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22 May 2017
Project 731641603

Mr. Keith Nowell, PG
Alameda County Health Care Services Agency
Environmental Health Department
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

Subject: Basis of Design for Vapor Mitigation System
Cleanup Case No. RO03236
3000 Broadway SPE LLC
260 30th Street
Oakland, California
Langan Project: 731635603

Dear Mr. Nowell:

I have read and acknowledge the content, recommendations and/or conclusions contained in the attached document submitted on my behalf to ACDEH's FTP server and the SWRCB's GeoTracker website.

Sincerely yours,

Alan Chamorro
3000 Broadway SPE LLC

22 May 2017

Mr. Keith Nowell
Hazardous Materials Specialist, PG, CHG
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, California 94502

Re: Basis of Design for Vapor Mitigation System
3000 Broadway Redevelopment:
260 30th Street
Oakland, California
Langan Project: 750635603
ACEH RO3236

Dear Mr. Nowell:

Langan Engineering and Environmental Services, Inc. (Langan) is designing a vapor mitigation system (VMS) on behalf of 3000 Broadway SPE LLC for the 3000 Broadway Redevelopment in Oakland, California (Figure 1). Specifically, the VMS will be associated with the 260 30th Street portion of the redevelopment (site), because the significant volatile organic compound (VOC) impacts are limited to this portion of the redevelopment area. The purpose of this letter is to provide the basis of design for the VMS, including a set of preliminary draft design drawings depicting the major system components. The basis of design reflects Langan's years of design experience along with field data gathered during multiple field investigations. This letter is intended to streamline the process for approval of the final VMS engineering design drawings that Langan will be submitting for the structures.

BACKGROUND

The redevelopment area consists of 3000 and 3020 Broadway; 3007 and 3009 Brook Street; and 250, 260, and 288 30th Street in Oakland, California (Figure 1). Current development plans include the construction of a lot-line-to-lot-line, five-story, wood-frame apartment building, over a one- to two-story concrete podium with only parking proposed on the lowest level. The proposed development will have a single level basement garage along Broadway leveling out to the current grade at Brook Street, as the ground surface elevation drops. The entrance to the partial below grade parking will be along Brook Street. The partial below-grade parking level will be naturally ventilated along the southern and eastern faces of the proposed building. In addition to natural ventilation, mechanical ventilation will be provided for the interior parking area. All residential and commercial units will be situated above the parking podium.

Several environmental investigations have been performed at the site and the larger redevelopment area by Langan since April 2016. Figure 2 shows soil and groundwater sampling locations completed in 2016 and 2017. Phase I (Langan, 2016a) and Phase II (Langan, 2016b) Environmental Site Assessments (ESAs) were performed in April 2016. The Phase I ESA for the larger redevelopment area reported a history of contamination associated with a leaking underground storage tank (LUST), which was abandoned in place, located near 250 30th Street. The April 2016 Phase II ESA focused on groundwater impacts associated with the 250 30th Street LUST and classifying soil for off-haul during future construction. The findings of the Phase II ESA indicated that low levels of contaminants are present in the subsurface beneath the redevelopment area with lead detected in soil samples exceeding the hazardous waste criteria and residual concentrations of total petroleum hydrocarbons (TPH) as gasoline (TPHg), as diesel (TPHd), and as motor oil (TPHmo) in groundwater near a previously closed-in-place underground storage tank (UST).

During a November 2016 geotechnical investigation, a petroleum odor was noted and responses on a photoionization detector (PID) were detected in soil collected from boring B-16 (Figure 2), which was advanced in the 260 30th Street portion of the redevelopment area. Soil samples were analyzed for TPH, VOCs, and metals. The results of the soil analyses indicated the subsurface of the 260 30th Street property had been impacted by TPH and VOCs. Subsequent environmental investigations focused on the 250 and 260 30th Street properties have found elevated concentrations of TPH and VOCs, particularly tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (cis-1,2-DCE), in groundwater beneath the 260 30th Street portion of the redevelopment likely originating from a floor drain located on the same property. Boring B-17 was advanced in the 250 30th Street property, upgradient of the 260 30th Street property, to determine if this parcel was a contributing source. Based on the lack of significant detections in B-17, the 250 30th Street property was ruled out as a potential source. Summaries of soil and groundwater results are presented in Attachment 1.

TPH and VOC concentrations in soil at the 260 30th Street property were found to exceed the Regional Water Quality Control Board (RWQCB) Tier 1 Environmental Screening Levels (ESLs) within the upper 10 feet. One boring, B-33, also had Tier 1 ESL exceedances in soil at a depth of 17.5 feet bgs. In addition, groundwater levels at the site were found to have risen as much as 15 feet between November 2016 and February 2017 during a period of above average rainfall. Groundwater elevations measured in February 2017 were just below the proposed bottom of slab elevation for the planned development (see Attachment 2). Due to the potential hydrostatic conditions created by elevated groundwater levels at the Site, the entire building slab will be waterproofed.

Because VOCs in soil and groundwater beneath portions of the 260 30th Street property exceed the RWQCB vapor intrusion ESLs but do not appear to extend to other areas of the Site, a VMS will be included beneath the 260 30th Street portion of the site, as shown on the attached draft Design Drawings (Attachment 3), as part of the building design. The VMS will tie into the sub-slab waterproofing so that the entire building slab is waterproofed.

Due to the presence of PCE, TCE, and petroleum hydrocarbons at elevated concentrations in soil, Langan anticipates that extensive soil removal, to depths of 18 feet below ground surface (bgs), will occur during the initial phase of site redevelopment. Consequently, the proposed VMS may not even be necessary to mitigate health risks, as all soil currently exceeding Tier 1 ESLs is proposed for removal; however, the VMS will be constructed, to allow the redevelopment to proceed within a reasonable timeframe.

CONCEPTUAL DESIGN

The VMS will consist of a continuous, spray-applied vapor barrier membrane located immediately beneath a portion of the structural building slab, combined with a horizontal collection and venting system installed below the vapor barrier membrane to allow any soil vapors that would otherwise collect beneath the slab to migrate and vent to the atmosphere outside the building. These features are described in greater detail in the following paragraphs.

Vapor Barrier Membrane

A typical section showing the vapor barrier membrane beneath the structural slab is shown in Detail 1 of Sheet VMS2.01 (see Attachment 3). The foundation for the building will consist of a spread-footing supported structural slab system. Typically, the footing and grade beams will be poured before the structural slab. After these foundation members are constructed, a carrier fabric will be placed on the soil subgrade and overlap onto the foundation units. The spray-applied membrane will be applied onto the carrier fabric. The membrane will then be covered by an HDPE-reinforced bentonite sheet protection course layer, so that the membrane is not damaged during the laying of the reinforcing steel for the concrete slab and to act as an underslab water barrier for the building. As it cures, the concrete of the structural slab will form a bond with the protection course fabric, causing the membrane system to adhere to the underside of the slab. In the event that voids are created beneath the slab due to settlement of the subgrade, the integrity of the membrane will not be compromised.

The vapor barrier membrane will be applied only in the 260 30th Street portion of the redevelopment area with elevated VOC concentrations localized around the previously-identified floor drain. This area is located in the southeastern corner of the redevelopment with the proposed vapor barrier membrane extending to the eastern and southern boundaries of the proposed development. The western extent of the vapor barrier membrane was chosen based on groundwater concentrations at B-17, which were below vapor intrusion ESLs (see Attachment 1). The northern extent of the vapor barrier membrane extends approximately 25 feet past B-21. Groundwater concentrations at B-21 exceeded the residential vapor intrusion via shallow groundwater ESL for TCE of 5.6 µg/L. However, because concentrations of VOCs decrease with distance from the floor drain and the direction of groundwater flow is likely toward the southeast, extending the vapor barrier membrane 25 feet to the north of B-21 is believed to be sufficient to mitigate the vapor intrusion risk.

The balance of the foundation slab will be underlain by a waterproofing membrane that is made by the same manufacturer (and applied by the same applicator) as the vapor barrier membrane.[1] Where the transition occurs between the vapor barrier membrane and the waterproofing products, the gravel layer will be interrupted by a lateral barrier constructed of controlled density fill, concrete, or similar low-permeability material; the purpose of this barrier is to

[1] It is anticipated that the "vapor barrier membrane" product will be E-Protect-Plus and the "waterproofing" product will be E-Proformance (or E-Protect), all manufactured by EPRO Services Inc. of Wichita, KS. In the event of unacceptable delays in EPRO product delivery due to a shortage of materials or other reasons, the proposed alternative for both the "vapor barrier membrane" and the "waterproofing" product is Coreflex, manufactured by CETCO Minerals Technologies of Hoffman Estates, IL.

mitigate against the potential lateral migration of VOCs along the gravel layer into areas that are not covered by the vapor barrier membrane.

In addition, as shown in the architectural plans for the project, the entire site will be underlain by a partially below-grade parking garage, which will be naturally ventilated along the southern and eastern faces of the site. It is our opinion that the ventilated partially below-grade garage provides a break in potential exposure pathways that may exist between the sub-slab vapors and first floor occupants, providing a second, independent barrier against vapor intrusion into the occupied spaces.

In order to limit potential vapor migration via utility trenches beneath the proposed building, trench dams consisting of controlled density fill will be incorporated into the final design and will be installed in utility trenches, as appropriate, at the perimeter of the building during construction.

Passive Vapor Collection and Venting System

A passive horizontal collection and venting system will be installed beneath the vapor barrier, described above, to collect soil vapors potentially containing VOCs from beneath the building slab and vent them to atmosphere outside the building. The system will include an interconnected network of 3-inch perforated PVC piping embedded in a 4-inch gravel layer directly beneath the building slab. The piping network will be connected to a vertical riser, constructed of cast iron pipe, which will trend vertically (typically through utility pipe chases) to the roof level, where it will be capped with a wind turbine that will generate a slight vacuum on the piping network to enhance collection and venting of the vapors. The vertical riser will also include a test port above the roof.

Groundwater level data collected in February 2017 indicates that, during exceptionally wet winters, the piping system may, at times, be under water; nevertheless, the vapor barrier/waterproofing membrane will remain protective. The VMS piping system is designed to drain and return to functionality as the water table drops and returns to more normal levels.

The area covered by the VMS is approximately 7,000 square feet (sf). The Los Angeles Department of Building and Safety (LADBS) *Standard Plan: Methane Hazard Mitigation*, revised 8 March 2010, the recommended riser frequency is one per 10,000 sf of plan area. By that standard, which Langan also uses as a guideline for VMS design, one riser is sufficient for this building's VMS. In certain situations, the addition of a second riser may be warranted in order to provide engineering redundancy; however, in this case, other design redundancies are already anticipated (complete removal of impacted soils; vented garage between foundation slab and lowest residential floor), therefore one riser will suffice.

Perimeter Inlet Vents

The purpose of the perimeter inlet vents is to facilitate convective airflow up the vertical riser pipe of the collection and venting system by allowing fresh air to enter the space beneath the building slab. Each vent is constructed of solid PVC or cast iron pipe, and is placed through the formwork prior to pouring the concrete (see Attachment 3).

VMS Completion Report and Operations and Maintenance Manual

The installation of the VMS will be documented by periodic site visits to observe the installation of the gravel layer, piping, vapor barrier membrane, and risers; site visits will also include quality assurance/quality control (QA/QC) functions such as coupon sampling and smoke testing of the vapor barrier membrane. After the installation has been completed, a VMS Completion Report will be prepared and submitted to ACEH. The report will include field daily observation reports for all site visits, photographs taken during VMS installation, and a set of Record Drawings.

An Operation and Maintenance (O&M) Manual will also be prepared for use by the building owner; maintenance requirements will be comparatively minimal, as this will be a passive VMS. The O&M Plan will describe routine, periodic maintenance activities, with a checklist for use by the building engineer or other owner's representative, as well as emergency response procedures in the event of a fire, earthquake, or other event that may damage the VMS. The O&M Plan will also state the conditions under which long-term O&M may be discontinued.

POST-CONSTRUCTION VMS MONITORING PLAN

The performance of the VMS will be evaluated by collecting whole air samples from the VMS risers and measuring airflow within the riser. Grab samples will be collected in 1-liter SUMMA canisters; a primary and a duplicate sample will be collected and sent to a state-certified laboratory for analysis by EPA Method SIM TO-15 for VOCs.

