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SITE MITIGATION PLAN

10700 MacArthur Boulevard
Oakland, California

AEI Project No. 261829
Toxics Case No. RO0002580

Prepared For

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1.0 INTRODUCTION

This workplan describes the proposed site mitigation activities for the property located at 10700 MacArthur Boulevard, Oakland, California (Figure 1: Site Location Map). This plan has been required by the Alameda County Health Care Services (ACHCS) relating to the release of tetrachloroethylene (PCE) from historical dry-cleaning activities at the former Young's Cleaners location on the subject property. The ACHCS is providing regulatory oversight for the investigation and mitigation of the release.

The purpose of these remedial activities is to eliminate, to the extent reasonably possible, any potential for vapor intrusion into the site buildings to allow for unrestricted use of the building areas prior to achieving formal case closure. As discussed below, extensive site assessment and source removal was conducted in the 1990s. However, during recent soil vapor investigation activities, residual impact was discovered that may present a potential for vapor intrusion. The shopping center buildings will be significantly refurbished during which time remedial installations will be completed. In summary, this plan outlines the following measures to be implemented:

- Removal of shallow source soil, contingent on if contaminated soil is identified during sampling prior to construction.
- A subslab venting and vapor extraction system will be installed to create a negative pressure beneath the building slab, thereby eliminating the vapor intrusion pathway and removing residual volatile organics.
- A subslab vapor barrier (Liquid Boot®) will be installed beneath the concrete slab under the day care center as an additional protective measure against vapor intrusion.
- A monitoring program will be implemented utilizing soil vapor monitoring points installed around the former source area to evaluate induced vacuum and volatile contaminant concentration reductions over time.

2.0 SITE DESCRIPTION AND HISTORY

The subject property (hereinafter referred to as the site or property) is located at 10700 MacArthur Boulevard (Figure 1). The site is approximately 13.5 acres in size and is currently developed with the Foothill Square Shopping Center. The shopping center consists of five buildings, together totaling approximately 155,600 square feet.

The site is situated in a mixed commercial and residential area of Oakland. The site is bound by MacArthur Boulevard to the west, Foothill Boulevard to the east, and 108th Avenue to the south. An ARCO gasoline station is located adjacent to the northwest and residences to the north. Refer to Figure 2 for a site plan of the western section of the Foothill Square Shopping Center property.

Construction of the shopping center began in the early 1960s. Additions to the original center continued through the 1970s, including the construction of a gas station at the southeastern corner in 1970. This gas station was operated by USA Petroleum which ceased operations and was eventually demolished in 1994. A current open leaking underground storage tank (LUST) case exists for this former gas station, the responsibility for which is with USA.

Between 1984 and 1995, Young's Cleaners, a dry-cleaning business, operated in one of the units of the shopping center, located at the southwestern end of the northern building (Figure 2). A release of PCE was discovered as part of an offsite investigation, which was later traced to Young's Cleaners. Below is a chronology of discovery, investigation, and mitigation of the release.

2.1 Preliminary Investigations

In August 1988, Kaldveer Associates performed a Preliminary Soil and Groundwater Quality Testing Program at the site. Fifteen soil borings were drilled to depths of 11.5 to 36.5 below ground surface (bgs) around the perimeter of the site. The investigation focused on past use of the site as a truck manufacturing facility, the then operating USA Gasoline Station on the southeast corner of the site, and an ARCO service station adjacent to the north west corner of the site. The result of the analytical program indicated the presence of hydrocarbons in the soil and groundwater in the northwest corner of the site, adjacent to the ARCO station.

WGR installed 5 groundwater monitoring wells (WGR-MW-1 to WGR-MW-5) on the shopping center property in January, 1989. Soil and groundwater samples confirmed the presence of petroleum hydrocarbons in the northwest corner of the site. Groundwater samples from well WGR-MW-2 and WGR-MW-3, contained low concentrations of 1,1-trichloroethane. Wells WGR-MW-1 through WGR-MW-3 and WGR-MW-5 were installed in what was described as the "shallow" groundwater, described as between 20 to 35 feet bgs. Well WGR-MW-4 was installed in what was described as the "deeper" groundwater zone, with the well slots from 25 to 45 feet bgs.

RESNA conducted several investigations of the ARCO service station between 1991 and 1993 to define the extent of the petroleum hydrocarbon release that occurred on that property. During their investigations, RESNA detected chlorinated volatile organic compounds (CVOCs) in several of their borings and wells. On March 23, 1993, the ACHCS requested that the vertical and lateral extent of PCE contamination, discovered on the shopping center by ARCO while investigating its release, be investigated by the shopping center owners.

2.2 Exploratory Excavation - 1994

In May 1994, Augeas performed an exploratory excavation within the Young's Cleaners location. Approximately 8 cubic yards of soil were removed from site of the coin operated dry cleaning machines. An area approximately 1.5 feet deep and 6 feet by 8 feet was excavated by the south wall of the facility. Augeas collected 4 soil samples (SB-1 through SB-4) from the floor and sidewalls of the shallow excavation which were analyzed by EPA method 8240. PCE was detected in these samples at concentrations ranging from 890 milligrams per kilogram (mg/kg) (SB-1) to 9,100 mg/kg (SB-2). Sample SB-2 was located about three feet directly below a floor drain that was shown by Augeas to be connected to the sanitary sewer.

In July 1994, the existing excavation was extended four feet to the west and deepened to about 4 feet bgs. On August 29, 1994, Augeas collected eight additional soil samples (H-1 through H-8) from floor and sidewalls of the excavation. PCE was reported at concentrations ranging from 1.4 mg/kg (H-2) to 5.0 mg/kg (H-3).

2.3 Site Characterization – 1994 to 1995

Between September and November 1994, Augeas drilled seven soil borings and three groundwater monitoring wells on the site. Boring B-1 was drilled to a depth of 5 feet bgs and borings B-2 through B-7 to depths of 21 to 25 feet bgs. One well AMW-1 was drilled near the back of Young's Dry Cleaners and two (AMW-2 and AMW-3) near the front of the facility.

Augeas reported PCE soil contamination in 5 of the soil borings (B-3 through B-7) and monitoring wells AMW-2 and AMW-3 at concentrations ranging from 0.012 mg/kg (B-3) to 90 mg/kg (AMW-2).

PCE was detected in groundwater samples from soil borings B-4 through B-6 at concentrations ranging from 870 micrograms per liter (µg/L) to 11,000 µg/L. No chlorinated solvents were detected in the groundwater sample from well AMW-1. The groundwater sample from well AMW-2, located in front of the drycleaners, adjacent to the sanitary sewer line was reported to contain PCE, trichloroethylene (TCE), cis & trans-1,2-dichloroethylene (c-1,2-DCE), (t-1,2 –DCE), 1,1-DCE and c-1,3-DCP at concentrations of 35,000 µg/L, 320 µg/L, 110 µg/L, 50 µg/L, 8 µg/L and 4.2 µg/L, respectively. Total petroleum hydrocarbons as Stoddard solvent (TPHs) was also reported in the groundwater sample from AMW-2.

In March 1995, Augeas installed two additional wells, AMW-4 and MW-5. Wells AMW-6 through AMW-9 were installed in July through August 1995. Based on the investigations, Augeas concluded that the PCE contamination centered on the Young's Cleaners, and was caused by a release of solvents from the drycleaner and associated sanitary sewer line in front of the facility. They also concluded that the extent of soil contamination was not wide spread. Augeas recommended that the PCE affected soil be excavated, thereby removing the source. Augeas expected this to result in reduction of PCE and other contaminant concentrations in the groundwater over time.

2.4 Source Excavation – 1995 to 1996

Between October 1995 and January 1996, AEI excavated PCE contaminated soil from beneath the Young's Cleaners and adjacent tenant spaces and around the sanitary sewer. Upon removal, the excavation was backfilled with clean imported fill. The lateral and vertical extent of the contamination was found to be greater than initially estimated by Augeas. Augeas initially recommended removal of soil with PCE concentrations in excess of 1.0 mg/kg. During excavation, PCE dechlorination products were identified for the first time in soil and the clean-up goal was revised to a total VOC concentration of 1.0 mg/kg. The resulting excavation extended into adjacent tenant spaces and required the removal of approximately 2,500 cubic yards of affected soil. During excavation activities, wells AMW-2 and AMW-3 were properly abandoned and destroyed.

This action was successful in removing a significant volume of highly impacted soil from the source area. However, several areas with residual total VOC concentrations above the 1.0 mg/kg goal remained at the final extent of excavation: 1) The northwest corner of the Young's Cleaners space, where total VOCs were 1.8 mg/kg and 1.9 mg/kg at depths of 4 and 8 feet respectively; 2) beneath the breezeway west of the former cleaners where total VOCs were 2.5 mg/kg at a depth of 5 feet; and 3) beneath the breezeway, in front of and east of the former location of Young's Cleaners (near AMW-3), where total VOC of 1.4 mg/kg were reported in the boring at a depth of 25.5 feet bgs (outside of the extent of the excavation).

The excavated soil was spread over the southeaster corner of the property. In February 1996, ten soil samples were collected by AEI from the stockpile and analyzed for VOCs to evaluate baseline concentrations in the stockpile. PCE was detected in these samples at concentrations ranging from ND<5.0 μg/kg to 380 μg/kg. TCE was detected in three samples at concentrations ranging from 11 μg/kg to 38 μg/kg. No other VOCs were detected in the stockpile.

The soil stockpile was tilled between February 1996 and January 1997. In January 1997 and again in May 1999, stockpile sampling occurred. During the May 1999 sampling, PCE was only detected in one of eight samples, at 28 μg/kg. Based on the sampling data, limited reuse of the soil was approved.

2.5 Additional Groundwater Investigation and Risk Evaluation

To assess potential offsite migration of PCE in the groundwater, PES Environmental performed a preliminary investigation consisting of a CPT survey and HydroPunch ™ sampling of the groundwater. The survey consisted of obtaining CPT measurements at nine locations (HP-1 through HP-9), to depths of up to 60 feet. Following the collection of the CPT data, water samples were collected from HydroPunch ™ borings located within several feet of the CPT locations.

In the "shallow" zone, groundwater samples could not be collected from drilling locations HP-1, HP-3, HP-5 HP-6 and HP-9. Although, the CPT logs indicated that the silts of the "shallow" aquifer were saturated and monitoring wells in this interval are productive, the low transmissivity of the silts and clays prevented groundwater sample collection in this shallow zone using this sampling technique. PCE was only detected in groundwater at location HP-7, at 230 μg/L. No PCE has been detected in the "shallow" zone in offsite borings.

In the “deep” groundwater zone, PCE was detected in borings HP-0, HP-1, HP-6 and HP-9 at concentrations of 440 μg/l, 20 μg/L, 40 μg/L, and 25 μg/L, respectively. This data indicated that although PCE had been detected at the ARCO station at concentrations up to 2,600 μg/L, only low concentrations of PCE were present in the “deep” groundwater zone west of MacArthur Boulevard and west toward 106th Avenue.

PES concluded that the PCE plume had not migrated substantially off site and was stable. They attributed the stability of the plume primarily to natural attenuation. PCE dechlorination products were observed, including TCE and cis- and trans- 1,2-DCE.

An evaluation of risk to human health via migration of contaminant vapors into the occupied building spaces was documented in the February 15, 1996 report prepared by PES. The numerical evaluation modeled the indoor concentrations of the site contaminants (PCE, TCE, 1,1-DCE, 1,2-DCE, cis- and trans-) using residual contaminant concentrations in soil. The modeled indoor air contaminant concentrations were below their respective Preliminary Remediation Goals (PRGs) (US EPA Region IX, 1995) and, therefore, it was concluded that the concentrations of remaining contaminants in the soil did not pose a significant threat to human health. This finding was concurred with by the ACHCS and Regional Water Quality Control Board (RWQCB) in letters dated March 26, 1996 and March 21, 1996, respectively.

Based on the findings of the groundwater investigation, PES recommended that two additional down gradient “sentry” wells be installed to monitor the down gradient edge of the groundwater plume. In July 1997, these two wells (FHS-MW-10 and FHS-MW-11) were drilled and installed at depths of 54.5 and 62.5 feet bgs, respectively. Sampling of these wells began in September 1997. During subsequent groundwater monitoring, PCE was detected in well FHS-MW-10 and FHS-MW-11 at maximum concentrations of 18 μg/L and 12 μg/L, respectively. Monitoring continued on a roughly semi-annual basis through the present.

2.6 Additional Investigation – 2006 & 2007

On October 11 through October 13, 2006, two soil borings (SB-1 and SB-2) and a total of seventeen (17) soil gas probes (VB-1 through VB-17), each with a shallow boring as well as a deep boring, were advanced by AEI. The investigation was performed at the request of the ACHCS to evaluate the presence of vapor phase contaminants within and around the release area and the possibility of contaminant vapor intrusion. In addition, a groundwater monitoring and sampling event for the existing monitoring well network was performed at this time.

Results of soil vapor sample analyses indicate the presence of subsurface vapor phase contaminants, include PCE, TCE, cis-1,2 DCE, and vinyl chloride. The highest concentrations detected were in the area of the former excavation of impacted soil, likely the result of low concentrations of residual contaminants that remained upon completion of the excavation activities. Vapor phase contaminant concentrations decrease significantly away from the former release area. The data suggests that vapor phase migration along the onsite utility corridor has not occurred.

Following review of this 2006 report by ACHCS, it was agreed the additional soil vapor investigation was needed to further characterize the extent of vapor phase impact prior to finalization of remedial approach for the residual impact. Subsequently on June 25, 2007, AEI performed the additional soil vapor investigation to further define the extent of the PCE release from the former Young's Cleaners. A total of eight soil gas samples were collected from five additional probe locations to the northeast of the former release area, where previous investigations had been limited. Based on the analyses of the eight additional soil gas samples, it was determined that PCE and related contaminants (TCE, c-1,2 DCE, t-1,2 DCE, and VC) have not spread northwest of the release area beneath the existing building. Therefore it was determined that the extent of the contamination is confined to non-detectable concentrations to the east, north, and northwest of the former Young's Cleaners.

Locations of monitoring wells, previous soil borings, and soil vapor sampling locations are presented on Figure 2. Historical soil data is included on Table 1, and historical soil vapor data is included on Table 2 and Figure 3. Historical groundwater monitoring and sample analytical data is presented in Tables 3 and 4.

3.0 GEOLOGY AND HYDROGEOLOGY

The subject site is located on the eastern edge of the East Bay, a broad, gently westward sloping area produced by coalescing alluvial fans and bay margin plains along the eastern shore of San Francisco Bay. In the site vicinity the sediments underlying the surface are mapped as Holocene aged alluvium, consisting of weakly consolidated, slightly weathered poorly sorted, irregularly bedded clay, silt, sand and gravel, interpreted to be primarily alluvial fan and fluvial deposits. These alluvial fan deposits extend westward over the Late Pleistocene Alameda formation, the major basin-filling unit in the area.

On the eastern portion of the site in the vicinity of the former USA station, the alluvial sediments are underlain at depths ranging from 12 to 25 feet bgs by deeply weathered highly fractured silty sandstone, siltstone, claystone and chert. These units are interpreted as bedrock and may be part of the Cretaceous aged Novato Quarry terrain sandstones similar to what is exposed to the north of the northwest of the site along the west side of the Hayward Fault. On the eastern edge of the site, the Hayward fault separates the sediments of the East Bay Plain from the igneous rocks that comprise the western portion of the adjacent San Leandro Hills.

During the 2006 site investigation, soil borings SB-1 and SB-2 revealed the presence of silty clay to the maximum depth explored (18 feet bgs). The silty clay contained varying amounts of sand with a maximum of up to approximately 25% sand content. During the June 2007 soil vapor probe installation, two probes out of five encountered refusal at a depth of 6 feet bgs, northeast of the release area.

3.1 Hydrology

Historically the groundwater had been classified as "shallow" or "deep" aquifers or "zones". The shallow water table has been reported at depths ranging from approximately 10 feet bgs to 24 feet bgs and the deep at depths ranging from approximately 14 feet bgs to 45 feet bgs. AEI interprets the underlying groundwater to represent a single complex aquifer that consists of highly variable sediments ranging from high transmissivity gravel to low transmissivity silt. Wells are completed with well screens of varying lengths installed at varying depths based on were sands, if any, were encountered. Refer to Table 3 for well construction details, where known. This combination of variable screens and sediments results in highly variable groundwater elevation data in the wells. Examination of the CPT and well logs show that few if any sands are continuous across the site and that the silts between the sands are apparently water saturated. With this taken into account, the following hydrologic generalizations can be made. Based on the available data, the gradient across the ARCO site appears to be generally to the south. The gradient between the ARCO site and the former Young's dry cleaners appears generally to be to the southwest. The reported gradients at the USA site have been in all directions, both radial internal and external (at times influenced by remedial efforts); however, a southeasterly direction is predominant. These gradients are consistent with the general topography which shows a slight southwesterly swale along the north side of the site and a slight southwesterly nose through the former USA station. These topographic features are likely are reflective of the underlying bedrock topography and would effect shallow groundwater flow. Actual groundwater movement would also preferentially follow higher transmissivity sediments of variable orientations.

Groundwater in the shallow wells has historically flowed towards the west and that in the deeper wells towards the west/southwest.

4.0 CURRENT CONDITIONS

Based on the results of the 2006 and 2007 soil vapor investigations, residual PCE and related CVOCs remain in the subsurface in the immediate vicinity of the former release area. The 1996 soil excavation activities greatly reduced the mass of CVOCs present in the release area. Since these activities, dissolved concentrations within and down-gradient of the source area have significantly decreased, confirming that the source area was adequately remediated to protect long-term groundwater quality. Both the ACHCS and RWQCB agreed with the 1996 PES report that there was no significant human health threat associated with the residual impact, although the recent data suggests that vapor intrusion into the building is a potential. Concentrations of PCE, TCE, c-1,2 DCE, and VC detected in shallow soil vapor samples exceed current regulatory commercial / industrial and residential (sensitive) land use screening levels for potential vapor intrusion. Soil vapor sample data is presented in Table 2 and on Figure 3. The upcoming major renovations to the building will provide an opportunity to perform remedial installations where access would normally be significantly limited.

5.0 REMEDIAL OPTION EVALUATION

The primary goal of remedial measures at this time is to eliminate the potential for vapor intrusion in the building area immediately over and around the former source area and secondarily to treat residual source material. Several remedial options have been considered for the site given the nature of residual impact, site conditions and plans for the building, practicality and cost of implementation, and likelihood of success. These include *in situ* treatment of residual contaminants, excavation of impacted soil, vapor extraction, and natural attenuation.

In situ treatment options involve injecting material into the source area to chemically and/or biologically breakdown the contaminants of concern. Several chemical oxidants are widely used to directly destroy site contaminants, including ozone, peroxide, and permanganates. Enhanced reductive dechlorination involves injecting electron donors and amendments to promote anaerobic breakdown of site contaminants. These materials are injected through wells or borings directly into the impacted area. Limiting factors in the success of *in situ* treatments include complex biological and geochemical reactions, permeability restrictions in delivering treatment media directly to target contaminants, the creation of unwanted byproducts, and the need to perform multiple episodes of injection. While an appropriate *in situ* treatment could be expected to be successful at the site, this approach would not directly reduce subslab soil vapor contaminant concentrations without supplemental measures (such as venting and/or vapor barrier).

Excavation of impacted soil is not considered practical or cost effective to mitigate vapor phase contaminants as a stand alone approach. Based on the extent and volume of previous soil removal action, limited source material is expected to remain, in which case excavation of the limited source material would be an effective remedial measure. Although not the primary remedial approach to mitigate the potential for vapor intrusion, a contingency for removal of residually impacted shallow soil is included.

Vapor extraction involves the use of vacuum equipment to remove volatile organic compounds, including site contaminants, from the subsurface through extraction wells and/or trenches. In addition to removing site contaminants, the application of a vacuum creates a zone of negative pressure in the subsurface. This pressure differential between the soils beneath a building and the interior of the building reverses the pressure gradient which can cause vapor intrusion into overlying buildings. The pressure gradient upward into the building [cased by the stack and venturi (wind) effects and building ventilation characteristics] is utilized in the Johnson and Ettinger model to estimate amount of a volatile contaminant within a building. By reversing this gradient, vapor intrusion cannot occur. This use of 'sub-slab' venting has been widely used to reduce vapor intrusion in structures overlying volatile contaminants. Limitations of vapor extraction and sub-slab venting include the air permeability of soils, the need to monitoring and equipment maintenance, and performing installations in and around buildings.

