FINAL RESPONSE PLAN

2550 Irving Street Affordable Housing Project

San Francisco, California

September 2, 2021

Prepared for:

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PROFESSIONAL CERTIFICATION

This *Final Response Plan* for the redevelopment project located at 2550 Irving Street in San Francisco, California has been prepared by a California Professional Geologist and/or California Professional Engineer. This document is based on information available to Path Forward Partners, Inc. and current laws, policies, and regulations as of the date of this document. The opinions expressed in this document are based upon the information available to Path Forward Partners, Inc. and are given in response to a limited assignment and should be considered and implemented only in light of that assignment. The services provided by Path Forward Partners, Inc. in completing this project were consistent with normal standards of the profession. No other warranty, expressed or implied, is made.

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EXECUTIVE SUMMARY

This *Final Response Plan* (Response Plan) has been prepared by Path Forward Partners, Inc. (Path Forward) on behalf of the Tenderloin Neighborhood Development Corporation (TNDC) for the proposed mixed-use development project located at 2550 Irving Street in San Francisco, California (the Site). TNDC entered into a California Land Use and Revitalization Act (CLRRA) agreement (HSA-FY20/21-082) with the Department of Toxic Substances Control (DTSC) to address on-Site impacts associated with volatile organic compounds (VOCs) detected in on-Site soil gas. This Response Plan does not include investigation results and/or response actions associated with off-Site impacts as The Police Credit Union (TPCU) has entered into Standard Voluntary Agreement Docket No. HAS-FY19/20-141, as amended, (the SVA) with the DTSC to investigate and address those off-Site issues.

A site assessment plan prepared pursuant to California Health and Safety Code (HSC) Section 25395.94 has determined that the presence of VOCs in Site soil gas pose an unreasonable risk to health and safety in the context of future redevelopment of the Site for mixed residential and commercial use (Path Forward 2021).

Upon review of the site assessment plan, the DTSC has determined that a response action is necessary to prevent or eliminate the unreasonable risk to public health and safety in the context of the anticipated future site use. As owner of the Site, TNDC has submitted this Response Plan to DTSC to conduct a response action at the site, to mitigate the presence of VOCs in soil gas as they pertain to future on-Site receptors in coordination with redevelopment of the Site. The Response Action Objective (RAO) for the Site is to minimize or eliminate exposures between future building occupants and VOCs present in Site soil gas. The potential exposure route to chemicals in soil gas is inhalation of VOCs present in indoor air of future site buildings as a result of transport (vapor intrusion) from the subsurface. Assessment, evaluation of risk, and/or risk mitigation, if necessary, of VOCs in soil, groundwater, and soil gas to off-Site receptors are outside of the scope of this Response Plan, and will be performed by TPCU in accordance with the SVA.

Three possible response action alternatives have been identified and evaluated:

- **Alternative 1 – No Action**. This alternative is included to provide a baseline for comparisons among other response action alternatives. Under this alternative, the Site would be redeveloped for residential use; but no response actions would be taken, no mitigation measures would be implemented, and no costs would be incurred.
- **Alternative 2 – Soil Excavation**. This alternative is intended to reduce concentrations of VOCs in soil to levels that are protective of human health under residential/unrestricted land use, to the extent possible.
- **Alternative 3 – Vapor Intrusion Mitigation System, Land Use Covenant, and Operations and Maintenance**. This alternative is intended to mitigate potential vapor intrusion

concerns by incorporating a vapor intrusion mitigation system (VIMS) into the design and construction of the proposed building. The VIMS would consist of a sub-slab venting system and a sub-slab vapor-barrier membrane. This alternative would additionally provide institutional controls to ensure long-term protection from residual soil gas impacts through a Land Use Covenant (LUC). The LUC would prohibit residential use of the property unless engineering controls (i.e., the VIMS) are in place and operating as designed. The LUC would also provide a measure of protection of the floor slab that protects the VIMS and provide for periodic inspection and reporting on the condition of the floor slab and VIMS.

The three response action alternatives were evaluated and compared on the bases of effectiveness, implementability, and cost.

- The effectiveness criterion considers overall protection of human health and the environment on Site; compliance with applicable or relevant and appropriate requirements (ARARs) and to-be-considered criteria (TBCs); short-term effectiveness; long-term effectiveness and permanence; and reduction of toxicity, mobility, or volume.
- The implementability criterion evaluates the technical and administrative feasibility of implementing the response action alternative, as well as the availability of the necessary equipment and services. This includes the ability to design and perform a response action alternative to address on-Site risks, ability to obtain services and equipment, ability to monitor the performance and effectiveness of technologies, and the ability to obtain necessary permits and approvals from agencies, and acceptance by the state and the community.
- The cost criterion assesses the relative cost of each technology based on estimated fixed capital for construction or initial implementation and ongoing operational and maintenance costs.

Based on this comparative analysis, Alternative 3 – Vapor Intrusion Mitigation System, Land Use Covenant, and Operations and Maintenance, is the preferred and recommended response action alternative for the Site. Alternative 3 would achieve RAOs, be protective of human health and the environment, and a have a much lower impact on the adjacent community as compared to Alternative 2 while being a cost-effective remedy.

This Response Plan provides an overview of the implementation of the preferred response action alternative. This includes specifications for the VIMS design components and details of the long-term operations and maintenance. At the completion of construction, prior to the issuance of the system certification and certification of occupancy, indoor air sampling and analysis will be conducted to demonstrate that the system is effective in mitigating potential vapor intrusion. Also prior to building occupancy, a Response Plan Implementation Report will be prepared for DTSC review, and an Operation and Maintenance Agreement shall be executed.

Prior to approving this Response Plan, DTSC prepared a Community Letter and Survey (DTSC 2021b), a Community Profile (DTSC 2021c), a Public Notice of the Public Comment Period for 2550 Irving Street (DTSC 2021d), and a Community Update of the Public Comment Period for 2550 Irving Street (DTSC 2021e) to notify the public regarding the Site and inviting the public to comment on the Draft Response Plan. The public comment period for the Draft Response Plan was from July 12 to August 13, 2021 and included a Remote Public Meeting on July 22, 2021. Following public comment, the DTSC prepared a Responsiveness Summary (DTSC 2021f) to respond to all public comments received during the 33-day public comment period on the Draft Response Plan. This Final Response Plan reflects changes which the DTSC determined were appropriate in response to public comments.

1.0 INTRODUCTION

This *Final Response Plan* (Response Plan) has been prepared by Path Forward Partners, Inc. (Path Forward) on behalf of the Tenderloin Neighborhood Development Corporation (TNDC) for the proposed mixed-use development project located at 2550 Irving Street in San Francisco, California (the Site). The Site location is shown in Figure 1. TNDC entered into a California Land Use and Revitalization Act (CLRRA) agreement (HSA-FY20/21-082) with the Department of Toxic Substances Control (DTSC) to address on-Site impacts associated with volatile organic compounds (VOCs) detected in on-Site soil gas. This Response Plan does not include investigation results and/or response actions associated with off-Site impacts as The Police Credit Union (TPCU) has entered into Standard Voluntary Agreement Docket No. HAS-FY19/20-141, as amended, (the SVA) with the DTSC to investigate and address those off-Site issues.

A site assessment plan prepared pursuant to California Health and Safety Code (HSC) Section 25395.94 has determined that the presence of VOCs in Site soil gas pose an unreasonable risk to health and safety in the context of future redevelopment of the Site for mixed residential and commercial use (Path Forward 2021 and DTSC 2021a).

In accordance with HSC Section 25395.96, this Response Plan contains the following elements:

- Opportunity for the public, other agencies, and the City and County of San Francisco to participate in decisions regarding the response action, taking into consideration the nature of the community interest;
- Identification of the release or threatened release that is the subject of the Response Plan and documentation that the Response Plan is based on an adequate characterization of the Site;
- An identification of the Response Plan objectives and the proposed remedy, and an identification of the reasonably anticipated future land uses of the Site and of the current and projected land use and zoning designations;
- A description of activities that will be implemented to control any endangerment to human health or the environment that may occur during the response action at the Site;
- A description of the land use controls that are part of the response action;
- A description of wastes other than hazardous materials at the Site and how they will be managed in conjunction with the response action;
- Provisions for the removal of containment or storage vessels and other sources of contamination that cause an unreasonable risk; and
- Provisions for the agency to require further response actions based on the discovery of hazardous materials that pose an unreasonable risk to human health and safety or the environment that are discovered during the course of the response action or subsequent development of the Site.

2.0 SITE DESCRIPTION

2.1 Site Land Use

The Site occupies approximately 19,125 square feet located at 2520 and 2550 Irving Street in San Francisco, California. The Assessor's Parcel Number (APN) assigned to the Site is 1724-038, which includes the addresses 2520 and 2550 Irving Street. According to the San Francisco Property Information Map (PIM) the Site is zoned under the Irving Street Neighborhood Commercial District. The Site is currently improved with a 18,561 square foot two-story commercial building, constructed in 1966, that is currently used as a bank (TPCU).

2.2 Site Owner

The 2520 and 2550 Irving Street property is currently owned by TPCU; however, prior to redevelopment, TNDC intends to acquire the property.

2.3 Historic Uses

According to the *Phase I Environmental Site Assessment* (Phase I ESA; Path Forward 2020), the Site was vacant land as early as 1895 and remained vacant until at least 1915. By 1928, two structures had been developed in the central portion. The 1928 Sanborn map depicts these as a drugstore and a cleaning business. By 1940, a gas station had been added to the southeast corner of the Site, and by 1946, a second gas station had been added to the western end of the Site. By 1950, the central buildings on the Site were occupied by an undertaker, and in 1966, this business redeveloped the entire property with the current building and open areas for use as a mortuary and funeral chapel. The funeral business continued in the building until 1985, when the building was modified for its current use. The Site has been utilized as a bank since 1987.

2.4 Adjacent Properties

The Phase I ESA (Path Forward 2020) identified adjoining property and surrounding area uses as primarily commercial and residential including the following:

- North: Single family residences (1281 26th Avenue and 1280 27th Avenue).
- South: Irving Street, followed by from east to west: Sterling Bank and Trust (2501 Irving Street), vacant retail space (2511 Irving Street), surface parking lot used by employees of the bank on the subject property, apparent office building (2533, 2535 and 2537 Irving Street), residential building (2539 and 2541 Irving Street), residential building with street level retail space (the Artisans custom framing, 2549 Irving Street) and Nomad Cyclery bike shop (2555 Irving Street).
- East: 26th Avenue followed by a surface parking lot.

- West: One residential building between the north portion of the bank property and 27th Avenue (1284 27th Avenue), and 27th Avenue followed by residences.

2.5 Site Geology and Hydrogeology

According to information presented by the United States Geological Survey (USGS) on the 1996 7.5-Minute Series San Francisco North, California Quadrangle Topographic Map, the ground surface elevations at the Site is approximately 202 feet above mean sea level (amsl) with a slight downward slope to the west. The Site is located in an urban commercial setting within the Coast Ranges physiographic province of California. The nearest surface water body to the subject property is the Mallard Lake, approximately 961 feet to the north within Golden Gate Park. In addition, the Pacific Ocean is 1.5 mile to the west.

Path Forward reviewed a subsurface investigation report for the Site (AllWest 2019e). The report describes lithology encountered in those borings as coarse-grained, poorly to well graded sand to a depth of 90 feet below ground surface (bgs), which corresponds to the maximum depth explored.

Groundwater was measured on the subject property at a static depth of approximately 78 feet bgs (AllWest 2019e). Flow direction has not been established but is presumed to be to the northwest.

Groundwater in the Site vicinity is a drinking water resource – the Site is located within the North Westside Groundwater Basin, which per the Basin Plan has a designated beneficial use of Municipal and Domestic Supply (SFBRWQCB 2017).

2.6 Previous Site Characterizations

Historical sampling results from the Site characterization activities described below are provided in Appendix A. Tables appended in Appendix A include both on- and off-Site investigation results; however, the discussion below is primarily focused on on-Site investigation results. As previously discussed, any necessary assessment, evaluation of risk, and/or risk mitigation, if necessary, of VOCs in soil, groundwater, and soil gas to off-Site receptors are outside of the scope of this Response Plan and will be performed by TPCU in accordance with the SVA.

2.6.1 Phase I Environmental Site Assessment (AllWest)

In February 2019, a Phase I Environmental Site Assessment was conducted by AllWest Environmental, Inc. (AllWest) on behalf of TPCU (AllWest 2019a). The AllWest Phase I ESA included the Site and 2525 Irving Street, a parcel across Irving Street to the south also owned by TPCU. The AllWest Phase I ESA identified historical uses of potential concern including two on-Site gas stations at 2500 and 2550 Irving Street, an on-Site clothes cleaner at 2520 Irving Street, and an off-Site dry cleaners (Albrite Cleaners) at 2511 Irving Street (adjacent to the 2525 Irving

Street parcel). The AllWest Phase I ESA recommended an underground storage tank (UST) survey to locate potential abandoned-in-place USTs and recommended a subsurface site investigation of soil, soil gas, and groundwater conditions to evaluate if a release had occurred from the on-Site or off-Site cleaners.

2.6.2 Subsurface Investigations

A series of subsurface site investigations have been performed in 2019 and 2020, including several investigations conducted by AllWest on behalf of TPCU and one investigation conducted by Path Forward on behalf of TNDC.

May 2019

In May 2019, AllWest produced a *Phase II Subsurface Investigation Report* to address concerns that were discovered in their earlier Phase I ESA. Based on the findings of the Phase I ESA, AllWest performed an investigation which involved collecting soil and sub-slab soil gas samples (AllWest 2019b).

Borings were advanced at five locations for collection of soil samples (B-1 through B-5). A total of five soil samples, collected from 4.5-5.0 feet below ground surface (bgs), were submitted for chemical analysis. Soil samples were analyzed for total petroleum hydrocarbons (TPH) in the diesel range (TPH-d) and motor oil range (TPH-mo), TPH in the gasoline range (TPH-g), VOCs, polycyclic aromatic hydrocarbons (PAHs), and LUFT-5 metals. Soil sampling results were below current DTSC HERO Note 3 risk-based screening levels (RBSLs) for residential soil (DTSC 2020) and/or ambient/background levels (Bradford et al. 1996, Duvergé 2011).

Sub-slab soil gas samples were collected at two locations beneath the existing building (VP-1 and VP-2). Tetrachloroethene (PCE) was detected in sub-slab soil gas samples at concentrations of 480 micrograms per cubic meter (µg/m³) and 530 µg/m³, which exceed the commercial/industrial soil gas RBSL of 67 µg/m³ (DTSC 2020). Based on these findings, AllWest recommended additional investigation to determine the source and extent of the PCE contamination found on-Site.

July 2019

In July 2019, AllWest advanced three additional borings to collect soil samples (B-8 through B-10) and collected sub-slab soil gas samples at four locations beneath the existing building (VP-1A, VP-2A, VP-3, and VP-4) (AllWest 2019c).

Six soil samples were analyzed for PCE and its breakdown products, consisting of trichloroethene (TCE), *cis*-1,2-dichloroethene, *trans*-1,2-dichloroethene, 1,1-dichloroethene, and vinyl chloride. All analytes were not detected in soil above laboratory reporting limits.

PCE was detected in all four sub-slab soil gas samples at concentrations ranging from 270 µg/m³ to 1,100 µg/m³. Based on these results, AllWest recommended collecting groundwater samples from the Site and the 2525 Irving Street parcel to delineate the extent and origin of PCE.

Also in July 2019, AllWest conducted an investigation at the 2525 Irving Street parcel to assess potential off-Site PCE impacts (AllWest 2019d). Two borings were advanced to collect soil samples (B-6 and B-7) and two borings were advanced to collect soil gas samples (SVP-1 and SVP-2). Soil sampling results were generally low, and VOCs were not detected. PCE was detected in the soil gas samples at concentrations of 1,800 µg/m³ and 1,300 µg/m³. AllWest concluded these results were similar to results from the Site and recommended additional investigation to delineate the PCE in soil gas.

September 2019

In September 2019, AllWest advanced two borings (B-11 and B-12) to a maximum depth of 90 feet bgs to investigate soil and groundwater conditions near the former Albrite Cleaners (AllWest 2019f). Soil and groundwater were analyzed for PCE and its breakdown products. PCE and its breakdown products were not detected in any soil samples. PCE was detected at a concentration of 0.71 micrograms per liter (µg/L) in one groundwater sample. AllWest concluded that it was likely there had been a release from the Albrite Cleaners but could not rule out additional contributors to the PCE in soil gas.

December 2019

In December 2019, Path Forward conducted a soil gas and groundwater investigation at the Site.

Four temporary nested soil gas probes (B-13-5/15, B-14-5/15, B-15-8/18 and B-17-7/17) and one single-depth soil gas probe (B-17-7) were installed at depths of 4 to 8 feet bgs and 15 to 18 feet bgs. Depths were selected based on Site topography relative to the adjacent residential properties as the Site is built-up along the northern property boundary. PCE was detected in all soil gas samples at concentrations ranging from 48 µg/m³ to 900 µg/m³.

Groundwater was sampled at locations B-19 and B-20 where it was encountered at 77.4 and 79.2 feet bgs, respectively. PCE was detected at 0.67 µg/L at location B-20 and not detected above laboratory reporting limits at location B-19.

May-June 2020

In May and June 2020, AllWest advanced a total of 20 borings for the installation of temporary and permanent soil gas probes throughout the Site and surrounding streets (AllWest 2020c). 48 soil samples from these borings were analyzed for PCE and its breakdown products. PCE was the only constituent detected in a single sample (SVP-12-4.5) at a concentration of 0.052 milligrams per kilogram (mg/kg) at a depth of 4.5 to 5.0 feet bgs. PCE was detected in soil gas in

all areas sampled at concentrations ranging from 120 µg/m³ to 2,500 µg/m³. Given the distribution of results, AllWest concluded that PCE contamination was contributed from the former Albrite Cleaners (2511 Irving Street) and that the plume likely extends off-Site to north of the TPCU building.

2.6.3 Indoor Air Investigations

AllWest has conducted indoor air quality monitoring events at the existing TPCU building on a semi-annual basis since August of 2019. Based on reports available to Path Forward, sampling events have occurred in August 2019 (AllWest 2019e), December 2019 (AllWest 2020a), and February 2020 (AllWest 2020b). Sampling events consisted of collecting four indoor air samples and one outdoor air sample over a 24-hour period. Samples were analyzed for PCE and its breakdown products. During the August 2019, December 2019, and February 2020 sampling events, results were similar with maximum detected concentrations of PCE in indoor air of 3.85 µg/m³, 4.3 µg/m³, and 3.3 µg/m^3 respectively.

