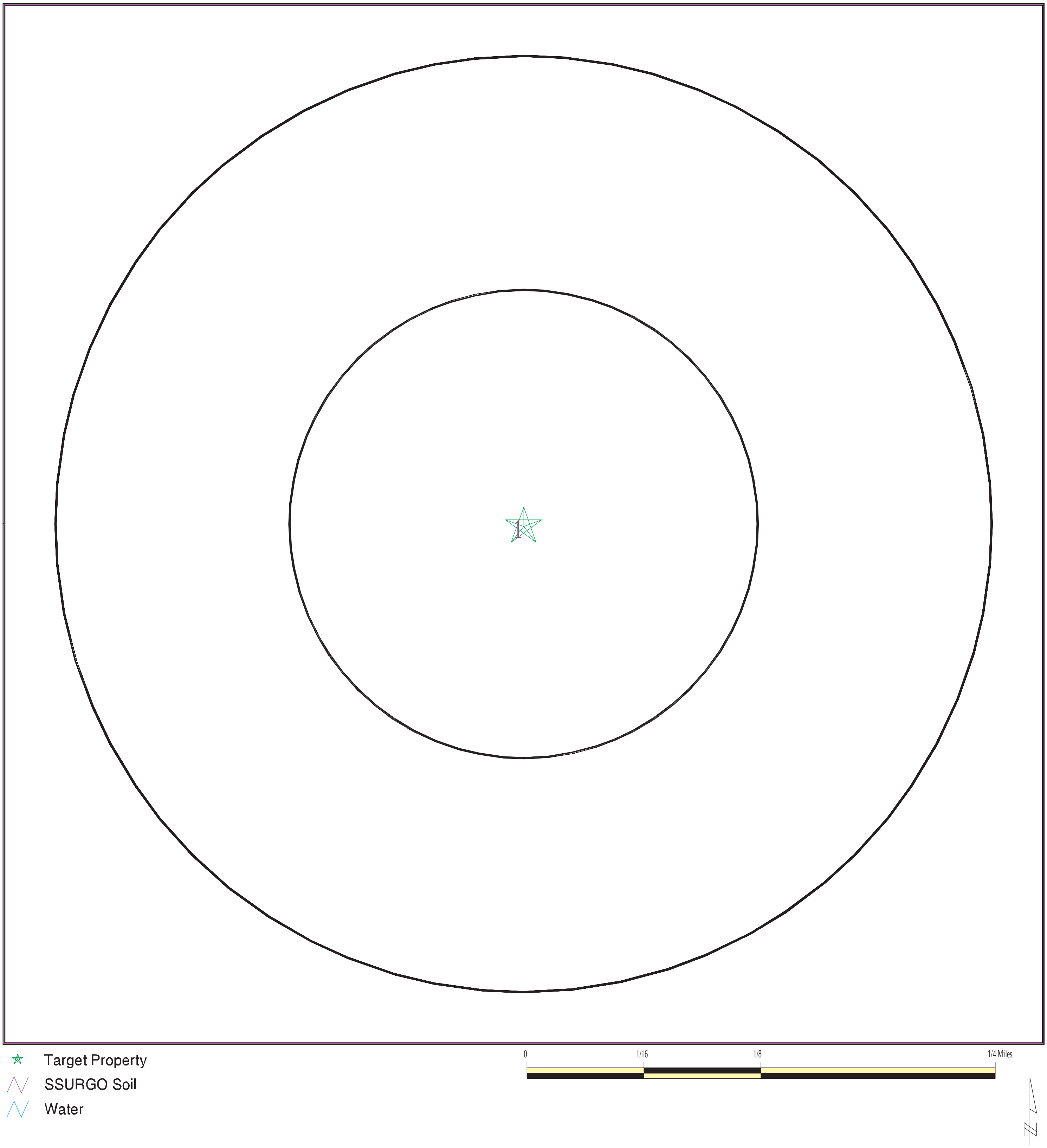
Era:	Cenozoic
System:	Quaternary
Series:	Quaternary
Code:	Q *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratifed Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 3685707.1s



SITE NAME: 3884 Martin Luther King Jr Way ADDRESS: 3884 Martin Luther King Jr Way Oakland CA 94609 LAT/LONG: 37.8288 / 122.2687	CLIENT: URS Corporation CONTACT: Suzanne Nase INQUIRY #: 3685707.1s DATE: August 05, 2013 3:17 pm

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: Urban land

Soil Surface Texture:
Hydrologic Group: Not reported

Soil Drainage Class:
Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

No Layer Information available.