Monitored natural attenuation of groundwater has been successful at the site following source removal. However, based on the presence of residual vapor phase contaminants, this will not be sufficient alone to mitigation possible vapor intrusion in a timely manner.

6.0 PROPOSED REMEDIAL ACTIVITIES

Soil vapor extraction and subslab depressurization have been selected to mitigate possible vapor intrusion and allow for unrestricted use of the property building until closure can be achieved. The system has been designed to remove PCE vapors from shallow soil and reverse the pressure gradient between the soil and the building, thereby making the vapor intrusion exposure pathway incomplete. As an added level of protection, a vapor barrier will be installed beneath the concrete slab over the former release area. A monitoring program will be implemented to verify the effectiveness of mitigation. This western portion of the building, include the former Young's cleaners area and space to the west will be significantly remodeled, with interior improvements removed and refurbished, providing opportunity for installations prior to re-occupancy of these spaces.

6.1 Soil Sampling and Contingency Source Excavation

Upon removal of the building slab in the barrier area (see Section 3 and Figure 4), shallow soil testing will be performed to assess whether residually impacted soil remains. Soil samples will be collected at depths of approximately 2 feet and 5 feet bgs. Borings will be placed at approximately 20 foot spacing within this area (9 total). Soil samples will be analyzed for CVOCs by EPA method 8260. Site contaminants that exist above Environmental Screening Levels for shallow soil for potential vapor intrusion (PCE > 0.087 mg/kg; TCE>0.26 mg/kg; c-1,2 DCE>1.6 mg/kg; t-1,2 DCE>3.1 mg/kg; and VC> 0.0067 mg/kg) will be considered for removal. The removal action is intended to remove easily accessible residually impacted soil to a depth of up to 5 feet bgs that may act as a continued source for potential vapor intrusion. If based on the soil sample data, excavation is planned, the ACHCS will be provided with analytical results, sampling locations, and planned excavation extent for review. Otherwise, if no samples exceed the above stated levels, the installations discussed below will proceed without soil removal activities.

If soils are excavated, they will be temporarily stockpiled onsite. Any stockpiled soil will be placed over visqueen sheeting, appropriately covered and surrounded by appropriate runoff control. Upon acceptance for disposal, soils will be transported under appropriate manifest to an approved disposal facility. Upon completion of removal action, the area will be backfilled prior to proceeding with the tasks outlined below. Backfill material and compaction will be in accordance with the engineering requirements of the site building.

6.2 Sub-slab Venting and Vapor Extraction Installations

The subslab venting and vapor extraction system will consist of a series of horizontal extraction wells placed in and around the former source area. In addition, a single vertical excavation well screened from a depth of 6 to 11 feet bgs will be installed in the identified hot-spot (boring VB-11). Layout and screen interval of the horizontal extraction / venting wells and the vertical well are shown on Figure 4.

If excavation of impacted soil is performed, backfilling will occur prior to installation of the venting and barrier system. Each horizontal well will be constructed within an approximately 1 foot deep trench beneath the bottom of the building slab. The horizontal wells will consist of 15 feet of 4” diameter 40 PVC 0.020 to 0.040 slotted casing and set within clean, medium grained sand in the trench. The piping will be reduced to 2” diameter, schedule 40 PVC blank casing plumbed to equipment housing area. The vertical well will be constructed of 5 feet of 4” diameter 40 PVC 0.020 to 0.040 slotted casing set to a depth of approximately 11 feet (just above historical high groundwater) installed using hollow stem auger equipment under an appropriate drilling / well construction permit. The vertical well will be constructed with a sand pack to depth of 5 feet, a bentonite seal and grout seal to the surface. The vertical extraction well and horizontal wells will be piped to a manifold for connection to a common header. Each well will be equipment with a flow control valve, vacuum gauge, and sample ports. The proposed location for the SVE piping and tentative equipment placement is shown on Figure 4. Refer to Appendix C for a typical extraction trenching diagram.

Upon completion of installations (see Sections 6.2 and 6.3), a venting test will be run for up to 1 day to allow for selection of appropriate vacuum equipment sizing. Using vapor probes, induced vacuums will be recorded, flow rates, and contaminant concentrations will be measured. Several design features for the subslab system are based on radon mitigation standards which are applicable to vapor intrusion sites (Folkes, 2002). A subslab induced negative pressure of -0.025 to -0.035 inches of water is generally considered minimum to eliminate vapor intrusion potential (ASTM 2003). Equipment capacity will be selected with a factor of safety to ensure that adequate vacuum is applied beneath the building. Effluent will be treated with granular activated carbon filtration under Bay Area Air Quality Management District (BAAQMD) permit.

6.3 Vapor Membrane Barrier (Liquid Boot)

Although operation of the proposed subslab venting and extraction system will eliminate or significantly reduce the vapor intrusion potential, for an added safety factor, a vapor barrier will also be installed beneath the portion of the building slab. The proposed extent of the barrier is shown on Figure 4. The barrier will cover an area approximately 3,600 square feet over the release area. The proposed barrier system will be the 60 dry mil Cetco Liquid Boot ® Brownfield Membrane / Liner, product specifications and installation guidelines are provided in Appendix A. The membrane is spray-applied to geotextile fabric over compacted subgrade material. The liner will be installed by a manufacturer approved contractor in accordance with manufacturer’s specifications to adequately seal the liner to grade beams, slab cuts, footings, and penetrations. All joints and seals will be inspected following installation and a smoke test will be performed to ensure that the barrier is properly installed.

6.4 Soil Vapor Monitoring Points

Subsurface conditions and venting performance will be monitored through five soil vapor monitoring points (labeled VM-1 to VM-5). In each location, two soil gas monitoring points will be installed, one at 6 to 12 inches below the slab and the second at a depth of 5 feet.

Soil gas probes will be installed using a hand auger to the desired depth. Approximately 6" of #2/16 sand will then be placed in the bottom of the borehole and a 6" long stainless steel vapor sampling implant attached to ¼-inch O.D. Kynar or equivalent tubing will then be lowered to the terminus of the boring. #2/12 sand is then placed around the implant to approximately 6" above the top of the implant. Hydrated bentonite is placed above the sand pack to seal the probe interval from overlying soils. A gas-tight Swagelok® valve will be used to cap the sampling tube. Refer to Figure 4 for the proposed locations for the soil gas probes. Each probe will be finished with a utility access port flush with the grade of the slab in location that can be accessed for sampling and other measurements (such as a bathroom, storage closet, or maintenance / utility room). The exact location for the final soil vapor monitoring points may be adjusted slightly based on architecture design plans for the new building layout. Probes within the vapor barrier will be installed before barrier installation so that a seal is formed around the probe tubing. Refer to Appendix B for a typical soil vapor probe diagram.

The probes will be utilized to collect soil gas samples and measure subsurface induced vacuum to monitor the effectiveness of the venting system and reduction of contaminant concentrations and for eventual data collection need to support a formal case closure.

7.0 MONITORING AND OPERATIONS & MAINTENANCE

Following installation of the venting system components, vapor barrier, and soil gas probes, and startup of the system, a regular monitoring and operations and maintenance (O&M) program will be implemented. Daily field inspections and measurements will be made during the first week and weekly visits during the remainder of the first month to optimize system performance and operation. Following the first month through 1 year of operation, inspections and monitoring will occur on a bi-weekly to monthly basis, as needed. At a minimum, monthly measurements of induced vacuum will be measured from both depths of each soil gas probe, manifold vacuum recorded, and combined influent and effluent samples collected in accordance with anticipated BAAQMD minimum permit requirements. Monthly data and mass removal calculations will be performed and submitted to BAAQMD, as necessary. Other system checks will be performed as necessary to ensure proper operation.

Semi-annual sampling of soil gas probes will be performed with the ongoing groundwater monitoring program. Probes will be sampled in accordance with the *Advisory – Active Soil Gas Investigation*, dated January 28, 2005, issued by the Department of Toxic Substances Control (DTSC) and Los Angeles RWQCB. Samples will be analyzed for PCE, TCE, c-1,2 DCE, t-1,2 DCE, VC, and an appropriate leak check by either a certified mobile laboratory or via EPA method TO-15 at a fixed laboratory.

8.0 REPORTING

Following installation and startup, a report will be prepared presenting the details of the remedial installations. The report will include as built diagrams of system components, measurements and documentation of the installations, and startup and operational data from approximately the first 3 months.

Regular semi-annual groundwater monitoring reports will also include data on semi-annual soil gas sampling, subsurface vacuum readings, and operational parameter of the venting system, including flows, applied vacuum, compliance sample data, and maintenance activities. Data evaluation will include CVOC removal rates, extent of venting influence, and may include recommendations relating to ongoing operation of the venting system. The system is proposed to operate for one year after which time, data will be reviewed with ACHCS to determine the need for continued operations. It is expected that a after a period of operation, vapor monitoring points will be utilized to assess subsurface soil vapor conditions along with ongoing groundwater monitoring data for an eventual case closure.

9.0 HEALTH AND SAFETY PLAN

AEI will prepare a site specific Health and Safety Plan (HSP) conforming to Part 1910.120 (i) (2) of 29 CFR. The HSP will designate a site safety office, will include a hazard assessment associated with the required tasks, and outline specific appropriate monitoring criteria and work practices. Prior to commencement of each day's field activities for installation of remedial equipment, a site safety meeting will be held at a designated command post near the working area. The HSP will be reviewed with all personnel performing work on these tasks and emergency procedures will be outlined at this meeting, including an explanation of the hazards of the known or suspected chemicals of interest. The HSP will outline required levels of personal protective equipment (PPE) and criteria for changing levels of PPE. A working area will be established to delineate the zone where required PPE must be worn, and where unauthorized personnel will not be allowed. The HSP will be on site at all times during the project. An operation manual for remedial equipment will be onsite at all times once installed and operation. The manual will outline safety features of the equipment, emergency shutdown procedures, and 24-hour emergency contact information for the manager of the property, AEI primary project personnel, and local emergency services. Key site personnel, including the facility manager, will be provided with necessary safety and contact information.

10.0 WASTE HANDLING

Spoils from the remedial installations and work within the former release area, along with excavated soil, if any, will be stored temporarily onsite. If no excavation work is to be performed, soil generated from remedial installations will be temporarily placed within a covered soil bin in a secure area. Any stockpiled soil will be placed over plastic sheeting, surrounded by runoff control waddles, and covered with plastic sheeting to limit potential contact and prevent runoff. Soils will be sampled and profiled for disposal and upon acceptance, transported under appropriate waste manifest to the approved landfill.

11.0 SCHEDULE

Renovation activities for the portions of the shopping center building are underway, with work in the area of the former Young's Cleaners to begin shortly. Several of the tenant spaces are currently vacant; once the remainder of the spaces is vacated, field installation will be begin. BAAQMD permit applications will be submitted once a detailed renovation schedule has been established. Formal startup of the venting system will occur following permit approval. ACHCS staff will be provided with a detailed schedule of field activities once established to perform field inspections, as necessary.

12.0 REFERENCES

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13.0 CLOSING AND SIGNATURES

This document has been prepared by AEI Consultants for the property located at 10700 Foothill Boulevard, Oakland, Alameda County, California, and presents information from previous investigation, summary of conditions and plans and presents a scope of work relating to the historical release of hazardous materials on the property. Portions of this report rely on previous field investigations, laboratory testing of material samples, and evaluations performed by AEI and others. AEI is not responsible for the accuracy or quality of work performed by others, information not available or provided to AEI, and other data or information gaps. This report does not reflect subsurface variations that may exist between sampling points. These variations cannot be anticipated, nor could they be entirely accounted for, in spite of exhaustive additional testing. This report should not be regarded as a guarantee that no further contamination, beyond that which could have been detected within the scope of past investigations, is present beneath the property or that all contamination present at the site would be identified, treated, or removed. Undocumented, unauthorized releases of hazardous material(s) and petroleum products, the remains of which are not readily identifiable by visual inspection and/or are of different chemical constituents, are difficult and often impossible to detect within the scope of a chemical specific investigation and may or may not become apparent at a later time. All specified work was performed in accordance with generally accepted practices in environmental engineering, geology, and hydrogeology which existed at the time and location of the work.

If you have any questions regarding our investigation, please do not hesitate to contact the undersigned at (925) 944-2899.

Sincerely,
AEI Consultants

Jeremy Smith
Project Manager

Peter J. McIntyre, PG, REA
Senior Project Manager

REGISTERED GEOLOGIST
PETER J. MCINTYRE
Exp. 5/31/08
No. 7702
STATE OF CALIFORNIA

For
Ricky Bradford
Project Engineer

Distribution:
Jay-Phares Corp. Attn: John Jay, 10700 MacArthur Blvd., Oakland, CA 94605
Alameda County Health Care Services, Attn: Barney Chan, 1131 Harbor Bay Parkway, Suite 250, Alameda, CA 94502 (Electronic Upload to ACHCS FTP)
GeoTracker Database

FIGURES

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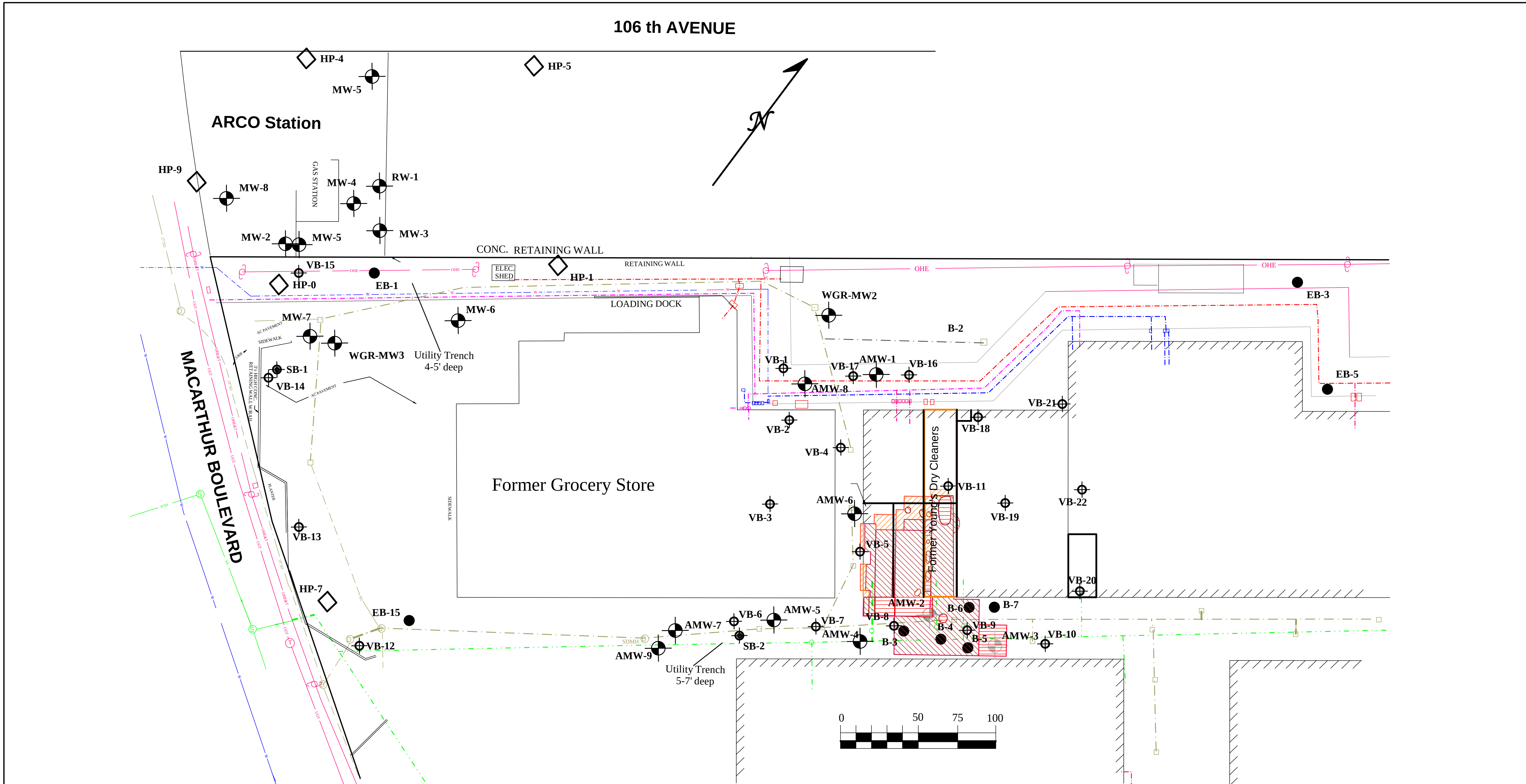
AEI CONSULTANTS

2500 Camino Diablo, Suite 200, Walnut Creek, CA 94597

SITE LOCATION MAP

10700 MACARTHUR BLVD
OAKLAND, CALIFORNIA

FIGURE 1
PROJECT NO. 261829



KEY

EB-1 ●	Soil Boring - Kaldveer 1988	Excavated to depth of 5 to 7 feet bgs		On Site Storm Drain
B-1 ●	Soil Boring - Augeas 1994	Excavated to depth of 8 to 13 feet bgs		Off Site Storm Drain
HP-8 ◇	CPT Boring/HydroPunch Sample - PES 1997	Excavated to depth of 14 to 18 feet bgs		On Site Sanitary Sewer
MW4	Groundwater Monitoring Well			Off Site Sanitary Sewer
				On Site Underground Power
				On Site Gas Line