2.6.4 Phase I Environmental Site Assessment (Path Forward)

In September 2020, a Phase I ESA of the Site was prepared by Path Forward on behalf of TNDC (Path Forward 2020), The Path Forward Phase I ESA identified following recognized environmental conditions (RECs):

- Soil gas on the subject property is impacted by PCE, which has resulted in a vapor intrusion condition in the building. Investigation is ongoing and TPCU has entered into a Voluntary Cleanup Agreement under oversight of the DTSC to investigate and mitigate effects of the condition. Data obtained during multiple investigation in 2019 and 2020 have not ruled out the subject Site as a source for the impacts; however, they have identified a former dry cleaner off-Site to the south as a potential contributing source. Based on the ongoing investigation under regulatory oversight, no additional investigation is warranted at this time. However, due to the known impacts at concentrations exceeding reference criteria, this condition is a REC.
- Article 22A of the San Francisco Health Code (the Maher Ordinance) requires San Francisco Department of Public Health (SFDPH), “oversight for characterization and mitigation of hazardous substances in soil and groundwater in designated areas zoned for industrial uses, sites with industrial uses or underground storage tanks, sites with historic bay fill, sites in close proximity to freeways or underground storage tanks.” The subject property has been identified as subject to the Maher Ordinance, based on review of the current Maher Map maintained by the City and County of San Francisco. According to DataSF (a city and county government data access point), the subject property was identified as a Maher property in 2013. The rationale may be related to historical gas station use, as the Site is not known to be filled land. While the Maher listing is considered to be a REC, historical investigations and DTSC oversight related to historical Site use will, per SFDHPH Case Officer (SFDPH 2021a), meet the SFDPH’s

standard to satisfy the Maher requirements, and further testing and mitigation beyond the DTSC requirements is unlikely to be required by the SFDPH.

2.7 Site Redevelopment Plans

Upon acquiring the property, TPCU may continue to occupy the building for a short period of time; however, TNDC ultimately plans to demolish the existing credit union building and redevelop the Site into a seven-story mixed commercial and residential use facility. The facility would be constructed at-grade with ground floor parking and/or commercial use with residential occupancy above the ground floor. It is noted that the redevelopment may include a ground floor daycare with an associated residential use. The footprint of the proposed building is presented on Figure 2.

3.0 HEALTH RISK EVALUATION

3.1 Data Evaluation

3.1.1 Soil

As discussed above, Site soil conditions have been characterized in recent investigations that included a total of 66 soil samples collected from 36 borings. The soil samples have been analyzed for a variety of analytes; however, PCE was found to be the only compound of significance detected during these investigations. PCE was detected in one sample at a low concentration of 0.052 mg/kg, which is below the SFBRWQCB Tier 1 ESL and below the DTSC-recommended human health RBSL for residential land use. Samples analyzed for total petroleum hydrocarbons (TPH), semi-volatile organic compounds (SVOCs), and metals were either not detected or were detected at concentrations below their respective SFBRWQCB Tier 1 soil ESLs and DTSC-recommended human health RBSLs for residential land use. Further, Site soils will be largely covered with the proposed building and hardscape elements, eliminating potential soil exposures except in landscaped areas.

3.1.2 Groundwater

As discussed above, Site groundwater conditions have been characterized in recent investigations that included a total of three on-Site grab-groundwater samples. Depth to encountered groundwater ranged from 77 to 90 feet bgs. The groundwater samples were analyzed for PCE and PCE breakdown products (one sample) or for a full suite of VOCs including PCE and PCE breakdown products (two samples). PCE was detected in two groundwater samples, at concentrations of 0.74 µg/L and 0.67 µg/L; and not detected in the other. These detected concentrations are below the PCE drinking water criterion of 5 µg/L and below the PCE groundwater-to-indoor air vapor intrusion screening level for commercial land use of 2.8 µg/L. Other target analytes were either not detected or were detected at concentrations below their respective drinking water criteria and vapor intrusion screening levels. These

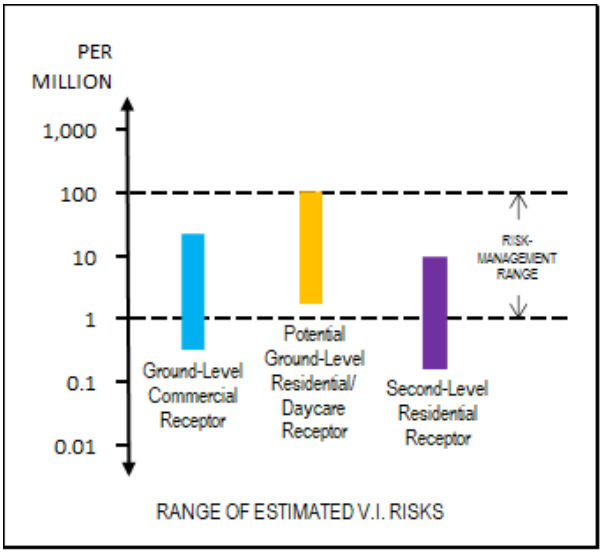
sampling results indicate that Site groundwater is not significantly impacted. Detected concentrations of VOCs in groundwater do not represent a health risk for future Site occupants.

3.1.3 Soil Gas

As discussed above, Site soil gas conditions have been well characterized through a series of recent investigations. With few exceptions, PCE is the only chemical that has been detected. The PCE breakdown products have not been detected. Chloroform was detected at a low concentration in one soil gas sample, which is common in areas serviced by water disinfected with chlorine-based disinfectants.

Detected concentrations of PCE in soil gas are fairly consistent across the Site. The highest detected concentration of PCE in shallow or sub-slab soil gas within the footprint of the proposed building is 1,500 µg/m³ – this concentration may be considered representative of the vapor intrusion concern for the proposed building.

The proposed building is an at-grade multi-story building with commercial and other non-residential uses on the ground level and residential uses above. As summarized in Table 1, the potential vapor intrusion risk associated with PCE in soil gas may be bounded using the previous and current DTSC-recommended attenuation factors of 0.0005 and 0.03 (DTSC 2011a, DTSC and SWRCB 2020). For ground-level commercial receptors, the soil gas conditions represent a risk level of 0.4 to 20 per million. For second-level residential receptors, assuming the SFBRWQCB-recommended inter-floor transfer factor of 0.1 (SFBRWQCB 2019), unmitigated (no response action implemented) soil gas conditions represent a risk level of 0.2 to 10 per million. It is noted in Section 2.7, that the redevelopment may include a ground floor daycare with an associated residential use. Under the ground floor daycare/residential scenario the unmitigated (no response action implemented) soil gas conditions, using residential screening levels as a conservative surrogate screening level for daycare receptors, represent a risk level of 1.6 to 100 per million.



It is noted that the controlling receptor is the potential ground-level residential/daycare receptor: soil gas RBSLs for the ground-level residential/daycare receptor are thus protective of both the ground-level commercial/residential receptor and of the residential receptors on the floors above.

The Site soil gas conditions represent a modest vapor intrusion concern for the proposed building. Under previous DTSC guidance (i.e., attenuation factor of 0.0005), estimated risks would be 1.6 per million (e.g for the controlling ground-level residential/daycare receptor), which is at the low end of the risk management range. For a new commercial building that is plumbed and ventilated to building codes, the previous DTSC-recommended attenuation factor of 0.0005 is likely more representative than the current value of 0.03, and vapor intrusion risks are likely on the lower end of the ranges discussed above.

3.2 Conceptual Site Model

The conceptual site model (CSM) is depicted in Figure 3. The CSM illustrates potentially complete and significant exposure pathways to on-Site receptors, after Site redevelopment, in the absence of any mitigation. Assessment, evaluation of risk, and/or risk mitigation, if necessary, of VOCs in soil, groundwater, and soil gas to off-Site receptors are outside of the scope of this Response Plan and will be performed by TPCU in accordance with the SVA.

Detected concentrations of PCE or other compounds in on-Site soil do not pose a direct contact human health risk to future on-Site residents or construction workers during redevelopment. Depth to groundwater is on the order of 80 feet below ground surface and sampling results indicate groundwater is not significantly impacted. Soil and groundwater exposure pathways are therefore considered incomplete and/or insignificant.

On-Site soil gas is impacted with PCE which is suspected to have leaked from on-Site and/or off-Site sanitary sewer pipelines. Location(s) of off-Site sanitary sewer pipeline release(s) and

location and extent of soil impacts are unknown and are not subject to this Response Plan. These off-Site impacts will be assessed by TPCU. The soil gas-to-indoor air vapor intrusion pathway is considered potentially complete and significant for future on-Site building occupants.

While breakdown products of PCE have not been detected to date, it is possible such biotic or abiotic breakdown products may form in the future, including potentially trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride.

4.0 PURPOSE OF RESPONSE PLAN

Based on the information developed during the site characterization activities, DTSC has determined that a response action is necessary to prevent or eliminate an unreasonable risk to public health and safety in the context of future on-Site receptors associated with the anticipated redevelopment of the Site for mixed use.

- PCE is present in Site soil gas at concentrations exceeding current DTSC-recommended RBSLs that are protective of vapor intrusion under residential and commercial land uses. These soil gas impacts are widespread throughout the Site and appear to be associated with historical releases on and nearby the Site.

5.0 RESPONSE ACTION OBJECTIVES

5.1 Objective

The response action at the Site will reduce or eliminate unreasonable risk to future on-Site residential and commercial occupants posed by the presence of VOCs in Site soil gas. Assessment, evaluation of risk, and/or risk mitigation, if necessary, of VOCs in soil, groundwater, and soil gas to off-Site receptors are outside of the scope of this Response Plan and will be performed by TPCU in accordance with the SVA. As discussed above, chemicals are present in on Site soil gas as result of historical activities nearby and on the Site. Specific response action objectives (RAOs) are as follows:

- Minimize or eliminate exposures between Site residents and commercial occupants to PCE present in Site soil gas, including any future PCE breakdown products. The potential exposure route to chemicals in soil gas is inhalation of volatile chemicals present in indoor air of future Site buildings as a result of transport (vapor intrusion) from soil gas to indoor air.

Remedial goals developed and adopted for contaminated media at the Site would be responsive to these objectives.

5.2 ARARs and TBC Criteria

In addition to evaluating the technical aspects of potential response action alternatives, environmental laws and regulations must be reviewed to determine whether the alternatives meet the requirements that are identified as ARARs. These ARARs are identified under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) process guidance. The following section presents an overview of the ARARs process and identifies ARARs for the response action. Additional TBC criteria that are meant to complement the use of ARARs are presented herein.

5.2.1 Overview of ARARs

Identification of ARARs is a site-specific determination involving a two-part analysis: first, a determination of whether a given requirement is applicable; then if it is not applicable, whether it is relevant and appropriate.

Applicable requirements are those cleanup standards, standards of control, and/or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address the situation at a particular site. The requirement is applicable if the jurisdictional prerequisites of the standard show a direct correspondence when objectively compared to the conditions at the site.

If the requirement is not legally applicable, then the requirement is evaluated to determine whether it is relevant and appropriate. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable, address problems or situations sufficiently similar to the circumstances of the proposed response action and are well suited to the conditions of a site (USEPA 1988).

A requirement must be substantive in order to constitute an ARAR for activities conducted on-site. Procedural or administrative requirements, such as permits and reporting requirements, are not ARARs (55 Fed. Reg. 8666, 8745 (1990). ARARs are promulgated, or legally enforceable federal and state requirements.

5.2.2 Overview of TBC Criteria

The USEPA has also developed another category known as TBC criteria, that includes non-promulgated criteria, advisories, guidance, and proposed standards issued by federal or state governments. Because TBC criteria are not potential ARARs, they are neither promulgated nor enforceable, and their identification and use are not mandatory. Rather, TBC criteria are meant to complement the use of ARARs, not to compete with or replace them. For instance, many ARARs have broad performance criteria, but do not provide specific instructions for implementation and those instructions are contained in supplemental program guidance. It

may be necessary to consult TBC criteria to interpret ARARs, or to determine preliminary remediation goals when ARARs do not exist for particular contaminants.

5.2.3 ARARs and TBC Criteria Affecting RAOs

A summary of the applicable ARARs and TBC criteria that may pertain to the proposed response alternatives for the Site is included in Table 3.

5.3 Remedial Goals

This section identifies appropriate remedial goals for the Site media that would be protective of on-Site human health under the proposed Site redevelopment for mixed commercial and residential use.

Per standard USEPA risk assessment methodology (USEPA 1989), the potential health impacts associated with exposure to a chemical or physical agent are qualified on the basis of the average concentration of the agent in the exposure medium over the duration of the exposure. Also, of relevance to establishment of remedial goals, the *de minimis* cancer risk and noncancer hazard thresholds are defined as the cumulative (multi-chemical and multi-exposure pathway) cancer risk of 1×10^{-6} (one in a million) and cumulative noncancer hazard index of 1.0, respectively. Thus, the ultimate remedial goal would be to achieve conditions such that average chemical concentration in on-Site soil, soil gas, and groundwater produce an estimated cancer risk less than 1×10^{-6} and estimated noncancer hazard index of less than 1.0, considering cumulative exposures to all chemicals in Site soil (via dermal contact, ingestion, and dust inhalation), soil gas (via vapor intrusion into indoor air), and groundwater (via use of groundwater as tap water).

Given this overall remedial goal, appropriate chemical- and media-specific target remedial goals would be risk-based values that are protective of the specific exposure under the proposed land use; or background concentrations where higher than risk-based values. Remedial goals for the Site include the following:

- DTSC-recommended indoor air RBSLs for commercial/industrial land use (DTSC 2020, USEPA 2020) (ground level of proposed building); and
- DTSC-recommended indoor air RBSLs for residential land use (DTSC 2020, USEPA 2020) (second and higher levels of proposed building).
- DTSC-recommended indoor air RBSLs for residential land use and for daycare use (with residential use as a conservative surrogate exposure scenario) (DTSC 2020, USEPA 2020) (ground- levels of proposed building).

Per DTSC (2011b), attainment of indoor air RBSLs may be demonstrated through sub-slab soil gas sampling. Therefore, remedial goals for the Site also include:

- DTSC-recommended sub-slab soil gas RBSLs that incorporate:

- DTSC-recommended RBSLs for indoor air under commercial land use (DTSC 2020);
- DTSC-recommended RBSLs for indoor air under residential land use (DTSC 2020); and
- DTSC-recommended sub-slab soil gas-to-indoor air attenuation factor of 0.03 (DTSC and SWRCB 2020).

A summary of estimated risk from PCE assuming no response action is enacted (i.e., VIMS not installed) as well as derivation of remedial goals are presented in Tables 1 and A. Although PCE-breakdown products have not been detected at the Site in soil gas, remedial goals and their derivation are presented in Tables 2 and B.

Table A – Remedial Goals

Compound	Sub-Slab Soil Gas Commercial Scenario ($\mu g/m^3$)	Sub-Slab Soil Gas Potential Residential Daycare Scenario ($\mu g/m^3$)	Ground-Level Commercial Indoor Air ($\mu g/m^3$)	Ground-Level Potential Residential Daycare Indoor Air ($\mu g/m^3$)	Second-Level Residential Indoor Air ($\mu g/m^3$)
Tetrachloroethene	67	15	2.0	0.46	0.46

Table B – Contingent Remedial Goals for Potential PCE Breakdown Products

Compound	Sub-Slab Soil Gas Commercial Scenario ($\mu g/m^3$)	Sub-Slab Soil Gas Potential Residential Daycare Scenario ($\mu g/m^3$)	Ground-Level Commercial Indoor Air ($\mu g/m^3$)	Ground-Level Potential Residential Daycare Indoor Air ($\mu g/m^3$)	Second-Level Residential Indoor Air ($\mu g/m^3$)
TCE	100	16	3.0	0.48	0.48
1,1-DCE	10,000	2,400	310	73	73
cis-1,2-DCE	1,200	280	35	8.3	8.3
trans-1,2-DCE	12,000	2,800	350	83	83
Vinyl Chloride	5.3	0.32	0.16	0.0095	0.0095

6.0 EVALUATION OF RESPONSE ACTION ALTERNATIVES

The purpose of this section of the Response Plan is to identify possible response action alternatives that could achieve the objectives discussed in Section 5.1; evaluate these alternatives on the basis of their effectiveness, implementability, and cost; and recommend a preferred alternative.

6.1 Identification and Description of Response Action Alternatives

Three possible response action alternatives (alternatives) have been identified.

- Alternative 1 – No Further Action;
- Alternative 2 – Soil Excavation; and
- Alternative 3 – Vapor Intrusion Mitigation System, Land Use Covenant, and Operations and Maintenance.

These alternatives are described below.

6.1.1 Alternative 1 – No Further Action

As required by the DTSC, the no further action alternative has been included to provide a baseline for comparisons among other response action alternatives. The no further action alternative would not require implementing any mitigative or remedial measures at the Site, and no incremental costs (i.e., beyond those associated with constructing the redevelopment project) would be incurred. This alternative includes no institutional controls, treatment of soil, or monitoring.

6.1.2 Alternative 2 – Soil Excavation

This alternative would consist of removing and transporting impacted soils to an appropriate permitted off-Site facility for disposal in association with construction of the redevelopment project. Excavation would include using loaders, backhoes, and/or other appropriate equipment, which would generate fugitive dust emissions. Dust control may be required during excavation, and workers may be required to use personal protective equipment to reduce exposure to VOCs. Additional soil profiling would be conducted to assess the quality of soil and determine the appropriate off-Site disposal facility. Additionally, confirmation soil samples would be taken to verify that cleanup goals have been achieved. Based on previous investigations, soil gas impacts are present at 15 feet bgs and as a conservative measure soils would be excavated to below the depth of these soil gas samples. Excavation of Site soils to a depth of 15 feet would produce at least 10,000 bank cubic yards (CY) of soil requiring off-Site disposal at an appropriate facility (landfill).

6.1.3 Alternative 3 –Vapor Intrusion Mitigation System, Land Use Covenant, and Operations and Maintenance

A vapor intrusion mitigation system (VIMS) would be incorporated into the design of the proposed building. The VIMS would consist of a sub-slab venting system and a sub-slab vapor-barrier membrane. The sub-slab venting system would consist of a gravel layer with horizontal perforated piping to collect impacted soil gas from beneath the building slab and route it to the edge of the building, then route soil gas upwards through a vertical riser pipe that would run along the inner or outer building wall, for discharge above the roofline. The sub-slab venting

system could also include inlets near the building exterior to dilute the sub-slab soil gas with ambient air. The sub-slab vapor-barrier membrane would be installed above the venting system and will provide a physical barrier to air flow into the building.

The ongoing effectiveness of the VIMS to prevent vapor intrusion at levels of concern at the buildings would be evaluated in accordance with the Site *VIMS Operations and Maintenance Plan* (VIMS O&M Plan; Appendix B). The VIMS O&M Plan incorporates applicable performance measures in accordance with the 2011 DTSC Vapor Intrusion Mitigation Advisory (VIMA; DTSC 2011b).

This alternative would additionally provide institutional controls to ensure long-term protection from residual soil gas impacts through a Land Use Covenant (LUC). The LUC would prohibit residential use of the property unless engineering controls (i.e., the VIMS) are in place. The VIMS would be maintained, and accessible parts inspected regularly (e.g., annually) in accordance with the LUC (to be developed), the Site Operations and Maintenance Agreement, and the VIMS O&M Plan.

6.2 Evaluation Criteria

Each response action alternative is independently analyzed below without consideration to the other alternatives. Each of the response action alternatives is screened based on effectiveness, implementability, and cost.