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	1.000
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

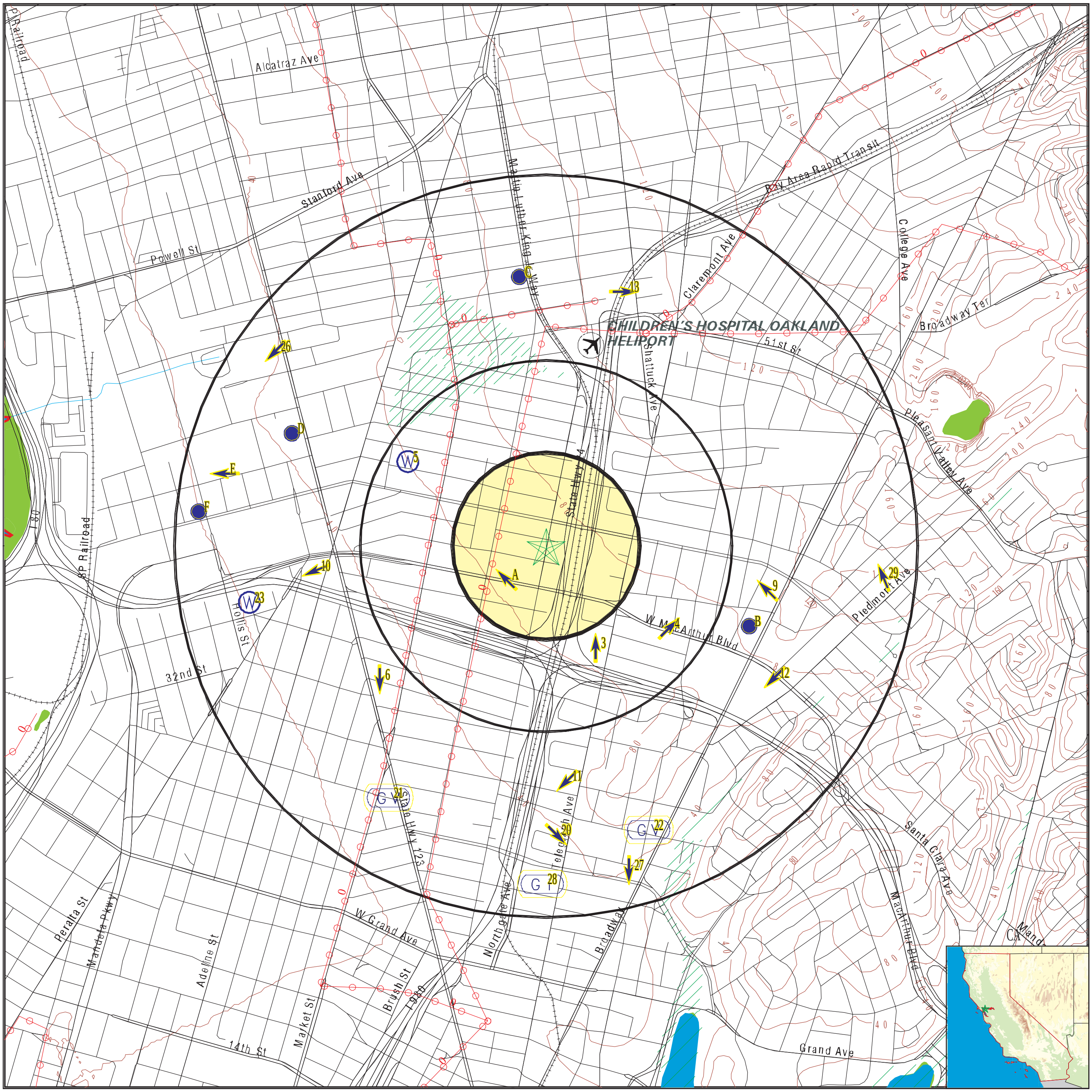
MAP ID	WELL ID	LOCATION FROM TP
E30	CA1009246	1/2 - 1 Mile West