Drafted 6/30/05 - RFF on Dirk Slooten base
Revised 10/19/07 by J.SMITH

AEI CONSULTANTS

2500 CAMINO DIABLO, WALNUT CREEK, CA

SITE PLAN

10700 MACARTHUR BLVD.
OAKLAND, CALIFORNIA

FIGURE 2
PROJECT NO. 261829

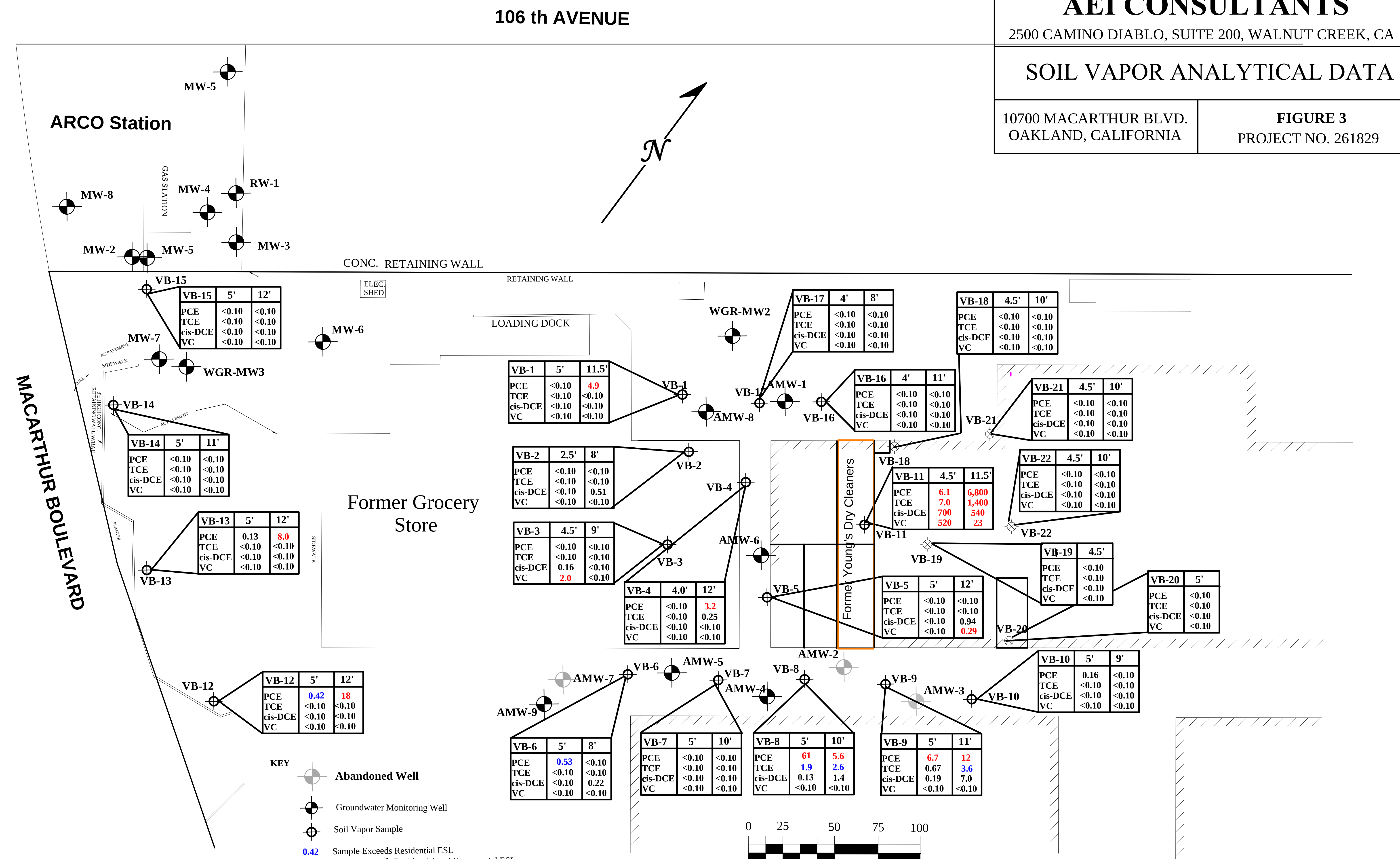
AEI CONSULTANTS

2500 CAMINO DIABLO, SUITE 200, WALNUT CREEK, CA

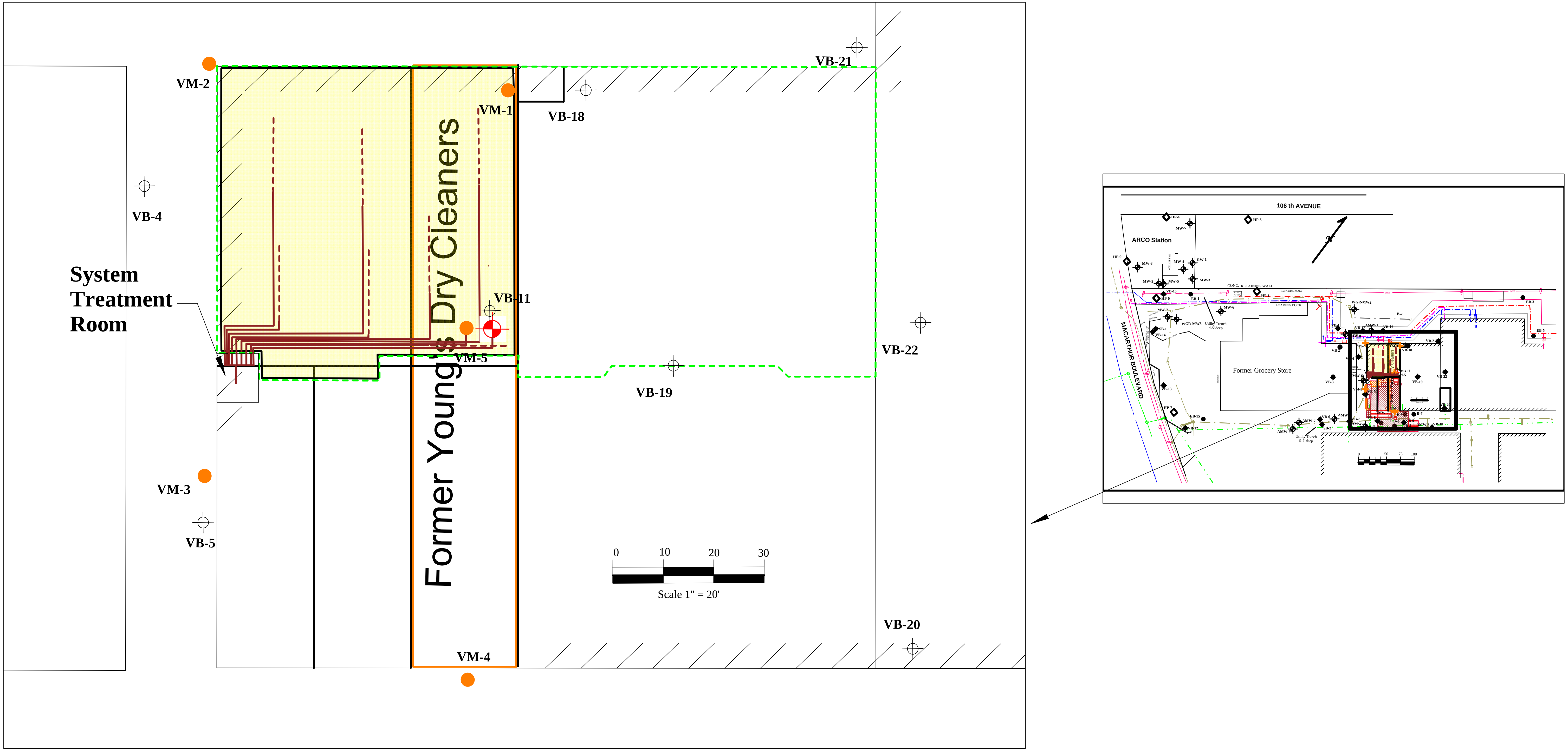
SOIL VAPOR ANALYTICAL DATA

10700 MACARTHUR BLVD.
OAKLAND, CALIFORNIA

FIGURE 3
PROJECT NO. 261829



DRAFTED 6/30/05 BY R. FLORY ON D. SLOOTEN BASE
REVISED 7/31/07 BY R. BRADFORD



Extent of Liquid Boot Barrier

Soil Vapor Monitoring Point

Vapor Extraction Well

Previous Soil Vapor Probe

Extraction Line (PVC Blank)

Extraction Line (PVC Screen)

Proposed Extent of Head Start Program

AEI CONSULTANTS

2500 CAMINO DIABLO, WALNUT CREEK, CA

PROPOSED VENTING SYSTEM, BARRIER, AND MONITORING POINTS

10700 MACARTHUR BLVD.
OAKLAND, CALIFORNIA

FIGURE 4
PROJECT NO. 261829

TABLES

Table 1

Summary of Historical Analytical Results for Soil

Foothill Square Shopping Center, 10700 MacArthur Blvd., Oakland, California

Sample Location	Sampled By	Depth (ft bgs)	Date Sampled	Concentrations reported in micrograms per kilogram (µg/kg)							Comments
				PCE	TCE	c-1,2-DCE	t-1,2-DCE	1,1-DCE	1 ,1,1- TCA	VC	
WGR MW-1	WGR	20	12/5/1988	<5	<5	<5	<5	<5	<5	<5	
		31.5	12/5/1988	<1	<1	<1	<1	<1	<1	<1	
WGR MW-2	WGR	20	12/5/1988	<1	<1	<1	<1	<1	<1	<1	
		40.5	12/5/1988	<1	<1	<1	<1	<1	<1	<1	
WGR MW-3	WGR	18	12/6/1988	<1	<1	<1	<1	<1	<1	<1	
		38.5	12/6/1988	<2	<2	<2	<2	<2	<2	<2	
WGRMW-4	WGR	14.5	12/7/1988	<1	<1	<1	<1	<1	<1	<1	
		49	12/7/1988	<1	<1	<1	<1	<1	<1	<1	
WGRMW-4	WGR	14.5	12/8/1988	<5	<5	<5	<5	<5	<5	<5	
B-2	Augeus	6	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		11	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		16	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		21	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		24	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
B-3	Augeus	6	10/7/1994	**15**	<8	<5	<6	<12	<12	<20	Soil Excavated
		13	10/7/1994	<10	<8	<5	<6	<12	<12	<20	
		16	10/7/1994	**12**	<8	<5	<6	<12	<12	<20	
		21	10/7/1994	**27**	<8	<5	<6	<12	<12	<20	
B-4	Augeus	5.5	10/7/1994	**1,600**	**150**	**120**	<6	<12	<12	<20	Soil Excavated
		11	10/7/1994	**70**	<8	**22**	<6	<12	<12	<20	Soil Excavated
		16	10/7/1994	**100**	<8	**9**	<6	<12	<12	<20	
		21	10/7/1994	**30**	<8	<5	<6	<12	<12	<20	
B-5	Augeus	6.5	11/3/1994	**1,600**	<5	<5	<5	<5	<5	<10	Soil Excavated
		11	11/3/1994	**450**	<5	<5	<5	<5	<5	<10	Soil Excavated
		16	11/3/1994	**440**	<5	<5	<5	<5	<5	<10	
		21	11/3/1994	<5	<5	<5	<5	<5	<5	<10	
		26	11/3/1994	<5	<5	<5	<5	<5	<5	<10	
B-6	Augeus	11	11/3/1994	**5,000**	<5	<5	<5	<5	<5	<10	Soil Excavated
		15.5	11/3/1994	**590**	<5	<5	<5	<5	<5	<10	
		21	11/3/1994	<5	<5	<5	<5	<5	<5	<10	
		26	11/3/1994	<5	<5	<5	<5	<5	<5	<10	
B-7	Augeus	10.5	11/23/1994	**38**	<5	<5	<5	<5	<5	<10	
		15.5	11/23/1994	**60**	<5	<5	<5	<5	<5	<10	
		20.5	11/23/1994	<5	<5	<5	<5	<5	<5	<10	
		25.5	11/23/1994	<5	<5	<5	<5	<5	<5	<10	

Table 1

Summary of Historical Analytical Results for Soil

Foothill Square Shopping Center, 10700 MacArthur Blvd., Oakland, California

Sample Location	Sampled By	Depth (ft bgs)	Date Sampled	Concentrations reported in micrograms per kilogram (µg/kg)							Comments
				PCE	TCE	c-1,2-DCE	t-1,2-DCE	1,1-DCE	1 ,1,1- TCA	VC	
B-8	Augeus	6	3/23/1995	<0.5	<0.5	-	<0.5	-	<0.5	<1.0	
AMW-1	Augeus	4	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		6	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		11	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		16	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		21	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		26	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		31	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
		34	9/12/1994	<5	<5	<5	<5	<5	<5	<5	
AMW-2	Augeus	10	9/30/1994	**22,000**	**50**	**250**	<6	<12	<12	<20	Soil Excavated
		15	9/30/1994	**90,000**	**600**	**210**	<6	<12	<12	<20	Soil Excavated
		20	9/30/1994	**400**	**20**	**30**	<6	<12	<12	<20	
		25	9/30/1994	**30**	<8	<5	<6	<12	<12	<20	
AMW-3	Augeus	5.5	11/18/1994	**6**	<5	<5	<5	<5	<5	<10	Soil Excavated
		10	11/18/1994	**390**	<5	<5	<5	<5	<5	<10	Soil Excavated
		15.5	11/18/1994	**59**	<5	<5	<5	<5	<5	<10	Soil Excavated
		20.5	11/18/1994	**820**	<5	<5	<5	<5	<5	<10	
		25.5	11/18/1994	**1,400**	<5	<5	<5	<5	<5	<10	
		30	11/18/1994	**210**	<5	<5	<5	<5	<5	<10	
AMW-4	Augeus	6	3/22/1995	**870**	<5	-	<5	-	<5	<10	
		11	3/22/1995	**13**	<0.5	-	<0.5	-	<0.5	<1.0	
		16	3/22/1995	**7.5**	<0.5	-	<0.5	-	<0.5	<1.0	
		21	3/22/1995	**5.3**	<0.5	-	<0.5	-	<0.5	<1.0	
		26	3/22/1995	<0.5	21	-	<0.5	-	<0.5	<1.0	
AMW-5	Augeus	6	3/22/1995	**1.1**	<0.5	-	<0.5	-	<0.5	<10	
		11	3/22/1995	<0.5	<0.5	-	<0.5	-	<0.5	<1.0	
		16	3/22/1995	<0.5	<0.5	-	<0.5	-	<0.5	<1.0	
		21	3/22/1995	<0.5	<0.5	-	<0.5	-	<0.5	<1.0	
		26	3/22/1995	<0.5	<0.5	-	<0.5	-	<0.5	<1.0	
		31	3/22/1995	<0.5	<0.5	-	<0.5	-	<0.5	<1.0	
AMW-6	Augeus	6	8/1/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	
		11	8/1/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		16.5	8/1/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		21	8/1/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		26	8/1/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	

Table 1

Summary of Historical Analytical Results for Soil

Foothill Square Shopping Center, 10700 MacArthur Blvd., Oakland, California

Sample Location	Sampled By	Depth (ft bgs)	Date Sampled	Concentrations reported in micrograms per kilogram (µg/kg)							Comments
				PCE	TCE	c-1,2-DCE	t-1,2-DCE	1,1-DCE	1 ,1,1- TCA	VC	
AMW-7	Augeus	6	8/2/1998	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	
		11.5	8/2/1998	**33**	**14**	<0.5	<0.5	<0.5	<0.5	<1.0	
		16	8/2/1998	**60**	**10**	<0.5	<0.5	<0.5	<0.5	<1.0	
		21	8/2/1998	**85**	**11**	<0.5	<0.5	<0.5	<0.5	<1.0	
		26	8/2/1998	**210**	**39**	<0.5	<0.5	<0.5	<0.5	<1.0	
AMW-8	Augeus	6	2/28/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	
		11	2/28/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		16.5	2/28/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		21	2/28/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		26	2/28/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		31.5	8/1/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		36.5	8/1/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		41	8/1/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		46	8/1/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		51.5	8/1/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
AMW-9	Augeus	5	7/31/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		9.5	7/31/1995	**29**	**17**	<0.5	<0.5	<0.5	<0.5	<1.0	
		14.5	7/31/1995	**120**	**31**	<0.5	<0.5	<0.5	<0.5	<1.0	
		19.5	7/31/1995	**27**	**7.7**	<0.5	<0.5	<0.5	<0.5	<1.0	
		24.5	7/31/1995	**110**	**2.1**	<0.5	<0.5	<0.5	<0.5	<1.0	
		31	8/2/1995	**30**	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		36	8/2/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		41	8/2/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		45	8/2/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		51	8/2/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	
		54.5	8/2/1995	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	

Table 2:
Historical \Soil Vapor Analytical Results
10700 MacArthur Blvd., Oakland, California

Sample ID	Date	Depth (feet bgs)	PCE µg/L	TCE µg/L	cis-1,2-DCE µg/L	trans-1,2 DCE µg/L	Vinyl Chloride µg/L
October 2006 Investigation							
VB-1-5	10/12/2006	5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-1-11.5	10/12/2006	11.5	**4.9**	**0.44**	ND<0.10	ND<0.10	ND<0.10
VB-2-2.5	10/12/2006	2.5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-2-8	10/12/2006	8	ND<0.10	ND<0.10	**0.51**	ND<0.10	ND<0.10
VB-3-4.5	10/12/2006	4.5	ND<0.10	ND<0.10	**0.16**	ND<0.10	**2.0**
VB-3-9	10/12/2006	9	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-4-4	10/13/2006	4	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-4-12	10/13/2006	12	**3.2**	**0.25**	ND<0.10	ND<0.10	ND<0.10
VB-5-5	10/13/2006	5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-5-12 [1]	10/13/2006	12	ND<0.10	ND<0.10	**0.94**	**0.13**	**0.29**
VB-6-5 [2]	10/11/2006	5	**0.53**	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-6-8 [1]	10/11/2006	8	ND<0.10	ND<0.10	**0.22**	ND<0.10	ND<0.10
VB-7-5	10/12/2006	5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-7-10	10/12/2006	10	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-8-5	10/12/2006	5	**61**	**1.9**	**0.13**	ND<0.10	ND<0.10
VB-8-10	10/12/2006	10	**5.6**	**2.6**	**1.4**	ND<0.10	ND<0.10
VB-9-5 [1]	10/12/2006	5	**6.7**	**0.67**	**0.19**	ND<0.10	ND<0.10
VB-9-11	10/12/2006	11	**12**	**3.6**	**7.0**	ND<0.10	ND<0.10
VB-10-5	10/13/2006	5	**0.16**	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-10-9	10/13/2006	9	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-11-4.5	10/13/2006	4.5	**6.1**	**7.0**	**700**	**170**	**520**
VB-11-11.5	10/13/2006	11.5	**6,800**	**1,400**	**540**	**64**	**23**
VB-12-5	10/11/2006	5	**0.42**	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-12-12	10/11/2006	12	**18**	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-13-5	10/11/2006	5	**0.13**	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-13-12	10/11/2006	12	**8.0**	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-14-5	10/11/2006	5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-14-11	10/11/2006	11	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-15-5	10/11/2006	5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-15-12	10/11/2006	12	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10

Sample ID	Date	Depth (feet bgs)	PCE µg/L	TCE µg/L	cis-1,2-DCE µg/L	trans-1,2 DCE µg/L	Vinyl Chloride µg/L
VB-16-4	10/13/2006	4	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-16-11	10/13/2006	11	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-17-4	10/13/2006	4	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-17-8	10/13/2006	8	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
June 2007 Investigation							
VB-18-4.5	6/25/2007	4.5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-18-10	6/25/2007	10	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-19-4.5	6/25/2007	4.5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-20-5.0	6/25/2007	5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-21-4.5	6/25/2007	4.5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-21-10	6/25/2007	10	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-22-4.5	6/25/2007	4.5	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
VB-22-10	6/25/2007	10	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
Residential Land Use ESL		--	**0.4**	**1.2**	**7.3**	**15**	**0.032**
Commercial Land Use ESL		--	**1.4**	**4.1**	**20**	**41**	**0.11**

Notes:

PCE = Tetrachloroethene

TCE = Trichloroethene

c-1,2-DCE = cis-1,2-Dichloroethene

trans-1,2-DCE = trans-1,2-Dichloroethene

µg/L = micrograms per liter (ppb)

bgs = below ground surface

[1] = Duplicate analysis performed on this sample. Highest results reported on table.

[2] = Purge volume test performed on this sample. Sample reported after 3 purge volumes for all samples.

ESL's = Environmental Screening Level for shallow soil gas screening levels.