6.2.1 Effectiveness

In the effectiveness evaluation, the following factors are considered:

- *Overall Protection of Human Health and the Environment* – this criterion evaluates whether the alternative provides adequate protection to on-Site human health and the environment and is able to meet the Site's RAOs.
- *Compliance with ARARs/TBCs* – this criterion evaluates the ability of the alternative to comply with ARARs and TBCs.
- *Short-Term Effectiveness* – this criterion evaluates the alternative during the construction and implementation phase until the RAOs are met. This criterion accounts for the protection of workers and the community during response activities and environmental impacts from implementing the response action.
- *Long-Term Effectiveness and Permanence* – this criterion addresses issues related to the management of residual risk remaining on-Site after the response action has been performed and has met its RAOs.
- *Reduction of Toxicity, Mobility, or Volume* – this criterion evaluates whether the response technology employed results in significant reduction in toxicity, mobility, or volume of the hazardous substance.

The effectiveness of each alternative to address off-Site risks is beyond the scope of this Response Plan.

6.2.2 Implementability

Response actions are evaluated with respect to technical and administrative feasibility of implementing the alternative and applicability to Site conditions. Some factors to consider when assessing the implementability of response action alternatives include the ability to obtain necessary permits, regulatory approval of response actions, availability of necessary equipment and skilled workers, and acceptance by the state and the community. The implementability of each alternative to address off-Site risks is beyond the scope of this Response Plan.

6.2.3 Cost

This criterion assesses the relative cost of each technology based on estimated fixed capital for construction or initial implementation and ongoing operation and maintenance. The actual costs will depend on true labor and materials costs, competitive market conditions, final project scope, and the implementation schedule.

6.3 Analysis of Response Action Alternatives

6.3.1 Alternative 1 – No Further Action

The no further action alternative would not require implementing any mitigative or remedial measures at the Site, and no incremental costs would be incurred. Consequently, there would be no additional activities that would disturb Site soil, and therefore no additional short-term risks to Site workers or the community as a result of implementing this alternative. This alternative would be highly implementable from a technical feasibility perspective; however, it is unlikely to obtain regulatory or community approval and thus is given a low overall implementability rating. Under this alternative, the impacts in soil gas would not be addressed and there would be no reduction in the potential risks. This alternative therefore does not meet the effectiveness criterion.

6.3.2 Alternative 2 – Soil Excavation

<u>Effectiveness</u>

The overall effectiveness of this alternative is low, given widespread and diffuse nature of PCE in soil gas. Removal of soils across the Site may lead to removal of some PCE impacted soil; however, it is believed there is an additional off-Site source that is commingled with the on-Site soil vapor plume. Therefore, it is entirely possible that, post-excavation, on-Site soil gas may become re-contaminated due to the Site's proximity to the off-Site soil vapor plume.

Implementability

Excavation and off-Site disposal is a readily-implementable technology that is a common method for cleaning up contaminated Sites. This alternative, however, would likely have the greatest impact on nearby residents and businesses due to the excavation volume, including: the duration of soil handling activities, greater potential for dust emissions, and large number of truck trips required to haul soil to and from the Site.

Cost

The soil excavation and off-Site disposal alternative would require high costs to implement compared to Alternatives 1 and 3, due to the off-Site disposal of a minimum estimated volume of 10,000 bank CY of soil. Costs also include importing fill to replace the excavated soil. Estimated costs for Alternative 2 are presented in Appendix C.

6.3.3 Alternative 3 –Vapor Intrusion Mitigation System, Land Use Covenant, and Operations and Maintenance

Effectiveness

The overall effectiveness of this alternative would be high; however, this alternative requires long-term operations and maintenance to meet ARARs and provide long-term effectiveness. This alternative would require additional planning during redevelopment and would likely have a minimal additional impact on nearby residents and businesses.

Implementability

This alternative is expected to achieve the RAOs and be acceptable to the DTSC. This alternative would have a low impact on the Site and the community, and would be most compatible with a practical schedule for Site redevelopment.

Cost

This alternative would require higher costs than Alternative 1, however, the costs for this alternative would be far lower than Alternative 2. This alternative would have reasonable costs added to the development. Associated costs would include ongoing monitoring and inspections (see Appendix B). Estimated costs for Alternative 3 are presented in Appendix C.

6.4 Evaluation Summary

Each of the criteria have been qualitatively rated with values between 1 and 5 with low values indicating a less desirable result and high values indicating a desirable result. The ratings for each of the criteria were then summed, with a maximum potential overall rating of 15, to develop an overall rating for each of the alternatives. Additionally, the estimated costs to

implement each alternative has been provided. Derivation of these costs is provided in Appendix C. A table summarizing this evaluation is presented as Table C.

Table C – Summary of Response Action Alternatives Evaluation

Alternative	Effectiveness	Implement-ability	Cost	Overall Rating	Estimated Costs
1. No Further Action	0	0	5	5	$0
2. Soil Excavation	1	3	1	5	$4,088,000
3. VIMS, LUC, and O&M	4	5	4	13	$799,000

6.5 Selection of Recommended Response Action Alternative

Based on the evaluation above, Alternative 3 – Vapor Intrusion Mitigation System, Land Use Covenant, and Operations and Maintenance, is the preferred and recommended response action alternative for the Site. Alternative 3 would achieve RAOs, be protective of human health and the environment, and a have a much lower impact on the adjacent community as compared to Alternative 2 while being a cost-effective remedy.

7.0 RESPONSE ACTION IMPLEMENTATION

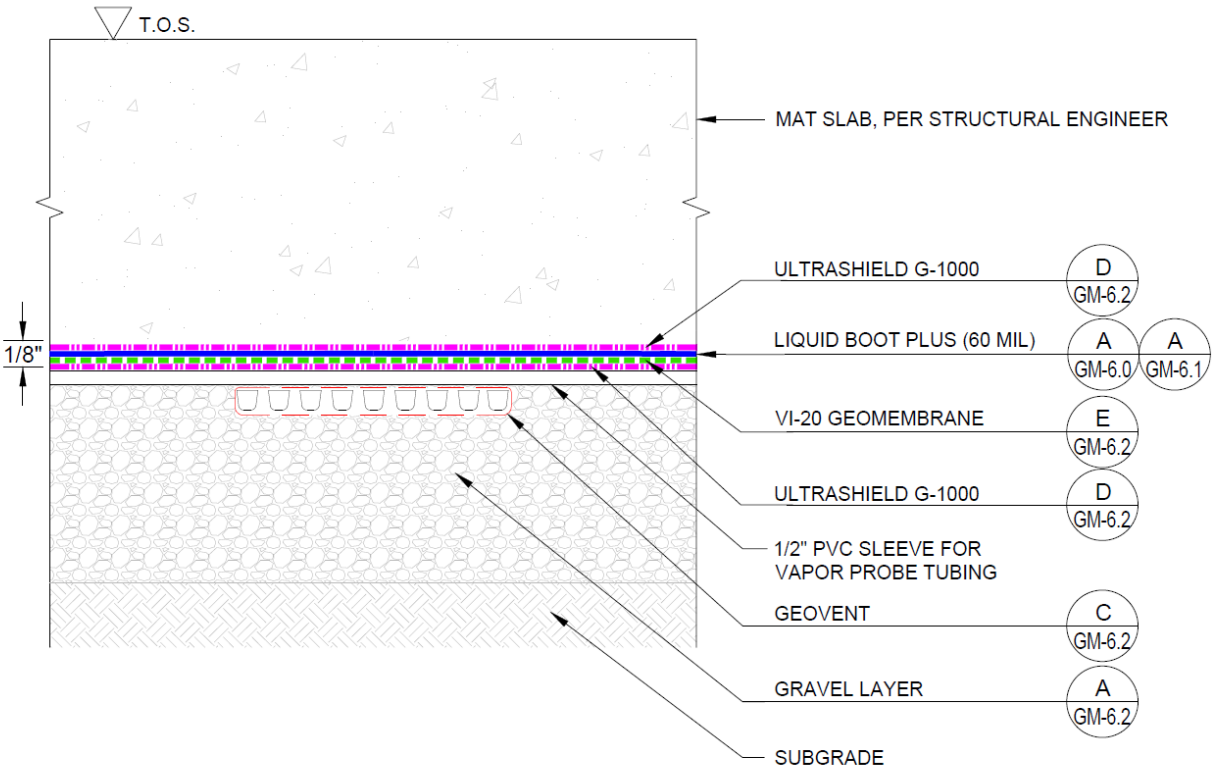
This Response Plan provides specifications for the VIMS design components of the response plan (see below). As previously mentioned, details of long-term operations and maintenance are included in Appendix B.

7.1 Sub-Slab Passive Venting System

7.1.1 System Design

The planned redevelopment of the Site will address the presence of VOCs in soil gas that may pose a potential vapor intrusion concern for the proposed building. The building will incorporate a VIMS consisting of sub-slab wind-assisted passive venting system and vapor-barrier membrane (see Appendix D).

The sub-slab sections which include the gravel layer, vent piping, and membrane are illustrated below.



The required components of the VIMS are summarized below, generally from bottom to top. Details and specifications are provided in Appendix D.

- **Gravel layer.** This "clean" (i.e., containing negligible soil fines content) gravel layer will provide a sub-slab region of high permeability that is ventilated by gas-collection piping and ambient air supply (see next items).
- **Gas-collection piping**. Soil gas will be vented from the sub-slab gravel layer via horizontal perforated gas-collection piping. The proposed collection-piping product is CETCO Geovent low-profile gas venting system.

  The horizontal Geovent will transition to rigid pipe and connect to vertical rigid pipe risers, which will rise upwards through the building to exhaust above the building roofline. Each exhaust riser will be equipped with a wind-driven turbine ("whirlybird") to create updraft to extract soil gas from the sub-slab gravel layer.
- **Dilution-air.** Dilution air will be passively supplied to the sub-slab gravel layer via ambient air inlets at the building perimeter near ground level.
- **Soil gas probes.** Nine sub-slab soil gas sampling probes will be installed in the gravel layer to allow collection of sub-slab soil gas samples (or measurement of differential pressure). Each probe will consist of a 1-inch stainless steel vapor implant connected to

1/4-inch Teflon tubing which runs to a sampling port with stopcock valve located inside a restricted access cabinet.

- **Vapor-barrier membrane.** The vapor-barrier membrane will be installed above the gravel layer and will provide waterproofing protection and vapor-intrusion mitigation. The proposed membrane system is the Liquid Boot Plus.
- **Upgradability.** The passive venting system is designed to be upgradable to an active system by replacing any wind-driven turbine with a continuously running mechanical fan, if ever necessary. The mechanical fan would be installed on the rooftop at the location of the exhaust stack and wired to a nearby electrical circuit as shown in the VIMS design plans. Conversion to an active system would require an Authority to Construct/Permit to Operate (ATC/PTO) from the Bay Area Air Quality Management District (BAAQMD). (Passive venting systems including wind-turbine assisted systems are typically exempt from BAAQMD permitting requirements. TNDC will apply to BAAQMD prior to construction to document this exemption.)

Other products, materials, or methods may be acceptable substitutes for those specified in the VIMS design plans. Any deviation from this VIMS Design Report must be pre-approved by the Owner, General Contractor, VIMS Design Engineer, and Regulatory Agency.

7.1.2 Quality Assurance/Quality Control

Periodic inspections/observations of the VIMS will be performed by the VIMS Design Engineer (or designee) at the following stages:

- During the installation of sub-slab vent piping and sampling probes.
- After backfilling of the sub-slab vent piping.
- During the installation of the sub-slab vapor barrier.
- After the installation of the sub-slab vapor barrier. This includes the smoke testing detailed below.
- During the placement of the protective course.
- Immediately prior to placement of foundation concrete.
- During, and at the completion of, the vent riser installation.
- At the completion of construction prior to the issuance of the system certification and certification of occupancy.

Additionally, a smoke test will be performed on all gas membranes in accordance with protocols described in the VIMS design plans and certified “gas tight” by the VIMS Design Engineer.

TNDC will grant site access to DTSC for oversight and as-requested inspection of the VIMS installation and performance testing. VIMS Design Engineer will provide advanced notice to DTSC of installation and testing milestones, and support DTSC during DTSC inspections.

7.1.3 Protection of the VIMS

Following the completion of construction of the interior and exterior of the building, VIMS vent piping will be labeled where they exit the building or other locations accessible to the general public, including language to notify the building owner if damage is discovered. In addition, signage will be installed on the ground floor warning of the presence of the membrane and stating that any penetration of the slab requires a permit from the Building Department to ensure the membrane is properly repaired following the penetration. Further information regarding the signage is presented in Appendix D.

In addition, as presented in the VIMS Operations and Maintenance Plan (Appendix B), any tenant improvements or other construction project that involves cutting or drilling through the foundation slab will require notification to the Site Owner at least 14 calendar days in advance to ensure the sub-slab membrane and venting system are repaired and restored consistent with the VIMS Plans and manufacturer's specifications. To ensure the long-term protection of the VIMS, a Land Use Covenant (LUC) and CLRRA-compliant Operation and Maintenance (O&M) Agreement will be recorded, and voluntary/prudential 5-Year Reviews will be conducted. As a potential aspect of LUC implementation, DTSC may receive advanced warning (via third-party monitoring used at other DTSC sites) of most planned ground- or floor-invasive work. Third-party notifications may be triggered by building permits, required "dig alert" notices, or other construction and maintenance-related activities. Further details regarding the LUC and CLRRA-compliant O&M Agreement is presented in Section 7.4.

7.1.4 Activities to Control Endangerment

As described in Section 5.1, the response action objective is to minimize or eliminate exposures between Site residents and commercial occupants to PCE present in Site soil gas, including any future potential PCE breakdown products. The potential exposure route to chemicals in soil gas is inhalation of volatile chemicals present in indoor air of future Site buildings as a result of transport (vapor intrusion) from soil gas to indoor air. To achieve this response action objective, a VIMS has been proposed to ensure long-term protection of future residential and commercial occupants, including daycare facilities.

In the event that the response action has been discovered or suspected to be compromised, such as from fire, earthquake, explosion, or human-caused damage, the Site Owner will immediately take appropriate action to prevent, abate, or minimize exposure and immediately notify the DTSC of the discovery and action taken. Appropriate action to address these concerns may include, repairing damage to the slab and/or membrane, repairs to damaged vent risers and/or fresh-air inlets, sealing conduits and/or other preferential pathways, upgrading the passive system to an active system, additional soil gas, sub-slab and/or indoor air sampling,

and/or other activities that may be deemed appropriate in consultation with the DTSC to ensure protection of the inhabitants. The continued performance and protectiveness of the VIMS will be evaluated in future, voluntary, prudential 5-Year Reviews performed in consultation with DTSC. Further details regarding operation and maintenance of the VIMS are presented in Appendix B.

7.2 Methods to Prevent Vapor Migration through Utilities

7.2.1 Utility Trench Dams

Underground utility trench dams will be installed as a precautionary measure to reduce the potential for vapors to migrate beneath a structure through the relatively permeable trench backfill. An impermeable dam or plug constructed of bentonite-soil mixture or sand-cement slurry (or equivalent) will be installed in all utility trenches that are backfilled with sand or other permeable material for new or replacement utility lines (such as potable water, reclaimed irrigation water, fire water, sanitary sewer, storm sewer, natural gas, phone, electrical, and cable). These dams will extend for a distance of at least 3 feet from the perimeter of the structure and from at least 6 inches above the bottom of the perimeter footing to the base of the trench.

7.2.2 Conduit Seals

Conduit seals will be provided at the termination of all utility conduits to reduce the potential for soil gas migration along the conduit to the interior of the building. These seals will be constructed of closed cell polyurethane foam, or other inert gas-impermeable material, extending a minimum of six conduit diameters or 6 inches, whichever is greater, into the conduit. Wye seals should not be used for main electrical feed lines.

Electrical conduits will be provided with seals as required by the appropriate sections of the National Electrical Code (National Fire Protection Association [NFPA] 70) as presented in Article 500 Hazardous (Classified) Locations Class I, II, and III, Divisions 1 and 2. All NFPA 70 requirements will be met for all work in any classified area, given the specified classifications of the project.

7.2.3 Penetration Seals for Ground-Floor Building Slab

All penetrations through the ground floor building slab will be sealed to reduce the potential for soil gas entry. These seals will be constructed of the same materials as the vapor-barrier membrane (Section 7.1.1) and will enclose gaps that may be present around the penetrations. All portions of the vapor barrier membrane will undergo a testing procedure to verify that a gas tight seal has been achieved. Details of the membrane at slab penetrations and testing are included in Appendix D.

7.3 Confirmation Sampling

Once building construction and all vapor mitigation measures have been completed (and prior to occupancy), a confirmation sampling event will be conducted to confirm the effectiveness of vapor mitigation measures. The confirmation sampling event will consist of sub-slab soil gas sampling from the probes installed beneath the building, indoor air sampling within the ground level of the building, and outdoor air sampling to characterize ambient/background conditions and assist the evaluation of indoor air results. The sampling locations will be provided to the DTSC for approval prior to sampling activities.

7.3.1 Indoor and Outdoor Air

Indoor air samples will be collected over an approximately 24-hour period with the building heating, ventilation and air conditioning (HVAC) systems in normal operation, including for at least 24 hours prior to the start of sampling. At least six indoor air samples will be collected from the ground level of the building, including four from occupiable spaces and two from locations with utility penetrations through the building slab (e.g., restroom, telecommunications point-of-entry). Sampling locations will be biased towards the center of the building footprint as practical. Samples from occupiable spaces will be collected at breathing height near the center of rooms in accordance with DTSC guidance (DTSC 2011a).

Outdoor air samples will be collected over an approximately 24-hour period concurrent with the indoor air sampling. At least two outdoor air samples will be collected, preferably from the building roof (provided accessible) at the upwind edge and/or at HVAC intakes. Any outdoor air sample collected instead near ground level would be collected near the upwind boundary of the Site, approximately 6 feet off the ground, and 10 feet beyond a tree's drip line, to the extent practical.

Indoor and outdoor air sampling locations will be selected during a pre-sampling building walkthrough. During the walkthrough, a parts-per-billion (ppb)-level photoionization detector (PID) will be used to screen the building for indoor VOC sources and for preferential vapor intrusion pathways. Any indoor VOC sources identified during the walkthrough would be removed prior to the start of the sampling event, to the extent practical.

Indoor and outdoor air samples will be collected into pre-cleaned, individually certified, 6-liter Summa canisters at a rate of 6 liters per 24 hours. The time and canister pressure at the stop and start of sample collection will be recorded in field notes and sampling locations will be documented with photographs.

7.3.2 Sub-Slab Soil Gas

Sub-slab soil gas sampling will be conducted within the 24-hour indoor air sampling period. Sub-slab soil gas samples will be collected from the nine probes beneath the building. Each sub-slab

probe will be purged and sampled as follows. It is noted that the sub-slab probe sample lines terminate at sampling ports located within a restricted access cabinet.