The initial round of monitoring will be conducted when the VMS is substantially complete, i.e., completed at the roof level with a wind turbine and sampling port. Monitoring will continue on a quarterly basis until two consecutive sampling events indicate that all primary COCs, as identified in the Corrective Action Plan (Langan, pending) are present at concentrations at or below 75% of their respective RWQCB ESLs for soil gas. It is anticipated that this milestone will be achieved within one year or less, based on the proposed removal of all soil exceeding Tier 1 ESLs. If this milestone is not achieved within that timeframe, or if the monitoring data or other observations indicate any cause for concern, additional monitoring or mitigative measures will be discussed with ACEH.

SUMMARY

In summary, it is Langan's opinion that the proposed VMS described herein is a conservative design that is consistent with designs for other sites with similar site conditions. Having a vapor barrier membrane and collection and ventilation system below a naturally ventilated parking garage provides for additional engineering redundancy in the mitigation system for this Site.

We look forward to receiving the ACEH's approval of this basis of design. If you have any questions regarding this letter, please feel free to contact us at (510) 874-7000.

Sincerely,
Langan Engineering & Environmental Services, Inc.

Sigrida Reinis, Ph.D., P.E.
Associate

REGISTERED PROFESSIONAL ENGINEER
SIGRIDA REINIS
NO. C69777
Exp. 6-30-2018
CIVIL
STATE OF CALIFORNIA

Joshua Graber. CHMM
Associate

cc: Alan Chamorro, 3000 Broadway SPE LLC

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REFERENCES

Langan Engineering and Environmental Services (Langan), *Phase I Environmental Site Assessment, 3000 and 3020 Broadway; 3007 and 3009 Brook Street; and 250, 260, and 288 30th Street, Oakland, California*, April 2016a.

Langan, *Phase II Environmental Site Assessment, 3000 and 3020 Broadway; 3007 and 3009 Brook Street; and 250, 260, and 288 30th Street, Oakland, California*, April 2016b.

Langan, *Additional Environmental Site Characterization 250 and 260 30th Street, Oakland, California*, March 2017.

Langan, *Feasibility Study and Corrective Action Plan, 3000 Broadway Redevelopment, Oakland, California 94611*, pending.

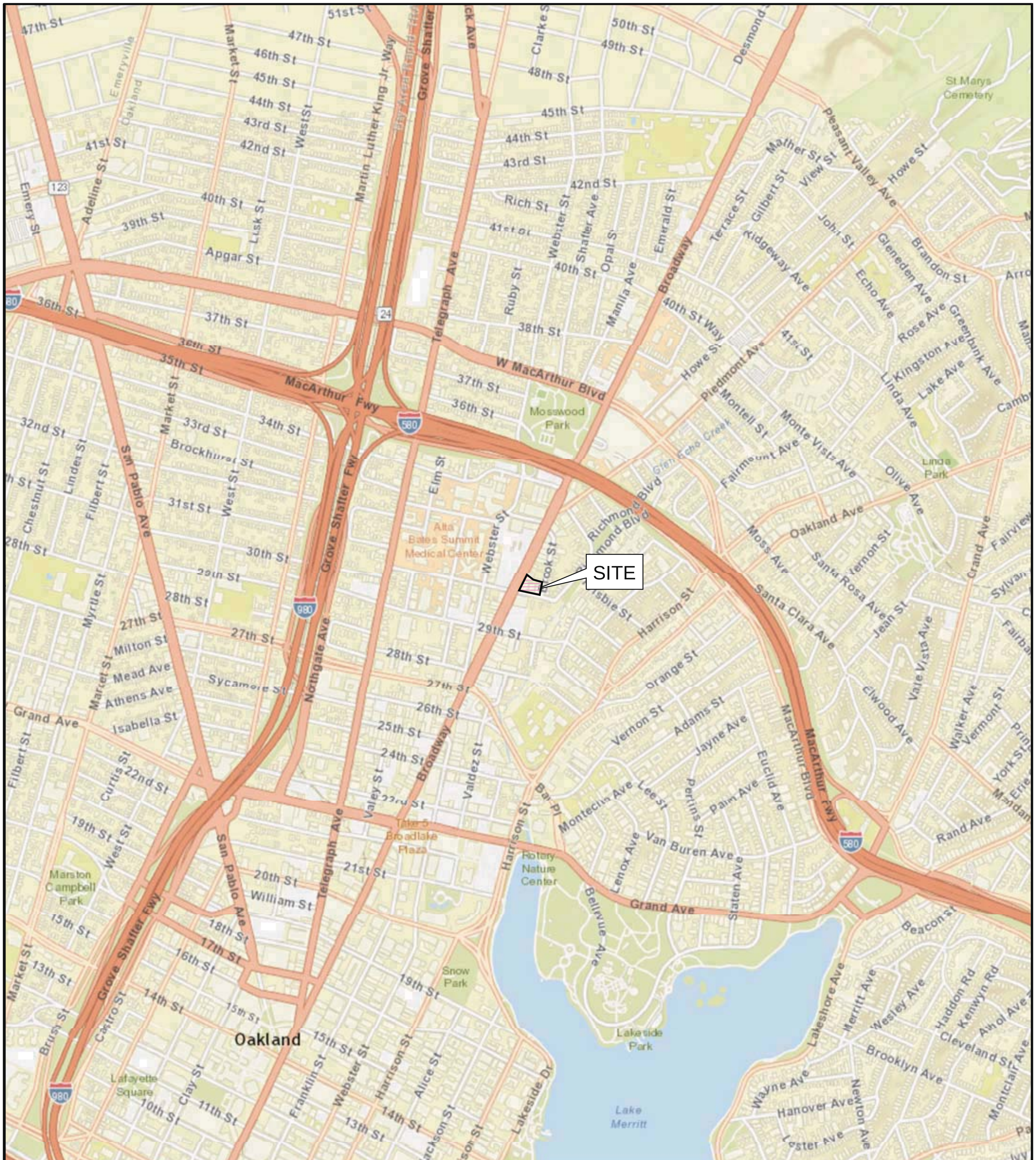
Enclosures:

Figure 1	Site Location Map
Figure 2	Site Plan

Attachments:

Attachment 1	Site Plans with Soil and Groundwater Exceedances from *Feasibility Study and Corrective Action Plan*, dated 2 May 2017
Attachment 2	Idealized Subsurface Profile A-A' *Feasibility Study and Corrective Action Plan*, dated 2 May 2017
Attachment 3	Preliminary Draft VMS Design Drawings

FIGURES



NOTES:

World street basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online.
Credits: Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN.

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3000 BROADWAY REDEVELOPMENT
260 30TH STREET
Oakland, California

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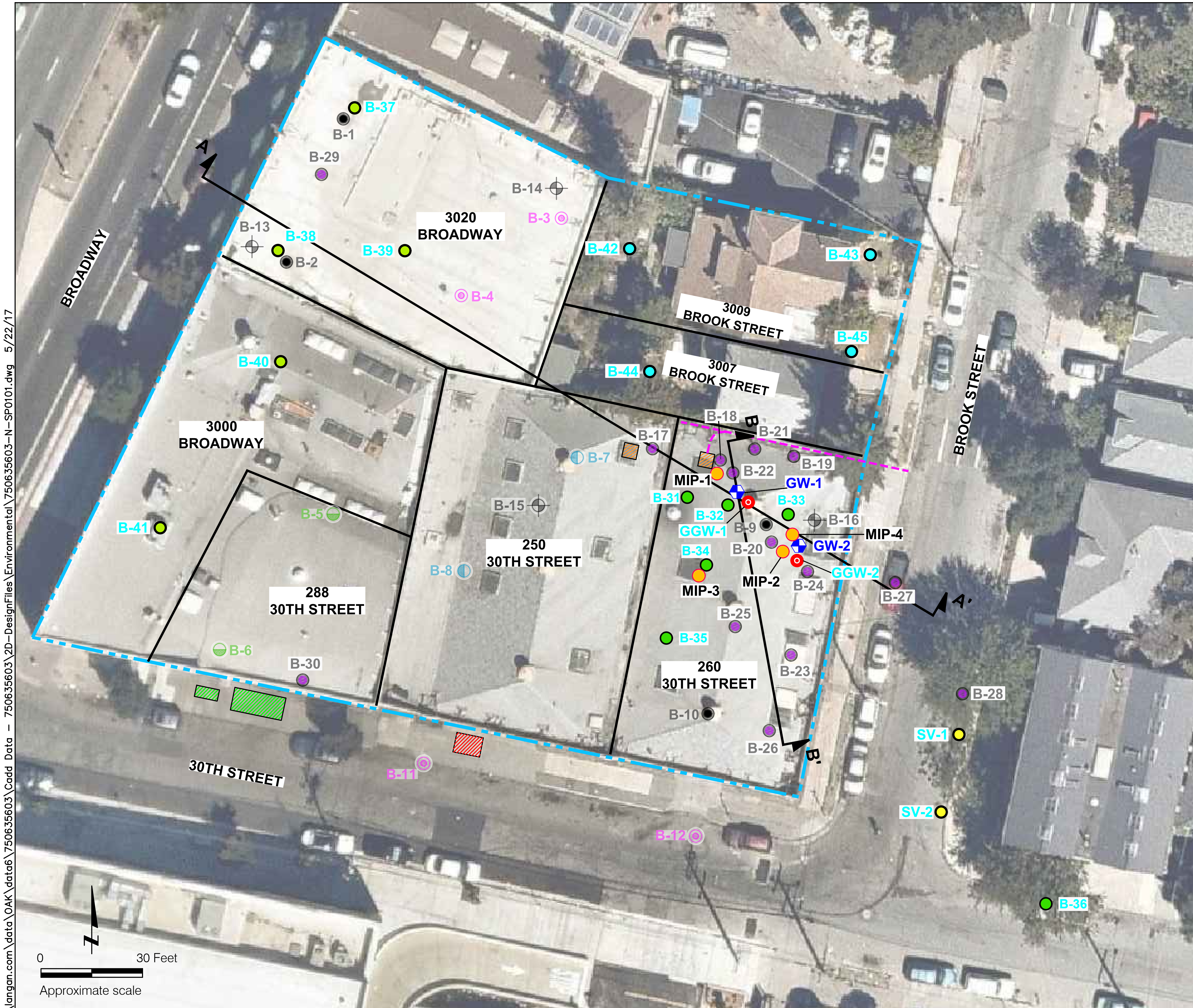
SITE LOCATION MAP

Date 05/22/17	Project No. 750635603	Figure 1



EXPLANATION

GGW-1	Approximate location of deep grab groundwater sample by Langan, March 2017
GW-1	Approximate location of groundwater monitoring well
SV-1	Approximate location of soil gas sample by Langan, April 2017
MIP-1	Approximate location of MIP by Langan, March 2017
B-31	Approximate location of soil and/or groundwater boring by Langan, March and April 2017
B-37	Approximate location of soil sampling boring for composite characterization, 20 feet bgs max. by Langan, April 2017
B-42	Approximate location of boring for composite characterization, 8 feet bgs max. by Langan, April 2017
B-17	Approximate location of environmental boring by Langan, February 2017
B-13	Approximate location of geotechnical boring by Langan, November 2016
B-1	Approximate location of 5-foot boring by Langan Treadwell Rollo, April 2016
B-3	Approximate location of 20-foot boring by Langan Treadwell Rollo, April 2016
B-5	Approximate location of 15-foot boring by Langan Treadwell Rollo, April 2016
B-7	Approximate location of 10-foot boring by Langan Treadwell Rollo, April 2016
	Approximate location of abandoned in-place 1,000-gallon waste oil UST, March 1997
	Approximate location of former USTs (350-gallon gasoline and 1,000-gallon diesel), removed in July 1992
	Approximate location of floor drain
	Approximate footprint of proposed 3000 Broadway Redevelopment
	Approximate location of drain line piping
A A'	Idealized subsurface profile location