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
5	CADW50000030634	1/4 - 1/2 Mile WNW
23	CADW50000030621	1/2 - 1 Mile West

PHYSICAL SETTING SOURCE MAP - 3685707.1s



County Boundary	Groundwater Flow Direction
Major Roads	G I Indeterminate Groundwater Flow at Location
Contour Lines	G V Groundwater Flow Varies at Location
Power transmission lines	HD Closest Hydrogeological Data
Earthquake Fault Lines	Oil, gas or related wells
Airports	100-year flood zone
Earthquake epicenter, Richter 5 or greater	500-year flood zone
W Water Wells	National Wetland Inventory
P Public Water Supply Wells	
Cluster of Multiple Icons	

0 1/4 1/2 1 Miles

SITE NAME: 3884 Martin Luther King Jr Way	CLIENT: URS Corporation
ADDRESS: 3884 Martin Luther King Jr Way, Oakland CA 94609	CONTACT: Suzanne Nase
	INQUIRY #: 3685707.1s
LAT/LONG: 37.8288 / 122.2687	DATE: August 05, 2013 3:17 pm

Map ID / Direction / Distance / Elevation			Database	EDR ID Number
A1 **SW** **1/8 - 1/4 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-0118 NW Not Reported Not Reported 8-11 09/16/1991	**AQUIFLOW**	**51860**
A2 **SW** **1/8 - 1/4 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-0118 NW Not Reported Not Reported 18 bg 07/22/1994	**AQUIFLOW**	**51861**
3 **SSE** **1/4 - 1/2 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-0264 N Not Reported Not Reported 8 04/25/1996	**AQUIFLOW**	**63712**
4 **ESE** **1/4 - 1/2 Mile** **Higher**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-1597 NE Not Reported Not Reported 15 08/05/1995	**AQUIFLOW**	**63784**
5 **WNW** **1/4 - 1/2 Mile** **Lower**			**CA WELLS**	**CADW50000030634**

Latitude :	37.8321		
Longitude :	122.2755		
Site code:	378321N1222755W001	Casgem sta:	01S04W23E001M
Local well:	Not Reported	Casgem s 1:	Industrial
County id:	1		
Basin cd:	2-9.04	Basin desc:	East Bay Plain
Org unit n:	North Central Region Office	Site id:	CADW50000030634

6 **SW** **1/2 - 1 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-0924 S Not Reported Not Reported 5 ft. 05/10/1988	**AQUIFLOW**	**66595**