- A shut-in test will be conducted to verify the integrity of sample train connections.
- A small amount of the leak-detection compound, 1,1-difluoroethane or 2-propanol, will be placed on a rag which will be placed near the sampling port connection.
- The probe (consisting of the sampling line internal volume) will be purged of three volumes at a rate of 100 to 200 milliliters per minute, using either a Summa canister with flow controller or a syringe.
- A sub-slab soil gas sample will be collected into a pre-cleaned, batch-certified, 1-liter Summa canister at a rate of 100 to 200 milliliters per minute. The time and canister pressure at the stop and start of sample collection will be recorded in field notes.

7.3.3 Sample Analysis

The collected indoor air, outdoor air, and sub-slab soil gas samples will be labeled and delivered under chain-of-custody protocol to a State-certified analytical laboratory. The samples will be analyzed on standard turnaround time for the following:

- PCE, contingent PCE breakdown products (TCE, 1,1-DCE, cis-,1,2-DCE, trans-1,2-DCE, and vinyl chloride), and the leak-detection compound by USEPA Method TO-15; and
- Fixed gases by ASTM Method D1946 (sub-slab soil gas samples only).

The fixed gases analysis of sub-slab soil gas samples is included to evaluate VIMS efficiency in drawing ambient dilution air to the sub-slab gravel layer as an additional line-of-evidence in demonstrating the VIMS performance.

7.3.4 Data Evaluation

Sub-slab soil gas sampling results for PCE will be compared to the DTSC-recommended sub-slab soil gas RBSL of 67 µg/m³, which incorporates the indoor air RBSL for commercial/industrial land use of 2.0 µg/m³ and attenuation factor of 0.03.

Ground-level indoor air sampling results for PCE will be compared to the DTSC-recommended indoor air RBSL for commercial/industrial land use of 2.0 µg/m³.

Detections of PCE in indoor air (if any) would be further evaluated to determine their source. The outdoor air sampling results and sub-slab soil gas sampling results would be used as lines of evidence to determine if indoor air PCE impacts are associated with vapor intrusion from the subsurface, outdoor/ambient air, or an indoor source.

The sub-slab soil gas and indoor air sampling results will be evaluated to quantify an empirical sub-slab soil gas-to-indoor air attenuation factor for the building. This attenuation factor may

be used to evaluate future (post-occupancy) sub-slab soil gas sampling results as an alternative to the conservative default value of 0.03.

The empirical attenuation factor may also be evaluated utilizing a radon tracer in addition to sub-slab soil gas and indoor air sampling for PCE and breakdown products. As a naturally-occurring, radioactive noble gas, radon acts as a conservative tracer for gases that originate underground and have the potential to migrate into indoor air. Radon is ubiquitous and not tied to a specific source area, so concentrations should remain relatively constant in soil vapor. Radon measurements from sub-slab probes and indoor air would be made using Durridge RAD7 Electronic Radon Detectors (or equivalent field meter) or collecting sub-slab soil gas and indoor in laboratory provided medium for off-Site analysis at a certified analytical laboratory. Utilizing paired sub-slab and indoor air results, an empirical attenuation factor would be calculated. The sub-slab and indoor air radon results could be evaluated as a second line of evidence to estimate the empirical sub-lab soil gas-to-indoor air attenuation factor for the building. Other attenuation factor derivation approaches may alternatively be considered and utilized with DTSC-approval.

If indoor air sampling results for PCE are below the indoor air RBSL, the building would be demonstrated as safe for occupancy with respect to vapor intrusion concerns. If any indoor air sampling results exceed the RBSL, further evaluation would be performed. Any additional sampling would be planned and implemented in consultation with DTSC.

7.4 Land Use Covenant and Operations and Maintenance

The VIMS will be maintained and regularly (e.g., annually) inspected in accordance with a Land Use Covenant (to be developed), CLRRA-compliant O&M Agreement, and the VIMS O&M Plan. The VIMS O&M Plan contains specifications to repair or upgrade the VIMS components, in the event that this is warranted.

The LUC will include the following elements, at a minimum:

- Prohibits residential or commercial (including daycare) occupancy without engineering controls (i.e., VIMS in place, confirmed operating as designed);
- Annual LUC inspections of building ground-floor slab, and VIMS, with LUC inspection reports submitted for DTSC approval.
- Conducting prudential, voluntary 5-year Reviews, to be submitted for DTSC approval.

The O&M Agreement shall be executed prior to building occupancy. The O&M Agreement will require a financial assurance instrument funding for the estimated 30-year O&M cost of long-term site management per the Response Plan.

7.5 Maher Ordinance Compliance and Site Management Plan

By virtue of the Site's location and historical uses, the project is required to comply with San Francisco Health Code Article 22A, known as the Maher Ordinance. The Maher Ordinance defines a process for characterization and mitigation of soil and groundwater contamination, for the protection of public health and safety during and after Site redevelopment. It is expected that the San Francisco Department of Public Health (SFDPH), who oversees activities related to the Maher Ordinance, will indicate that the Site characterization and mitigation process conducted by TNDC and TPCU under DTSC oversight will effectively meet the requirements of the Maher Ordinance. While the Site is not required to implement a Site-Specific Dust Control Plan under San Francisco Health Code Article 22B (known as the Dust Ordinance) due to parcel size, as a conservative measure, TNDC has volunteered to prepare a Site Management Plan which will include response action implementation procedures, including dust and vapor control, and monitoring measures during construction activities. Additional protective measures designed to ensure worker safety during response action implementation will be included in a health and safety section of the Site Management Plan. The Site Management Plan will also include a contingency plan to be implemented if unanticipated soil contamination is encountered during response action implementation.

8.0 PUBLIC PARTICIPATION PROCESS

This Response Plan included a public participation process that was intended to ensure full and robust participation of the affected community. Thirty-three (33) days before taking any action on the proposed Response Plan, DTSC:

- Notified other appropriate governmental entities and local agencies of the proposed Response Plan including, but not limited to, SFDPH, San Francisco Planning Department, and the San Francisco Bay Regional Water Quality Control Board;
- Placed a notice in a newspaper of general circulation, in the area of the Site including, but not limited to, a community-based newspaper, as appropriate; and
- Provided notification of a 33-day public comment period on the proposed Response Plan, in factsheet format, in English and any other language commonly spoken in the area of the Site.

The proposed Response Plan, site assessment reports, and materials listed as references in the proposed Response Plan and site assessment reports have been made accessible for public review at the DTSC office in Berkeley and in electronic format on DTSC's publicly accessible EnviroStor database. Notification of the availability of these documents was provided in the factsheet. Procedures for providing comment on the proposed Response Plan and related documents were included in the factsheet. DTSC held a public meeting to receive comments.

DTSC has considered the comments received before taking any action regarding the proposed Response Plan. As part of its communication with affected communities, DTSC has provided

information regarding the process by which decisions about the Site are made and the recourse that is available for those who may disagree with an agency decision. DTSC has considered the issue of environmental justice, as defined in subdivision (e) of Section 65040.12 of the Government Code, for communities most impacted, including low-income and racial minority populations before taking action on the Response Plan.

Prior to approving this Response Plan, DTSC prepared a Community Letter and Survey (DTSC 2021b), a Community Profile (DTSC 2021c), a Public Notice of the Public Comment Period for 2550 Irving Street (DTSC 2021d), and a Community Update of the Public Comment Period for 2550 Irving Street (DTSC 2021e) to notify the public regarding the Site and inviting the public to comment on the Draft Response Plan. The public comment period for the Draft Response Plan was from July 12 to August 13, 2021 and included a Remote Public Meeting on July 22, 2021. Following public comment, the DTSC prepared a Responsiveness Summary (DTSC 2021f) to respond to all public comments received during the 33-day public comment period on the Draft Response Plan. This Final Response Plan reflects changes which the DTSC determined were appropriate in response to public comments. The Responsiveness Summary is included as Appendix E.

Prior to the start of construction at the Site, DTSC will prepare a Work Notice and will distribute the Work Notice to the project mailing list.

9.0 CEQA DOCUMENTATION

The California Environmental Quality Act (CEQA), modeled after the National Environmental Policy Act (NEPA) of 1969, was enacted in 1970 as a system of checks and balances for land use development and management decisions in California. It is an administrative procedure to ensure comprehensive environmental review of cumulative impacts prior to project approval.

A CEQA project has the potential to cause a direct physical change or a reasonably foreseeable indirect physical change in the environment. CEQA applies to discretionary projects proposed to be carried out or approved by California public agencies, unless an exemption applies.

On August 4, 2020, the San Francisco Planning Department issued a Senate Bill 35 Determination letter confirming the proposed project at 2550 Irving Street (i.e., the Site) meets the objective criterion of Senate Bill 35. Per the San Francisco Planning Department's *Affordable Housing Streamlined Approval Pursuant to Senate Bill 35 and Planning Director Bulletin #5*:

- CEQA review is not required for SB-35 eligible projects because they are subject to a ministerial approval process. The site or building permit will not be subject to any applicable neighborhood notice requirements in the Planning Code, and the Department will not accept Discretionary Review applications for these projects because they are subject to a ministerial approval process.

DTSC has prepared and will file a notice of exemption with the State Clearinghouse within 5 days of approving this Response Action. A copy of the notice of exemption is provided in Appendix F.

10.0 OVERSIGHT AND DETERMINATION OF RESPONSE ACTION COMPLETENESS

TNDC will grant site access to DTSC for oversight and as-requested inspection of the VIMS installation and performance testing. VIMS Design Engineer will provide advanced notice to DTSC of installation and testing milestones, and support DTSC during DTSC inspections.

Pursuant to H&SC §25395.90 et seq., DTSC shall make final approval of whether the response action is complete.

DTSC may require further response actions based on the discovery of hazardous materials during the course of the response action, or during subsequent development of the Site.

If the use of the property changes, DTSC may require a new response plan, or response plan amendment.

11.0 REFERENCES AND ADMINISTRATIVE RECORD

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DTSC. 2021b. *Community Letter and Community Survey*. April 19 (English and Chinese).

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DTSC. 2021d. *Public Notice of the Public Comment Period for 2550 Irving Street*. July 8 (English) and July 12 (Chinese).

DTSC. 2021e. *Community Update of the Public Comment Period for 2550 Irving Street*. July 12 (English and Chinese).

DTSC. 2021f. *Responsiveness Summary for 2550 Irving Street*. September 2.

DTSC and SWRCB. 2020. *Supplemental Guidance: Screening and Evaluating Vapor Intrusion*. Public Draft. February.

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Path Forward. 2021. *Site Assessment Plan and Report of Findings, 2550 Irving Street Affordable Housing Project, San Francisco, California.* Final. February 2.

SFBRWQCB. 2017. *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)*. May 4.

SFBRWQCB. 2019. *Review by Ross Steenson (RAS) – December 2, 2019; November 12, 2019, Meeting Minutes, Former FMC Corporation Facility, 328 West Brokaw Road, Santa Clara, CA, GeoTracker ID SL18204584*. December 2.

SFDPH. 2001a. Email, dated August 19, 2021 between David Grunat, Path Forward, and Ryan Casey, SFDPH, forwarded to Arthur Machado, DTSC Project Manager.

USEPA. 1988*. CERCLA Compliance with Other Laws Manual: Interim Final*. August.

USEPA. 1989. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part A).* Interim Final. Office of Emergency and Remedial Response. December

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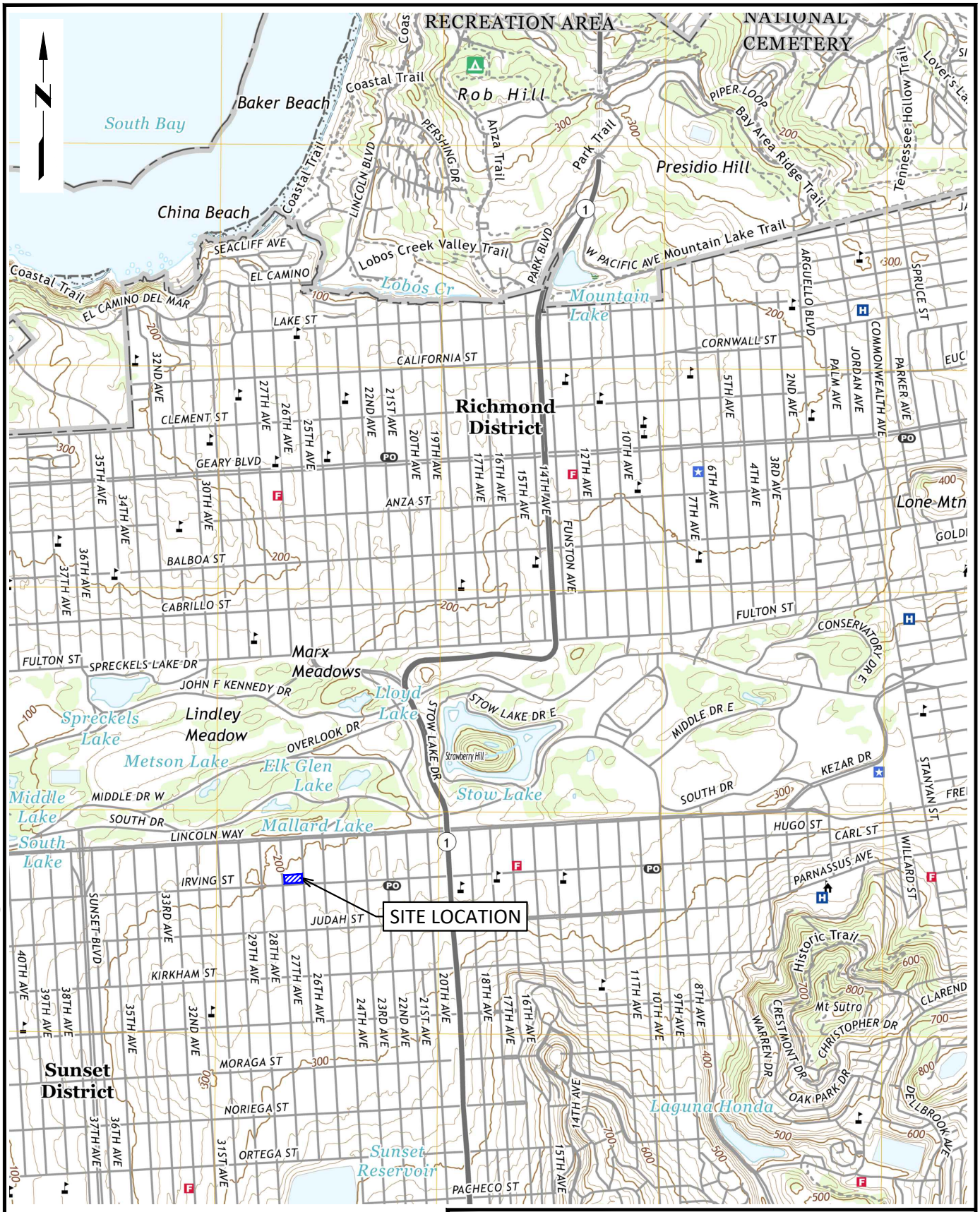
Figures



0 2,000

SCALE: feet

Reference:
USGS San Francisco North 7.5 Minute quadrangle, 2018.

SITE LOCATION MAP

PATH FORWARD
Environmental Engineering & Geology

2550 IRVING STREET,
SAN FRANCISCO,
CALIFORNIA

Figure
1

Project No. 115-102-100

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Legend:

- Geoprobe Permanent Soil Vapor Probe Cluster to 5-ft and 15-ft bgs (AllWest, 8/26-28/2020)
- Geoprobe Permanent Soil Vapor Probe Cluster to 5-ft and 15-ft bgs (AllWest, 5/23-24/2020)
- Geoprobe Temporary Soil Vapor Probe to 15-ft bgs (AllWest, 5/28/2020)
- Temporary Soil Vapor Probe (Path Forward, 12/14-15/2019)
- Geoprobe Boring with Temporary Soil Vapor Probe to 5-ft bgs (AllWest, 7/17/2019)
- Geoprobe Boring to 40 to 52-ft bgs (AllWest, 7/17/2019)
- Geoprobe Boring to Groundwater at ~80 to 90-ft bgs (AllWest)
- Sub-Slab Vapor Pin (AllWest, 5/21/2019 and 7/17/2019)
- Grab-Groundwater Sampling Location (Path Forward, 12/14-15/2019)

0 50

SCALE: feet

SITE MAP

PATH FORWARD
Environmental Engineering & Geology

2550 IRVING STREET, SAN FRANCISCO, CALIFORNIA

Figure **2**

Project No. 115-102-105

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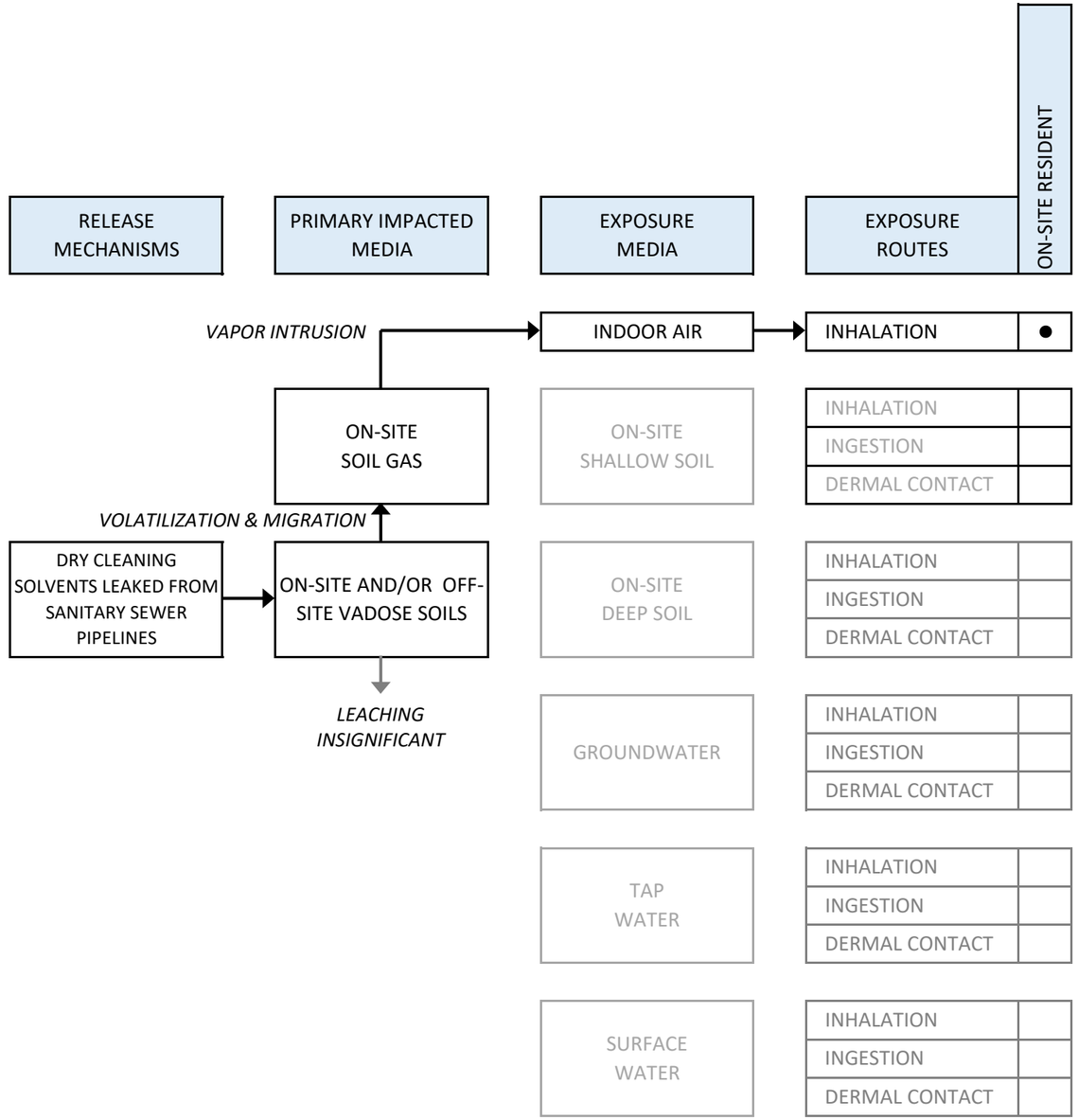
NOTES

(1) This CSM depicts potentially complete and significant exposure pathways to on-Site receptors, after Site redevelopment, in the absence of any mitigation. Off-Site impacts are not addressed within the scope of this Response Plan.