3000 BROADWAY REDEVELOPMENT
Oakland, California

SITE PLAN WITH SAMPLING LOCATIONS AND CROSS SECTIONS

Date 05/22/17 | Project No. 750635603 | Figure 2

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ATTACHMENT 1

SITE PLAN WITH GROUNDWATER EXCEEDANCES FROM *FEASIBILITY STUDY AND CORRECTIVE ACTION PLAN*, DATED 2 MAY 2017

Sample ID - Depth (ft bgs)		B-18-10	B-18-15	B-18-20
Date		2/2/2017	2/2/2017	2/2/2017
Chemical Name	Matrix / Units	Soil / mg/kg		
TPH gasoline		< 1.0	< 1.0	< 1.0
TPH diesel		< 1.0	< 1.0	< 1.0
TPH motor oil		< 5.0	< 5.0	< 5.0
PCE		< 1.0	<0.005	<0.005
TCE		6.4	0.025	<0.005
Cis-1,2-DCE		1.1	0.0063	<0.005

Sample ID - Depth (ft bgs)		B-21-10
Date		2/2/2017
Chemical Name	Matrix / Units	Soil / mg/kg
TPH gasoline		< 1.0
TPH diesel		< 1.0
TPH motor oil		< 5.0
PCE		<0.025
TCE		0.50
Cis-1,2-DCE		0.065

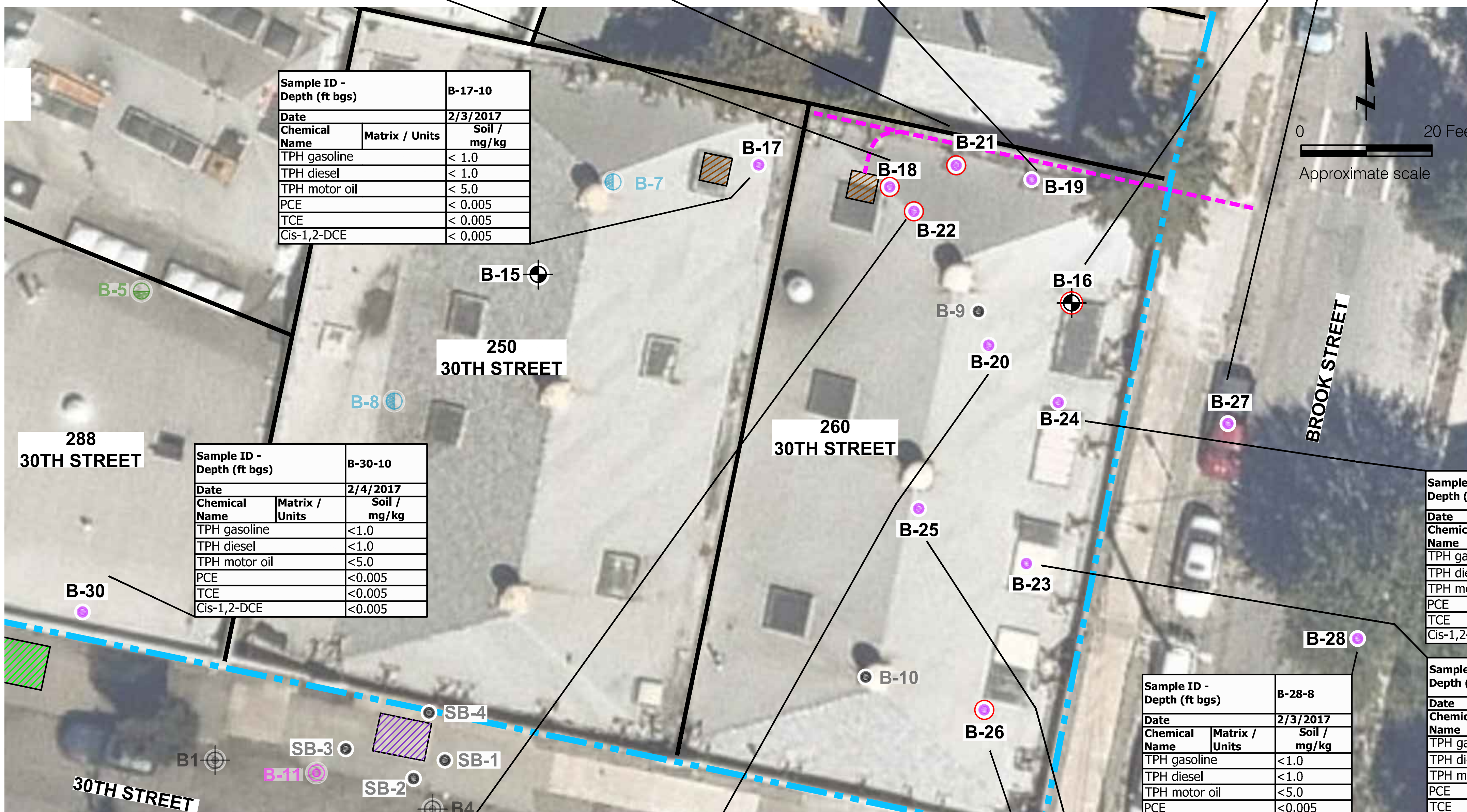
Sample ID - Depth (ft bgs)		B-19-10
Date		2/1/2017
Chemical Name	Matrix / Units	Soil / mg/kg
TPH gasoline		< 1.0
TPH diesel		< 1.0
TPH motor oil		< 5.0
PCE		< 0.005
TCE		< 0.005
Cis-1,2-DCE		< 0.005

Sample ID - Depth (ft bgs)		B-16-6	B-16-10	B-16-20.5
Date		11/3/2016	11/3/2016	11/3/2016
Chemical Name	Matrix / Units	Soil / mg/kg		
TPH gasoline		810	460	15
TPH diesel		2,900	1,600	100
TPH motor oil		6,100	3,600	100
PCE		2.0	0.059	0.013
TCE		< 0.20	0.29	0.017
Cis-1,2-DCE		< 0.20	0.29	< 0.005

Sample ID - Depth (ft bgs)		B-27-10
Date		2/3/2017
Chemical Name	Matrix / Units	Soil / mg/kg
TPH gasoline		<1.0
TPH diesel		<1.0
TPH motor oil		<5.0
PCE		<0.005
TCE		<0.005
Cis-1,2-DCE		<0.005

EXPLANATION

- B-18 — Approximate location of environmental boring by Langan, February 2017
- B-13 — Approximate location of geotechnical boring by Langan, November 2016
- B-1 — Approximate location of 5-foot boring by Langan Treadwell Rollo, April 2016
- B-11 — Approximate location of 20-foot boring by Langan Treadwell Rollo, April 2016
- B-5 — Approximate location of 15-foot boring by Langan Treadwell Rollo, April 2016
- B-7 — Approximate location of 10-foot boring by Langan Treadwell Rollo, April 2016
- B1 — Approximate location of boring by P&D Environmental, Inc., September 2014
- SB-1 — Approximate location of boring by Faultline Associates, Inc., March 1997
- Approximate location of abandoned in-place 1,000-gallon waste oil UST, March 1997
- Approximate location of former USTs (350-gallon gasoline and 1,000-gallon diesel), removed in July 1992
- Approximate location of floor drain
- Approximate footprint of proposed 3000 Broadway Redevelopment
- Approximate location of drain line piping
- 6.4 — Sample concentration in exceedance of Tier 1 ESLS
- Sample location in exceedance of Tier 1 Environmental screening wells (ESLS) as established by the San Francisco Regional Water Quality Control Board (RWQCB) in February 2016.



Sample ID - Depth (ft bgs)		B-17-10
Date		2/3/2017
Chemical Name	Matrix / Units	Soil / mg/kg
TPH gasoline		< 1.0
TPH diesel		< 1.0
TPH motor oil		< 5.0
PCE		< 0.005
TCE		< 0.005
Cis-1,2-DCE		< 0.005

Sample ID - Depth (ft bgs)		B-30-10
Date		2/4/2017
Chemical Name	Matrix / Units	Soil / mg/kg
TPH gasoline		<1.0
TPH diesel		<1.0
TPH motor oil		<5.0
PCE		<0.005
TCE		<0.005
Cis-1,2-DCE		<0.005

Sample ID - Depth (ft bgs)		B-24-8	B-24-10	B-24-15	B-24-20
Date		2/1/2017	2/1/2017	2/1/2017	2/1/2017
Chemical Name	Matrix / Units	Soil / mg/kg			
TPH gasoline		< 1.0	12	< 1.0	< 1.0
TPH diesel		< 1.0	70	< 1.0	< 1.0
TPH motor oil		< 5.0	180	< 5.0	< 5.0
PCE		<0.005	<0.005	<0.005	<0.005
TCE		<0.005	0.010	0.047	0.030
Cis-1,2-DCE		<0.005	0.012	0.14	<0.005

Sample ID - Depth (ft bgs)		B-28-8
Date		2/3/2017
Chemical Name	Matrix / Units	Soil / mg/kg
TPH gasoline		<1.0
TPH diesel		<1.0
TPH motor oil		<5.0
PCE		<0.005
TCE		0.017
Cis-1,2-DCE		<0.005

Sample ID - Depth (ft bgs)		B-23-10	B-23-12.5	B-23-16
Date		2/2/2017	2/2/2017	2/2/2017
Chemical Name	Matrix / Units	Soil / mg/kg		
TPH gasoline		<1.0	20	<1.0
TPH diesel		<1.0	8.1	<1.0
TPH motor oil		<5.0	25	<5.0
PCE		<0.005	<0.005	<0.005
TCE		<0.005	<0.005	<0.005
Cis-1,2-DCE		<0.005	<0.005	<0.005

Sample ID - Depth (ft bgs)		B-22-10	B-22-15	B-22-20
Date		2/1/2017	2/1/2017	2/1/2017
Chemical Name	Matrix / Units	Soil / mg/kg		
TPH gasoline		< 1.0	< 1.0	< 1.0
TPH diesel		< 1.0	< 1.0	< 1.0
TPH motor oil		< 5.0	< 5.0	< 5.0
PCE		<0.33	< 0.005	< 0.005
TCE		5.0	< 0.005	< 0.005
Cis-1,2-DCE		0.81	< 0.005	< 0.005

Sample ID - Depth (ft bgs)		B-20-10
Date		2/1/2017
Chemical Name	Matrix / Units	Soil / mg/kg
TPH gasoline		< 1.0
TPH diesel		< 1.0
TPH motor oil		< 5.0
PCE		< 0.01
TCE		0.21
Cis-1,2-DCE		0.011

Sample ID - Depth (ft bgs)		B-26-10	B-26-15
Date		2/2/2017	2/2/2017
Chemical Name	Matrix / Units	Soil / mg/kg	
TPH gasoline		170	<1.0
TPH diesel		1,500	<1.0
TPH motor oil		2,800	<5.0
PCE		<0.10	<0.005
TCE		<0.10	<0.005
Cis-1,2-DCE		<0.10	<0.005

Sample ID - Depth (ft bgs)		B-25-10	B-25-15.5	B-25-20
Date		2/2/2017	2/2/2017	2/2/2017
Chemical Name	Matrix / Units	Soil / mg/kg		
TPH gasoline		18	3	<1.0
TPH diesel		33	42	<1.0
TPH motor oil		150	170	<5.0
PCE		<0.005	<0.005	<0.005
TCE		0.011	0.0074	0.0075
Cis-1,2-DCE		<0.005	<0.005	<0.005