Table 3
Groundwater Level Data
10700 MacArthur Blvd., Oakland, California

Well ID (Aquifer zone)	Date	Screen Interval (ft bgs)	Well Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)
AMW-1	1/29/1999	24-34	64.51	23.01	41.50
(Shallow)	5/5/1999		64.51	21.25	43.26
	10/9/1999		64.51	24.14	40.37
	1/20/2000		64.51	24.66	39.85
	8/8/2000		64.51	23.30	41.21
	2/15/2001		64.51	23.22	41.29
	8/29/2001		64.51	24.38	40.13
	3/12/2002		64.51	21.29	43.22
	9/27/2002		64.51	23.62	40.89
	3/25/2003		64.51	22.45	42.06
	10/2/2003		64.51	24.31	40.20
	10/17/2006		64.51	22.91	41.60
	5/3/2007		**64.51**	**18.61**	**45.90**
AMW-4	1/29/1999	15-25	64.79	11.51	53.28
(Shallow)	5/5/1999		64.79	10.14	54.65
	10/9/1999		64.79	12.04	52.75
	1/20/2000		64.79	13.50	51.29
	8/8/2000		64.79	11.74	53.05
	2/15/2001		64.79	12.32	52.47
	8/29/2001		64.79	12.40	52.39
	3/12/2002		64.79	10.13	54.66
	9/27/2002		64.79	12.14	52.65
	3/25/2003		64.79	11.03	53.76
	10/2/2003		64.79	12.33	52.46
	10/17/2006		64.79	12.76	52.03
	5/3/2007		**64.79**	**11.11**	**53.68**
AMW-5	1/29/1999	20-30	64.97	13.87	51.10
(Shallow)	5/5/1999		64.97	12.83	52.14
	10/9/1999		64.97	14.25	50.72
	1/20/2000		64.97	14.91	50.06
	8/8/2000		64.97	14.14	50.83
	2/15/2001		64.97	14.32	50.65
	8/29/2001		64.97	14.72	50.25
	3/12/2002		64.97	13.12	51.85
	9/27/2002		64.97	14.62	50.35
	3/25/2003		64.97	13.45	51.52
	10/2/2003		64.97	14.74	50.23
	10/17/2006		64.97	14.15	50.82
	5/3/2007		**64.97**	**13.92**	**51.05**
AMW-6	1/29/1999	Unknown	65.10	12.74	52.36
(Shallow)	5/5/1999		65.10	11.30	53.80
	10/9/1999		65.10	13.29	51.81
	1/20/2000		65.10	14.21	50.89
	8/8/2000		65.10	12.95	52.15
	2/15/2001		65.10	12.64	52.46
	8/29/2001		65.10	13.65	51.45
	3/12/2002		65.10	11.41	53.69
	9/27/2002		65.10	13.25	51.85
	3/25/2003		65.10	12.22	52.88
	10/2/2003		65.10	14.74	50.36
	10/17/2006		65.10	11.46	53.64
	5/3/2007		**65.10**	**13.04**	**52.06**
AMW-7	1/29/1999	Unknown	64.24	14.91	49.33
(Shallow)	5/5/1999		Well Covered during consturction		
AMW-8	1/29/1999	Unknown	64.55	16.86	47.69
(Deep)	5/5/1999		64.55	14.46	50.09
	10/9/1999		64.55	17.10	47.45
	1/20/2000		64.55	18.51	46.04
	8/8/2000		64.55	16.71	47.84
	2/15/2001		64.55	17.31	47.24
	8/29/2001		64.55	18.30	46.25
	3/12/2002		64.55	16.03	48.52
	9/27/2002		64.55	18.03	46.52
	3/25/2003		64.55	17.31	47.24
	10/2/2003		64.55	21.54	43.01
	10/17/2006		64.55	16.05	48.5
	5/3/2007		**64.55**	**23.01**	**41.54**

Table 3: Continued

Well ID (Aquifer zone)	Date	Screen Interval (ft bgs)	Well Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)
AMW-9	1/29/1999	Unknown	63.48	23.22	40.26
(Deep)	5/5/1999		63.48	21.40	42.08
	10/9/1999		63.48	23.74	39.74
	1/20/2000		63.48	24.92	38.56
	8/8/2000		63.48	23.01	40.47
	2/15/2001		63.48	21.20	42.28
	8/29/2001		63.48	22.59	40.89
	3/12/2002		63.48	21.94	41.54
	9/27/2002		63.48	24.16	39.32
	3/25/2003		63.48	23.00	40.48
	10/2/2003		63.48	23.80	39.68
	10/17/2006		63.48	23.07	40.41
	5/3/2007		**63.48**	**23.17**	**40.31**
WGR MW-2	1/29/1999	23-28	63.18	23.41	39.77
(Shallow)	5/5/1999		63.18	21.41	41.77
	10/9/1999		63.18	24.62	38.56
	1/20/2000		63.18	25.24	37.94
	8/8/2000		63.18	23.41	39.77
	8/29/2001		63.18	25.09	38.09
	3/12/2002		63.18	21.86	41.32
	9/27/2002		63.18	24.69	38.49
	3/25/2003		63.18	23.71	39.47
	10/2/2003		63.18	25.13	38.05
	10/17/2006		63.18	23.91	39.27
	5/3/2007		**63.18**	**24.11**	**39.07**
WGR MW-3	1/29/1999	22-27	58.34	15.81	42.53
(Shallow)	5/5/1999		58.34	18.43	39.91
	10/9/1999		58.34	21.38	36.96
	1/20/2000		58.34	19.76	38.58
	8/8/2000		58.34	20.88	37.46
	8/29/2001		58.34	21.22	37.12
	3/12/2002		58.34	14.80	43.54
	9/27/2002		58.34	22.32	36.02
	3/25/2003		58.34	18.07	40.27
	10/2/2003		58.34	22.22	36.12
	10/17/2006		58.34	21.85	36.49
	5/3/2007		**58.34**	**18.37**	**39.97**
WGR MW-4	1/29/1999	23-45	60.02	26.23	33.79
(Deep)	5/5/1999		60.02	23.80	36.22
	10/9/1999		60.02	27.73	32.29
	1/20/2000		60.02	27.97	32.05
	8/8/2000		60.02	26.00	34.02
	2/15/2001		60.02	26.55	33.47
	8/29/2001		60.02	27.14	32.88
	3/12/2002		60.02	24.90	35.12
	9/27/2002		60.02	27.09	32.93
	3/25/2003		60.02	25.75	34.27
	10/2/2003		60.02	27.41	32.61
	10/17/2006		60.02	26.31	33.71
	5/3/2007		**60.02**	**26.13**	**33.89**
FHS MW-10	1/29/1999	42-52	52.34	23.91	28.43
(Deep)	5/5/1999		52.34	20.55	31.79
	10/9/1999		52.34	25.00	27.34
	1/20/2000		52.34	27.23	25.11
	8/8/2000		52.34	24.06	28.28
	2/15/2001		52.34	24.16	28.18
	8/29/2001		52.34	26.11	26.23
	3/12/2002		52.34	23.94	28.40
	9/27/2003		52.34	25.86	26.48
	3/25/2003		52.34	23.20	29.14
	10/6/2003		52.34	26.39	25.95
	10/17/2006		52.34	24.35	27.99
	5/3/2007		**52.34**	**23.97**	**28.37**

Table 3: Continued

Well ID (Aquifer zone)	Date	Screen Interval (ft bgs)	Well Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)
FHS MW-11	1/29/1999	59-64	54.06	26.38	27.68
(Deep)	5/5/1999		54.06	22.72	31.34
	10/9/1999		54.06	27.42	26.64
	1/20/2000		54.06	29.31	24.75
	8/8/2000		54.06	26.11	27.95
	2/15/2001		54.06	26.43	27.63
	8/29/2001		54.06	28.28	25.78
	3/12/2002		54.06	21.61	32.45
	9/27/2002		54.06	27.93	26.13
	3/25/2003		54.06	45.21	8.85
	10/2/2003			Well Inaccessible	
	10/17/2006		54.06	26.54	27.52
	5/3/2007		**54.06**	**26.25**	**27.81**
MW-6	1/29/1999	37.5-56	61.78	32.87	28.91
(Deep)	5/5/1999		61.78	29.41	32.37
	9/10/1999		61.78	33.98	27.80
	1/20/2000		61.78	36.02	25.76
	8/8/2000		61.78	32.73	29.05
	2/15/2001		61.78	33.34	28.44
	8/29/2001		61.78	34.98	26.80
	3/12/2002		61.78	30.72	31.06
	9/27/2002		61.78	34.50	27.28
	3/25/2003		61.78	32.08	29.70
	10/2/2003		61.78	34.86	26.92
	10/17/2006		61.78	32.58	29.20
	5/3/2007		**61.78**	**32.54**	**29.24**
MW-7	1/20/2000	17.5-37.5	58.64	20.32	38.32
(Shallow)	8/8/2000		58.64	20.50	38.14
	2/15/2001		58.64	16.95	41.69
	8/29/2001		58.64	21.61	37.03
	3/12/2002		58.64	17.03	41.61
	9/27/2002		58.64	22.73	35.91
	3/25/2003		58.64	19.09	39.55
	10/2/2003		58.64	22.46	36.18
	10/17/2006		58.64	22.19	36.45
	5/3/2007		**58.64**	**19.52**	**39.12**

Notes: All well elevations are measured from the top of casing not from the ground surface.
ft msl = feet above mean sea level

Table 4
Groundwater Sample Analytical Data
10700 MacArthur Blvd., Oakland, California

Well (aguifer zone)	Date	Consultant	cis 1,2 DCE µg/L	trans 1,2 DCE µg/L	PCE µg/L	TCE µg/L	VHCs* µg/L
AMW-1	3/23/95	Augeus	-	ND<0.5	ND<0.5	ND<0.5	ND<0.5
(shallow - 29)	6/21/95	Augeus	-	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	9/11/95	Augeus	-	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	4/16/96	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	7/17/96	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	10/23/96	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	9/29/97	PES	NS	NS	NS	NS	NS
	1/20/00	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	8/8/00	AEI	NS	NS	NS	NS	NS
	2/15/01	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	8/29/01	AEI	NS	NS	NS	NS	NS
	3/12/02	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	9/27/02	AEI	NS	NS	NS	NS	NS
	3/25/03	AEI	ND<0.5	ND<0.5	1.8	ND<0.5	ND<0.5
	10/2/03	AEI	NS	NS	NS	NS	NS
	10/17/06	AEI	ND<0.5	ND<0.5	2.2	ND<0.5	ND<RL
	5/2/07	**AEI**	**ND<0.5**	**ND<0.5**	**ND<0.5**	**0.69**	**ND<RL**
AMW-4	5/15/95	Augeus	NR	ND<50	2400	ND<50	NR
(shallow - 25)	6/21/95	Augeus	NR	ND<50	2500	ND<50	NR
	9/13/95	Augeus	NR	ND<25	1100	ND<25	NR
	4/16/96	PES	ND<10	ND<10	1200	10	NR
	7/17/96	PES	ND<10	ND<10	860	ND<10	NR
	10/23/96	PES	ND<0.5	ND<0.5	22	0.5	NR
	9/29/97	PES	ND<3	ND<3	340	3	NR
	1/29/99	AEI	ND<3	ND<3	100	ND<3	ND<3
	5/5/99	AEI	ND<5	ND<5	210	ND<5	ND<5
	9/10/99	AEI	10	ND<5	240	18	ND<5
	1/20/00	AEI	46	ND<2.5	97	6.2	ND<2.5
	8/8/00	AEI	ND<5	ND<5	440	8	ND<5
	2/15/01	AEI	ND<2.5	ND<2.5	81	2.6	ND<2.5
	8/29/01	AEI	ND<2.5	ND<2.5	230	4.6	ND<2.5
	3/12/02	AEI	ND<5.0	ND<5.0	190	ND<5.0	ND<5.0
	9/27/02	AEI	ND<5.0	ND<5.0	220	ND<5.0	10***
	3/25/03	AEI	1.2	ND<1.0	22	1.9	ND<1.0
	10/2/03	AEI	2.8	ND<0.5	50	2.8	ND<0.5
	10/17/06	AEI	9.9	ND<0.5	6.5	ND<0.5	ND<RL
	5/3/07	**AEI**	**2.7**	**ND<0.5**	**5.1**	**1.2**	**ND<RL****
AMW-5	5/15/95	Augeus	NR	ND<0.5	1.2	ND<0.5	NR
(shallow - 30)	6/21/95	Augeus	NR	ND<0.5	ND<0.5	ND<0.5	NR
	9/13/95	Augeus	NR	ND<0.5	ND<0.5	ND<0.5	NR
	4/16/96	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	NR
	7/17/96	PES	ND<0.5	ND<0.5	0.6	ND<0.5	NR
	10/23/96	PES	ND<0.5	ND<0.5	0.8	ND<0.5	NR
	9/29/97	PES	ND<0.5	ND<0.5	13	ND<0.5	NR
	1/29/99	AEI	NA	NA	NA	NA	NA
	5/5/99	AEI	ND<1	ND<1	36	ND<1	ND<1
	9/10/99	AEI	ND<1	ND<1	35	ND<1	ND<1
	1/20/00	AEI	ND<1	ND<1	36	ND<1	ND<1
	8/8/00	AEI	ND<0.5	ND<0.5	50	0.72	ND<0.5
	2/15/01	AEI	ND<0.5	ND<0.5	26	0.76	ND<0.5
	8/29/01	AEI	ND<0.5	ND<0.5	28	0.87	ND<0.5
	3/12/02	AEI	ND<0.5	ND<0.5	25	0.75	ND<0.5
	9/27/02	AEI	ND<0.5	ND<0.5	17	ND<0.5	ND<0.5
	3/25/03	AEI	ND<1.0	ND<1.0	23	ND<1.0	ND<1.0
	10/2/03	AEI	ND<0.5	ND<0.5	20	0.58	ND<0.5
	10/17/06	AEI	0.68	ND<0.5	22	0.88	ND<RL
	5/3/07	**AEI**	**0.91**	**ND<0.5**	**42**	**2.0**	**ND<RL**

Well (aguifer zone)	Date	Consultant	cis 1,2 DCE µg/L	trans 1,2 DCE µg/L	PCE µg/L	TCE µg/L	VHCs* µg/L
AMW-6	9/13/95	Augeus	NR	ND<25	930	ND<25	NR
(shallow - 25)	4/16/96	PES	20	ND<10	1900	110	NR
	7/17/96	PES	ND<30	ND<30	3300	280	NR
	10/23/96	PES	ND<30	ND<30	2900	140	NR
	9/29/97	PES	220	70	4600	580	NR
	1/29/99	AEI	270	77	2400	390	ND<63
	5/5/99	AEI	370	110	2700	470	ND<71
	9/10/99	AEI	190	49	1400	250	ND<36
	1/20/00	AEI	210	ND<35	1600	270	ND<35
	8/8/00	AEI	150	56	1100	180	ND<25
	2/15/01	AEI	190	40	930	200	ND<25
	8/29/01	AEI	77	17	780	110	ND<10
	3/12/02	AEI	150	37	1300	170	ND<25
	9/27/02	AEI	67	ND<17	490	91	ND<17
	3/25/2003	AEI	94	ND<33	740	110	ND<33
	10/2/2003	AEI	66	13	440	60	ND<10
	10/17/2006	AEI	32	4.9	98	14	ND<RL
	5/3/2007	**AEI**	**32**	**ND<5.0**	**120**	**22**	**ND<RL**
AMW-7	9/13/95	Augeus	NR	ND<25	2350	340	NR
(shallow)	4/16/96	PES	2200	60	2300	500	NR
	7/17/96	PES	2100	ND<30	2400	530	NR
	10/23/96	PES	3100	50	3400	610	NR
	9/29/97	PES	33	20	520	100	NR
	1/29/99	AEI	22	ND<3	95	12	ND<3
	5/5/99	AEI	Well Covered During Construction				
AMW-8	9/13/95	Augeus	-	ND<25	95	ND<25	ND<25
(deep - 45)	4/16/96	PES	ND<0.5	ND<0.5	0.8	ND<0.5	ND<0.5
	7/17/96	PES	ND<0.5	ND<0.5	1.6	ND<0.5	ND<0.5
	10/23/96	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	9/29/97	PES	ND<0.5	ND<0.5	0.7	ND<0.5	ND<0.5
	1/20/00	AEI	ND<0.5	ND<0.5	0.73	ND<0.5	ND<0.5
	8/8/00	AEI	NS	NS	NS	NS	NS
	2/15/01	AEI	ND<0.5	ND<0.5	1.7	ND<0.5	ND<0.5
	8/29/01	AEI	NS	NS	NS	NS	NS
	3/12/02	AEI	ND<0.5	ND<0.5	7.5	ND<0.5	ND<0.5
	9/27/02	AEI	NS	NS	NS	NS	NS
	3/25/03	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	10/2/03	AEI	NS	NS	NS	NS	NS
	10/17/06	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<RL
	5/3/07	**AEI**	**NS**	**NS**	**NS**	**NS**	**NS**
AMW-9	9/13/95	Augeus	NR	ND<25	170	ND<25	NR
(deep - 54)	4/16/96	PES	7	ND<3	170	4	NR
	7/17/96	PES	ND<3	ND<3	190	4	NR
	10/23/96	PES	ND<3	ND<3	190	ND<3	NR
	9/29/97	PES	ND<3	ND<3	110	ND<3	NR
	1/29/99	AEI	ND<4	ND<4	90	ND<4	ND<4
	5/5/99	AEI	ND<2.5	ND<2.5	94	ND<2.5	ND<2.5
	9/10/99	AEI	ND<2.1	ND<2.1	99	ND<2.1	ND<2.1
	1/20/00	AEI	ND<0.5	ND<0.5	100	ND<0.5	ND<0.5
	8/8/00	AEI	ND<2.5	ND<2.5	130	ND<2.5	ND<2.5
	2/15/01	AEI	ND<1.0	ND<1.0	69	ND<1.0	ND<1.0
	8/29/01	AEI	ND<2.5	ND<2.5	98	ND<2.5	ND<2.5
	3/12/02	AEI	ND<2.5	ND<2.5	100	ND<2.5	ND<2.5
	9/27/02	AEI	ND<5.0	ND<5.0	80	ND<5.0	ND<5.0
	3/25/03	AEI	4.1	ND<2.5	48	ND<2.5	ND<2.5
	10/2/03	AEI	4.8	<0.5	36	1.1	ND<0.5
	10/17/06	AEI	ND<1.7	ND<1.7	73	ND<1.7	ND<RL
	5/3/07	**AEI**	**ND<2.5**	**ND<2.5**	**86**	**ND<2.5**	**ND<RL**

Well (aguifer zone)	Date	Consultant	cis 1,2 DCE µg/L	trans 1,2 DCE µg/L	PCE µg/L	TCE µg/L	VHCs* µg/L
FHS MW-10	10/9/97	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	NR
(deep - 52)	1/29/99	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	5/5/99	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	9/10/99	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	1/20/00	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	8/8/00	AEI	NS	NS	NS	NS	NS
	2/15/01	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	8/29/01	AEI	NS	NS	NS	NS	NS
	3/12/02	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	9/27/02	AEI	NS	NS	NS	NS	NS
	3/25/03	AEI	1.7	ND<1.0	18	2.5	5.0**
	10/6/03	AEI	ND<0.5	ND<0.5	1.4	ND<0.5	1.0**
	10/17/06	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<RL
	5/3/2007 [1]	**AEI**	**ND<0.5**	**ND<0.5**	**ND<0.5**	**ND<0.5**	**ND<RL**
FHS MW-11	9/29/97	PES	ND<0.5	ND<0.5	4	ND<0.5	NR
(deep 64.5)	1/29/99	AEI	ND<0.5	ND<0.5	7	ND<0.5	ND<0.5
	5/5/99	AEI	ND<0.5	ND<0.5	7.1	ND<0.5	ND<0.5
	9/10/99	AEI	ND<0.5	ND<0.5	7.5	ND<0.5	ND<0.5
	1/20/00	AEI	ND<0.5	ND<0.5	7.5	ND<0.5	ND<0.5
	8/8/00	AEI	ND<0.5	ND<0.5	38	ND<0.5	ND<0.5
	2/15/01	AEI	ND<0.5	ND<0.5	18	ND<0.5	ND<0.5
	8/29/01	AEI	ND<0.5	ND<0.5	16	ND<0.5	ND<0.5
	3/12/02	AEI	ND<0.5	ND<0.5	13	ND<0.5	0.77**
	9/27/02	AEI	ND<1	ND<1	13	ND<1	6.4** 1.1***
	3/25/03	AEI	0.78	ND<0.5	12	0.88	4.0** 1.0****
	10/2/03			Well Inaccessible			
	10/17/06	AEI	ND<0.5	ND<0.5	20	ND<0.5	ND<RL
	5/3/2007 [1]	**AEI**	**ND<0.5**	**ND<0.5**	**25**	**1.1**	**ND<RL**
MW-6	3/11/95	EMCON	ND<20	ND<0.5	1300	ND<20	NR
(deep 48.69)	6/5/95	EMCON	ND<20	ND<20	2000	ND<20	NR
	8/29/95	EMCON	ND<20	ND<20	1300	ND<20	NR
	9/11/95	Augeus	NR	ND<50	2000	ND<50	NR
	11/16/95	EMCON	ND<20	ND<20	1300	ND<20	NR
	2/28/96	EMCON	ND<20	ND<20	960	ND<20	NR
	4/16/96	PES	10	10	1400	10	NR
	5/28/96	EMCON	ND<20	ND<20	970	ND<20	NR
	7/17/96	PES	ND<5	ND<5	590	ND<5	NR
	8/19/96	EMCON	ND<20	ND<20	820	ND<20	NR
	10/23/96	PES	ND<5	ND<5	680	ND<5	NR
	11/21/96	EMCON	ND<20	ND<20	680	ND<20	NR
	3/26/97	EMCON	ND<40	ND<40	830	ND<40	NR
	5/20/97	EMCON	ND<5	ND<5	270	ND<5	NR
	9/29/97	PES	ND<10	ND<10	670	ND<10	NR
	1/29/99	AEI	1.4	ND<1.3	49	3	ND<1.3
	5/5/99	AEI	19	ND<11	530	38	ND<11
	9/10/99	AEI	27	ND<12	560	53	ND<12
	1/20/00	AEI	18	ND<8.5	660	31	ND<8.5
	8/8/00	AEI	98	16	1700	170	ND<5
	2/15/01	AEI	64	ND<10	650	87	ND<10
	8/29/01	AEI	19	ND<5.0	550	38	ND<5.0
	3/12/02	AEI	61	ND<20	1200	99	ND<20
	9/27/02	AEI	ND<12	ND<12	300	27	ND<12
	3/25/03	AEI	2.6	ND<2.5	49	3.8	ND<2.5
	10/2/03	AEI	13	ND<5.0	340	21	ND<5.0
	10/17/06	AEI	16	ND<5.0	320	18	ND<RL
	5/3/07	**AEI**	**0.92**	**ND<0.5**	**39**	**2.1**	**ND<RL**