(2) On-Site soil gas is impacted with tetrachloroethene (PCE) which is suspected to have leaked from on-Site and/or off-Site sanitary sewer pipelines. Location(s) of sanitary sewer pipeline release(s), location and extent of soil impacts unknown.

(3) Detected concentrations of PCE in on-Site soil do not pose a direct contact human health risk to future on-Site residents.

(4) Depth to groundwater is on the order of 80 feet. Groundwater sampling results indicate the release has not impacted groundwater.



LEGEND

● Potentially complete and significant exposure pathway

CONCEPTUAL SITE MODEL

PATH FORWARD
Environmental Engineering & Geology

2550 IRVING STREET
SAN FRANCISCO, CALIFORNIA

FIGURE
3

Tables

Table 1. Tetrachlorothene Vapor Intrusion Risk

Indoor Air RBSL ($\mu g/m^3$)	Attenuation Factor	Soil Gas RBSL ($\mu g/m^3$)	Soil Gas Concentration ($\mu g/m^3$)	Soil Gas Risk (per million)
Ground-Level Commercial Receptor				
2.0	0.03	67	1,500	20
2.0	0.0005	4,000	1,500	0.4
Potential Ground-Level Residential/Daycare Receptor				
0.46	0.03	15	1,500	100
0.46	0.0005	920	1,500	1.6
Second-Level Residential Receptor				
0.46	0.003	150	1,500	10
0.46	0.00005	9,200	1,500	0.2

Notes:

(1) Tetrachloroethene (PCE) indoor air risk-based screening levels (RBSLs) are DTSC-recommended values, represent 1 per million risk level (DTSC 2020).

(2) Attenuation factors are current and previous DTSC-recommended values for future commercial buildings (DTSC 2011, DTSC and SWRCB 2020).

(3) Second-level attenuation factors incorporate SFBRWQCB-recommended inter-floor transfer factor of 0.1 (SFBRWQCB 2019).

(4) Soil gas RBSL equals indoor air RBSL divided by attenuation factor.

(5) Soil gas concentration is highest detected concentration of PCE in shallow soil gas within the footprint of proposed building (AllWest 2020c).

(6) Soil gas risk equals soil gas concentration divided by soil gas RBSL; is rounded to one significant figure.

(7) If the final redevelopment plan includes ground-floor residential receptors and/or other sensitive receptors, DTSC-recommended RBSLs for indoor air under residential land use will be utilized.

Table 2. Tetrachloroethene Breakdown Product Contingent Remedial Goals

PCE Breakdown Product	Indoor Air RBSL (µg/m³)	Attenuation Factor	Soil Gas RBSL (µg/m³)	Soil Gas Concentration (µg/m³)	Soil Gas Risk (per million)
Ground-Level Commercial Receptor					
Trichloroethene	100	0.03	3,300	ND	NA
Dichloroethene, 1,1-	310	0.03	10,000	ND	NA
Dichloroethene, 1,2-, cis-	35	0.03	1,200	ND	NA
Dichloroethene, 1,2-, trans-	350	0.03	12,000	ND	NA
Vinyl Chloride	0.16	0.03	5.3	ND	NA
Trichloroethene	100	0.0005	200,000	ND	NA
Dichloroethene, 1,1-	310	0.0005	620,000	ND	NA
Dichloroethene, 1,2-, cis-	35	0.0005	70,000	ND	NA
Dichloroethene, 1,2-, trans-	350	0.0005	700,000	ND	NA
Vinyl Chloride	0.16	0.0005	320	ND	NA
Potential Ground-Level Residential/Daycare Receptor					
Trichloroethene	0.48	0.03	16	ND	NA
Dichloroethene, 1,1-	73	0.03	2,400	ND	NA
Dichloroethene, 1,2-, cis-	8.3	0.03	280	ND	NA
Dichloroethene, 1,2-, trans-	83	0.03	2,800	ND	NA
Vinyl Chloride	0.0095	0.03	0.32	ND	NA
Trichloroethene	0.48	0.0005	960	ND	NA
Dichloroethene, 1,1-	73	0.0005	150,000	ND	NA
Dichloroethene, 1,2-, cis-	8.3	0.0005	17,000	ND	NA
Dichloroethene, 1,2-, trans-	83	0.0005	170,000	ND	NA
Vinyl Chloride	0.0095	0.0005	19	ND	NA
Second-Level Residential Receptor					
Trichloroethene	0.48	0.003	160	ND	NA
Dichloroethene, 1,1-	73	0.003	24,000	ND	NA
Dichloroethene, 1,2-, cis-	8.3	0.003	2,800	ND	NA
Dichloroethene, 1,2-, trans-	83	0.003	28,000	ND	NA
Vinyl Chloride	0.0095	0.003	3.2	ND	NA
Trichloroethene	0.48	0.00005	9,600	ND	NA
Dichloroethene, 1,1-	73	0.00005	1.5E+06	ND	NA

Table 2. Tetrachloroethene Breakdown Product Contingent Remedial Goals

PCE Breakdown Product	Indoor Air RBSL ($\mu g/m^3$)	Attenuation Factor	Soil Gas RBSL ($\mu g/m^3$)	Soil Gas Concentration ($\mu g/m^3$)	Soil Gas Risk (per million)
Dichloroethene, 1,2-, cis-	8.3	0.00005	170,000	ND	NA
Dichloroethene, 1,2-, trans-	83	0.00005	1.7E+06	ND	NA
Vinyl Chloride	0.0095	0.00005	190	ND	NA

Notes:

(1) PCE Breakdown Product indoor air risk-based screening levels (RBSLs) are DTSC-recommended values, represent 1 per million risk level (DTSC 2020).

(2) Attenuation factors are current and previous DTSC-recommended values for future commercial buildings (DTSC 2011, DTSC and SWRCB 2020).

(3) Second-level attenuation factors incorporate SFBRWQCB-recommended inter-floor transfer factor of 0.1 (SFBRWQCB 2019).

(4) Soil gas RBSL equals indoor air RBSL divided by attenuation factor.

(5) Soil gas concentration is highest detected concentration of PCE in shallow soil gas within the footprint of proposed building (AllWest 2020c).

(6) Soil gas risk equals soil gas concentration divided by soil gas RBSL; is rounded to one significant figure.

(7) If the final redevelopment plan includes ground-floor residential receptors and/or other sensitive receptors, DTSC-recommended RBSLs for indoor air under residential land use will be utilized.

(8) ND = Not detected above the laboratory reporting limit. NA = Risk not calculated as breakdown product was ND during sampling.

Table 3. Summary Applicable or Relevant and Appropriate Requirements (ARARs)

Statue and Regulatory Citation	Determination	Description	Comment
Federal ARARs			
National Historic Preservation Act (NHPA), 16 U.S.C. ' 470 40 CFR 6.301(b) 36 CFR 60, 63, 800	Applicable	This statute and implementing regulations require federal agencies to take into account the effect of this response action upon any district, site, building, structure, or object that is included in or eligible for the National Register of Historic Places.	If cultural resources on or eligible for the national register are present, it will be necessary to determine if there will be an adverse effect and if so how the effect may be minimized or mitigated. The unauthorized removal of archaeological resources from public or Indian lands is prohibited without a permit, and any archaeological investigations at a site must be conducted by a professional archaeologist. There are no known Historical or Archaeological features recognized within the project area.
Archaeological and Historic Preservation Act 16 U.S.C. ' 469 40 CFR 6.301(c) 43 CFR 7	Applicable	This statute and implementing regulations establish requirements for the evaluation and preservation of historical and archaeological data, which may be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	
Fish and Wildlife Coordination Act 16 U.S.C. '' 661, et seq., 40 CFR 6.302(g) 50 CFR 83 33 CFR 320-330	Applicable	This statute and implementing regulations require coordination with federal and state agencies for federally funded projects to ensure that any modification of any stream or other water body affected by any action authorized or funded by the federal agency provides for adequate protection of fish and wildlife resources.	If the remedial action involves activities that affect wildlife and/or non-game fish, federal agencies must first consult with the U.S. Fish and Wildlife Service and the relevant state agency with jurisdiction over wildlife resources. There are no known water bodies that will be affected by the project.
Endangered Species Act, 16 U.S.C. ' 1531 40 CFR 6.302(h) 50 CFR 17 and 402	Relevant and Appropriate	This statute and implementing regulations provide that federal activities not jeopardize the continued existence of any threatened or endangered species. Endangered Species Act, Section 7 requires consultation with the U.S. Fish and Wildlife Service to identify the possible presence of protected species and mitigate potential impacts on such species.	If threatened or endangered species are identified within the remedial areas, activities must be designed to conserve the species and their habitat. There are no known threatened or endangered species identified within the project area.
Migratory Bird Treaty Act, 16 U.S.C. '' 703, et seq. 50 CFR 10.13	Relevant and Appropriate	This requirement establishes a federal responsibility for the protection of the international migratory bird resource and requires continued consultation with the U.S. Fish and Wildlife Service during remedial design and remedial construction to ensure that the cleanup of the site does not unnecessarily impact migratory birds.	The selected remedial actions will be carried out in a manner to avoid adversely affecting migratory bird species, bald eagle and including individual birds or their nests. There are no known nesting sites identified within the project area.
Toxic Substances Control Act (TSCA) 40 CFR Part 763, Subpart G	Other Requirements	Asbestos abatement projects and asbestos worker protection. This subpart protects certain State and local government employees who are not protected by the Asbestos Standards of the Occupational Safety and Health Administration (OSHA). This subpart applies the OSHA Asbestos Standards in 29 CFR 1910.1001 and 29 CFR 1926.1101 to these employees.	The State requires that work be performed in accordance with 40 CFR 763.120 and 763.121 (asbestos abatement projects) and 29 CFR 1926.58 (asbestos standard for the construction industry). These requirements will be incorporated into the health & safety plan but do not meet the definition of an ARAR.
40 CFR Part 763 - Asbestos Containing Materials in Schools	Other Requirements	This regulation provides provision for investigation, handling and management of ACM at school sites.	Will not apply to this non-school related project.
Clean Air Act - (CAA) 40 CFR Part 61, Subpart M National Emission Standard for Asbestos	Relevant and Appropriate	The section of the Clean Air Act deals with management of ACMs.	Over-riding regulation for Asbestos Mitigation Management.

Table 3. Summary Applicable or Relevant and Appropriate Requirements (ARARs)

Statue and Regulatory Citation	Determination	Description	Comment
Clean Air Act (CAA) Air Cleaning 40 CFR 61.145 (c) & (d)	Relevant and Appropriate	This requirement establishes detailed standards and specifications for demolition and renovation. The regulation provides detailed procedures for controlling asbestos release during demolition of a building containing "regulated-asbestos containing material (RACM)".	Applicable to building demolitions that will occur as part of the removal if certain threshold volumes of RACM are disturbed. The dust control portions of the regulations are relevant and appropriate for soil disturbance activities and for asbestos contaminated material that does not meet the strict definition of RACM.
Clean Air Act (CAA) Air Cleaning 40 CFR 61.149 Note: Section 61.149(c)(2) is not delegated to the State	Relevant and Appropriate	This Act and implementing regulations, 40 CFR 61.149, establish detailed procedures and specifications for handling and disposal of asbestos containing waste material generated by an asbestos mill.	Requirements under this regulation are considered relevant and appropriate to the ACM disposal. It is not applicable because the facilities do not meet the regulatory definition of an asbestos mill.
Clean Air Act (CAA) Air Cleaning 40 CFR 61.150 Note: Section 61.150(a)(4) is not delegated to the State	Relevant and Appropriate	Standard for waste disposal for manufacturing, fabricating, demolition, renovation and spraying operations. This regulation provides detailed procedures for processing, handling and transporting asbestos containing waste material generated during building demolition and renovation (among other sources).	Applicable to RACM generated by building demolitions that will occur as part of the remedial action. Relevant and appropriate for soil disturbance activities and for asbestos contaminated material that does not meet the strict definition of RACM.
Clean Air Act (CAA) Air Cleaning 40 CFR 61.151 Note: Section 61.151(c) is not delegated to the State	Relevant and Appropriate	Standard for inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations. Provides requirements for covering, revegetation and signage at facilities where RACM will be left in place.	Requirements under this regulation are considered relevant and appropriate to asbestos containing soils and/or debris left in place. It is not applicable because the facilities that are part of this remedial action do not meet the facility definitions in the regulation.
Clean Air Act (CAA) Air Cleaning 40 CFR 61.152 Note: Section 61.152(b)(3) is not delegated to the State	Relevant and Appropriate	This requirement establishes detailed specifications for air cleaning used as part of a system to control asbestos emissions control system.	These requirements would be applicable if air cleaning is part of the building demolitions. It would be relevant and appropriate to other air cleaning operations.
Clean Air Act (CAA) Air Cleaning 40 CFR 61.154 Note: Section 61.154(d) is not delegated to the State	Relevant and Appropriate	Standard for active waste disposal sites. Provides requirements for off-site disposal sites receiving asbestos-containing waste material from building demolitions and other specific sources.	Requirements under this regulation are considered relevant and appropriate to asbestos containing soils and/or debris to be transported off-Site. It is not applicable because the facilities that are part of this remedial action do not meet the facility definitions in the regulation.
Clean Air Act (CAA) Air Cleaning 40 CFR 61.155	Relevant and Appropriate	This requirement establishes detailed standards for operations that convert asbestos containing waste material into non- asbestos (asbestos-free) material.	These requirements would be applicable if the remedial action includes any treatment of asbestos containing material.
U.S. EPA Office of Superfund Regional Screening Levels for Chemical Contaminants at Superfund Sites	To Be Considered	RSLs are risk-based concentration which can be used to evaluate whether a chemical release may pose a risk that warrants further investigation. RSLs are not legally enforceable standards. They are use for Site screening and should not be used as cleanup levels for a CERCLA site until the other remedy selections identified in the relevant portions of the National Contingency Plan (NCP), 40 CFR Part 300, have ben evaluated and considered	If a chemical is detected during removal actions and no cleanup level was previously established, the Hero Note 3, Water Board ESLs, or U.S. EPA RSLs will be used as a screening concentration. If the concentrations are below Hero Note 3, ESLs, or RSLs, as applicable, no further action will be taken.
Resource Conservation and Recovery Act (RCRA) 40 CFR §§260-299; Subtitle C (hazardous waste requirements); State of California citation: Cal. Health & Safety Code, Title 22	Applicable	RCRA is the primary federal law governing the disposal of hazardous and non-hazardous or municipal solid waste passed by Congress in 1976 and amended in 1984 by Hazardous and Solid Waste Amendments (HSWA). RCRA Subtitle C sets standards for the classification of hazardous waste, and requirements governing handling, management, transportation, treatment, and off- site disposal of these wastes.	RCRA applies to moving waste materials. Hazardous waste management efforts at the sites will be performed in accordance with RCRA and Title 22 Requirements.

Table 3. Summary Applicable or Relevant and Appropriate Requirements (ARARs)

Statue and Regulatory Citation	Determination	Description	Comment
Clean Water Act (CWA) 33 USC §1342	Applicable	Section 402 of the CWA regulates discharges of pollutants under the National Pollutant Discharge Elimination System (NPDES). The storm water discharges program is regulated by the State Water Board for certain municipal, industrial, and construction storm water discharges through NPDES permits. NPDES permits include requirements to prevent or reduce discharges of pollutants that cause or contribute to violations of water quality objectives.	Any construction storm water discharges will use controls to reduce pollutant loads in storm water in order to prevent violations of water quality objectives.
Safe Drinking Water Act (SDWA) 42 USC § 300g-1	To Be Considered	The National Contingency Plan (NCP) at 40 CFR §§300.43(e)(2)(i)(B)-(D) states that maximum contaminant level goals (MCLGs), established under the SDWA, that are set at levels above zero should be attained by remedial actions for surface water or groundwater that are current or potential sources of drinking water. For contaminants of concern (COCs) in groundwater that do not have MCLGs, or if the MCLGs have been set at zero, the remedial actions should achieve Maximum Contaminant Levels (MCLs).	Although no impacts to surface or groundwater are known, the planned cleanup is intended to be protective of water quality.
State and Local ARARs			
Title 8: Subchapter 7. General Industry Safety Orders Group 16. Control of Hazardous Substances Article 110. Regulated Carcinogens	Applicable	This regulation provides the State of California OSHA regulations for Hazardous Substance.	The necessary health and safety precautions will be included in project-specific HASP.
California Health and Safety Code - HSC Division 20. Miscellaneous Health and safety Provisions [24000 - 26217] Chapter 6.82. California Land Reuse and Revitalization Act of 2004 [25395.60 - 25395.109] Article 2. Definitions [25395.63 - 25395.79.2]	Applicable	"Response plan" means a written plan submitted to an agency pursuant to Section 25395.96 If, upon review of the site assessment prepared pursuant to this article, the agency determines that a response action is necessary to prevent or eliminate an unreasonable risk, the bona fide purchaser, innocent landowner, or contiguous property owner shall submit a response plan to the agency to conduct a response action at the site, in conformance with the agreement entered into pursuant to Section 25395.92.	This provides the definition for the Response Plan.
California Toxics Rule (CTR) 33 USC §1313(c)(2)(B); 40 CFR §131.38(b)(1), (2)	To Be Considered	The California Toxics Rule sets forth freshwater and saltwater criteria for a number of metals and chemical compounds.	Although no impacts to surface or groundwater are known, related to this removal action, the planned cleanup is intended to be protective of water quality.
California Regional Water Quality Control Board, San Francisco Bay Region (Water Board), Water Quality Water Quality Objectives Porter-Cologne Water Quality Control Act promulgated under California Water Code § 13240-13241, Basin Plan, Chapter 3	To Be Considered	Chapter 3 of the Basin Plan sets forth water quality objectives for surface water and groundwater.	Although no impacts to surface or groundwater are known, related to this removal action, the planned cleanup is intended to be protective of water quality.
Domestic Water Quality and Monitoring Regulations Cal. Health and Safety Code §11635, 22 CCR §§64431, 64432, 64432.1, 64432.2, 64444, 64444.5	Relevant and Appropriate	These sections of the California Code of Regulations, part of the state water quality standards, establish MCLs for organic and inorganic chemicals in drinking water.	Although no impacts to surface or groundwater are known, related to this removal action, the planned cleanup is intended to be protective of water quality.
Safe Drinking Water Act (SDWA) Cal. Health and Safety Code § 116375, 22 CCR § 64449	Relevant and Appropriate	This section of the SDWA establishes secondary MCLs for chemicals in drinking water that adversely affect its odor, taste, or appearance. They are desirable goals and are not enforceable.	Although no impacts to surface or groundwater are known, related to this removal action, the planned cleanup is intended to be protective of water quality.