3000 BROADWAY REDEVELOPMENT
260 30TH STREET
Oakland, California

SITE PLAN WITH SOIL EXCEEDANCES

Date 04/24/17 | Project No. 750635602 | Figure 5

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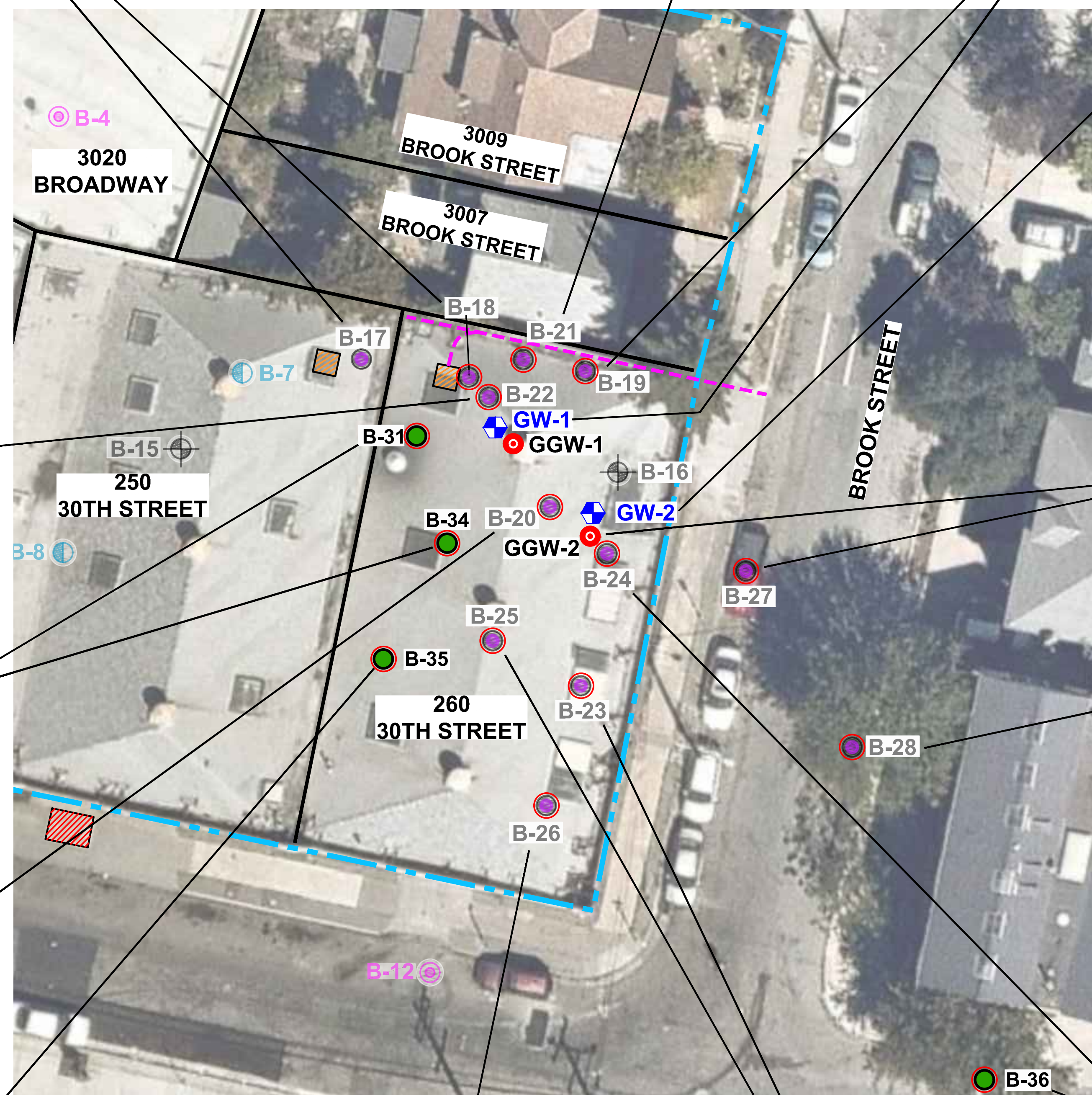
Sample ID - Depth (ft bgs)		B-17-GW
Date		2/3/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		<50
TPH diesel		<50
TPH motor oil		<250
PCE		0.58
TCE		3.5
Cis-1,2-DCE		2.7

Sample ID - Depth (ft bgs)		B-18-GW
Date		2/2/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		55
TPH diesel		200
TPH motor oil		1,200
PCE		< 100
TCE		2,000
Cis-1,2-DCE		350

Sample ID - Depth (ft bgs)		B-21-GW
Date		2/2/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		<50
TPH diesel		<100
TPH motor oil		510
PCE		<5.0
TCE		170
Cis-1,2-DCE		19

Sample ID - Depth (ft bgs)		B-19-GW
Date		2/2/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		<50
TPH diesel		<100
TPH motor oil		630
PCE		<1.2
TCE		41
Cis-1,2-DCE		5

Sample ID - Depth (ft bgs)		GW-1
Date		4/5/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		67
TPH diesel		<50
TPH motor oil		<250
PCE		<25
TCE		1,200.0
Cis-1,2-DCE		170.0



Sample ID - Depth (ft bgs)		B-22-GW
Date		2/2/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		120
TPH diesel		<100
TPH motor oil		680
PCE		<120
TCE		6,100
Cis-1,2-DCE		2,200

Sample ID - Depth (ft bgs)		B-31-GW
Date		3/29/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		<50
TPH diesel		110
TPH motor oil		870
PCE		<1.7
TCE		68.0
Cis-1,2-DCE		72.0

Sample ID - Depth (ft bgs)		B-34-GW
Date		3/29/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		<50
TPH diesel		140
TPH motor oil		700
PCE		<2.5
TCE		160.0
Cis-1,2-DCE		26.0

Sample ID - Depth (ft bgs)		B-20-GW
Date		2/2/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		75
TPH diesel		2,400
TPH motor oil		8,600
PCE		<120
TCE		4,700
Cis-1,2-DCE		460

Sample ID - Depth (ft bgs)		B-35-GW
Date		3/29/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		<50
TPH diesel		140
TPH motor oil		1,100
PCE		<0.5
TCE		4.3
Cis-1,2-DCE		1.0

Sample ID - Depth (ft bgs)		B-26-GW
Date		2/3/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		110
TPH diesel		770
TPH motor oil		1,300
PCE		<2.5
TCE		63
Cis-1,2-DCE		20

Sample ID - Depth (ft bgs)		B-25-GW
Date		2/3/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		66
TPH diesel		5,100
TPH motor oil		18,000
PCE		<5.0
TCE		210
Cis-1,2-DCE		29

Sample ID - Depth (ft bgs)		B-23-GW
Date		2/3/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		250
TPH diesel		40,000
TPH motor oil		110,000
PCE		<12
TCE		470
Cis-1,2-DCE		210

Sample ID - Depth (ft bgs)		GW-2
Date		4/5/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		130
TPH diesel		56
TPH motor oil		<250
PCE		<50
TCE		2,400.0
Cis-1,2-DCE		300.0

Sample ID - Depth (ft bgs)		GGW-2
Date		3/30/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		<50
TPH diesel		150
TPH motor oil		420
PCE		<0.5
TCE		5.2
Cis-1,2-DCE		<0.5

Sample ID - Depth (ft bgs)		B-27-GW
Date		2/3/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		59
TPH diesel		<100
TPH motor oil		540
PCE		<1.7
TCE		48
Cis-1,2-DCE		4.8

Sample ID - Depth (ft bgs)		B-28-GW
Date		2/3/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		<50
TPH diesel		<100
TPH motor oil		960
PCE		<10
TCE		230
Cis-1,2-DCE		37

Sample ID - Depth (ft bgs)		B-24-GW
Date		2/2/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		1,400
TPH diesel		250,000
TPH motor oil		500,000
PCE		<50
TCE		590
Cis-1,2-DCE		1,600

Sample ID - Depth (ft bgs)		B-36-GW
Date		4/11/2017
Chemical Name	Matrix / Units	Groundwater / µg/L
TPH gasoline		<50
TPH diesel		120
TPH motor oil		580
PCE		<0.5
TCE		28.0
Cis-1,2-DCE		4.7

EXPLANATION

- GGW-1 — Approximate location of deep grab groundwater sample by Langan, March 2017
- GW-1 — Approximate location of groundwater monitoring well
- B-31 — Approximate location of soil and/or groundwater boring by Langan, March and April 2017
- B-17 — Approximate location of environmental boring by Langan, February 2017
- B-15 — Approximate location of geotechnical boring by Langan, November 2016
- B-4 — Approximate location of 20-foot boring by Langan Treadwell Rollo, April 2016
- B-7 — Approximate location of 10-foot boring by Langan Treadwell Rollo, April 2016
- Approximate location of abandoned in-place 1,000-gallon waste oil UST, March 1997
- Approximate location of floor drain
- Sample concentration in exceedance of Tier 1 ESLS
- Sample location in exceedance of Tier 1 Environmental screening wells (ESLS) as established by the San Francisco Regional Water Quality Control Board (RWQCB) in February 2016.
- Approximate footprint of proposed 3000 Broadway Redevelopment
- Approximate location of drain line piping

0 30 Feet

Approximate scale

3000 BROADWAY REDEVELOPMENT
Oakland, California

SITE PLAN WITH GROUNDWATER EXCEEDANCES

Date 05/03/17	Project No. 750635603	Figure 6

LANGAN

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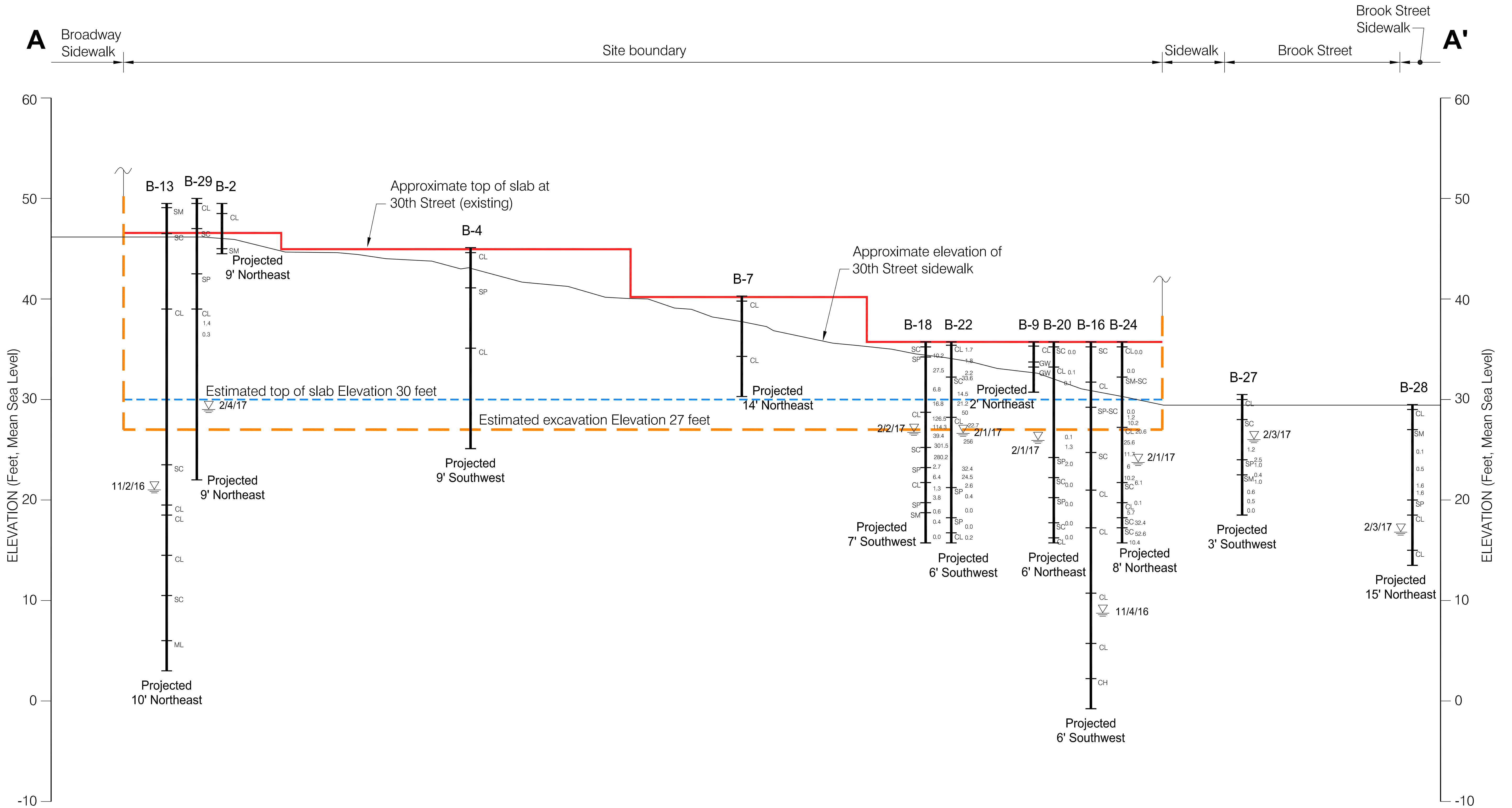
ATTACHMENT 2

IDEALIZED SUBSURFACE PROFILE A-A' *FEASIBILITY STUDY AND CORRECTIVE ACTION PLAN*, DATED 2 MAY 2017



Notes:
1. The above profile represents a generalized soil cross section interpreted from widely spaced borings. Soil deposits may vary in type, strength, and other important properties between points of exploration. All elevations are approximate.