Map ID / Direction / Distance / Elevation			Database	EDR ID Number
B7 **ESE** **1/2 - 1 Mile** **Higher**	Site ID:	01-0638	**AQUIFLOW**	**63720**
	Groundwater Flow:	NW		
	Shallow Water Depth:	Not Reported		
	Deep Water Depth:	Not Reported		
	Average Water Depth:	21		
	Date:	11/17/1988		
B8 **ESE** **1/2 - 1 Mile** **Higher**	Site ID:	01-2279	**AQUIFLOW**	**63727**
	Groundwater Flow:	W		
	Shallow Water Depth:	Not Reported		
	Deep Water Depth:	Not Reported		
	Average Water Depth:	20		
	Date:	09/29/1997		
9 **ESE** **1/2 - 1 Mile** **Higher**	Site ID:	01-1596	**AQUIFLOW**	**63753**
	Groundwater Flow:	NW		
	Shallow Water Depth:	Not Reported		
	Deep Water Depth:	Not Reported		
	Average Water Depth:	15		
	Date:	09/06/1995		
10 **West** **1/2 - 1 Mile** **Lower**	Site ID:	01-2120	**AQUIFLOW**	**67880**
	Groundwater Flow:	WSW		
	Shallow Water Depth:	Not Reported		
	Deep Water Depth:	Not Reported		
	Average Water Depth:	5.25		
	Date:	08/31/1995		
11 **South** **1/2 - 1 Mile** **Lower**	Site ID:	01-0886	**AQUIFLOW**	**63803**
	Groundwater Flow:	SW		
	Shallow Water Depth:	8.67		
	Deep Water Depth:	14.02		
	Average Water Depth:	Not Reported		
	Date:	04/07/1997		
12 **ESE** **1/2 - 1 Mile** **Higher**	Site ID:	01-1345	**AQUIFLOW**	**63931**
	Groundwater Flow:	SW		
	Shallow Water Depth:	13.82		
	Deep Water Depth:	14.30		
	Average Water Depth:	Not Reported		
	Date:	01/19/1995		
13 **NNE** **1/2 - 1 Mile** **Higher**	Site ID:	01-0111	**AQUIFLOW**	**67912**
	Groundwater Flow:	E		
	Shallow Water Depth:	Not Reported		
	Deep Water Depth:	Not Reported		
	Average Water Depth:	20		
	Date:	09/07/1994		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID / Direction / Distance / Elevation			Database	EDR ID Number
C14 **North** **1/2 - 1 Mile** **Higher**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-1005 N Not Reported Not Reported Not Reported 07/28/1997	**AQUIFLOW**	**66295**
D15 **WNW** **1/2 - 1 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-0394 Varies 3.21 10.66 Not Reported 01/03/1996	**AQUIFLOW**	**51585**
D16 **WNW** **1/2 - 1 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-0394 W Not Reported Not Reported Not Reported 12/04/1989	**AQUIFLOW**	**51586**
C17 **North** **1/2 - 1 Mile** **Higher**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-0220 NE Not Reported Not Reported Not Reported 12/03/1987	**AQUIFLOW**	**52371**
D18 **WNW** **1/2 - 1 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-2274 SW 4.57 10.27 Not Reported 03/16/1998	**AQUIFLOW**	**51587**
D19 **WNW** **1/2 - 1 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-2274 SW 4.57 6.74 Not Reported 12/16/1997	**AQUIFLOW**	**51588**
20 **South** **1/2 - 1 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-1349 SE 9.00 10.39 Not Reported 10/11/1988	**AQUIFLOW**	**63626**

Map ID / Direction / Distance / Elevation			Database	EDR ID Number
21 **SSW** **1/2 - 1 Mile** **Lower**	Site ID:	01-2181	**AQUIFLOW**	**63628**
	Groundwater Flow:	Varies		
	Shallow Water Depth:	1.2		
	Deep Water Depth:	7.8		
	Average Water Depth:	Not Reported		
	Date:	05/28/1996		
22 **SSE** **1/2 - 1 Mile** **Lower**	Site ID:	01-0575	**AQUIFLOW**	**64091**
	Groundwater Flow:	Varies		
	Shallow Water Depth:	10.40		
	Deep Water Depth:	14.49		
	Average Water Depth:	Not Reported		
	Date:	08/20/1992		
23 **West** **1/2 - 1 Mile** **Lower**			**CA WELLS**	**CADW50000030621**

Latitude :	37.8266		
Longitude :	122.2833		
Site code:	378266N1222833W001	Casgem sta:	01S04W22J001M
Local well:	Not Reported	Casgem s 1:	Industrial
County id:	1		
Basin cd:	2-9.04	Basin desc:	East Bay Plain
Org unit n:	North Central Region Office	Site id:	CADW50000030621

E24 **WNW** **1/2 - 1 Mile** **Lower**	Site ID:	01-2142	**AQUIFLOW**	**51574**
	Groundwater Flow:	W		
	Shallow Water Depth:	Not Reported		
	Deep Water Depth:	Not Reported		
	Average Water Depth:	8 ft.		
	Date:	12/21/1996		
E25 **WNW** **1/2 - 1 Mile** **Lower**	Site ID:	01-2142	**AQUIFLOW**	**51575**
	Groundwater Flow:	W		
	Shallow Water Depth:	Not Reported		
	Deep Water Depth:	Not Reported		
	Average Water Depth:	28ft.		
	Date:	03/04/1996		
26 **NW** **1/2 - 1 Mile** **Lower**	Site ID:	01-1987	**AQUIFLOW**	**67882**
	Groundwater Flow:	SW		
	Shallow Water Depth:	8.5		
	Deep Water Depth:	10.5		
	Average Water Depth:	Not Reported		
	Date:	11/17/1993		