Table 3. Summary Applicable or Relevant and Appropriate Requirements (ARARs)

Statue and Regulatory Citation	Determination	Description	Comment
State Water Resources Control Board (SWRCB) Resolution No. 88-63 Porter-Cologne Water Quality Control Act promulgated under California Water Code § 13140	Relevant and Appropriate	The resolution states that all surface and groundwaters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply, contamination, or the water source does not provide sufficient water to supply a well capable of producing 200 gallons per day.	Although no impacts to surface or groundwater are known, related to this removal action, the planned cleanup is intended to be protective of water quality.
Water Board Environmental Screening Levels (ESLs) Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Revision 2, July 2019	Relevant and Appropriate	ESLs can be used to evaluate whether a chemical release may pose a risk that warrants further investigation. ESLs are not legally enforceable standards. They are used for site screening.	If a chemical is detected during removal actions and no cleanup level was previously established, Hero Note 3, Water Board ESLs, or U.S. EPA RSLs will be used as a screening concentration. If the concentrations are below Hero Note 3, ESLs or RSLs, as applicable, no further action will be taken.
DTSC and Office of Human and Ecological Risk (OEHHA) Human Health Risk (HERO) Notes including Note 3 Title 22, California Code of Regulations (CCR),Chapter 50 Section 68400.5.	Relevant and Appropriate	For any release of hazardous waste or hazardous constituents, the human health risk assessment calculations, including, but not limited to, all cancer risk and non-cancer hazard screening levels and corrective action objectives, shall use the toxicity criteria specified in California Code of Regulations, title 22, sections 69021 and attain the human health protection specified in section 69022, subdivisions (a) and (b).	The appropriate HERO Notes will be followed when evaluating risks associated with known or discovered contaminants during the implementation of the removal action.
Bay Area Air Quality Management District (BAAQMD) Regulation 6 Rule 1 Section 305	Relevant and Appropriate	This section sets limits on visual particulates during construction activities.	A person shall not emit particles from any operation in sufficient number to cause annoyance to any other person, which particles are large enough to be visible as individual particles at the emission point or of such size and nature as to be visible individually as incandescent particles. This section will apply only if such particles fall on real property other than that of the person resposible for the emission.
Title 22, California Code of Regulations (CCR), Chapter 39 Section 67391.1, Requirements for Land Use Covenants	Applicable	Specify that a land use covenant imposing appropriate limitations on land use shall be executed and recorded when hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels, which are not suitable for unrestricted use of the land.	This is the regulation that will govern the land use covenant placed on the Site following capping.
San Francisco Police Code, Article 29, section 2908.	Applicable	This ordinance provides guidance for acceptable levels of noise and acceptable times for the emission of construction noise.	Noise between 8pm and 7am is unlawful without a special Public Works permit.
Underground Storage Tank (UST) Regulations California Code of Regulations, Title 23, Chapter 16, Article 11	To Be Considered	UST regulations protect waters of the state from discharges of hazardous substances from USTs.	No USTs are known to be present at the site. Although not anticipated, if removal actions involve the removal of a UST, the actions will comply with the substantive requirements of these regulations.
San Francisco Bay Water Board UST Program California Health and Safety Code, Division 20, Chapters 6.7 and 6.75	To Be Considered	The San Francisco Bay Water Board UST Program gives local agencies the authority to oversee investigation and cleanup of UST leak sites.	No USTs are known to be present at the site. Although not anticipated, if removal actions involve the removal of a UST, the actions will comply with the substantive requirements of these regulations.
San Francisco Public Health Code (SFPHC) Article 22A (also referred as Maher Ordinance)	Applicable	The Site is located within the area that is subject to compliance with Article 22A. For projects which will disturb at least 50 cubic yards of soil, the applicant is required to contact the Department of Public Health and to conduct an environmental investigation and submit the documents and certifications for review and approval by the Department of Public Health prior to issuance of the permit from the Department of Building Inspection.	Provides a description of the Maher Ordinance which will be required to be followed during redevelopment.

Table 3. Summary Applicable or Relevant and Appropriate Requirements (ARARs)

Statue and Regulatory Citation	Determination	Description	Comment
SFPHC Article 22B	Applicable	This article is applicable to any site preparation or construction activities taking place within the City and County of San Francisco that have the potential to create dust or that will expose or disturb soil be conducted and managed to eliminate visible dust;	Provides a description of the dust mitigation requirements to eliminate visible dust.

Appendix A

Summary of Historical Data

Tables 1 and 2 from

Phase II Subsurface Investigation Report **(AllWest 2020c)**

TABLE 1
SUMMARY OF SOIL ANALYTICAL DATA
2500-2550 Irving Street
San Francisco, California
AllWest Project No. 19089.23.1

Sample Name and Depth in feet bgs	Date Sampled	TPH-g (C6-C12) (mg/kg)	TPH-d (C10-C23) (mg/kg)	TPH-mo (C18-C36) (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Tetrachloroethene (PCE) (mg/kg)	Other VOCs (mg/kg)
B-1 (4.5-5)	5/21/2019	ND (<1.0)	13	**210**	ND (<0.25)	44	9.0	24	28	ND (<0.0050)	ND (varies)
B-2 (4.5-5)	5/21/2019	ND (<1.0)	3.6	70	ND (<0.25)	57	4.6	26	24	ND (<0.0050)	ND (varies)
B-3 (4.5-5)	5/21/2019	ND (<1.0)	1.1	19	ND (<0.25)	49	**39**	26	68	ND (<0.0050)	ND (varies)
B-4 (4.5-5)	5/21/2019	ND (<1.0)	ND (<1.0)	ND (<5.0)	ND (<0.25)	57	10	30	45	ND (<0.0050)	ND (varies)
B-5 (4.5-5)	5/21/2019	ND (<1.0)	ND (<1.0)	ND (<5.0)	ND (<0.25)	45	2.5	24	21	ND (<0.0050)	ND (varies)
B-8 (4.5-5)	7/17/2019	NA	NA	NA	NA	NA	NA	NA	NA	ND (<0.0050)	ND (varies)
B-8 (9.5-10)	7/17/2019	NA	NA	NA	NA	NA	NA	NA	NA	ND (<0.0050)	ND (varies)
B-9 (4.5-5)	7/17/2019	NA	NA	NA	NA	NA	NA	NA	NA	ND (<0.0050)	ND (varies)
B-9 (9.5-10)	7/17/2019	NA	NA	NA	NA	NA	NA	NA	NA	ND (<0.0050)	ND (varies)
B-10 (4.5-5)	7/18/2019	NA	NA	NA	NA	NA	NA	NA	NA	ND (<0.0050)	ND (varies)
B-10 (9.5-10)	7/18/2019	NA	NA	NA	NA	NA	NA	NA	NA	ND (<0.0050)	ND (varies)
SFRWQCB Tier 1 ESLs		**100 (Res-ON)**	**260 (Res-DE)**	**100 (Res-ON)**	**1.9 (TH)**	**160 (TH)**	**32 (TH)**	**86 (CW-DE)**	**340 (TH)**	**0.080 (TH)**	**Varies or NE**
SFRWQCB Tier 2 Commercial/Industrial ESLs		**500 (Com-ON)**	**1,000 (Com-ON)**	**500 (Com-ON)**	**1,100 (Com-DE)**	**1,800,000* (Com-DE)**	**320 (Com-DE)**	**11,000 (Com-DE)**	**350,000 (Com-DE)**	**1,000 (Com-ON)**	**Varies or NE**
SFRWQCB Tier 2 Construction Worker ESLs		**500 (CW-ON)**	**1,000 (CW-ON)**	**500 (CW-ON)**	**51 (CW-DE)**	**530,000* (CW-DE)**	**180 (CW-DE)**	**86 (CW-DE)**	**110,000 (CW-DE)**	**350 (CW-DE)**	**Varies or NE**
Title 22 TTLC (mg/kg)		**NE**	**NE**	**NE**	**100**	**2,500**	**1,000**	**2,000**	**5,000**	**NE**	**Varies or NE**
Title 22 STLC (mg/L)		**NE**	**NE**	**NE**	**1.0**	**5.0 (Cr III & total)**	**5.0**	**20**	**250**	**NE**	**Varies or NE**

TABLE 1
SUMMARY OF SOIL ANALYTICAL DATA
2500-2550 Irving Street
San Francisco, California
AllWest Project No. 19089.23.1

Sample Name and Depth in feet bgs	Date Sampled	TPH-g (C6-C12) (mg/kg)	TPH-d (C10-C23) (mg/kg)	TPH-mo (C18-C36) (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Tetrachloroethene (PCE) (mg/kg)	Other VOCs (mg/kg)
Title 22 TCLP (mg/L)		**NE**	**NE**	**NE**	**1.0**	**5.0**	**5.0**	**NE**	**NE**	**0.70**	**Varies or NE**
LBNL Mean/Median Background Concentrations		**NE**	**NE**	**NE**	**1.1**	**58 (total)**	**7.0**	**68**	**64**	**NE**	**NE**

Notes:

All samples analyzed at McCampbell Analytical, Inc., Pittsburg, California.
All results are reported in milligrams per kilogram (mg/kg)
bgs = below ground surface
VOCs - Volatile Organic Compounds, analytical method SW8260B
TPH-g - Total Petroleum Hydrocarbons as Gasoline, analytical method SW8260B
TPH-d - Total Petroleum Hydrocarbons as Diesel, analytical method SW8015 without Silica Gel cleanup
TPH-mo - Total Petroleum Hydrocarbons as Motor Oil, analytical method SW8015 without Silica Gel cleanup
PCE = Tetrachloroethene, analytical method SW8260B
ND - Not Detected above laboratory reporting limit (listed in paranthesis)
NA - Not Analyzed
NE - Not Established
* = Chromium III; ESL not established for total chromium

SFRWQCB ESLs = San Francisco Bay Regional Water Quality Control Board, *User's Guide: Derivation and Application of Environmental Screening Levels (ESLs)* , Tier 1 Environmental Screening Levels (ESLs), January 23, 2019

Tier 1 Environmental Screening Levels (ESLs) for residential land use and soil disposal acceptance profiling were established using the Tier 1 ESL Summary Table based on a generic conceptual site model designed for use at most sites. These ESLs were established with the following assumptions: Land Use = Residential, Groundwater Use = Drinking Water Resource, MCL Priority over RIsk-

Tier 2 Environmental Screening Levels (ESLs) for residential and commercial/industrial and construction worker/any land use where groundwater IS a potential drinking water resource were established using the site-specific Tier 2 Interactive Tool, Table T2-1: Tier 2 ESL Input and Output. These ESLs were established with the following assumptions: Commercial property use,

Res-DE = Residential Direct Exposure Human Health Risk Levels (*Table S-1*)
Com-DE = Commercial/Industrial Direct Exposure Human Health Risk Levels (*Table S-1*)
CW-DE = Construction Worker / Any Site Use Direct Exposure Human Health Risk Levels (*Table S-1*)
Res-ON = Residential Odor Nuisance Levels (*Table S-5*)
Com-ON = Residential Odor Nuisance Levels (*Table S-5*)
CW-ON = Construction Worker / Any Land Use Odor Nuisance Levels (*Table S-5*)

TABLE 1
SUMMARY OF SOIL ANALYTICAL DATA
2500-2550 Irving Street
San Francisco, California
AllWest Project No. 19089.23.1

Sample Name and Depth in feet bgs	Date Sampled	TPH-g (C6-C12) (mg/kg)	TPH-d (C10-C23) (mg/kg)	TPH-mo (C18-C36) (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Tetrachloroethene (PCE) (mg/kg)	Other VOCs (mg/kg)

Concentrations exceeding the applicable ESLs are indicated in **bold font**

TTLC - Total Threshold Limit Concentration value for hazardous waste established by State of California Code of Regulations Title 22, Chapter 11, Article 3, Tables II and III.

STLC - Soluble Threshold Limit Concentration value for hazardous waste established by State of California Code of Regulations Title 22, Chapter 11, Article 3, Tables II and III.

TCLP - Toxicity Characteristic Leaching Procedure value for hazardous waste established by State of California Code of Regulations Title 22, Chapter 11, Article 3, Tables II and III.

Lawrence Berkeley National Laboratory (LBNL) *Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory, Table 3: Summary Statistics for Background Data Sets After Removal of Outliers.* April, 2009. Arithmetic mean used where available; otherwise median concentration.

Table 2
Soil Vapor Analytical Data Summary
2500-2550 Irving Street
San Francisco, California
AllWest Project 19089.23.1

Probe & Sample ID Number	Date	Depth (feet bgs)	Probe Type	Acetone µg/m^3	2-Butanone (MEK) µg/m^3	Chloroform µg/m^3	cis-1,2-DCE µg/m^3	Isopropanol µg/m^3	PCE µg/m^3	Toluene µg/m^3	TCE µg/m^3	trans-1,2-DCE µg/m^3	Vinyl Chloride µg/m^3	Other VOCs µg/m^3	TPH-g µg/m^3	Helium (Leak detect gas) (% v/v)
VP-1	5/21/2019	0.5	TSS	56	ND (<10)	8.6	ND (<4.5)	46	**530**	ND (<4.3)	NA	ND (<4.5)	ND (<2.9)	ND (varies)	ND (<9,300)	ND (<0.0100)
VP-2	5/21/2019	0.5	TSS	57	9.5	ND (<2.4)	ND (<2.3)	27	**480**	3.6	NA	ND (<2.3)	ND (<1.3)	ND (varies)	ND (<9,300)	ND (<0.0100)
VP-1A	7/19/2019	0.5	SPVP	NA	NA	NA	ND (<6.3)	NA	**1,100**	NA	ND (<8.6)	ND (<6.3)	ND (<4.1)	NA	NA	ND (<0.025)
VP-2A	7/19/2019	0.5	SPVP	NA	NA	NA	ND (<6.3)	NA	**650**	NA	ND (<8.6)	ND (<6.3)	ND (<4.1)	NA	NA	ND (<0.025)
VP-3	7/19/2019	0.5	SPVP	NA	NA	NA	ND (<6.3)	NA	**270**	NA	ND (<8.6)	ND (<6.3)	ND (<4.1)	NA	NA	ND (<0.025)
VP-4	7/19/2019	0.5	SPVP	NA	NA	NA	ND (<2.0)	NA	**660**	NA	ND (<2.7)	ND (<2.0)	ND (<1.3)	NA	NA	ND (<0.025)
SFRWQCB ESL	Commercial Soil Gas			**1,000,000 (ON)**	**730,000 (DE)**	**18 (DE)**	**1,200 VI**	**NL**	**67 (DE)**	**44,000 (DE)**	**100 (DE)**	**12,000 VI**	**5.2 VI**	**Varies or NE**	**330 (ON)**	**NE**

Notes:

Laboratory analyses by Eurofins Calscience, Garden Grove, CA
µg/m^3 = micrograms per cubic meter
TPH-g = total petroleum hydrocarbons as gasoline, analytical method TO-3M
VOCs = volatile organic compounds, analytical method TO-15 SIM
cis-1,2-DCE = cis-1,2-Dichloroethene
trans-1,2-DCE =trans-1,2-Dichloroethene
PCE = perchloroethylene / tetrachloroethene
TCE = trichloroethene
MEK = Methyl Ethyl Ketone (2-Butanone)
ND = Not detected above the listed reporting limit
NL = Not listed
NE = Not established
Bold Font = Detected values exceed regulatory screening levels.
TSS = Temporary Sub-Slab Vapor Pin
SPVP = Semi-Permanent Sub-Slab Vapor Pin
NA = Not Analyzed

SFRWQCB ESLs = San Francisco Regional Water Quality Control Board, *User's Guide: Derivation and Application of Environmental Screening Levels (ESLs), Tier 2 ESLs from Table SG-1 - Subslab/Soil Gas Vapor Intrusion: Human Health Risk Levels, Commercial/Industrial* , and *Table SG-2 - Subslab/Soil Gas Vapor Intrusion: Odor Nuisance Levels* , Interim Final - January 23, 2019.