3000 BROADWAY REDEVELOPMENT
Oakland, California

IDEALIZED SUBSURFACE PROFILE A-A'

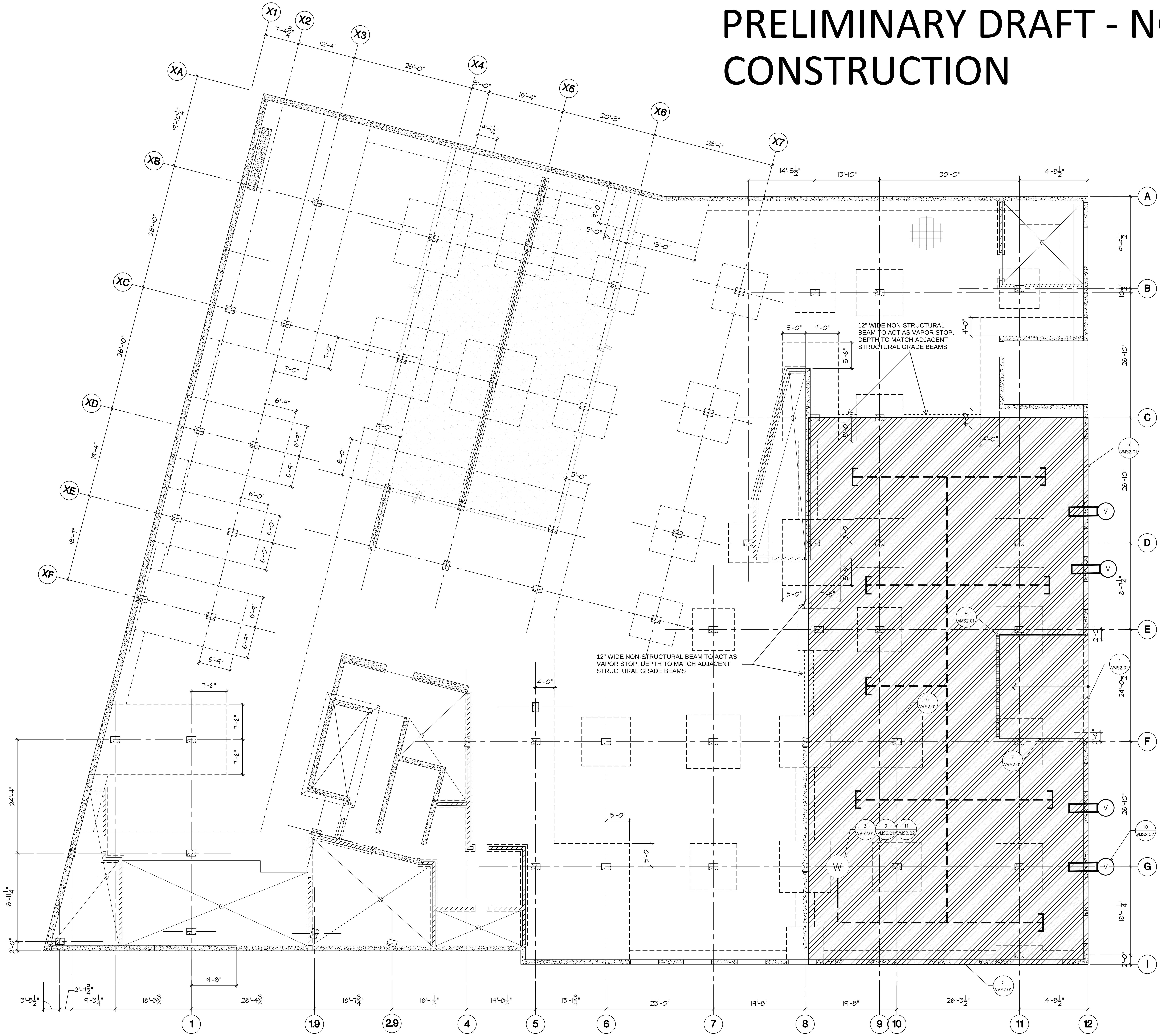
Date 04/24/17 | Project No. 750635603 | Figure 3

LANGAN

ATTACHMENT 3

PRELIMINARY DRAFT VMS DESIGN DRAWINGS, DATED 15 MAY 2017

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION



LEGEND

SOLID PVC PIPING
PERFORATED PVC PIPING
W VMS RISER TO ROOF
V PERIMETER INLET VENT
PVC END CAP
EXTENT OF SPRAY APPLIED VAPOR BARRIER MEMBRANE/WATERPROOFING
1 VMS2.01 SEE DETAIL 1, SHEET VMS 2.01

BDE ARCHITECTURE

950 Howard Street
San Francisco
CA 94103
P. (415)677-0966

Client

Consultant

LANGAN
555 Montgomery Street, Suite 1300
San Francisco CA 94111
P 415.955.5200 F 415.955.9041
www.langan.com

Issue	Date
GMP Set	05.19.2017

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Project No. Drawn By JS
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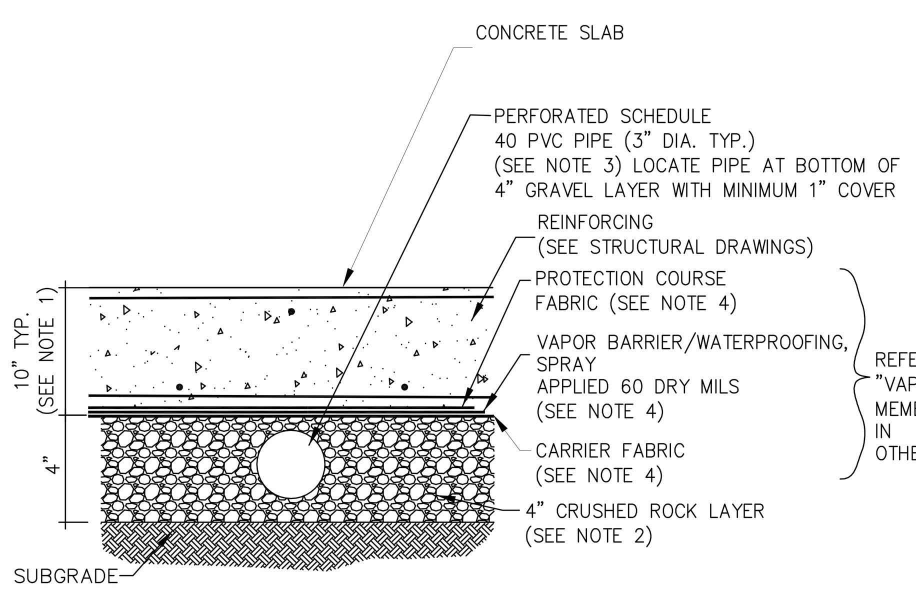
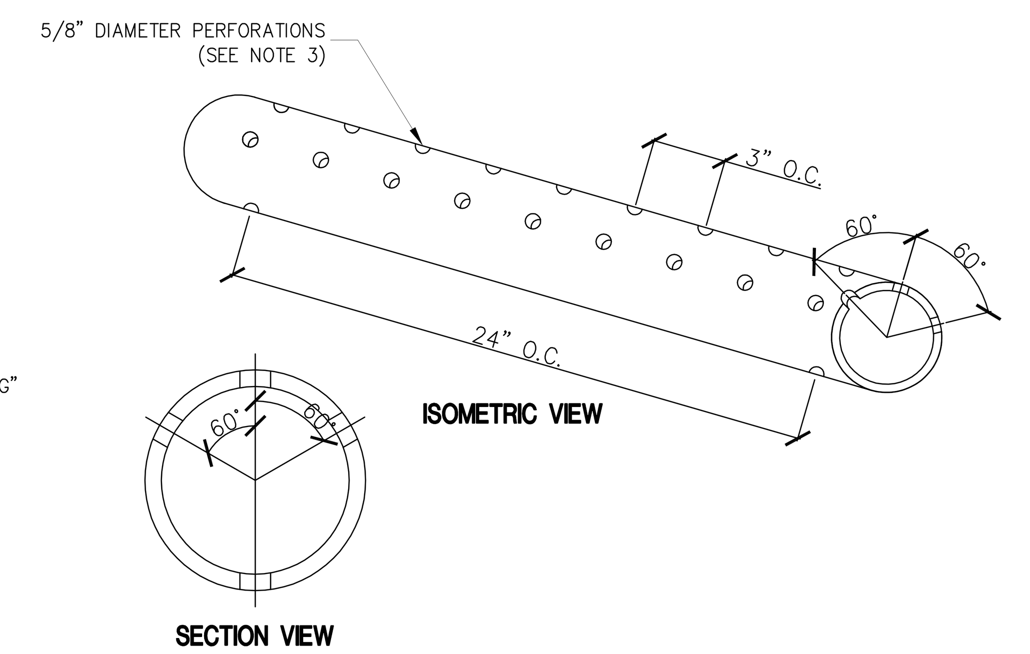
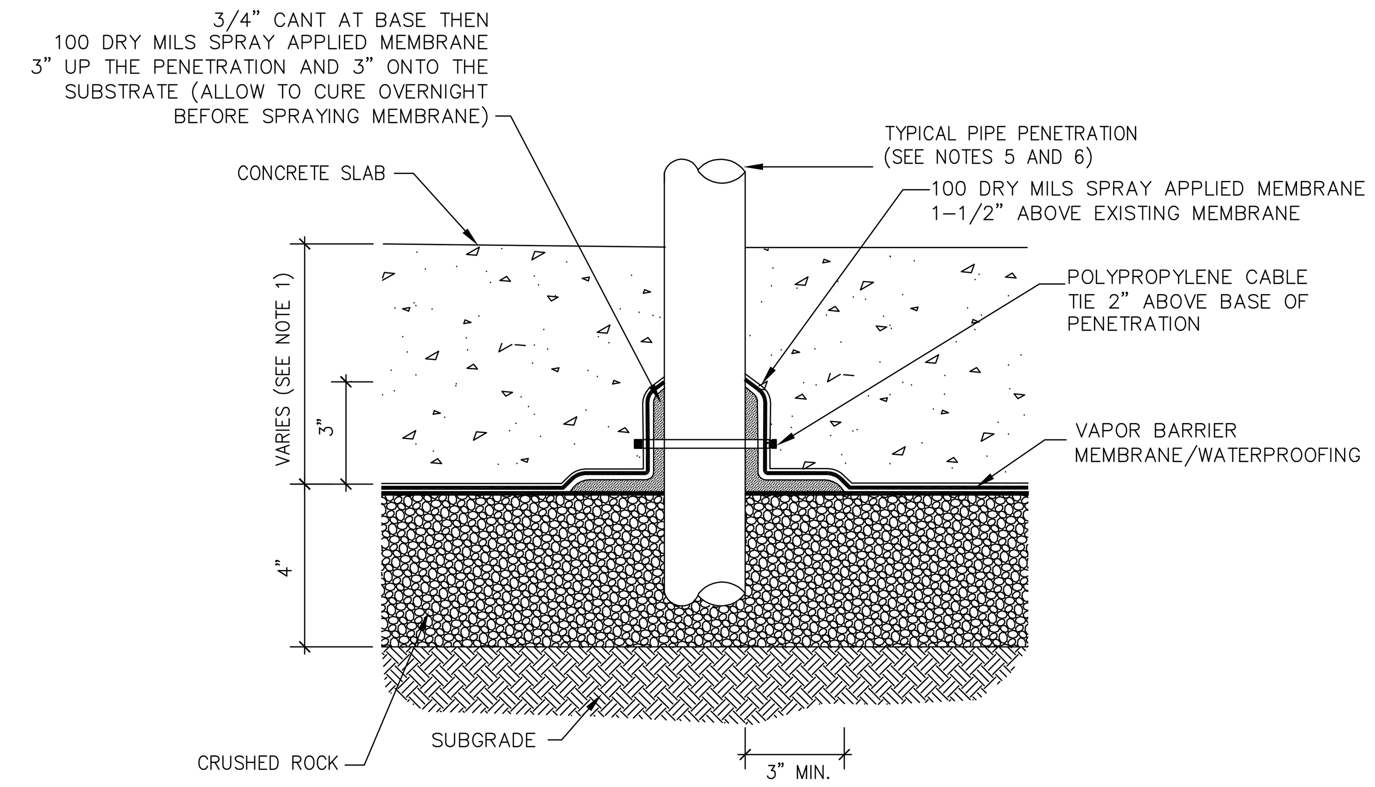