Map ID Direction Distance Elevation			Database	EDR ID Number
27 SSE 1/2 - 1 Mile Lower	Site ID:	01-0241	**AQUIFLOW**	**63622**
	Groundwater Flow:	S		
	Shallow Water Depth:	Not Reported		
	Deep Water Depth:	Not Reported		
	Average Water Depth:	7.9		
	Date:	11/28/1988		
28 South 1/2 - 1 Mile Lower	Site ID:	01-1313	**AQUIFLOW**	**64106**
	Groundwater Flow:	Not Reported		
	Shallow Water Depth:	Not Reported		
	Deep Water Depth:	Not Reported		
	Average Water Depth:	25-30		
	Date:	02/22/1999		
29 East 1/2 - 1 Mile Higher	Site ID:	01-1690	**AQUIFLOW**	**63786**
	Groundwater Flow:	NNW		
	Shallow Water Depth:	Not Reported		
	Deep Water Depth:	Not Reported		
	Average Water Depth:	18		
	Date:	10/11/1994		
E30 West 1/2 - 1 Mile Lower			**FRDS PWS**	**CA1009246**

PWS ID:	CA1009246		
Date Initiated:	7706	Date Deactivated:	Not Reported
PWS Name:	BERKELEY LAND COMPANY BERKELEY LAND COMPANY 13310 EAGLEFIELD RD FIREBAUGH, CA 93622		
Addressee / Facility:	System Owner/Responsible Party BERKELEY LAND COMPANY 1211 NEWALL AVENUE 1 WALNUT CREEK, CA 94596		
Facility Latitude:	37 49 53	Facility Longitude:	122 17 03
City Served:	Not Reported		
Treatment Class:	Untreated	Population:	00000060

Violations information not reported.

ENFORCEMENT INFORMATION:

System Name:	BERKELEY LAND COMPANY		
Violation Type:	Initial Tap Sampling for Pb and Cu		
Contaminant:	LEAD & COPPER RULE		
Compliance Period:	1993-07-01 - 2015-12-31		
Violation ID:	95V0001		
Enforcement Date:	Not Reported	Enf. Action:	Not Reported

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID Direction Distance Elevation			Database	EDR ID Number
F31 **West** **1/2 - 1 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-0155 Varies Not Reported Not Reported 4.5 12/01/1991	**AQUIFLOW**	**52363**
F32 **West** **1/2 - 1 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-1223 WSW 6.13 18.91 Not Reported 07/31/1996	**AQUIFLOW**	**52360**
F33 **West** **1/2 - 1 Mile** **Lower**	Site ID: Groundwater Flow: Shallow Water Depth: Deep Water Depth: Average Water Depth: Date:	01-1223 W 10 20 Not Reported 10/30/1989	**AQUIFLOW**	**52361**

AREA RADON INFORMATION

State Database: CA Radon

Radon Test Results

Zipcode	Num Tests	> 4 pCi/L
94609	10	1

Federal EPA Radon Zone for ALAMEDA County: 2

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for ALAMEDA COUNTY, CA

Number of sites tested: 49

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.776 pCi/L	100%	0%	0%
Living Area - 2nd Floor	-0.400 pCi/L	100%	0%	0%
Basement	1.338 pCi/L	100%	0%	0%

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

HYDROGEOLOGIC INFORMATION

AQUIFLOW[R] Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Services, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Water Well Database
Source: Department of Water Resources
Telephone: 916-651-9648

California Drinking Water Quality Database
Source: Department of Health Services
Telephone: 916-324-2319
The database includes all drinking water compliance and special studies monitoring for the state of California since 1984. It consists of over 3,200,000 individual analyses along with well and water system information.

OTHER STATE DATABASE INFORMATION

California Oil and Gas Well Locations
Source: Department of Conservation
Telephone: 916-323-1779
Oil and Gas well locations in the state.

RADON

State Database: CA Radon
Source: Department of Health Services
Telephone: 916-324-2208
Radon Database for California

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

California Earthquake Fault Lines: The fault lines displayed on EDR's Topographic map are digitized quaternary fault lines, prepared in 1975 by the United State Geological Survey. Additional information (also from 1975) regarding activity at specific fault lines comes from California's Preliminary Fault Activity Map prepared by the California Division of Mines and Geology.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

STREET AND ADDRESS INFORMATION