Well (aguifer zone)	Date	Consultant	cis 1,2 DCE µg/L	trans 1,2 DCE µg/L	PCE µg/L	TCE µg/L	VHCs* µg/L
MW-7	3/11/95	EMCON	NS	NS	NS	NS	NS
(shallow - 38)	6/5/95	EMCON	ND<10	ND<10	ND<10	ND<10	ND<10
	8/29/95	EMCON	ND<10	ND<10	ND<10	ND<10	ND<10
	9/11/95	Augeus	85	ND<50	-	ND<50	ND<50
	11/16/95	EMCON	ND<20	ND<20	ND<20	ND<20	ND<20
	2/28/96	EMCON	ND<10	ND<10	ND<10	ND<10	ND<10
	4/16/96	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	5/28/96	EMCON	ND<10	ND<10	ND<10	ND<10	ND<10
	7/17/96	PES	0.6	ND<0.5	ND<0.5	0.6	ND<0.5
	8/19/96	EMCON	ND<1	ND<1	ND<1	ND<1	ND<1
	10/23/96	PES	0.6	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	11/21/96	EMCON	ND<10	ND<10	ND<10	ND<10	ND<10
	3/26/97	EMCON	ND<20	ND<20	ND<20	ND<20	ND<20
	5/20/97	EMCON	ND<10	ND<10	ND<10	ND<10	ND<10
	9/29/97	PES	ND<10	ND<10	ND<10	ND<10	ND<10
	1/20/00	AEI	ND<6.5	ND<6.5	ND<6.5	ND<6.5	ND<6.5
	8/8/00	AEI	NS	NS	NS	NS	NS
	2/15/01	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	8/29/01	AEI	NS	NS	NS	NS	NS
	3/12/02	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	9/27/02	AEI	NS	NS	NS	NS	NS
	3/25/03	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	10/2/03	AEI	NS	NS	NS	NS	NS
	10/17/06	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<RL*****
	5/3/07	**AEI**	**NS**	**NS**	**NS**	**NS**	**NS**
WGR MW-2	10/17/06	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<RL
(Shallow)	**5/3/07**	**AEI**	**NS**	**NS**	**NS**	**NS**	**NS**
WGR MW-3	10/17/06	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<RL
(Shallow)	**5/3/07**	**AEI**	**NS**	**NS**	**NS**	**NS**	**NS**
WGR MW-4	4/16/96	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
(deep)	7/17/96	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	10/23/96	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	9/29/97	PES	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	2/15/01	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	8/29/01	AEI	NS	NS	NS	NS	NS
	3/12/02	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	9/27/02	AEI	NS	NS	NS	NS	NS
	3/25/03	AEI	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	10/2/03	AEI	NS	NS	NS	NS	NS
	10/17/06	AEI	ND<0.5	ND<0.5	0.62	ND<0.5	ND<RL
	5/3/07	**AEI**	**NS**	**NS**	**NS**	**NS**	**NS**

Table 2 Notes:

Please refer to the Laboratory Analytical Data for further detailed lab information including Reporting Limits and Dilution Factors

*VHCs = All other chemicals by EPA method 601/8010 or 8260

** Chloroform (trichloromethane)

*** Dibromochloromethane

**** Methylene Chloride

***** bromodichloromethane

cis 1,2-Dichloroethene (cis 1,2 DCE)

trans 1,2-Dichloroethene (trans 1,2 DCE)

NS = Well not sampled

NR = Not Reported

µg/L = micrograms per liter (parts per billion)

Tetrachloroethene (PCE)

Trichloroethene (TCE)

[1] = Reported by laboratroy without letters FHS as prefix

* Available data from AMW-7 is presented although this well was covered during 1999 construction activities

RL = Reporting Limit

APPENDIX A

LIQUID BOOT PRODUCT SPECIFICATION AND CONTACT INFORMATION

LIQUID BOOT® Brownfield Membrane/Liner

Section 2 | Version 4.0

These Specifications may have changed. Please contact CETCO Liquid Boot Company (CLB) at 714.384.0111 for the most recent version.

NOTE: If the membrane is to also perform as a waterproofing membrane, do not use this specification. Use the standard LIQUID BOOT® fluid-applied waterproofing specification.

PART 1 - GENERAL

1.01 DESCRIPTION- General and Supplementary Conditions and Division 1- General Requirements applies to this section. Provide gas vapor barrier as indicated, specified and required.

A. Work in this section - principal items include:
   1. Gas vapor barrier providing protection from the following gases: Methane, other Hydrocarbon vapors in concentrations up to 20,000ppm, Hydrogen Sulfide, Radon
   2. Gas vapor barrier under single family homes.

B. Related work NOT in this section: excavation and backfilling, parge coat on masonry to receive gas vapor barrier membrane, mortar beds or concrete toppings over gas vapor barrier membranes, latex waterproofing, damp-proofing, flashing and sheet metal, joint sealers, soil sterilant, gas collection systems, gas monitoring, and drainage.

1.02 QUALITY ASSURANCE- Gas vapor barrier contractor/applicator shall be trained and approved by gas vapor barrier manufacturer, CETCO Liquid Boot Company (CLB). A pre-installation conference shall be held prior to application of gas vapor barrier to assure proper substrate and installation conditions, to include contractor, applicator, architect/engineer and special inspector.

1.03 SUBMITTALS (Refer to section 01300 for procedures)

A. Project Data - Submit manufacturer's product data and installation instructions for specific application.

B. Samples - Submit representative samples of the following for approval:
   1. Gas vapor barrier membrane material.
   2. Protection Board and/or Protection Mat.
   3. Prefabricated Drainage Mat.
   4. Geotextiles.

1.04 DELIVERY, STORAGE AND HANDLING- Deliver materials to site in original unbroken packages bearing manufacturer's label showing brand, weight, volume, and batch number. Store materials at site in strict compliance with manufacturer's instructions. Do not allow materials to freeze in containers.

1.05 JOB CONDITIONS

A. Protect all adjacent areas not to receive gas vapor barrier. Where necessary, apply masking to prevent staining of surfaces to remain exposed wherever membrane abuts to other finish surfaces.

B. Perform work only when existing and forecasted weather conditions are within manufacturer's recommendations for the material and product used.

C. Minimum clearance of required for application of product: 90° spray wand- 2 feet / Conventional spray wand- 4 feet.

D. Ambient temperature shall be within manufacturer's specifications. If winter conditions apply, we recommend the use space of heaters and necessary cover (i.e. visqueen) to bring the ambient temperature to at least +45°F until the protection course and structural slab rebar or a mudslab protection course has been placed.

E. All plumbing, electrical, mechanical and structural items to be under or passing through the gas vapor barrier shall be positively secured in their proper positions and appropriately protected prior to membrane application.

F. Gas vapor barrier shall be installed before placement of reinforcing steel. When not possible, all exposed reinforcing steel shall be masked by General Contractor prior to membrane application.

G. Expansion joints must be filled with a conventional waterproof expansion joint material.

H. Surface preparation shall be per manufacturer's specification.

1.06 PRODUCT WARRANTY- CETCO Liquid Boot Company (CLB) warrants its products to be free of defects. This warranty only applies when the LIQUID BOOT® is applied by CETCO Liquid Boot Company Approved Applicators and that the required respective CLB products (such as LIQUID BOOT® UltraDrain. LIQUID BOOT® UltraShield, LIQUID BOOT® BaseFabric and LIQUID BOOT® GeoVent) are used. As factors, which affect the result obtained from this product, including weather, equipment utilized, construction, workmanship and other variables- are all beyond the manufacturer's control, CLB warrants only that the material conforms to its product specifications. Under this warranty CLB will replace at no charge any product not meeting these specifications within 12 months of manufacture, provided it has been applied in accordance with CLB's written directions for use recommended as suitable for this product. Warranties are available for a longer period upon request and mutual written consent. This warranty is in lieu of any and all other warranties expressed or implied (including any implied warranty of merchantability or fitness for a particular use), and CLB shall have no further liability of any kind including liability for consequential or incidental damages resulting from any defects or delays caused by replacement or otherwise.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fluid applied gas vapor barrier system - LIQUID BOOT®; a single course, high build, polymer modified asphaltic emulsion. Water borne and spray applied at ambient temperatures. A minimum thickness of 60 dry mils, unless specified otherwise as some cities and engineers may require a thicker membrane. Non-toxic and odorless. LIQUID BOOT® Trowel Grade has similar properties with greater viscosity and is trowel applied. Manufactured by CETCO Liquid Boot Company, Santa Ana, CA (714) 384-0111.

C. Gas vapor barrier physical properties:

GAS VAPOR MEMBRANE	TEST METHOD	VALUE
Hydrogen Sulfide Gas Permeability	ASTM D1434	None Detected
Benzene, Toluene, Ethylene, Xylene, Gasoline, Hexane, Perchloroethylene	ASTM D543, D412, D1434 (tested at 20,000 ppm)	Passed in gas permeability and weight change
Acid Exposure (10% H_2SO_4 for 90 days)	ASTM D543	Less than 1% weight change
Radon Permeability	Tested by US Dept. of Energy	Zero permeability to Radon (222Rn)
Bonded Seam Strength Tests	ASTM D6392	Passed
Micro Organism Resistance (Soil Burial)- average weight change, average tensile strength change, average tensile stress change, average elongation change, bonded seams, methane permeability	ASTM D4068-88	Passed
Methane Permeability	ASTM 1434-82	Passed
Oil Resistance Test- average weight change, average tensile strength change, average tensile stress change, average elongation change, bonded seams, methane permeability	ASTM D543-87	Passed
Heat Aging- average tensile strength change, average tensile stress change, average elongation change, bonded seams	ASTM D4068-88	Passed
Dead Load Seam Strength	City of Los Angeles	Passed
Environmental Stress-Cracking	ASTM D1693-78	Passed
PCE Diffusion Coefficient	Tested at 6,000 mg/m^3	2.74 x 10-14 m^2/sec
TCE Diffusion Coefficient	Tested at 20,000 mg/m^3	8.04 x 10-14 m^2/sec
WATERPROOFING	TEST METHOD	VALUE
Soil Burial	ASTM E154-88	Passed
Water Penetration Rate	ASTM D2434	<7.75 x 10^{-9} cm/sec
Water Vapor Permeability	ASTM E96	0.24 perms
Water Vapor Transmission	ASTM E96	0.10 grains/h-ft^2
POTABLE WATER	TEST METHOD	VALUE
Toxicity Test	22 CCR 66696	Passed. CCR Bioassay—Flathead Minnow
Potable Water Containment	ANSI/NSF 61	NSF Certified for tanks >300,000 gal
GENERAL INFORMATION	TEST METHOD	VALUE
Coefficient of Friction- geotextile both sides	ASTM D5321	0.72
Cold Bend Test	ASTM D146	Passed. No cracking at –25°F
Freeze-Thaw Resistance (100 Cycles)	ASTM A742	Meets criteria. No spalling or disbondment
Accelerated Weathering & Ultraviolet Exposure	ASTM D822	No adverse effect after 500 hours
Hydrostatic Head Resistance	ASTM D751	Tested to 138 feet or 60 p.s.i
Elongation	ASTM D412	1,332% - Ø reinforcement, 90% recovery
Elongation- 8oz. non-woven geotextile both sides	ASTM D751	100% (same as geotextile tested separately)
Tensile Strength	ASTM D412	58 p.s.i. without reinforcement
Tensile Strength-8oz. non-woven geotextile both sides	ASTM D751	196 p.s.i. (same as geotextile tested separately)
Tensile Bond Strength to Concrete	ASTM D413	2,556 lbs/ft^2 uplift force
Puncture Resistance-8oz. non-woven geotextile both sides	ASTM D4833	286 lbs. (Probe Travel= .756 in., same as geotextile tested separately)
Flame Spread	ASTM E108	Class A with top coat (comparable to UL790)
Electric Volume Resistivity	ASTM D257	1.91 x 10^{10} ohms-cm

C. Agency Approvals:

- City of Los Angeles Research Report # 24860-Approved for "LIQUID BOOT® Membrane for Below-Grade Waterproofing and Gas Barrier"
- United States Navy-Approved for "LIQUID BOOT® for Use World Wide to Waterproof Earth-Covered Steel Ammunition Storage"
- NSF International-NSF/61 approved for "Potable Water Tank Liner"
- Canadian Construction Materials Board-Approved for "Waterproofing and Damp proofing"
- County of Los Angeles Department of public works-Approved for "LIQUID BOOT® Application as a Methane Gas Barrier"

D. LIQUID BOOT® 500- Contact CETCO Liquid Boot Company before specifying or bidding LIQUID BOOT® 500 to insure LIQUID BOOT® 500 is appropriate for the project. LIQUID BOOT® 500 may be used in lieu of LIQUID BOOT® (described in section 2.01 B. above) where the membrane is not exposed to hydrostatic head pressure. The Agency Approvals in section 2.01 C above do not apply to LIQUID BOOT® 500. The physical properties for LIQUID BOOT® 500 are as follows:

Note: LIQUID BOOT® 500 may tend to sag on vertical surfaces at higher ambient temperatures. When this condition occurs, use LIQUID BOOT® at these locations.

WATERPROOFING	TEST METHOD	VALUE
Elongation	ASTM D412	800%
Bond Seam Strength Tests	ASTM D6392	Passed
Methane Permeability	ASTM D1434	None detected
Water Vapor Permeability	ASTM E96	0.18 perms

- Agency Approval- City of Los Angeles Research Report-RR 25549-Approved for "LIQUID BOOT® 500 Spray Applied Membrane for Below-Grade Waterproofing and Gas Barrier"

E. Protection- On vertical surfaces, use LIQUID BOOT® UltraShield P-100 or other protections as approved by the manufacturer, project architect or engineer. On horizontal surfaces, use LIQUID BOOT® UltraShield G-1000 or other protections as approved by the manufacturer, project architect or engineer.

Due to the diverse jobsite conditions, all protection materials must be approved by the membrane manufacturer, including the use of the LIQUID BOOT® UltraShield products.

F. Prefabricated Drain Mat- On vertical surfaces, use LIQUID BOOT® UltraDrain 6200. On horizontal surfaces, use LIQUID BOOT® UltraDrain 9000

G. Adhesive system for LIQUID BOOT® UltraShield and LIQUID BOOT® UltraDrain: Use LIQUID BOOT® UltraGrip.

H. Gas vapor vent piping- LIQUID BOOT® GeoVent system

I. Base Geotextile- LIQUID BOOT® BaseFabric T-40 non-woven geotextile, unless otherwise specified and approved by membrane manufacturer. The heat-rolled side shall be used as the application surface. Some projects may require a heavier geotextile (LIQUID BOOT® BaseFarbic T-60.)

J. Cold Joints, Cracks, Form Tie Holes: Covered with Hardcast CRT 1602 Tape 3" wide.

PART 3 - EXECUTION

3.01 EXAMINATION- All surfaces to receive gas vapor barrier shall be inspected and approved by the applicator at least one day prior to commencing work.

3.02 SURFACE PREPARATION- Provide 24 inch minimum clearance out from surfaces to receive the gas vapor barrier. The application surface shall be prepared and provided to the applicator in accordance with manufacturer's specifications listed below:

A. Concrete/Shotcrete/Masonry- Concrete surfaces shall be light broom finish or smoother, free of any dirt, debris, loose material, release agents or curing compounds. Fill all voids more than 1/4 inch deep and 1/4 inch wide. Masonry joints, cold joints, and form joints shall be struck smooth. All penetrations shall be prepared in accordance with manufacturer's specifications. Provide a 3/4 inch minimum cant of LIQUID BOOT®, or other suitable material as approved by manufacturer, at all horizontal to vertical transitions and other inside corners of 120° or less. Allow to cure overnight before the application of LIQUID BOOT®. All cracks or cold joints greater than 1/16 inch must be completely grouted with non-shrink grout as approved by engineer. Install Hardcast reinforcing tape over all cold joints, cracks and form tie holes (after holes and cracks are grouted).

B. Dirt & Gravel- The sub-grade shall be moisture conditioned and compacted to a minimum relative compaction of 90 percent or as specified by civil/geotechnical engineer. The finished surface shall be smooth, uniform, free of debris and standing water. Remove all stones or dirt clods greater than 1/4 inch. (NOTE: Aggregate sub-bases shall be rolled flat, free from any protruding sharp edges). Penetrations shall be prepared in accordance with manufacturer's specifications. All form stakes that penetrate the membrane shall be of rebar which shall be bent over and left in the slab. Trenches shall be cut oversize to accommodate gas vapor barrier membrane and protection course with perpendicular to sloped sides and maximum obtainable compaction. Adjoining grade shall be finish graded and compacted. Excavated walls shall be vertical or sloped back, free of roots and protruding rocks. Specific sub-grade preparation shall be designed by a qualified civil or geotechnical engineer. If organic materials with potential for growth (ie: seeds or grasses) exist within the sub-base, spray apply soil sterilant at the sterilant manufacturer's recommended rate.

3.03 INSTALLATION

3.03.10 INSTALLATION ON CONCRETE/SHOTCRETE/MASONRY (Follow the procedures below carefully)

A. Refer to section 3.03.30, "Sealing Around Penetrations", for procedures to seal around penetrations.

B. Provide a ¾" minimum cant of LIQUID BOOT®, or other suitable material as approved by manufacturer, at all horizontal to vertical transitions and other inside corners of 120° or less. Allow to cure overnight before the application of LIQUID BOOT®.

C Delineate a test area on site with a minimum dimension of 10 feet by 10 feet (3m by 3m). Apply LIQUID BOOT® to a thickness of 60 mils and let it cure for 24 hours. Observe for blisters. If minor or no blistering occurs, proceed to the next step. (See note regarding blisters). If significant blistering does occur, apply a thin (10 mil) tack coat of LIQUID BOOT® "A" side without catalyst to the entire concrete surface and allow to cure before proceeding. (See also information regarding blister repair).

D. Spray apply LIQUID BOOT® to a 60 mil minimum dry thickness. Increase thickness to 100 dry mils if shotcrete is to be applied directly to membrane. If a second coat is required, remove any standing water from the membrane before proceeding with the second application.

E. Do not penetrate membrane. Keep membrane free of dirt and debris and traffic until a protective cover is in place. It is the responsibility of the General Contractor to insure that the membrane and the protection system are not penetrated.

F. After membrane has cured and checked for proper thickness and flaws, install protection material pursuant to manufacturer's instructions.
NOTE: All testing or inspection to be performed prior to placing protection course.

NON-HORIZONTAL SURFACES: Spray on non-horizontal surfaces should begin at the bottom and work towards the top. This method allows the product to adhere to the surface before hitting catalyst runoff.

NOTE: Due to the nature of concrete as a substrate, it is normal for some blistering to occur. This is caused by either concrete's tendency to off-gas or water that is temporarily trapped between the concrete and the membrane. With time and the applied pressure of backfill or over-slab, blisters will absorb into the concrete without detriment to the membrane. A small number of blister heads should be sampled and checked for proper membrane thickness. If the samples have the minimum required membrane thickness, then the remaining blisters should not be punctured or cut. If the samples have less than the minimum required membrane thickness, then the area can either be re-sprayed to obtain the proper thickness, or the blisters can be cut out and the area re-sprayed or patched with LIQUID BOOT® Trowel Grade.

3.03.20 INSTALLATION ON DIRT SURFACES AND MUDSLABS

A. Roll out LIQUID BOOT® BaseFabric geotextile on sub-grade with the heat-rolled side facing up. Overlap seams a minimum of 6 inches. Lay geotextile tight at all inside corners. Apply a thin 10 mil tack coat of LIQUID BOOT® "A" side without catalyst within the seam overlap. Line trenches with geotextile extending at least six inches (6") onto adjoining sub-grade if slab and footings are to be sprayed separately. Overlap seams a minimum of 6 inches. Lay geotextile tight at all inside corners. Apply a thin 10 mil tack coat of LIQUID BOOT® "A" side without catalyst within the seam overlap.

B. Minimize the use of nails to secure the geotextile to the dirt subgrade. Remove all nails before spraying membrane, if possible. Nails that cannot be removed from the dirt subgrade are to be patched with geotextile or Hardcast reinforcing tape overlapping the nail head by a minimum of two inches (2"). Apply a thin tack coat of LIQUID BOOT® under the geotextile patch, when patching with geotextile.

C. Refer to section 3.03.30, "Sealing Around Penetrations", for procedures to seal around penetrations.

D. Spray apply LIQUID BOOT® onto geotextile to a 60 mil minimum dry thickness. Increase thickness to 100 dry mils if shotcrete is to be applied directly to membrane. If a second coat is required, remove any standing water from the membrane before proceeding with the second application.

E. Do not penetrate membrane. Keep membrane free of dirt, debris and traffic until a protective cover is in place. It is the responsibility of the General Contractor to insure that the membrane and the protection system are not penetrated.