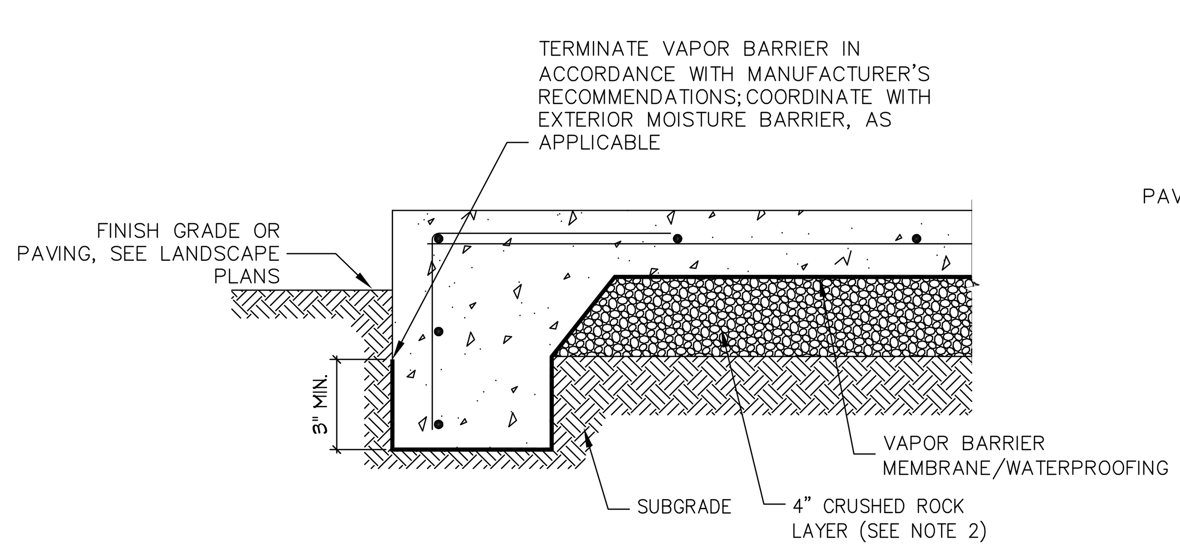
1 TYPICAL VAPOR MITIGATION SYSTEM CROSS-SECTION
NOT TO SCALE



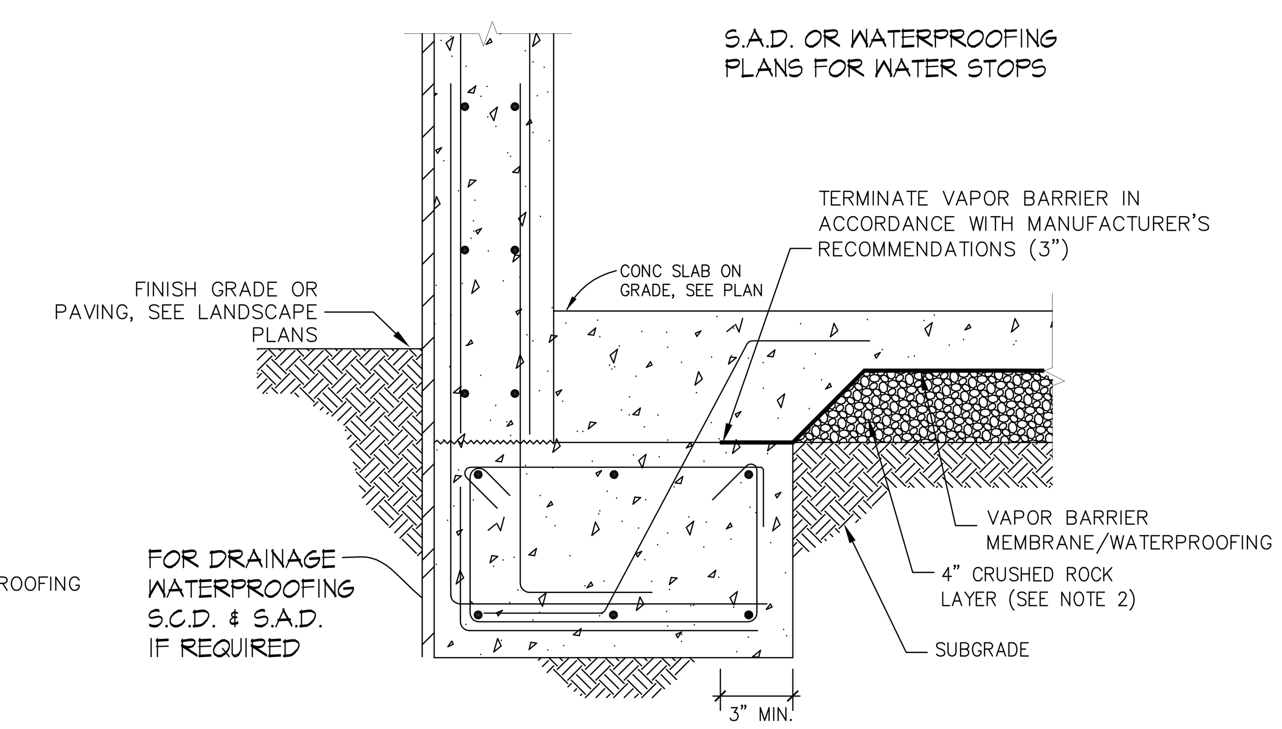
2 DETAIL OF PERFORATED PIPE PATTERN
NOT TO SCALE



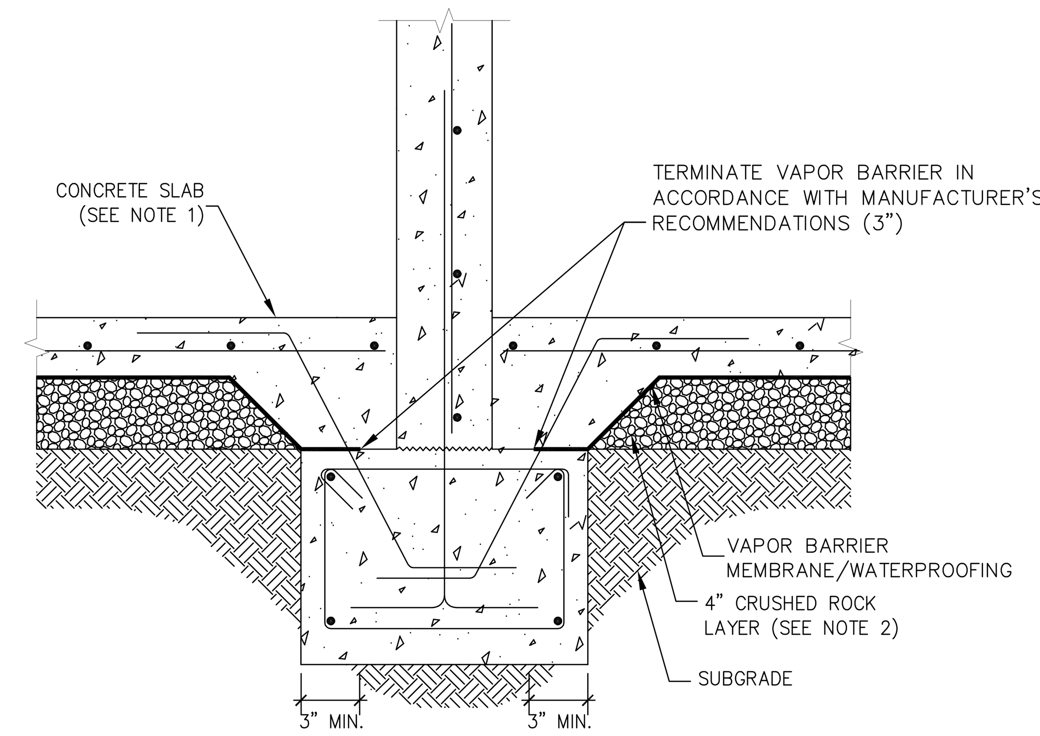
3 TYPICAL SEALING OF ALL PENETRATIONS THROUGH CONCRETE SLAB
NOT TO SCALE



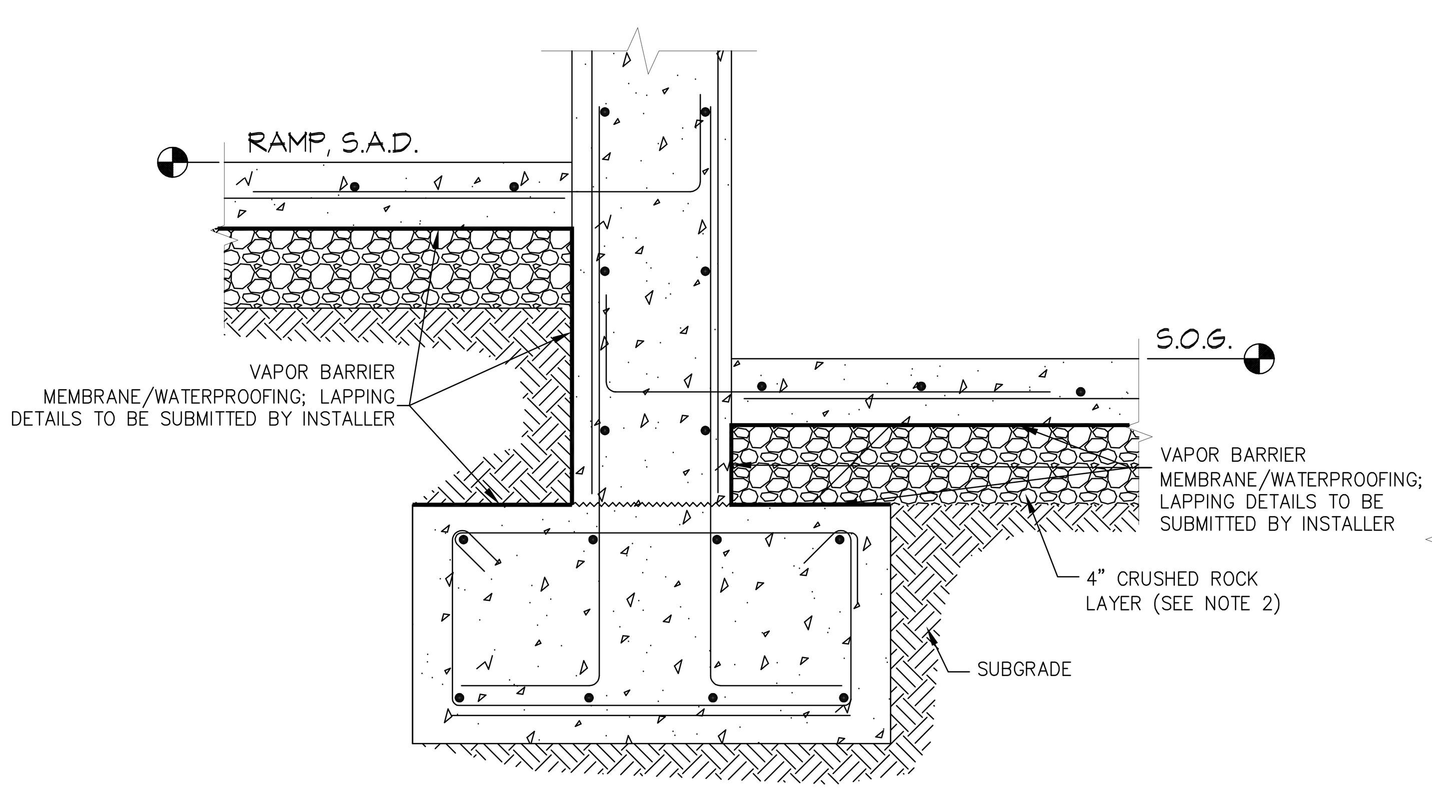
4 TYPICAL VAPOR BARRIER TIE-IN AT EDGE OF SLAB
NOT TO SCALE