DE = Direct Exposure (*Table SG-1 - Subslab/Soil Gas Vapor Intrusion: Human Health Risk Levels*)
ON = Odor Nuisance (*Table SG-2 - Subslab/Soil Gas Vapor Intrusion: Odor Nuisance Levels*)

Tables 1 and 2 from

Phase II Subsurface Investigation Report **(AllWest 2019d)**

PATH FORWARD

TABLE 1
SUMMARY OF SOIL ANALYTICAL DATA
2525 Irving Street
San Francisco, California
AllWest Project No. 19086.23.2

Sample Name and Depth in feet bgs	Date Sampled	TPH-g (C6-C12) (mg/kg)	TPH-d (C10-C23) (mg/kg)	TPH-mo (C18-C36) (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Tetrachloroethene (PCE) (mg/kg)	Other VOCs (mg/kg)
B-6 (1-1.5)	7/17/2019	ND (<0.25)	ND (<1.0)	ND (<5.0)	ND (<0.25)	82	26	37	62	ND (<0.0050)	ND (varies)
B-6 (4.5-5)	7/17/2019	ND (<0.25)	ND (<1.0)	ND (<5.0)	ND (<0.25)	49	2.0	26	21	ND (<0.0050)	ND (varies)
B-6 (9.5-10)	7/17/2019	ND (<0.25)	ND (<1.0)	ND (<5.0)	ND (<0.25)	62	1.6	24	22	ND (<0.0050)	ND (varies)
B-7 (1-1.5)	7/17/2019	ND (<0.25)	5.0	58	ND (<0.25)	39	7.6	22	27	ND (<0.0050)	ND (varies)
B-7 (4.5-5)	7/17/2019	ND (<0.25)	ND (<1.0)	ND (<5.0)	ND (<0.25)	61	1.9	29	23	ND (<0.0050)	ND (varies)
B-7 (9.5-10)	7/17/2019	ND (<0.25)	ND (<1.0)	ND (<5.0)	ND (<0.25)	65	1.8	26	23	ND (<0.0050)	ND (varies)
B-8 (4.5-5)	7/17/2019	NA	NA	NA	NA	NA	NA	NA	NA	ND (<0.0050)	ND (varies)
B-8 (9.5-10)	7/17/2019	NA	NA	NA	NA	NA	NA	NA	NA	ND (<0.0050)	ND (varies)
SVP-1 (1-1.5)	7/17/2019	ND (<0.25)	ND (<1.0)	ND (<5.0)	ND (<0.25)	53	7.8	26	32	ND (<0.0050)	ND (varies)
SVP-1 (4.5-5)	7/17/2019	ND (<0.25)	ND (<1.0)	ND (<5.0)	ND (<0.25)	59	1.6	22	21	ND (<0.0050)	ND (varies)
SVP-2 (1-1.5)	7/17/2019	ND (<0.25)	ND (<1.0)	ND (<5.0)	ND (<0.25)	74	2.1	30	26	ND (<0.0050)	ND (varies)
SVP-2 (4.5-5)	7/17/2019	ND (<0.25)	ND (<1.0)	ND (<5.0)	ND (<0.25)	53	1.7	23	20	ND (<0.0050)	ND (varies)
SFRWQCB Tier 1 ESLs		**100 (Res-ON)**	**260 (Res-DE)**	**100 (Res-ON)**	**1.9 (TH)**	**160 (TH)**	**32 (TH)**	**86 (CW-DE)**	**340 (TH)**	**0.080 (TH)**	**Varies or NE**
SFRWQCB Tier 2 Commercial/Industrial ESLs		**500 (Com-ON)**	**1,000 (Com-ON)**	**500 (Com-ON)**	**1,100 (Com-DE)**	**1,800,000* (Com-DE)**	**320 (Com-DE)**	**11,000 (Com-DE)**	**350,000 (Com-DE)**	**1,000 (Com-ON)**	**Varies or NE**
SFRWQCB Tier 2 Construction Worker ESLs		**500 (CW-ON)**	**1,000 (CW-ON)**	**500 (CW-ON)**	**51 (CW-DE)**	**530,000* (CW-DE)**	**180 (CW-DE)**	**86 (CW-DE)**	**110,000 (CW-DE)**	**350 (CW-DE)**	**Varies or NE**
Title 22 TTLC (mg/kg)		**NE**	**NE**	**NE**	**100**	**2,500**	**1,000**	**2,000**	**5,000**	**NE**	**Varies or NE**
Title 22 STLC (mg/L)		**NE**	**NE**	**NE**	**1.0**	**5.0 (Cr III & total)**	**5.0**	**20**	**250**	**NE**	**Varies or NE**

TABLE 1
SUMMARY OF SOIL ANALYTICAL DATA
2525 Irving Street
San Francisco, California
AllWest Project No. 19086.23.2

Title 22 TCLP (mg/L)	**NE**	**NE**	**NE**	**1.0**	**5.0**	**5.0**	**NE**	**NE**	**0.70**	**Varies or NE**
LBNL Mean/Median Background Concentrations	**NE**	**NE**	**NE**	**1.1**	**58 (total)**	**7.0**	**68**	**64**	**NE**	**NE**

Notes:

All samples analyzed at McCampbell Analytical, Inc., Pittsburg, California.
All results are reported in milligrams per kilogram (mg/kg)
bgs = below ground surface
VOCs - Volatile Organic Compounds, analytical method SW8260B
TPH-g - Total Petroleum Hydrocarbons as Gasoline, analytical method SW8260B
TPH-d - Total Petroleum Hydrocarbons as Diesel, analytical method SW8015 without Silica Gel cleanup
TPH-mo - Total Petroleum Hydrocarbons as Motor Oil, analytical method SW8015 without Silica Gel cleanup
PCE = Tetrachloroethene, analytical method SW8260B
ND - Not Detected above laboratory reporting limit (listed in paranthesis)
NA - Not Analyzed
NE - Not Established
* = Chromium III; ESL not established for total chromium

SFRWQCB ESLs = San Francisco Bay Regional Water Quality Control Board, *User's Guide: Derivation and Application of Environmental Screening Levels (ESLs)* , Tier 1 Environmental Screening Levels (ESLs), January 23, 2019

Tier 1 Environmental Screening Levels (ESLs) for residential land use and soil disposal acceptance profiling were established using the Tier 1 ESL Summary Table based on a generic conceptual site model designed for use at most sites. These ESLs were established with the following assumptions: Land Use = Residential, Groundwater Use = Drinking Water Resource, MCL Priority over RIsk-

Tier 2 Environmental Screening Levels (ESLs) for residential and commercial/industrial and construction worker/any land use where groundwater IS a potential drinking water resource were established using the site-specific Tier 2 Interactive Tool, Table T2-1: Tier 2 ESL Input and Output. These ESLs were established with the following assumptions: Commercial property use, minimal

Res-DE = Residential Direct Exposure Human Health Risk Levels (*Table S-1*)
Com-DE = Commercial/Industrial Direct Exposure Human Health Risk Levels (*Table S-1*)
CW-DE = Construction Worker / Any Site Use Direct Exposure Human Health Risk Levels (*Table S-1*)
Res-ON = Residential Odor Nuisance Levels (*Table S-5*)
Com-ON = Residential Odor Nuisance Levels (*Table S-5*)
CW-ON = Construction Worker / Any Land Use Odor Nuisance Levels (*Table S-5*)
Concentrations exceeding the applicable ESLs are indicated in **bold font**
TTLC - Total Threshold Limit Concentration value for hazardous waste established by State of California Code of Regulations Title 22, Chapter 11, Article 3, Tables II and III.
STLC - Soluble Threshold Limit Concentration value for hazardous waste established by State of California Code of Regulations Title 22, Chapter 11, Article 3, Tables II and III.
TCLP - Toxicity Characteristic Leaching Procedure value for hazardous waste established by State of California Code of Regulations Title 22, Chapter 11, Article 3, Tables II and III.

Lawrence Berkeley National Laboratory (LBNL) *Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory, Table 3: Summary Statistics for Background Data Sets After Removal of Outliers.* April, 2009. Arithmetic mean used where available; otherwise median concentration.

Table 2
Soil Vapor Analytical Data Summary
2500-2550 Irving Street
San Francisco, California
AllWest Project 19061.23

Probe & Sample ID Number	Date	Depth (feet bgs)	Probe Type	Acetone µg/m^3	Benzene µg/m^3	2-Butanone (MEK) µg/m^3	Chloroform µg/m3	Dichlorodifluoromethane µg/m^3	Isopropanol µg/m^3	Toluene µg/m^3	Tetrachloroethene (PCE) µg/m^3	TPH-g µg/m^3
VP-1	5/21/2019	0.5	TSS	56	ND (<3.6)	ND (<10)	8.6	ND (<9.7)	46	ND (<4.3)	**530**	ND (<9,300)
VP-2	5/21/2019	0.5	TSS	57	ND (<1.6)	9.5	ND (<2.4)	ND (<4.3)	27	3.6	**480**	ND (<9,300)
SFRWQCB ESL	Commercial Soil Gas			**1,000,000 (ON)**	**14 (DE)**	**730,000 (DE)**	**18 (DE)**	**NL**	**NL**	**44,000 (DE)**	**67 (DE)**	**330 (ON)**

Notes:

Laboratory analyses by Eurofins Calscience, Garden Grove, CA
µg/m^3 = micrograms per cubic meter
TPH-g = total petroleum hydrocarbons as gasoline, analytical method TO-3M
VOCs = volatile organic compounds, analytical method TO-15 SIM
DE = Direct Exposure
ON = Odor Nuisance
PCE = perchloroethylene / tetrachloroethene
MEK = Methyl Ethyl Ketone (2-Butanone)
ND = Not detected above the listed reporting limit
NL = Not listed
Bold Font = Detected values exceed regulatory screening levels.
TSS = Temporary Sub-Slab Vapor Pin

SFRWQCB ESLs = San Francisco Regional Water Quality Control Board, *User's Guide: Derivation and Application of Environmental Screening Levels (ESLs), Tier 2 ESLs from Table SG-1 - Subslab/Soil Gas Vapor Intrusion: Human Health Risk Levels, Commercial/Industrial* , and *Table SG-2 - Subslab/Soil Gas Vapor Intrusion: Odor Nuisance Levels* , Interim Final - January 23, 2019.

Tables 1 and 2 from

Subsurface Investigation Report **(AllWest 2019f)**

TABLE 1
SUMMARY OF SOIL ANALYTICAL DATA
2511 & 2550 Irving Street
San Francisco, California 94122
AllWest Project No. 19126.23

Sample Name and Depth in feet bgs	Date Sampled	cis-1,2-Dichloroethene (cis-1,2-DCE) (mg/kg)	trans-1,2-Dichloroethene (trans-1,2-DCE) (mg/kg)	Tetrachloroethane (PCE) (mg/kg)	Trichloroethene (TCE) (mg/kg)	Vinyl Chloride (mg/kg)
B-12 (4.5-5)	9/27/2019	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
B-12 (9.5-10)	9/27/2019	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
B-12 (14.5-15)	9/27/2019	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
B-12 (19.5-20)	9/27/2019	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
B-12 (24.5-25)	9/27/2019	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SFRWQCB Tier 1 Soil Leaching ESL - Groundwater is Drinking Water Resource		**0.19 (SL)**	**0.65 (SL)**	**0.080 (SL)**	**0.085 (SL)**	**0.0015 (SL)**
SFRWQCB Tier 2 Commercial/Industrial Direct Exposure ESL		**85 (DE)**	**600 (DE)**	**2.7 (DE)**	**6.1 (DE)**	**0.15 (DE)**

Notes:

All samples analyzed at McCampbell Analytical, Inc., Pittsburg, California by EPA Method 8260B.

All results are reported in milligrams per kilogram (mg/kg)

bgs = below ground surface

Concentrations exceeding the applicable ESLs are indicated in **bold font**

ND - Not Detected above laboratory reporting limit (listed in paranthesis)

San Francisco Bay Regional Water Quality Control Board (SFRWQCB), User's Guide: Derivation and Application of Environmental Screening Levels (ESLs), January 2019.

Tier 1 Environmental Screening Levels (ESLs) for residential land use and soil disposal acceptance profiling were established using the Tier 1 ESL Summary Table based on a generic conceptual site model designed for use at most sites. These ESLs were established with the following assumptions: Land Use = Residential, Groundwater Use = Drinking Water Resource, MCL Priority over RIsk-based Levels = Yes, Discharge to Surface Water = Saltwater & Freshwater, Vegetation Level = Substantial, Soil Exposure Depths = Shallow (≤10 ft bgs).

Tier 2 Environmental Screening Levels (ESLs) forcommercial/industrial land use where groundwater IS a potential drinking water resource were established using the site-specific Tier 2 Interactive Tool, Table T2-1: Tier 2 ESL Input and Output. These ESLs were established with the following assumptions: Commercial property use, minimal vegetation level, drinking water resource groundwater use, discharge to surface water, and shallow soil depths (≤10 ft bgs) for direct exposure.

DE - Direct Exposure (*Table S-1 Direct Exposure Human Health Risk Levels*)

SL = Soil Leaching (*Table S-3 - Leaching to Groundwater Levels, Drinking Water*)

Table 2
Summary of Groundwater Analytical Data
2550 & 2511 Irving Stret
San Francisco, California 94122
AllWest Project No. 19126.23

Sample ID	Sample Date	Well Type	cis-1,2-DCE (µg/L)	trans-1,2-DCE (µg/L)	Tetrachloroethene (PCE) (µg/L)	Trichloroethene (TCE) (µg/L)	Vinyl Chloride (µg/L)
B-11 (GW)	9/27/2019	TW	ND (<0.50)	ND (<0.50)	ND (<0.50)	ND (<0.50)	ND (<0.50)
B-12 (GW)	9/27/2019	TW	ND (<0.50)	ND (<0.50)	0.71	ND (<0.50)	ND (<0.50)
SFRWQCB Groundwater Tier 2 ESLs - Commercial/Industrial, Drinking Water Resource			**6.0 (DE)**	**10 (DE)**	**2.8 (VI)**	**5.0 (DE)**	**0.14 (VI)**

Notes:

All samples analyzed at McCampbell Analytical, Inc., Pittsburg, California by EPA Method 8260B.

cis-1,2-DCE - cis-1,2-Dichloroethene

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

PCE - Tetrachloroethene

TCE - Trichlorethene

NA - Not Analyzed

ND - Not detected at or above the laboratory reporting limit

NE - Not Established

TW - Temporary well from soil boring

bgs - below ground surface

San Francisco Bay Regional Water Quality Control Board (SFRWQCB), *User's Guide: Derivation and Application of Environmental Screening Levels (ESLs)* , January 2019.

Tier 1 Environmental Screening Levels (ESLs) for residential land use and soil disposal acceptance profiling were established using the Tier 1 ESL Summary Table based on a generic conceptual site model designed for use at most sites. These ESLs were established with the following assumptions: Land Use = Residential, Groundwater Use = Drinking Water Resource, MCL Priority over RIsk-based Levels = Yes, Discharge to Surface Water = Saltwater & Freshwater, Vegetation Level = Substantial, Soil Exposure Depths = Shallow (≤10 ft bgs).

Tier 2 Environmental Screening Levels (ESLs) for residential, commercial/industrial land use where groundwater IS a potential drinking water resource were established using the site-specific Tier 2 Interactive Tool, Table T2-1: Tier 2 ESL Input and Output. These ESLs were established with the following assumptions: Commercial property use, minimal vegetation level, drinking water resource groundwater use,discharge to surface water, and shallow soil depths (≤10 ft bgs) for direct exposure.

DE - Direct Exposure (*Table GW-1 - Direct Exposure Human Health Risk Levels*)

VI = Vapor Intrusion (*Table GW-3 - Groundwater Vapor Intrusion Human Health Risk Levels*)

TABLE 1
SUMMARY OF SOIL ANALYTICAL DATA
2525 & 2550 Irving Street
San Francisco, California
AllWest Project No. 202006.23

Sample Name and Depth in feet bgs	Date Sampled	cis-1,2-Dichloroethene (cis-1,2-DCE) (mg/kg)	trans-1,2-Dichloroethene (trans-1,2-DCE) (mg/kg)	Tetrachloroethane (PCE) (mg/kg)	Trichloroethene (TCE) (mg/kg)	Vinyl Chloride (mg/kg)
SVP-3 (14.5-15)	5/28/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-4 (14.5-15)	5/28/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-5 (14.5-15)	5/28/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-6 (14.5-15)	5/28/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-7 (4.5-5)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-7 (9.5-10)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-7 (14.5-15)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-8 (1-1.5)	5/24/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-8 (4.5-5)	5/24/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-8 (9.5-10)	5/24/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-8 (14.5-15)	5/24/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-9 (1-1.5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-9 (4.5-5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-9 (9.5-10)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-9 (14.5-15)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-10 (1-1.5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-10 (4.5-5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-10 (9.5-10)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-10 (14.5-15)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-11 (4.5-5)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-11 (9.5-10)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-11 (14.5-15)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-12 (1-1.5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-12 (4.5-5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	0.052	ND (<0.0050)	ND (<0.0050)
SVP-12 (9.5-10)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)

TABLE 1
SUMMARY OF SOIL ANALYTICAL DATA
2525 & 2550 Irving Street
San Francisco, California
AllWest Project No. 202006.23

SVP-12 (14.5-15)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-13 (1-1.5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-13 (4.5-5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-13 (9.5-10)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-13 (14.5-15)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-14 (4.5-5)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-14 (9.5-10)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-14 (14.5-15)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-15 (4.5-5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-15 (9.5-10)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-15 (14.5-15)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-16 (4.5-5)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-16 (9.5-10)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-16 (14.5-15)	5/26/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-17 (14.5-15)	5/28/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-18 (1-1.5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-18 (4.5-5)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-18 (9.5-10)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-18 (14.5-15)	5/23/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-19 (14.5-15)	5/27/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-20 (14.5-15)	5/27/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-21 (14.5-15)	5/27/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SVP-22 (14.5-15)	5/27/2020	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)	ND (<0.0050)
SFRWQCB Tier 1 Soil Leaching ESL - Groundwater is Drinking Water Resource		**0.19 (SL)**	**0.65 (SL)**	**0.080 (SL)**	**0.085 (SL)**	**0.0015 (SL)**
SFRWQCB Tier 2 Commercial/Industrial Direct Exposure ESL		**85 (DE)**	**600 (DE)**	**2.7 (DE)**	**6.1 (DE)**	**0.15 (DE)**

Notes: All samples analyzed at McCampbell Analytical, Inc., Pittsburg, California by EPA Method 8260B.
All results are reported in milligrams per kilogram (mg/kg)

TABLE 1
SUMMARY OF SOIL ANALYTICAL DATA
2525 & 2550 Irving Street
San Francisco, California
AllWest Project No. 202006.23

bgs = below ground surface

Concentrations exceeding the applicable ESLs are indicated in **bold font**

ND - Not Detected above laboratory reporting limit (listed in paranthesis)

San Francisco Bay Regional Water Quality Control Board (SFRWQCB), User's Guide: Derivation and Application of Environmental Screening Levels (ESLs), January 2019.

Tier 1 Environmental Screening Levels (ESLs) for residential land use and soil disposal acceptance profiling were established using the Tier 1 ESL Summary Table based on a generic conceptual site model designed for use at most sites. These ESLs were established with the following assumptions: Land Use = Residential, Groundwater Use = Drinking Water Resource, MCL Priority over RIsk-based Levels = Yes, Discharge to Surface Water = Saltwater & Freshwater, Vegetation Level = Substantial, Soil Exposure Depths = Shallow (≤10 ft bgs).

Tier 2 Environmental Screening Levels (ESLs) forcommercial/industrial land use where groundwater IS a potential drinking water resource were established using the site-specific Tier 2 Interactive Tool, Table T2-1: Tier 2 ESL Input and Output. These ESLs were established with the following assumptions: Commercial property use, minimal vegetation level, drinking water resource groundwater use, discharge to surface water, and shallow soil depths (≤10 ft bgs) for direct exposure.