F. After membrane has cured and checked for proper thickness and flaws, install protection material pursuant to manufacturer's instructions.
NOTE: All testing or inspection to be performed prior to placing protection course.

3.03.30 SEALING AROUND PENETRATIONS

3.03.31 OPTION 1

A. Clean all penetrations. All metal penetrations shall be sanded clean with emery cloth.

B. For applications requiring LIQUID BOOT® BaseFabric geotextile, roll out geotextile on sub-grade with the heat-rolled side facing up, overlapping seams a minimum of six inches (6"). Cut the geotextile around penetrations so that it lays flat on the sub-grade. Lay geotextile tight at all inside corners. Apply a thin (10 mil) tack coat of LIQUID BOOT® "A" side without catalyst within the seam overlap.

C. At the base of penetration Install a minimum ¾ inch thick membrane cant of LIQUID BOOT®, or other suitable material as approved by manufacturer. Extend the membrane at a 60 mil thickness three inches (3") around the base of penetration and up the penetration a minimum of three inches (3"). Allow to cure overnight before the application of LIQUID BOOT® membrane. (See attached manufacturer's standard detail.)

D. Spray apply LIQUID BOOT® to an 60 mils minimum dry thickness around the penetration, completely encapsulating the collar assembly and to a height of one and one half inches (1 1/2") minimum above the membrane as described in 3.03.31 C above. Spray apply LIQUID BOOT® to surrounding areas as specified for the particular application. (SEE MANUFACTURER'S STANDARD DETAIL)

E. <u>Allow LIQUID BOOT® to cure completely before proceeding to step "F".</u>

F. Wrap penetration with polypropylene cable tie at a point two inches (2") above the base of the penetration. Tighten the cable tie firmly so as to squeeze, but not cut, the cured membrane collar.

3.03.32 OPTION 2 (For Gas Vapor Membrane Only)

A. Clean all penetrations. All metal penetrations shall be sanded clean with emery cloth.

B. For applications requiring LIQUID BOOT® BaseFabric geotextile, roll out geotextile on sub-grade with the heat-rolled side facing up, overlapping seams a minimum of six inches (6"). Cut the geotextile around penetrations so that it lays flat on the sub-grade. Lay geotextile tight at all inside corners. Apply a thin (10 mil) tack coat of LIQUID BOOT® "A" side without catalyst within the seam overlap.

C. Spray-apply LIQUID BOOT® to surrounding areas as specified for the particular application to a 60 mil minimum dry thickness. At the base of penetration Install a minimum 3/4 inch thick membrane cant of LIQUID BOOT®, or other suitable material as approved by manufacturer. Extend the membrane at 60 mil thickness up the penetration a minimum of three inches (3"). Allow to cure overnight before proceeding to D (SEE MANUFACTURER'S STANDARD DETAIL)

D. Spray apply LIQUID BOOT® the membrane at an 60 mil thickness three inches (3") around the base of penetration and up the penetration, completely encapsulating the collar assembly, to a height of one and one half inches (1 1/2") minimum above the membrane as described in 3.03.32 C above. (SEE ATTACHED MANUFACTURER'S STANDARD DETAIL)

E. <u>Allow LIQUID BOOT® to cure completely before proceeding to step "F".</u>

F. Wrap penetration with polypropylene cable tie at a point two inches (2") above the base of the penetration. Tighten the cable tie firmly so as to squeeze, but not cut, the cured membrane collar.

3.04 FIELD QUALITY CONTROL- Field Quality Control is a very important part of all LIQUID BOOT® applications. Applicators should check their own work for coverage, thickness, and all around good workmanship <u>before</u> calling for inspections.

The membrane must be cured at least overnight before inspecting for dry-thickness, holes, shadow shrinkage, and any other membrane damage. If water testing is to be performed, allow the membrane to cure at least 72 hours prior to the water test. When thickness or integrity is in question the membrane should be tested in the proper manner as described below. However, over-sampling defeats the intent of inspections. Inspectors should always use visual and tactile measurement to guide them. Areas suspected of being too thin to the touch should be measured with the gauges to determine the exact thickness. With practice and by comparing tactile measurements with those of the gauges, fingers become very accurate tools.

3.04.10 ON CONCRETE/SHOTCRETE/MASONRY & OTHER HARD SURFACES

A. Membrane may be checked for proper thickness with a blunt-nose depth gauge, taking one reading every 500 square feet. Record the readings. Mark the test area for repair, if necessary.

B. If necessary, test areas are to be patched over with LIQUID BOOT® to a 60 mils minimum dry thickness, extending a minimum of one inch (1") beyond the test perimeter.

3.04.20 ON DIRT AND OTHER SOFT SUBSTRATES

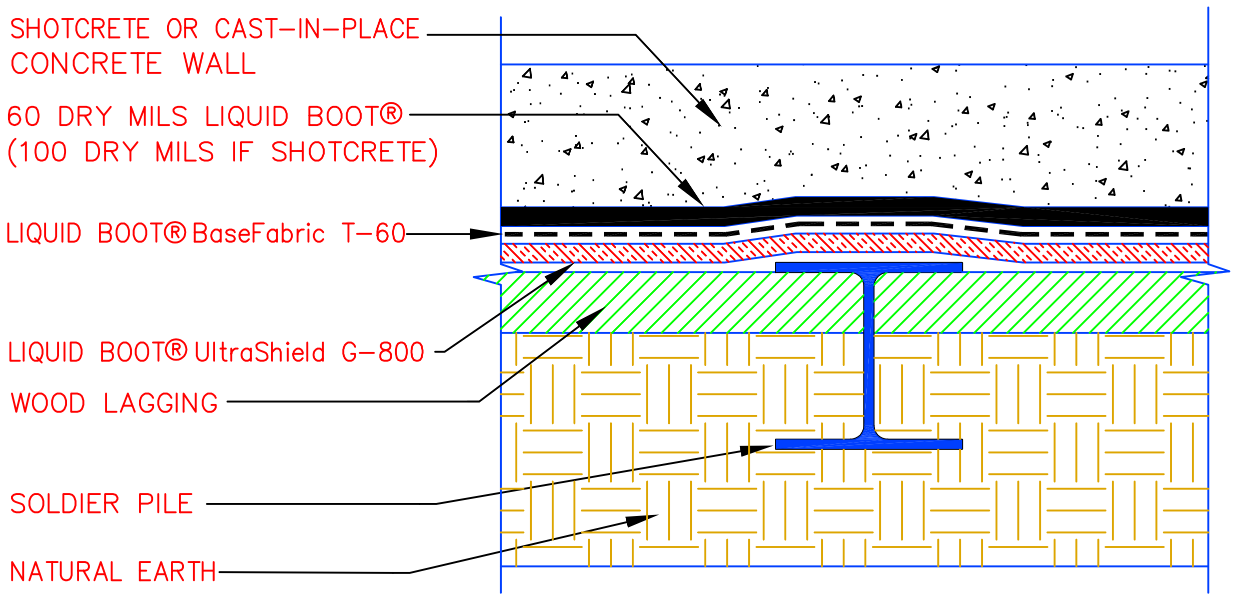
A. Samples may be cut from the membrane and geotextile sandwich to a maximum area of 2 square inches. Measure the thickness with a mil-reading caliper, per 500 sq. feet. Deduct the plain geotextile thickness to determine the thickness of LIQUID BOOT® membrane. Mark the test area for repair.

B. Voids left by sampling are to be patched with geotextile overlapping the void by a minimum of two inches (2"). Apply a thin tack coat of LIQUID BOOT® under the geotextile patch. Then spray or trowel apply LIQUID BOOT® to a 60 mils minimum dry thickness, extending at least three inches (3") beyond geotextile patch.

3.04.30 SMOKE TESTING FOR HOLES (Optional) - Holes or other breaches in the membrane can be detected by conducting a smoke test. This involves pumping smoke under the membrane for a specified period of time, under a specified pressure, which varies from project to project. Contact CLB for information about this test at 714-384-0111.

LIQUID BOOT® Brownfield Membrane/Liner

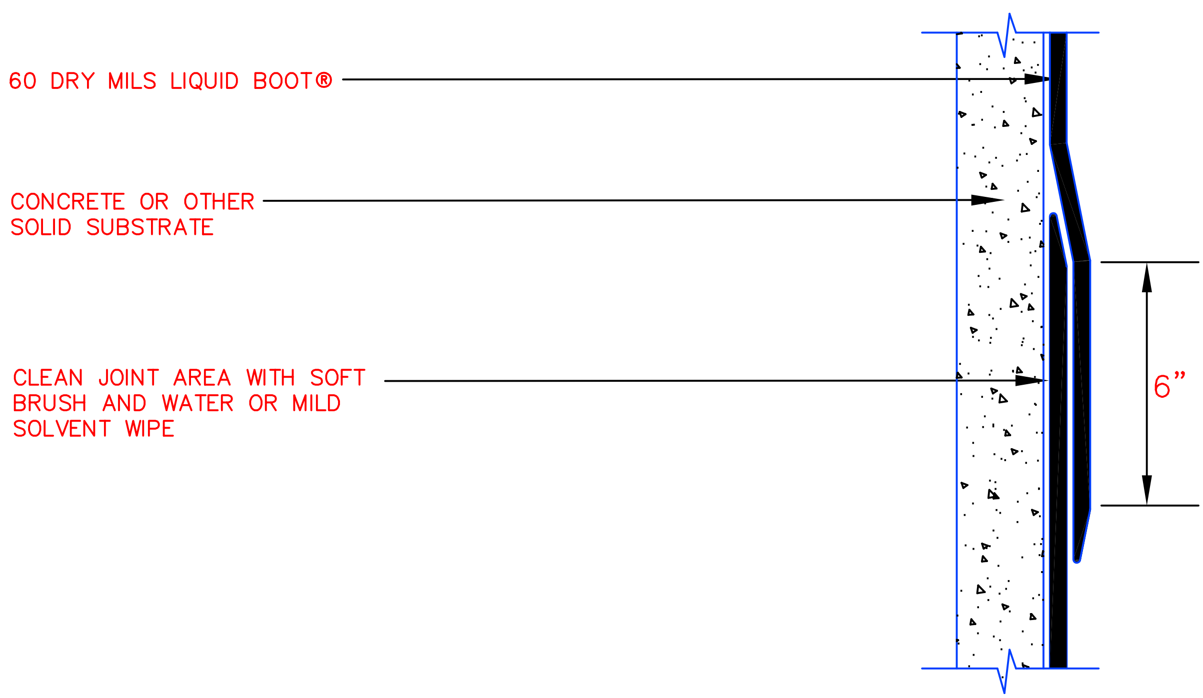
Standard Details



GAS VAPOR BARRIER
ZERO LOT LINE WITH LAGGING

NOT TO SCALE

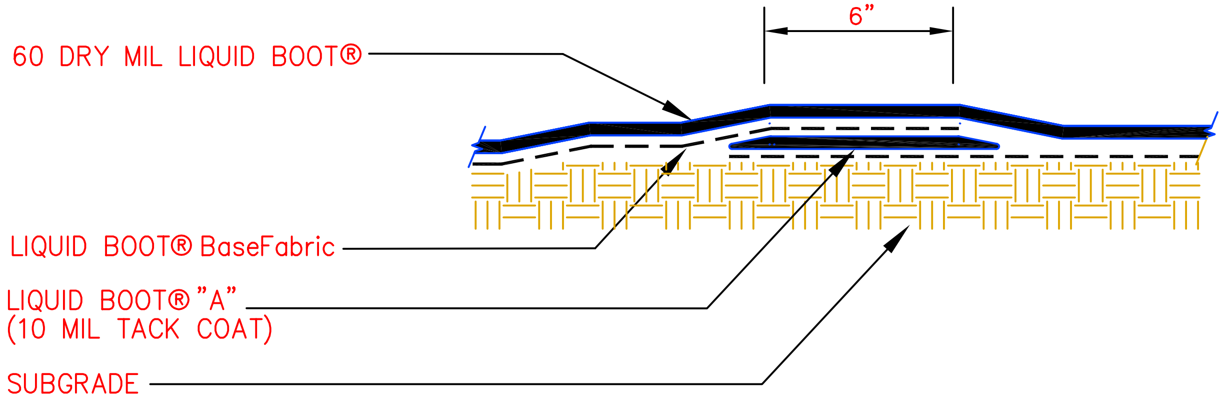
G1.1



GAS VAPOR BARRIER
MEMBRANE LAP JOINTS
ON SOLID SUBSTRATE

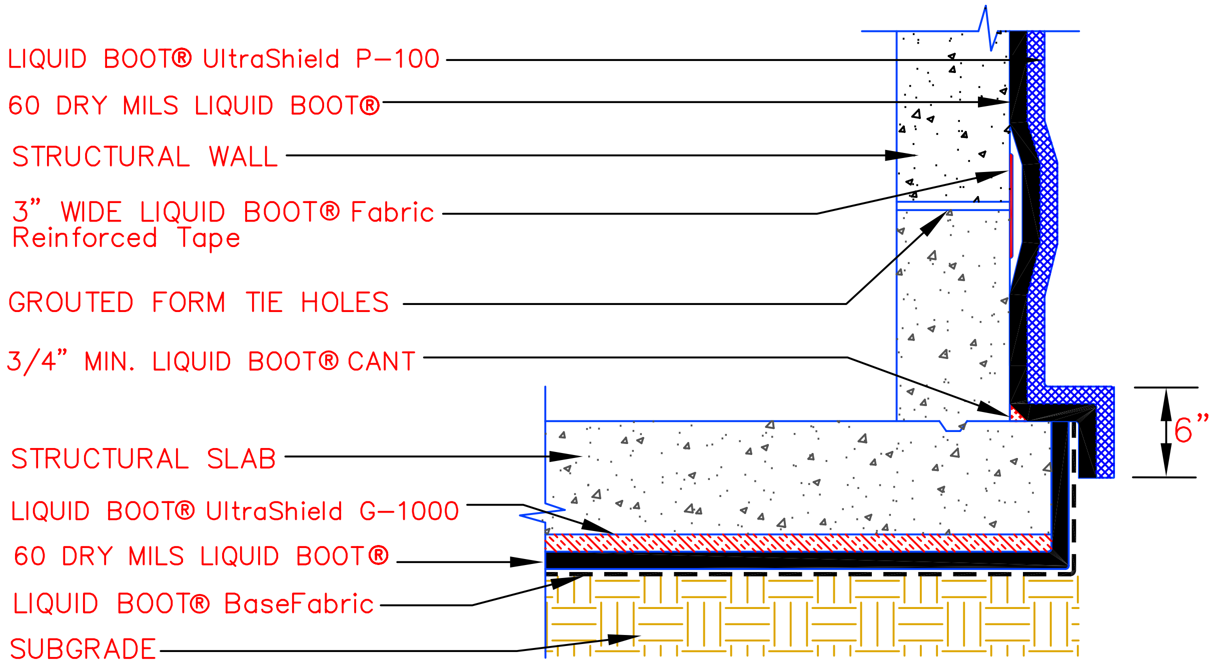
NOT TO SCALE

G1.2



GAS VAPOR BARRIER
MEMBRANE LAP JOINTS
ON GEOTEXTILE
NOT TO SCALE

G1.3

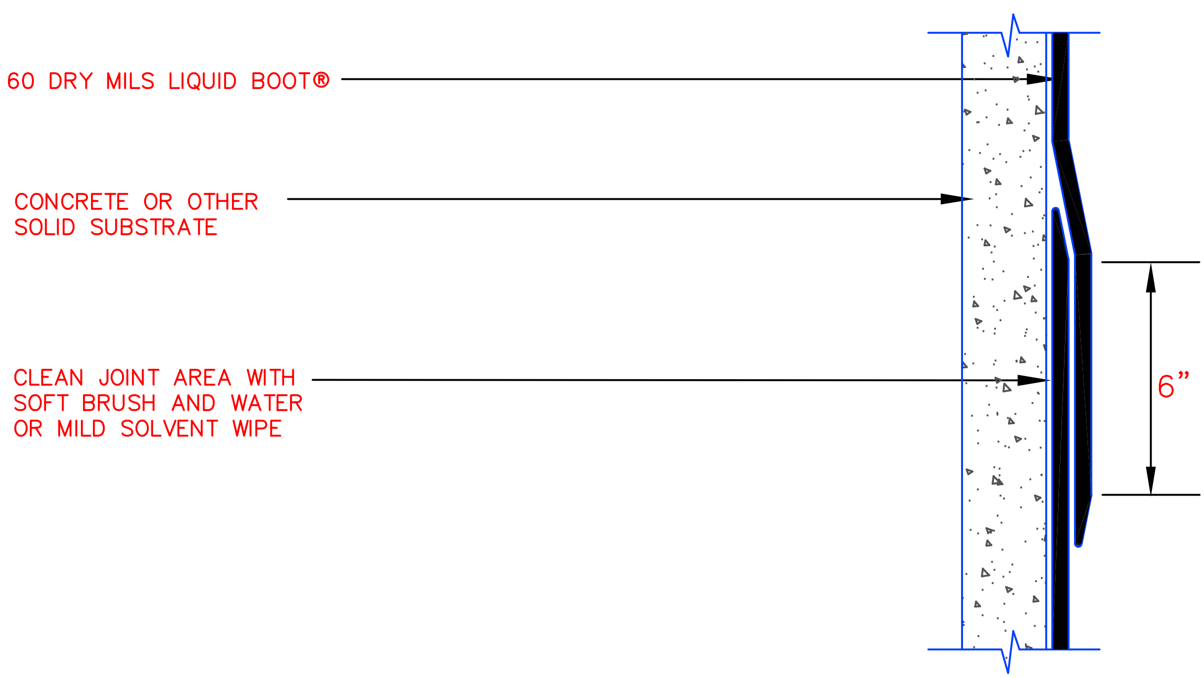


NOTE:
Terminate membrane
1" above finish grade.