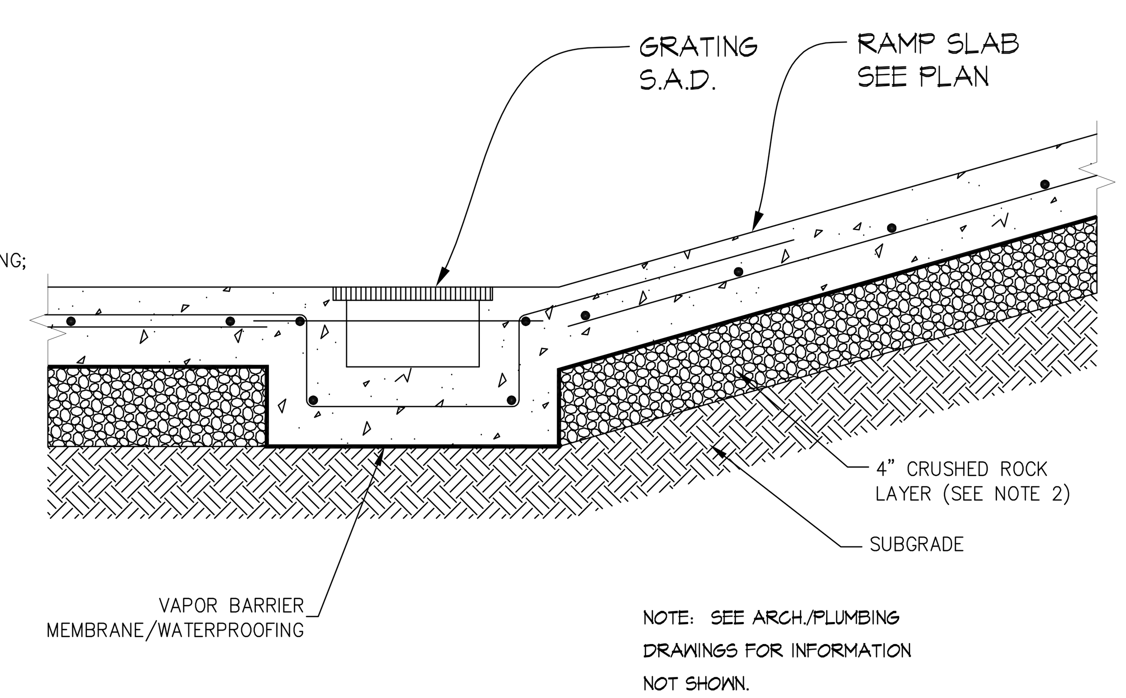
5 TYPICAL VAPOR BARRIER TIE-IN AT EXTERIOR ECCENTRIC FOOTING SECTION
NOT TO SCALE



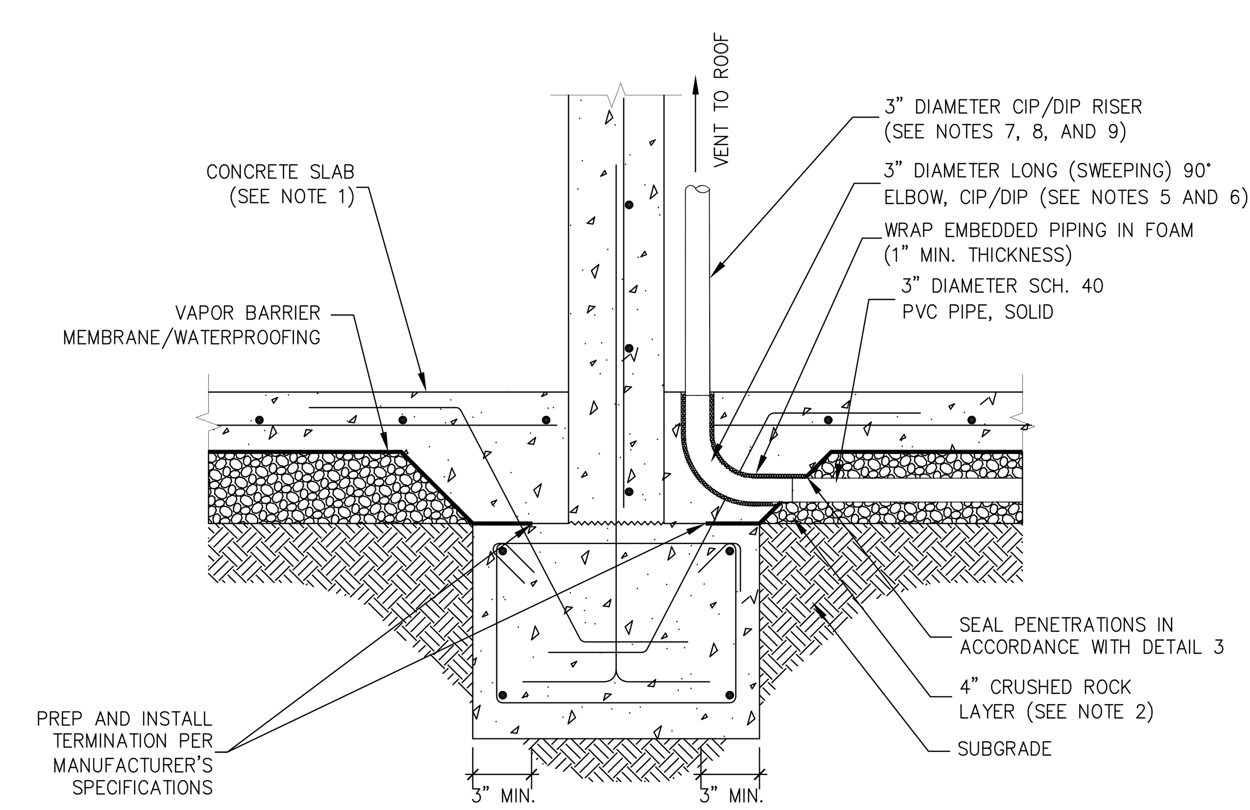
6 TYPICAL VAPOR BARRIER AT INTERIOR CONCENTRIC FOOTING SECTION
NOT TO SCALE



7 VAPOR BARRIER AT PARKING RAMP
NOT TO SCALE



8 VAPOR BARRIER AT PARKING RAMP AND GRATING
NOT TO SCALE



9 TYPICAL HORIZONTAL TO VERTICAL TRANSITION AT RISER
NOT TO SCALE

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

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BDE ARCHITECTURE
950 Howard Street
San Francisco
CA 94103
P. (415)677-0966
Client
Consultant
LANGAN
555 Montgomery Street, Suite 1300
San Francisco CA 94111
P 415.955.5200 F 415.955.9041
www.langan.com

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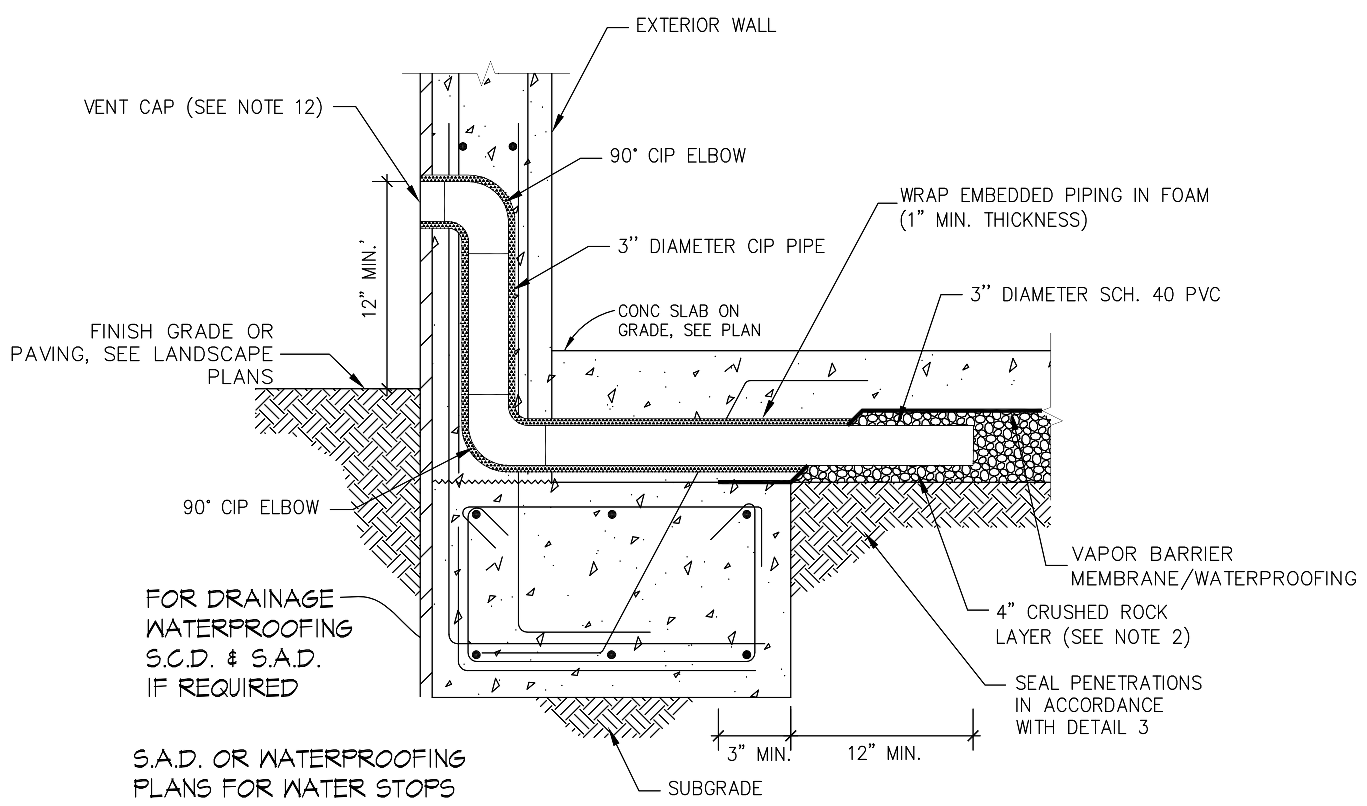
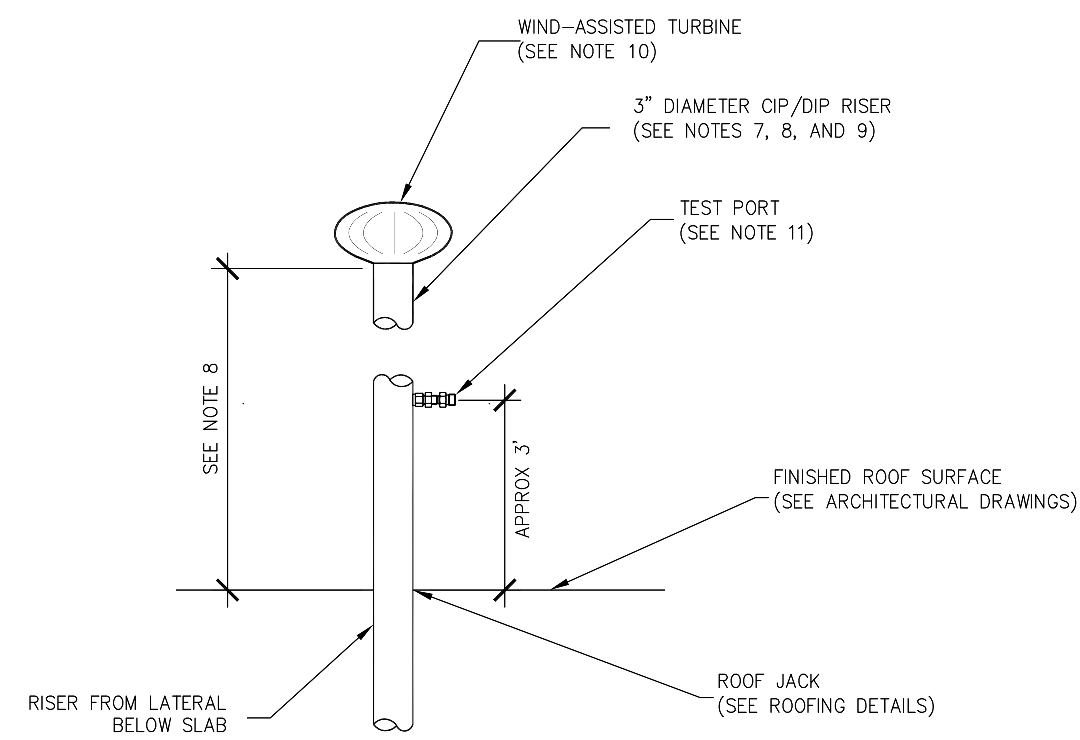
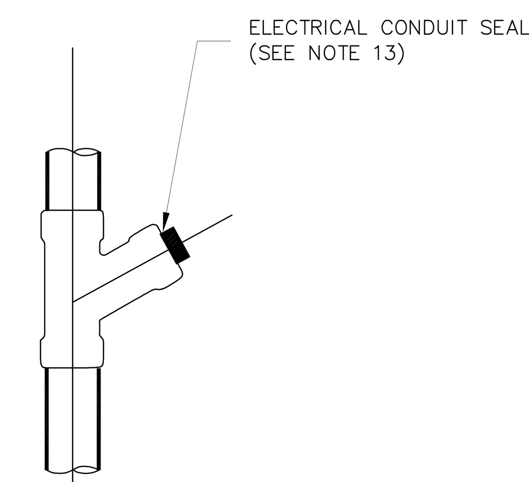