GAS VAPOR BARRIER
UNDER SLAB AND WALLS

NOT TO SCALE

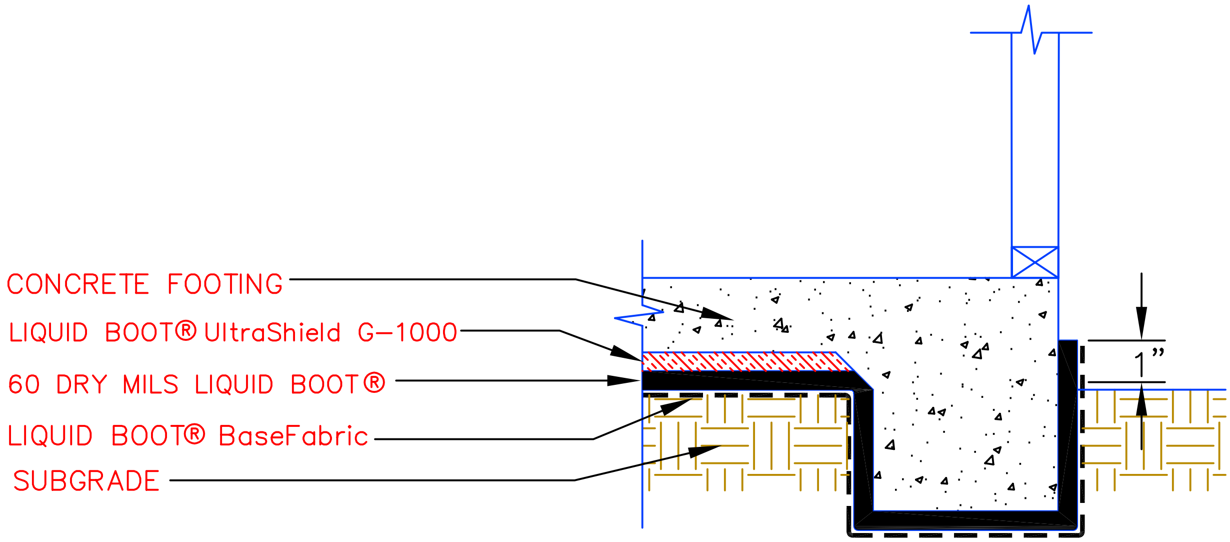
G2.1



GAS VAPOR BARRIER
MEMBRANE LAP JOINTS
ON SOLID SUBSTRATE

NOT TO SCALE

G3.2

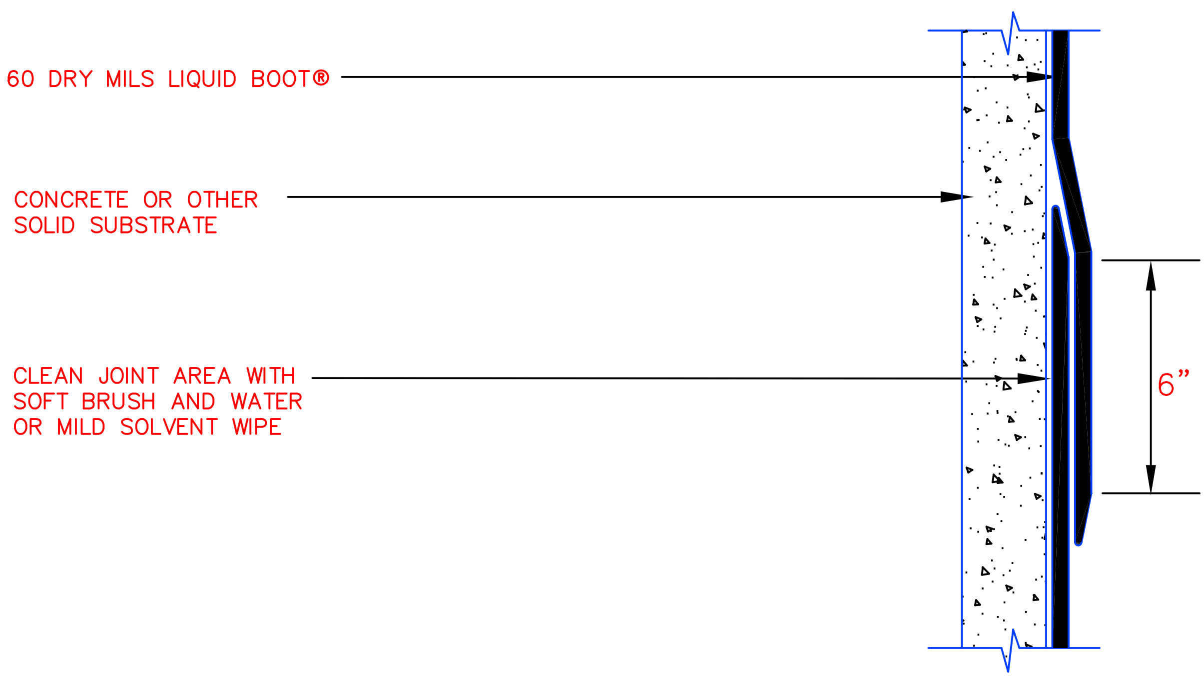


GAS VAPOR BARRIER
FOOTING AND GRADE BEAMS

NOT TO SCALE

G2.3

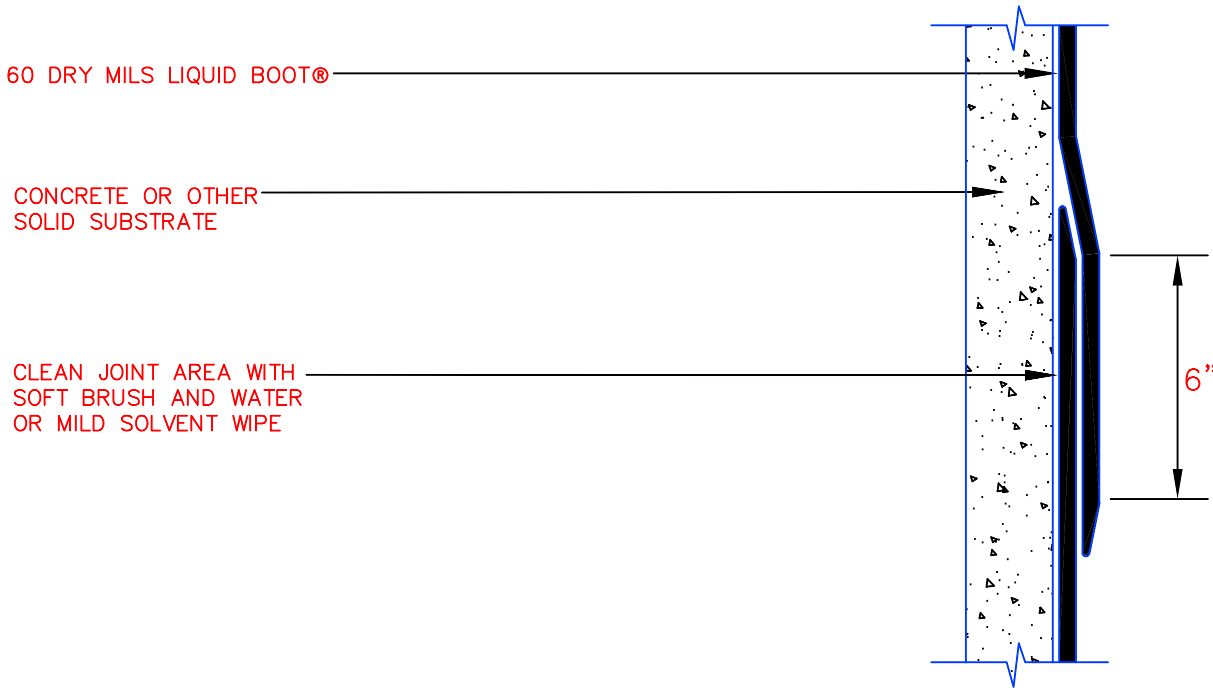
NOTE:
Terminate membrane
1" above finish grade.



GAS VAPOR BARRIER
MEMBRANE LAP JOINTS
ON SOLID SUBSTRATE

NOT TO SCALE

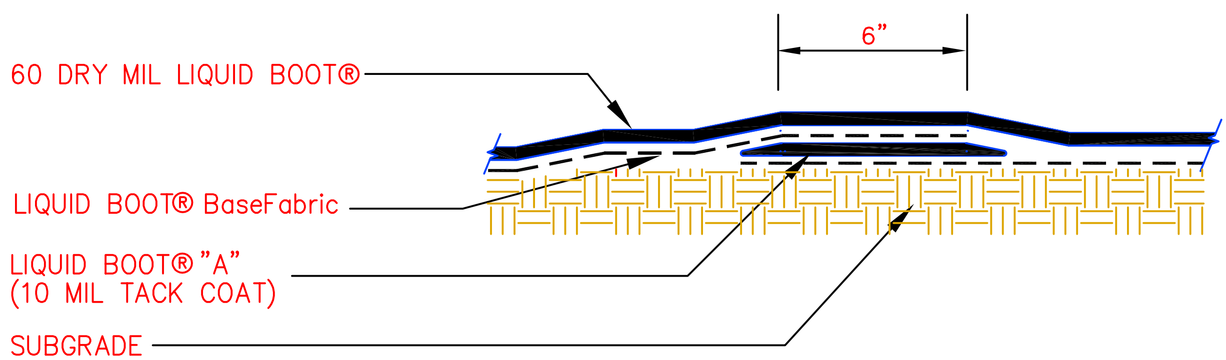
G3.2



GAS VAPOR BARRIER MEMBRANE LAP JOINTS ON SOLID SUBSTRATE

NOT TO SCALE

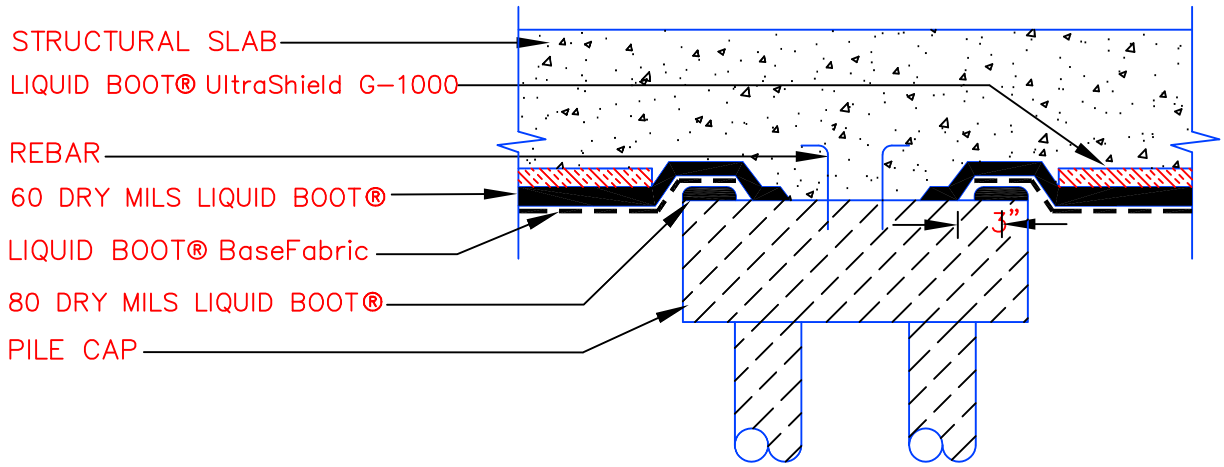
G2.5



GAS VAPOR BARRIER MEMBRANE LAP JOINTS ON GEOTEXTILE

NOT TO SCALE

G2.6

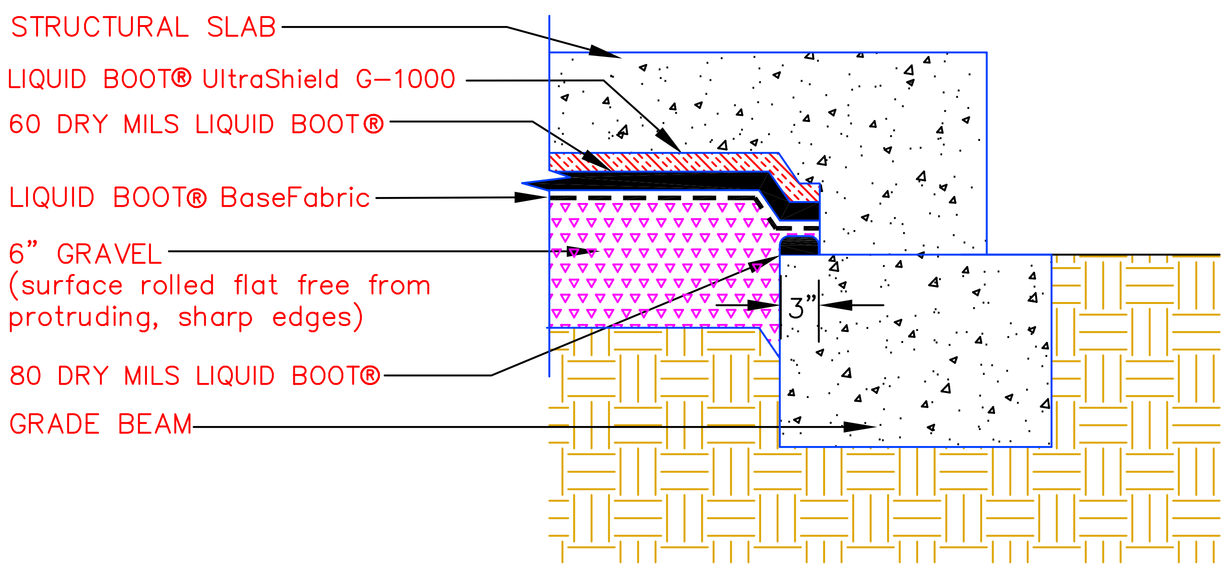


GAS VAPOR BARRIER
PILE CAP

NOT TO SCALE

G2.7

NOTE:
Bring the membrane 3" onto the pile cap. The geotextile is then encapsulated in the membrane.

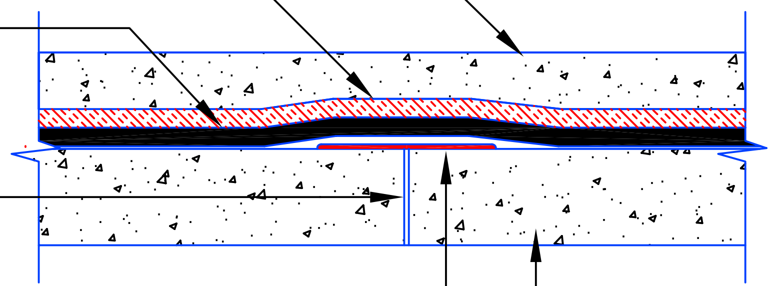


GAS VAPOR BARRIER
OVER FOOTINGS AND
GRADE BEAMS

NOT TO SCALE

G2.8

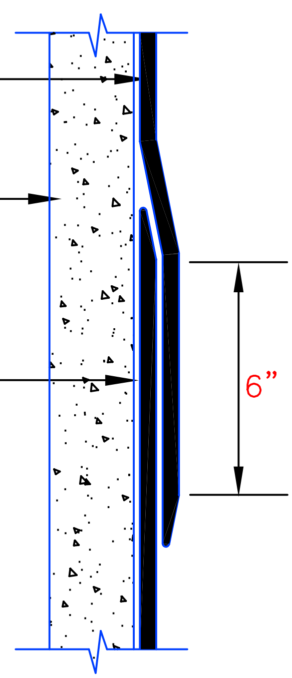
NOTE:
Bring the membrane 3" onto the footings. The geotextile is then encapsulated in the membrane.



GAS VAPOR BARRIER BETWEEN SLAB & CONCRETE COLD JOINTS

NOT TO SCALE

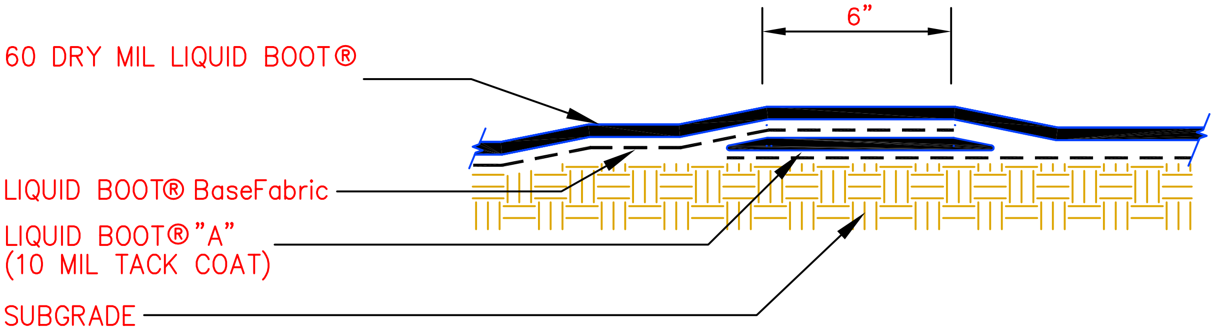
G3.1



GAS VAPOR BARRIER MEMBRANE LAP JOINTS ON SOLID SUBSTRATE

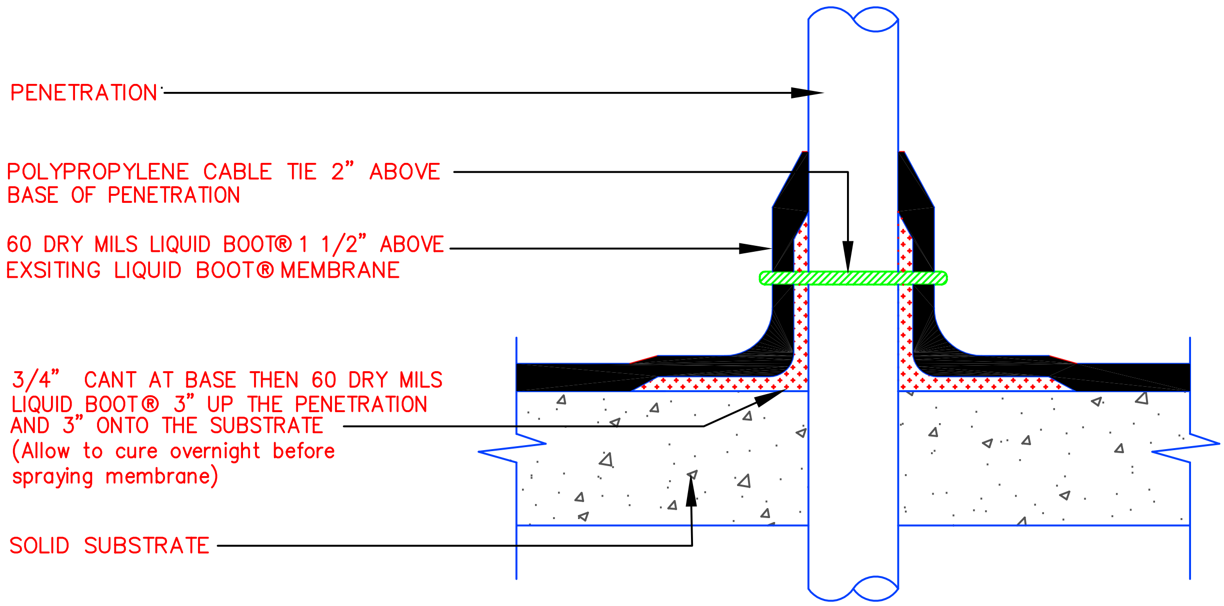
NOT TO SCALE

G3.2



GAS VAPOR BARRIER
MEMBRANE LAP JOINTS
ON GEOTEXTILE
NOT TO SCALE

G3.3

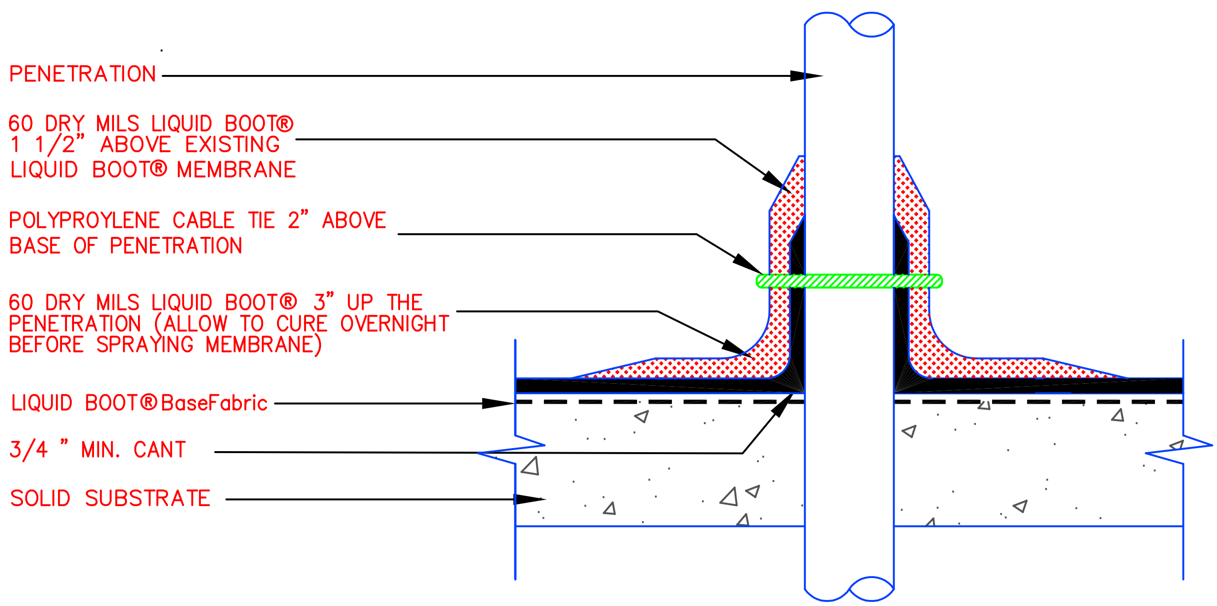


NOTE:
All penetrations shall be cleaned per specification before LIQUID BOOT® is applied.

GAS VAPOR BARRIER
PENETRATIONS
WITH SOLID SUBSTRATE

NOT TO SCALE

G4.1

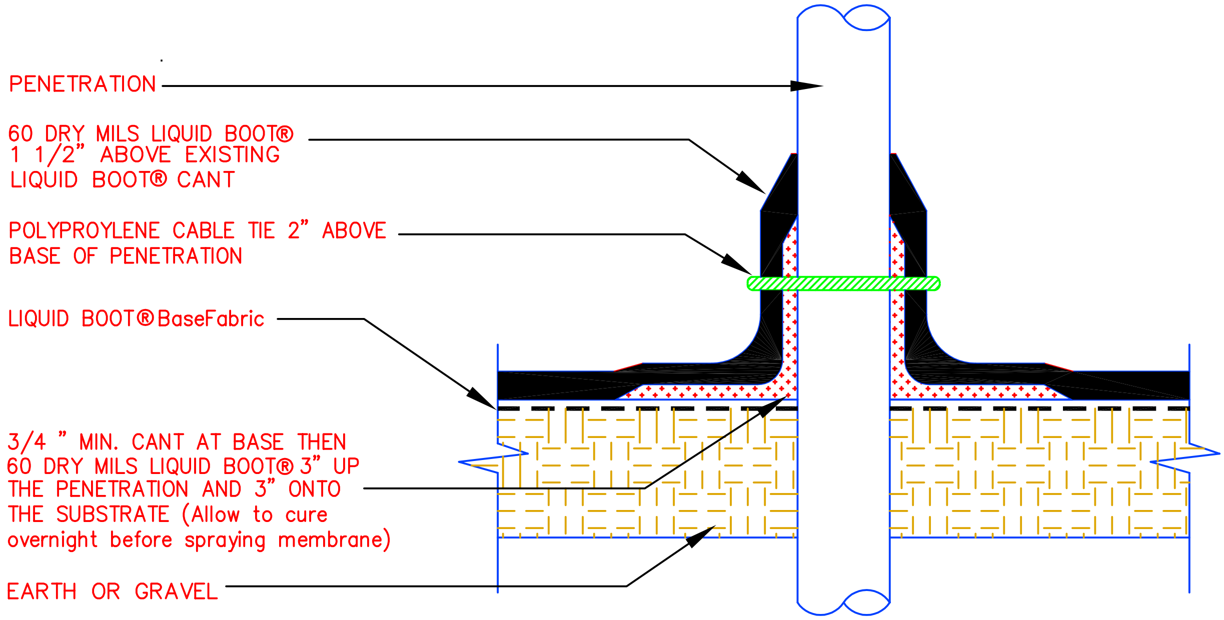


NOTE:
All penetrations shall be cleaned per specification before LIQUID BOOT® is applied

GAS VAPOR BARRIER
PENETRATIONS WITH SOLID
SUBSTRATE (OPTION 2)

NOT TO SCALE

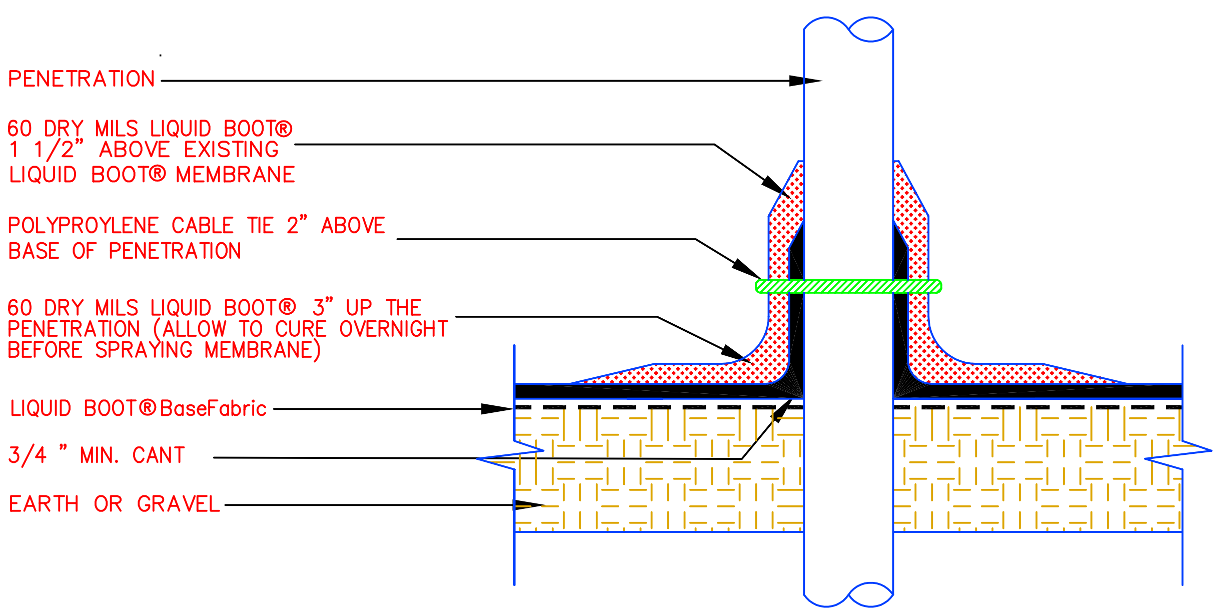
G4.2



NOTE:
All penetrations shall be cleaned per specifications before LIQUID BOOT® is applied.

GAS VAPOR BARRIER
PENETRATIONS ON EARTH OR
GRAVEL SUBSGRADE (OPTION 1)
NOT TO SCALE

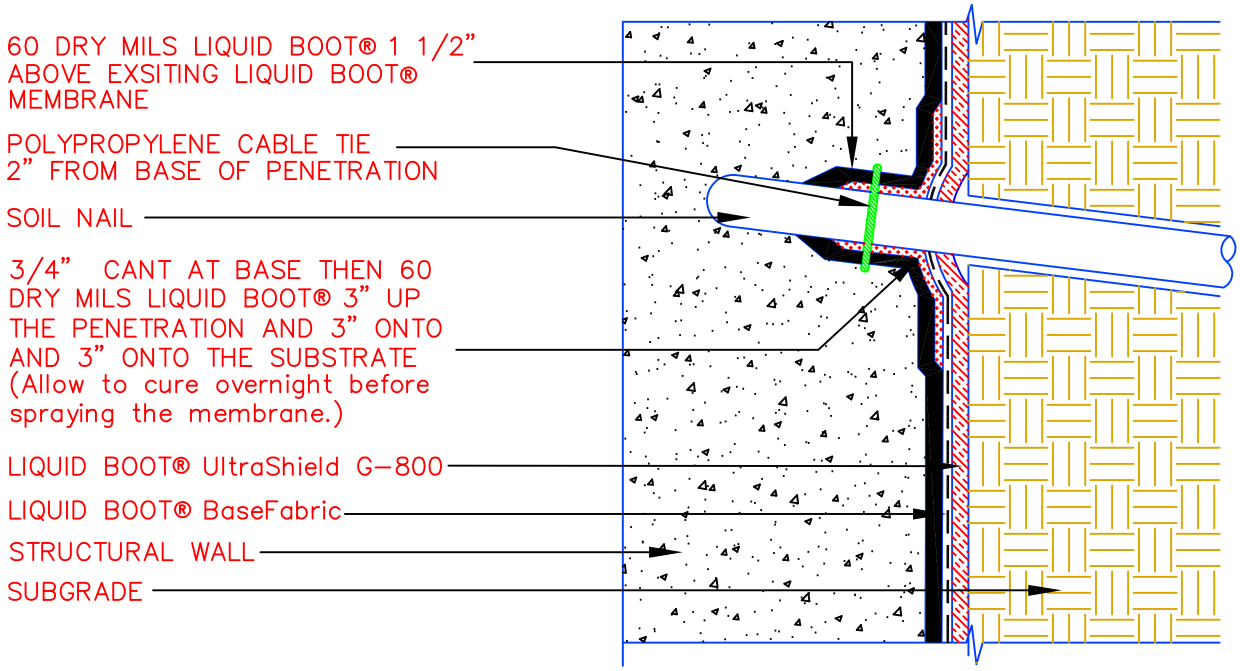
G4.3



NOTE:
All penetrations shall be cleaned per specification before LIQUID BOOT® is applied

GAS VAPOR BARRIER
PENETRATIONS ON EARTH OR
GRAVEL SUBSGRADE (OPTION 2)
NOT TO SCALE

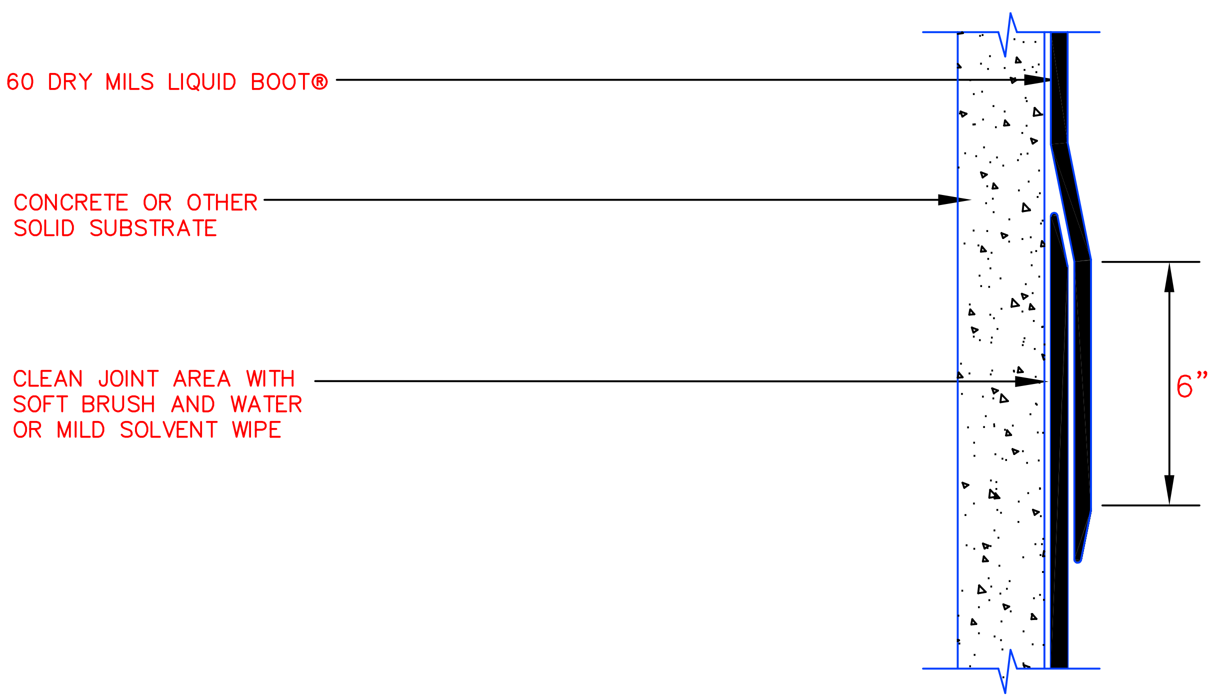
G4.4



NOTE:
All penetrations shall be cleaned per specifications before LIQUID BOOT® is applied.

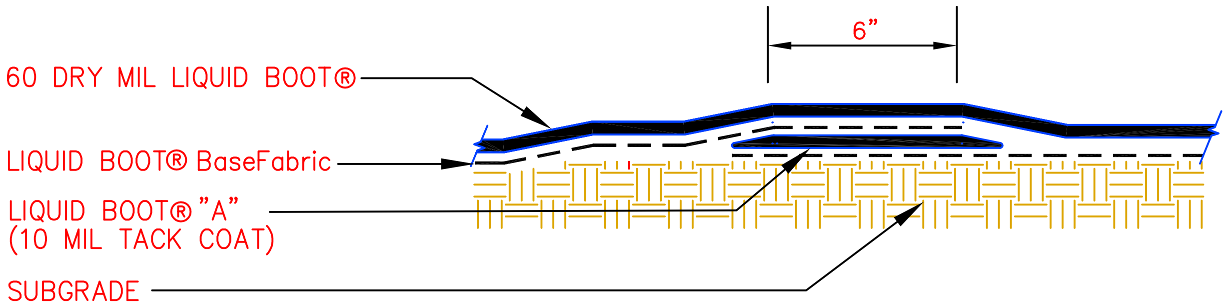
GAS VAPOR BARRIER
SOIL NAIL
NOT TO SCALE

G4.5



GAS VAPOR BARRIER
MEMBRANE LAP JOINTS
ON SOLID SUBSTRATE
NOT TO SCALE

G4.6



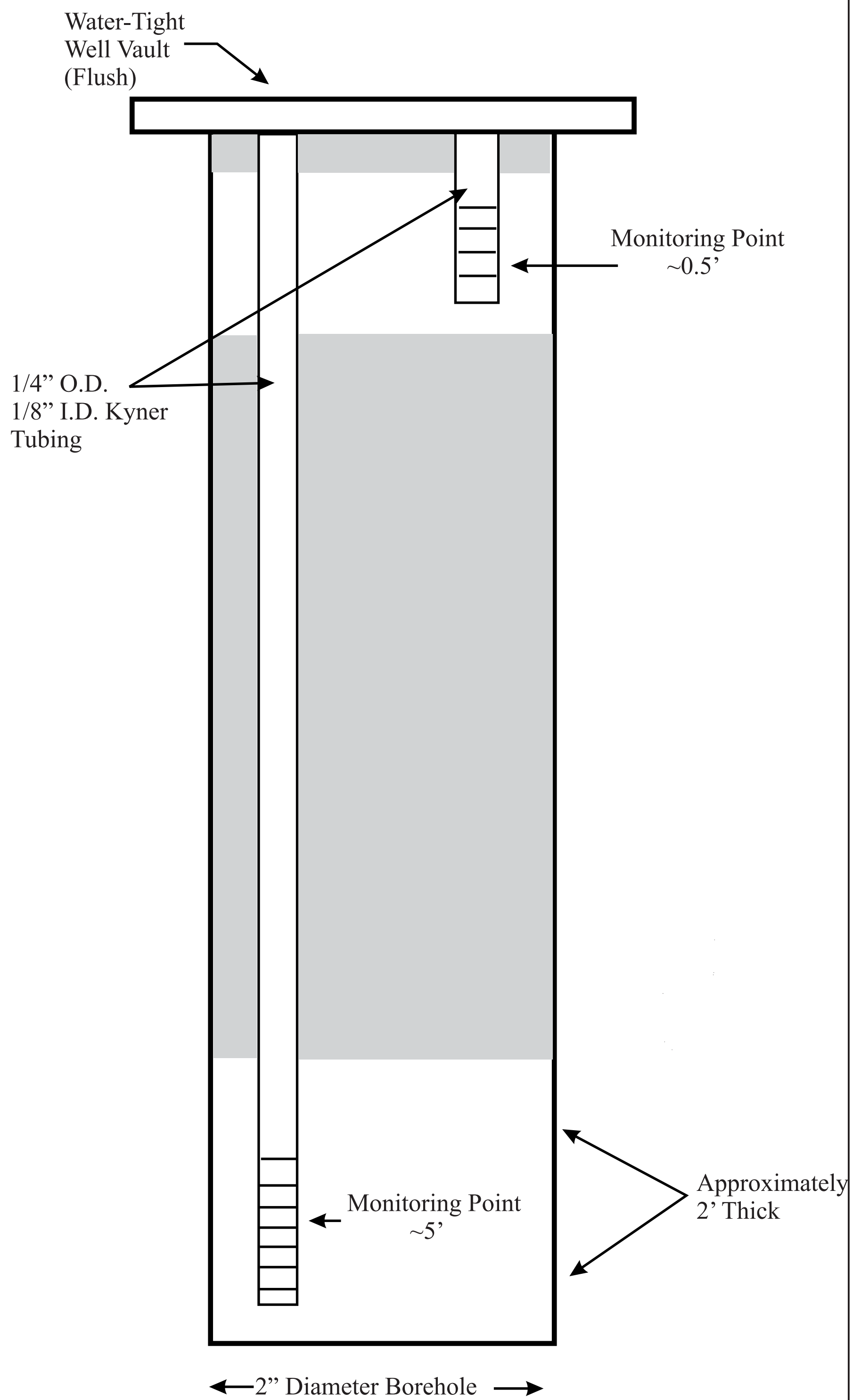
GAS VAPOR BARRIER
MEMBRANE LAP JOINTS
ON GEOTEXTILE

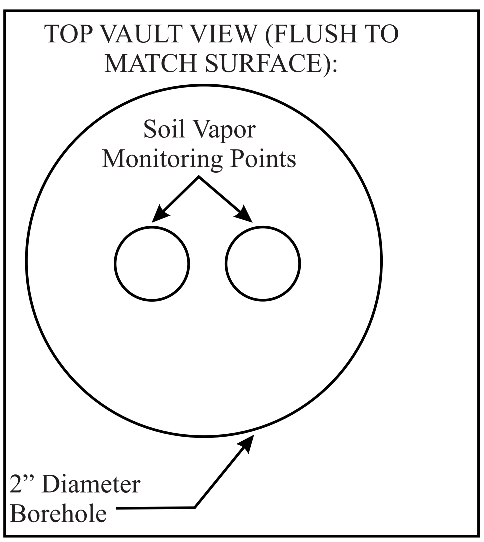
NOT TO SCALE

G4.7

APPENDIX B

NESTED SOIL GAS PROBE





NOT TO SCALE

LEGEND

Bentonite Seal

Sand Filter Pack

Monitoring Point

AEI CONSULTANTS

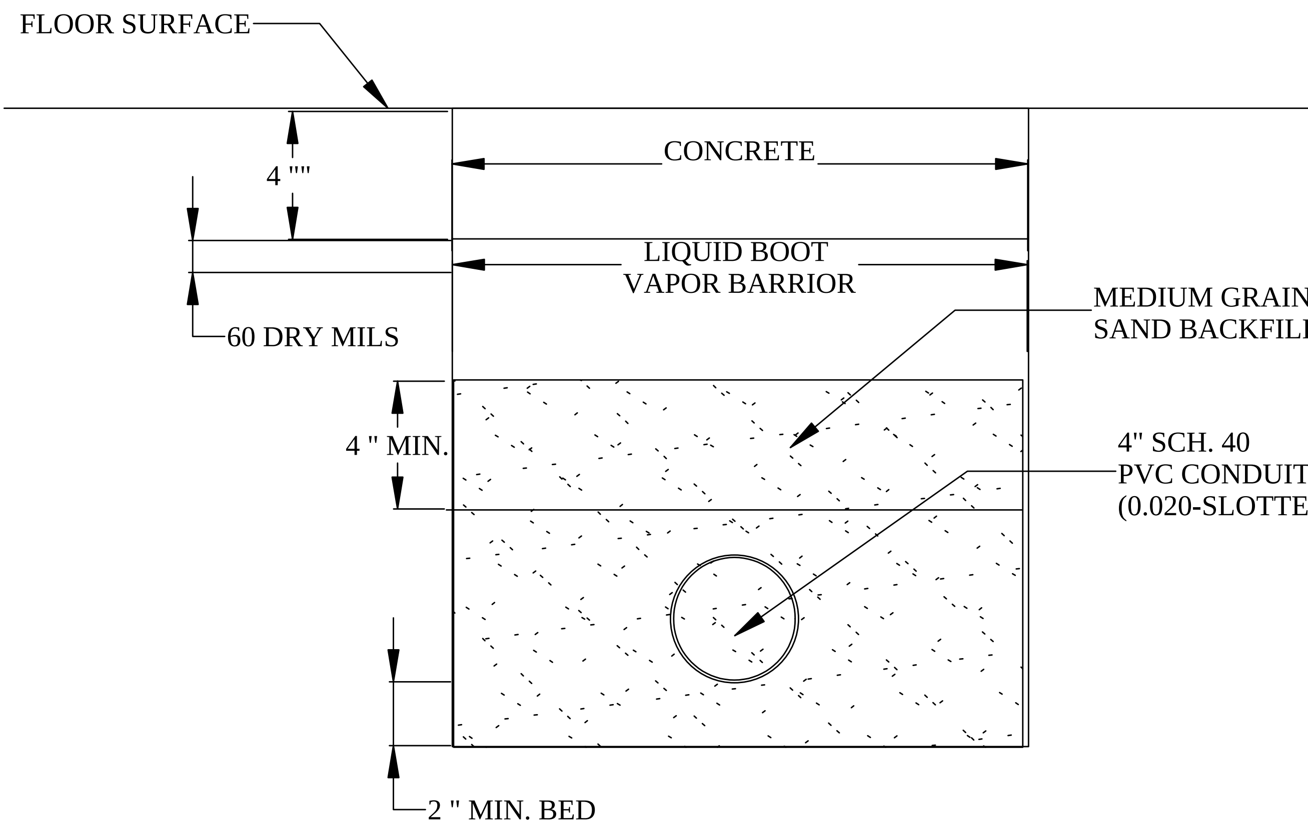
2500 CAMINO DIABLO, WALNUT CREEK, CA

TYPICAL NESTED SOIL VAPOR MONITORING POINT DETAIL

APPENDIX C

VAPOR EXTRACTION VENTING SYSTEM DIAGRAM

ACTIVE VAPOR SYSTEM
CROSS SECTION



AEI CONSULTANTS

2500 CAMINO DIABLO BLVD, WALNUT CREEK, CA

ACTIVE SUBSLAB VENTING SYSTEM DETAILS - TYPICAL