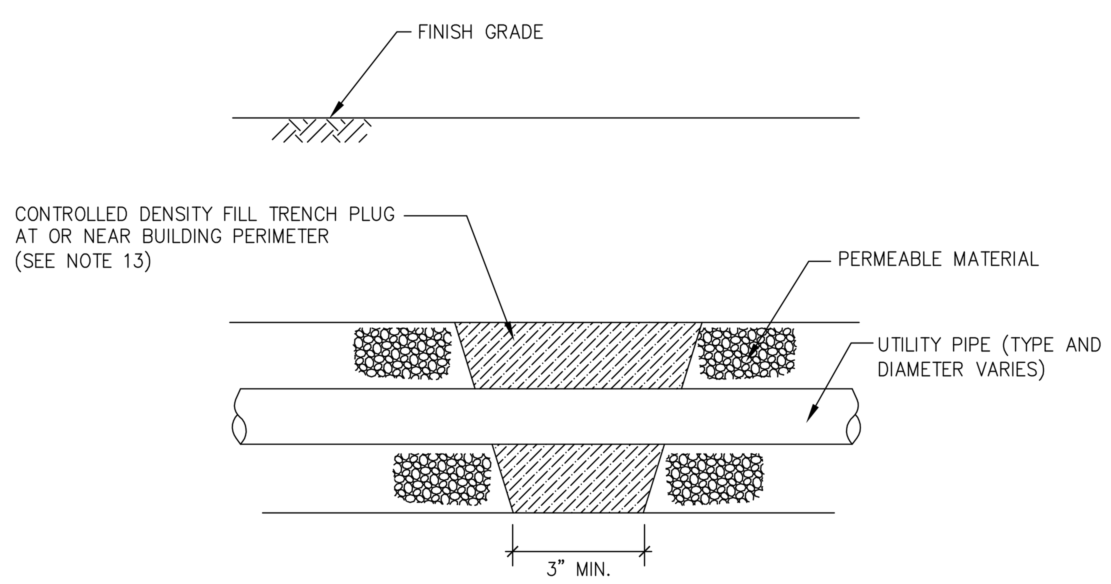
10 **TYPICAL PERIMETER INLET VENT**
NOT TO SCALE



11 **RISER AND TURBINE AT ROOF**
NOT TO SCALE



12 **TYPICAL INTERIOR AND EXTERIOR CONDUIT SEAL**
NOT TO SCALE



13 **SOIL VAPOR CUT-OFF BARRIER IN UTILITY TRENCH AT BUILDING PERIMETER**
NOT TO SCALE

SHEET NOTES

1. ALL LOCATIONS AND DIMENSIONS OF BUILDING SLABS, FOOTINGS, GRADE BEAMS, PILE CAPS, AND OTHER FOUNDATION ELEMENTS TO BE CONFIRMED WITH STRUCTURAL DETAILS.
2. CRUSHED ROCK (GRAVEL) LAYER SHALL BE 1/4-INCH BY 3/4-INCH (100% PASSING 1-INCH; BETWEEN 90% AND 100% PASSING 3/4-INCH; 5% MAXIMUM PASSING #4). SURFACE OF CRUSHED ROCK LAYER SHALL BE SMOOTH-ROLLED PRIOR TO APPLICATION OF THE CARRIER FABRIC.
3. THE HORIZONTAL PERFORATED PIPE SHALL BE SCHEDULE 40 POLY VINYL CHLORIDE (PVC). INDICATED SECTIONS OF HORIZONTAL PIPE SHALL BE PERFORATED WITH 5/8 INCH DIAMETER HOLES, THREE HOLES ACROSS THE UPPER ONE-THIRD OF THE PIPE, EVERY 3 INCHES ALONG THE PERFORATED SECTION; AN ADDITIONAL 5/8 INCH DIAMETER HOLE SHALL BE DRILLED ON THE UNDERSIDE OF THE PIPE AT LEAST EVERY 2 LINEAR FEET ALONG THE PERFORATED SECTION TO ALLOW WATER, IF ANY, TO DRAIN FROM THE PIPE.
4. THE SPRAY APPLIED VAPOR BARRIER MEMBRANE/WATERPROOFING SYSTEM SHALL UNDERLIE THE BUILDING PAD FOOTPRINT AS SHOWN WITH WATERPROOFING ONLY IN OTHER AREAS PER WATERPROOFING DRAWINGS. THE SPRAY APPLIED MEMBRANE SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S SPECIFICATIONS AND QA/QC REQUIREMENTS (INCLUDING COUPON AND SMOKE TESTING) BY A MANUFACTURER APPROVED APPLICATOR. CARRIER FABRIC AND PROTECTION COURSE FABRIC SHALL BE PER MEMBRANE MANUFACTURER'S SPECIFICATIONS. APPLICATION SEQUENCE AND TRANSITIONS FROM VERTICAL TO HORIZONTAL SURFACES SHALL BE COORDINATED BETWEEN APPLICATOR(S) AND GENERAL CONTRACTOR.
5. SLAB PENETRATIONS WILL BE PREPARED AND STUBBED PRIOR TO MEMBRANE INSTALLATION. ALL PENETRATIONS SHALL BE CLEANED PER SPECIFICATIONS BEFORE MEMBRANE IS APPLIED.
6. PENETRATIONS THROUGH SLAB SHALL BE LOCATED CLEAR OF AND BETWEEN REINFORCING STEEL OR TIES. SLAB PENETRATION SHALL NOT BE IN CONTACT WITH ADJACENT PENETRATIONS OR STEEL COLUMNS TO ALLOW ROLLER GRADE MEMBRANE APPLICATION IF NEEDED, FOR PROPER SEALING OF THE ENTIRE PENETRATION CIRCUMFERENCE.
7. THE VERTICAL RISER PIPES (W) TO THE WIND TURBINES SHALL BE 3 INCH DIAMETER DUCTILE IRON PIPE (DIP) OR CAST IRON PIPE (CIP). THE RISER SHALL BE FULLY SUPPORTED THROUGH THE ENTIRE HEIGHT OF THE BUILDING, SUCH THAT NO DOWNWARD FORCE (DUE TO WEIGHT OF RISER) IS EXERTED ON THE PVC ASSEMBLY LOCATED BENEATH THE SLAB.
8. THE RISER PIPES (W) SHALL BE AFFIXED TO THE STRUCTURE PER DETAILS PROVIDED BY THE PLUMBING CONTRACTOR AS A DESIGN-BUILD ITEM. ATTACHMENT METHODS MAY INCLUDE STRAPS, BRACES, OR OTHER MECHANISMS TO FULLY SUPPORT THE WEIGHT OF THE PIPE. THE TOP OF THE RISER PIPE SHALL EXTEND TO AN ELEVATION OF 1 FOOT ABOVE THE TOP OF WIND SCREEN, ROOF PARAPET, EDGE OF ROOF LEVEL OR ANY OTHER OBSTRUCTIONS TO WIND ACTIVATION OF THE TURBINE, BE LOCATED A MINIMUM OF 15 FEET AWAY FROM FRESH AIR INTAKES FOR BUILDING'S HVAC SYSTEM OR OTHER OPENINGS (WINDOWS, DOORS, ETC.), AND SHALL BE SUPPORTED BY UNISTRUTS ATTACHED TO AN ADJACENT COLUMN OR STABILIZED WITH GUY WIRES THAT ARE ATTACHED TO THE ROOF.
9. THE VERTICAL RISER PIPE (W) TO THE WIND TURBINE SHALL BE PROMINENTLY LABELED AS "CONTAINS VAPORS; DO NOT BREAK OR CUT," AT A MINIMUM OF ONCE PER FLOOR LEVEL. RISER PIPE MATERIAL WITHIN THE BUILDING ENVELOPE SHALL BE DIP OR CIP; TRANSITIONS FROM/TO PVC, AS APPLICABLE, SHALL OCCUR WITHIN OR BELOW THE FLOOR SLAB OR ABOVE FINISHED ROOF. RISER SHALL BE FIRE CAULKED AT THE PENETRATION THROUGH THE FOUNDATION FLOOR SLAB.
10. THE WIND-ASSISTED TURBINE VENT ON TOP OF THE VERTICAL RISER PIPE SHALL BE 12-INCH DIAMETER, 680 CFM, TYPE 304 STAINLESS STEEL (McMASTER-CARR CATALOG NO. 1992K48) AND SHALL BE SECURELY ATTACHED TO TOP OF RISER. TURBINE SHALL BE ADAPTED TO FIT A 3 INCH PIPE. TURBINE SHALL BE INSTALLED TO RESIST WIND, SEISMIC, AND OTHER LOADS, AS NEEDED.
11. A TEST PORT SHALL BE INSTALLED AT THE RISER PIPE (W) TO SAMPLE AIR FROM THE COLLECTION PIPE AT AN ACCESSIBLE LOCATION AT THE ROOF LEVEL. TEST PORT SHALL BE BRASS TUBE FITTING, BORED-THROUGH, MALE CONNECTOR, WITH ½ INCH TUBE OD AND 3/8 INCH MALE NPT (SWAGELOK B-810-1-6BT OR EQUIVALENT). TEST PORT CAP SHALL BE BRASS CAP FOR ½ INCH OD TUBING (SWAGELOK B-810-C OR EQUIVALENT). IF THE VERTICAL RISER IS AT LEAST 40 INCHES ABOVE THE TOP OF ROOF LEVEL, THE TEST PORT SHALL BE 36 INCHES ABOVE THE ROOF. IF THE VERTICAL RISER IS LESS THAN 40 INCHES ABOVE THE TOP OF ROOF LEVEL, THE TEST PORT SHALL BE 6 INCHES BELOW THE TOP OF RISER.
12. PERIMETER INLET VENT MATERIAL WITHIN THE BUILDING ENVELOPE SHALL BE DIP OR CIP; TRANSITIONS FROM/TO PVC, AS APPLICABLE, SHALL OCCUR WITHIN OR BELOW THE FLOOR SLAB. PERIMETER INLET VENTS SHALL BE FIRE CAULKED AT THE PENETRATION THROUGH THE FOUNDATION FLOOR SLAB. THE VENT PIPE CAP SHALL KEEP OUT DEBRIS BUT ALLOW AIR TO ENTER THE PIPE. VENTS SHALL BE LOCATED A MINIMUM OF 36 INCHES AWAY FROM OPERABLE WINDOWS AND DOOR JAMS. VENT CAP TO BE COORDINATED WITH ARCHITECT. VENT CAP SHALL BE FABRICATED OF METAL AND INCLUDE A MESH DEBRIS SCREEN.
13. SEE MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS FOR CONDUIT SEAL LOCATIONS AND SEALING PRODUCT.

BDE ARCHITECTURE
950 Howard Street
San Francisco
CA 94103
P. (415)677-0966

Client

Consultant

LANGAN
555 Montgomery Street, Suite 1300
San Francisco CA 94111
P 415.955.5200 F 415.955.9041
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