DE - Direct Exposure (*Table S-1 Direct Exposure Human Health Risk Levels*)

SL = Soil Leaching (*Table S-3 - Leaching to Groundwater Levels, Drinking Water*)

Table 2 from

Phase II Subsurface Investigation Report **(AllWest 2019b)**

Table 2
Soil Vapor Analytical Data Summary
2125 Irving Street
San Francisco, California
AllWest Project 19086.23.2

Probe & Sample ID Number	Date	Depth (feet bgs)	Probe Type	cis-1,2-DCE µg/m^3	PCE µg/m^3	TCE µg/m^3	trans-1,2-DCE µg/m^3	Vinyl Chloride µg/m^3	Helium (Leak detect gas) (% v/v)
SVP-1	7/17/2019	5	T	ND (<2.0)	**1,800**	ND (<2.7)	ND (<2.0)	ND (<1.3)	ND (<0.025)
SVP-2	7/17/2019	5	T	ND (<2.0)	**1,300**	ND (<2.7)	ND (<2.0)	ND (<1.3)	ND (<0.025)
SFRWQCB ESL	Commercial Soil Gas			**1,200 VI**	**67 (DE)**	**100 (DE)**	**12,000 VI**	**5.2 VI**	**NE**

Notes:

Laboratory analyses by Eurofins Calscience, Garden Grove, CA
µg/m^3 = micrograms per cubic meter
VOCs = volatile organic compounds, analytical method TO-15 SIM
cis-1,2-DCE = cis-1,2-Dichloroethene
trans-1,2-DCE =trans-1,2-Dichloroethene
PCE = perchloroethylene / tetrachloroethene
TCE = trichloroethene
ND = Not detected above the listed reporting limit
NL = Not listed
NE = Not established
Bold Font = Detected values exceed regulatory screening levels.
T = Temporary Soil Vapor Probe
NA = Not Analyzed
SFRWQCB ESLs = San Francisco Regional Water Quality Control Board, *User's Guide: Derivation and Application of Environmental Screening Levels (ESLs), Tier 2 ESLs from Table SG-1 - Subslab/Soil Gas Vapor Intrusion: Human Health Risk Levels, Commercial/Industrial* , and *Table SG-2 - Subslab/Soil Gas Vapor Intrusion: Odor Nuisance Levels* , Interim Final - January
DE = Direct Exposure (*Table SG-1 - Subslab/Soil Gas Vapor Intrusion: Human Health Risk Levels*)
ON = Odor Nuisance (*Table SG-2 - Subslab/Soil Gas Vapor Intrusion: Odor Nuisance Levels*)

Table 1 from

First Quarter 2020 Indoor Air Quality Monitoring Report **(AllWest 2020b)**

PATH FORWARD

Table 1
Summary of Indoor and Outdoor Air Analytical Data
2550 Irving Street
San Francisco, California 94122
AllWest Project No. 19086.28

Sample ID	Air Sample Start Date	Air Sample End Date	1,1-Dichloroethene (1,1-DCE) µg/m3	cis-1,2-Dichloroethene (cis-1,2-DCE) µg/m^3	trans-1,2-Dichloroethene (trans-1,2-DCE) µg/m^3	Tetrachloroethane (PCE) µg/m^3	Trichloroethene (TCE) µg/m^3	Vinyl Chloride µg/m^3
OAQ-1	8/19/2019	8/20/2019	0.0357	ND (<0.0198)	ND (<0.0198)	0.305	0.0483	ND (<0.00768)
IAQ-1	8/19/2019	8/20/2019	1.70	ND (<0.0198)	ND (<0.0198)	**3.85**	0.0644	ND (<0.00768)
IAQ-2	8/19/2019	8/20/2019	1.56	ND (<0.0198)	ND (<0.0198)	**3.85**	0.161	ND (<0.00768)
IAQ-3	8/19/2019	8/20/2019	2.63	ND (<0.0198)	ND (<0.0198)	**2.67**	0.0859	ND (<0.00768)
IAQ-4	8/19/2019	8/20/2019	1.41	ND (<0.0198)	ND (<0.0198)	**2.87**	0.0698	ND (<0.00768)
SFRWQCB Tier 2 Commercial/Industrial ESLs, Direct Exposure			**310**	**35**	**350**	**2.0**	**3.0**	**0.16**

Notes:
Laboratory analyses by Eurofins Calscience, LLC, Garden Grove, CA
OAQ = Outdoor Air Quality (ambient air control sample)
IAQ = Indoor Air Quality
µg/m^3 = micrograms per cubic meter
1,1-DCE = 1,1-Dichloroethene by EPA Method TO-15
cis-1,2-DCE = cis-1,2-Dichloroethene by EPA Method TO-15
trans-1,2-DCE = trans-1,2-Dichloroethene by EPA Method TO-15
PCE = perchloroethylene / tetrachloroethene by EPA Method TO-15
TCE = Trichloroethene by EPA Method TO-15
Vinyl chloride by EPA Method TO-15
ND = Not detected above the listed reporting limit
Bold Font = Detected values exceed regulatory screening levels.
SFRWQCB Tier 2 ESLs = San Francisco Regional Water Quality Control Board, *User's Guide: Derivation and Application of Environmental Screening Levels (ESLs), Tier 2 ESLs from Table IA-1 - Indoor Air Direct Exposure: Human Health Risk Levels* , Interim Final - January 23, 2019.

Table 1 from

Indoor Air Quality Monitoring Report **(AllWest 2019e)**

PATH FORWARD

Table 1
Summary of Indoor and Outdoor Air Analytical Data
2550 Irving Street
San Francisco, California 94122
AllWest Project No. 19086.28.3

Sample ID	Air Sample Start Date	Air Sample End Date	Tetrachloroethane (PCE) µg/m^3	Trichloroethene (TCE) µg/m^3	1,1-Dichloroethene (1,1-DCE) µg/m3	cis-1,2-Dichloroethene (cis-1,2-DCE) µg/m^3	trans-1,2-Dichloroethene (trans-1,2-DCE) µg/m^3	Vinyl Chloride µg/m^3
OAQ-1	8/19/2019	8/20/2019	0.305	0.0483	0.0357	ND (<0.0198)	ND (<0.0198)	ND (<0.00768)
OAQ-1	12/29/2019	12/30/2019	ND (<0.017)	ND (<0.013)	NA	ND (<0.099)	ND (<0.099)	ND (<0.013)
OAQ-1	2/2/2020	2/3/2020	ND (<0.017)	ND (<0.013)	NA	ND (<0.099)	ND (<0.099)	ND (<0.013)
IAQ-1	8/19/2019	8/20/2019	**3.85**	0.0644	1.70	ND (<0.0198)	ND (<0.0198)	ND (<0.00768)
IAQ-1	12/29/2019	12/30/2019	**3.6**	ND (<0.013)	NA	ND (<0.099)	ND (<0.099)	ND (<0.13)
IAQ-1	2/2/2020	2/3/2020	0.90	ND (<0.013)	NA	ND (<0.099)	ND (<0.099)	ND (<0.13)
IAQ-2	8/19/2019	8/20/2019	**3.85**	0.161	1.56	ND (<0.0198)	ND (<0.0198)	ND (<0.00768)
IAQ-2	12/29/2019	12/30/2019	**4.3**	ND (<0.013)	NA	ND (<0.099)	ND (<0.099)	ND (<0.13)
IAQ-2	2/2/2020	2/3/2020	1.7	ND (<0.013)	NA	ND (<0.099)	ND (<0.099)	ND (<0.13)
IAQ-3	8/19/2019	8/20/2019	**2.67**	0.0859	2.63	ND (<0.0198)	ND (<0.0198)	ND (<0.00768)
IAQ-3	12/29/2019	12/30/2019	**2.9**	ND (<0.013)	NA	ND (<0.099)	ND (<0.099)	ND (<0.13)
IAQ-3	2/2/2020	2/3/2020	**2.4**	0.53	NA	ND (<0.099)	ND (<0.099)	ND (<0.13)
IAQ-4	8/19/2019	8/20/2019	**2.87**	0.0698	1.41	ND (<0.0198)	ND (<0.0198)	ND (<0.00768)
IAQ-4	12/29/2019	12/30/2019	**3.5**	ND (<0.013)	NA	ND (<0.099)	ND (<0.099)	ND (<0.13)
IAQ-4	2/2/2020	2/3/2020	**3.3**	ND (<0.013)	NA	ND (<0.099)	ND (<0.099)	ND (<0.13)
SFRWQCB Tier 2 Commercial/Industrial ESLs, Direct Exposure			**2.0**	**3.0**	**310**	**35**	**350**	**0.16**

Table 1
Summary of Indoor and Outdoor Air Analytical Data
2550 Irving Street
San Francisco, California 94122
AllWest Project No. 19086.28.3

Sample ID	Air Sample Start Date	Air Sample End Date	Tetrachloroethane (PCE) µg/m^3	Trichloroethene (TCE) µg/m^3	1,1-Dichloroethene (1,1-DCE) µg/m3	cis-1,2-Dichloroethene (cis-1,2-DCE) µg/m^3	trans-1,2-Dichloroethene (trans-1,2-DCE) µg/m^3	Vinyl Chloride µg/m^3

Notes:
Laboratory analyses by Eurofins Calscience, LLC, Garden Grove, CA, except 8/29/19 analysis by Torrent Laboratory, Inc., Milpitas, CA
OAQ = Outdoor Air Quality (ambient air control sample)
IAQ = Indoor Air Quality
NA = Not analyzed
µg/m^3 = micrograms per cubic meter
1,1-DCE = 1,1-Dichloroethene by EPA Method TO-15 (only analyzed by Torrent as a PCE breakdown product)
cis-1,2-DCE = cis-1,2-Dichloroethene by EPA Method TO-15
trans-1,2-DCE = trans-1,2-Dichloroethene by EPA Method TO-15
PCE = perchloroethylene / tetrachloroethene by EPA Method TO-15
TCE = Trichloroethene by EPA Method TO-15
Vinyl chloride by EPA Method TO-15
ND = Not detected above the listed reporting limit
Bold Font = Detected values exceed regulatory screening levels.
SFRWQCB Tier 2 ESLs = San Francisco Regional Water Quality Control Board, *User's Guide: Derivation and Application of Environmental Screening Levels (ESLs), Tier 2 ESLs from Table IA-1 - Indoor Air Direct Exposure: Human Health Risk Levels* , Interim Final - January 23, 2019, Revision 2 (updated July 25, 2019)

Table 2
Summary of Soil Vapor Analytical Data
The Police Credit Union
2525 & 2550 Irving Street
San Francisco, California 94122
AllWest Project No. 202006.23

Probe & Sample ID Number	Date	Sample Depth feet bgs	Probe Type	Location	cis-1,2-Dichloroethene (cis-1,2-DCE) µg/m^3	trans-1,2-Dichloroethene (trans-1,2-DCE) µg/m^3	Tetrachloroethene (PCE) µg/m^3	Trichloroethene (TCE) µg/m^3	Vinyl Chloride µg/m^3	Helium** (Leak detection gas) (% v/v)
VP-1A	5/30/2020	0.5	SPVP	Area A - Inside PCU	ND (<2.3)	ND (<2.3)	**1,100**	ND (<3.1)	ND (<1.5)	ND (<0.025)
VP-2A	5/31/2020	0.5	SPVP	Area A - Inside PCU	ND (<2.0)	ND (<2.0)	**710**	ND (<2.8)	ND (<1.3)	ND (<0.025)
VP-3	5/30/2020	0.5	SPVP	Area A - Inside PCU	ND (<2.0)	ND (<2.0)	**370**	ND (<2.7)	ND (<1.3)	ND (<0.025)
VP-4	5/30/2020	0.5	SPVP	Area A - Inside PCU	ND (<2.0)	ND (<2.0)	**960**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-3	5/28/2020	15	T	Area C - S. side of Irving Street	ND (<9.9)	ND (<9.9)	**2,500**	ND (<13)	ND (<6.4)	ND (<0.025)
SVP-4	5/28/2020	15	T	Area C - S. side of Irving Street	ND (<9.9)	ND (<9.9)	**2,200**	ND (<13)	ND (<6.4)	ND (<0.025)
SVP-5	5/28/2020	15	T	Area C - S. side of Irving Street	ND (<9.9)	ND (<9.9)	**2,500**	ND (<13)	ND (<6.4)	ND (<0.025)
SVP-6	5/28/2020	15	T	Area C - S. side of Irving Street	ND (<6.3)	ND (<6.3)	**1,000**	ND (<8.6)	ND (<4.1)	ND (<0.025)
SVP-7A	6/1/2020	5	PNC	Area B - PCU Parking Lot	ND (<2.0)	ND (<2.0)	**470**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-7B	6/1/2020	15	PNC	Area B - PCU Parking Lot	ND (<2.0)	ND (<2.0)	**340**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-8A	5/30/2020	5	PNC	Area A - Inside PCU	ND (<2.2)	ND (<2.2)	**1,300**	ND (<3.0)	ND (<1.4)	ND (<0.025)
SVP-8B	5/30/2020	15	PNC	Area A - Inside PCU	ND (<2.0)	ND (<2.0)	**1,700**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-9A	5/30/2020	5	PNC	Area A - Inside PCU	ND (<2.1)	ND (<2.1)	**1,300**	ND (<2.8)	ND (<1.3)	ND (<0.025)
SVP-9B	5/30/2020	15	PNC	Area A - Inside PCU	ND (<2.0)	ND (<2.0)	**1,300**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-10A	5/31/2020	5	PNC	Area A - Inside PCU	ND (<2.1)	ND (<2.1)	**320**	ND (<2.8)	ND (<1.4)	ND (<0.025)
SVP-10B	5/31/2020	15	PNC	Area A - Inside PCU	ND (<3.8)	ND (<3.8)	**280**	ND (<5.2)	ND (<2.5)	ND (<0.025)
SVP-11A	6/1/2020	5	PNC	Area A- PCU Loading Dock	ND (<2.0)	ND (<2.0)	**630**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-11B	6/1/2020	15	PNC	Area A- PCU Loading Dock	ND (<2.0)	ND (<2.0)	**650**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-12A	5/31/2020	5	PNC	Area A - Inside PCU	ND (<6.1)	ND (<6.1)	**1,500**	ND (<8.3)	ND (<3.9)	ND (<0.025)
SVP-12B	5/31/2020	15	PNC	Area A - Inside PCU	ND (<2.0)	ND (<2.0)	**1,600**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-13A	5/31/2020	5	PNC	Area A - Inside PCU	ND (<2.0)	ND (<2.0)	**290**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-13B	6/13/2020	15	PNC	Area A - Inside PCU	NA	NA	NA	NA	NA	NA
SVP-14A	6/1/2020	5	PNC	Area B - PCU Parking Lot	ND (<2.0)	ND (<2.0)	**590**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-14B	6/1/2020	15	PNC	Area B - PCU Parking Lot	ND (<2.0)	ND (<2.0)	**540**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-15A	6/1/2020	5	PNC	Area B - PCU Parking Lot	ND (<2.0)	ND (<2.0)	**120**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-15B	6/1/2020	15	PNC	Area B - PCU Parking Lot	ND (<2.0)	ND (<2.0)	**240**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-16A	6/1/2020	5	PNC	Area B - PCU Parking Lot	ND (<2.0)	ND (<2.0)	**140**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-16B	6/1/2020	15	PNC	Area B - PCU Parking Lot	ND (<2.0)	ND (<2.0)	**220**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-17	5/28/2020	15	T	Area C - N. side of Irving Street	ND (<9.9)	ND (<9.9)	**1,700**	ND (<13)	ND (<6.4)	ND (<0.025)
SVP-18A	5/30/2020	5	PNC	Area A - Inside PCU	ND (<2.1)	ND (<2.1)	**1,200**	ND (<2.9)	ND (<1.4)	ND (<0.025)
SVP-18B	5/30/2020	15	PNC	Area A - Inside PCU	ND (<2.0)	ND (<2.0)	**1,000**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-19A	5/28/2020	5	TNC	Area D - Southern Parking Lot	ND (<2.0)	ND (<2.0)	**570**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-19B	5/28/2020	15	TNC	Area D - Southern Parking Lot	ND (<5.0)	ND (<5.0)	**990**	ND (<6.7)	ND (<3.2)	ND (<0.025)
SVP-20A	5/27/2020	5	TNC	Area D - Southern Parking Lot	ND (<7.9)	ND (<7.9)	**1,300**	ND (<11)	ND (<5.1)	ND (<0.025)
SVP-20B	5/27/2020	15	TNC	Area D - Southern Parking Lot	ND (<4.0)	ND (<4.0)	**910**	ND (<5.4)	ND (<2.6)	ND (<0.025)
SVP-21A	5/28/2020	5	TNC	Area D - Southern Parking Lot	ND (<2.0)	ND (<2.0)	**390**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-21B	5/28/2020	15	TNC	Area D - Southern Parking Lot	ND (<2.0)	ND (<2.0)	**200**	ND (<2.7)	ND (<1.3)	ND (<0.025)
SVP-22A	5/28/2020	5	TNC	Area D - Southern Parking Lot	ND (<6.3)	ND (<6.3)	**1,300**	ND (<8.6)	ND (<4.1)	ND (<0.025)
SVP-22B	5/28/2020	15	TNC	Area D - Southern Parking Lot	ND (<9.9)	ND (<9.9)	**1,800**	ND (<13)	ND (<6.4)	ND (<0.025)

Table 2
Summary of Soil Vapor Analytical Data
The Police Credit Union
2525 & 2550 Irving Street
San Francisco, California 94122
AllWest Project No. 202006.23

Probe & Sample ID Number	Date	Sample Depth feet bgs	Probe Type	Location	cis-1,2-Dichloroethene (cis-1,2-DCE) µg/m^3	trans-1,2-Dichloroethene (trans-1,2-DCE) µg/m^3	Tetrachloroethene (PCE) µg/m^3	Trichloroethene (TCE) µg/m^3	Vinyl Chloride µg/m^3	Helium** (Leak detection gas) (% v/v)
SFRWQCB ESL	**Commercial Soil Gas**				**1,200 VI**	**12,000 VI**	**67 VI**	**100 VI**	**5.2 VI**	**NE**
SFRWQCB ESL	**Residential Soil Gas**				**280 VI**	**2,800 VI**	**15 VI**	**18 VI**	**0.32 VI**	**NE**

Notes:

Samples analyzed for PCE, TCE, cis-1,2-DCE, trans-1,2-DCE and vinyl chloride by EPA Method TO-15, Eurofins/Calscience, Inc., Garden Grove, CA
Helium by analytical method ASTM D1946, Eurofins/Calscience, Inc., Garden Grove, CA

µg/m^3 = Micrograms per cubic meter = 0.001 micrograms per liter
bgs = below ground surface
% v/v = percent by volume
ND = Not detected at or above laboratory reporting limit
NE = Not Established
VI = Vapor Intrusion Human Health Risk Screening Level
NS = Not Sampled; No Recovery
NA = Not Analyzed due to laboratory error
Bold Font = Detected values exceed regulatory screening levels.
***** = LCS or LCSD is outside acceptance limits.
****** = Leak detection gas or agent

Locations:
Southern parking lot is located at 2525 Irving Street
Police Credit Union (PCU) building, parking lot and loading dock are located at 2550 Irving Street
The five sample locations along Irving Street were located within the parking lanes

AMBIENT = Helium leak detection gas shroud ambient air sample.
T = Temporary soil vapor probe (single), one time sampling event.
TNC = Temporary soil vapor probe (nested cluster), one time sampling event.
PNC = Permanent soil vapor probe (nested cluster), probe remains in the subsurface and can be sampled again. Flush-mounted vault box installation.
SPVP = Semi-Permanent Vapor Pin sub-slab soil vapor probe; remains within the floor slab and can be sampled again. Flush mounted, metal cover but no vault box, easily removed.

San Francisco Bay Regional Water Quality Control Board (SFRWQCB) Environmental Screening Levels (ESLs) for sub-slab and soil gas vapor intrusion for commercial/industrial and residential land use were established using the Tier 2 *Table SG-1 - Subslab/Soil Gas Vapor Intrusion: Human Health Risk Levels,* and *Table SG-2 - Subslab/Soil Gas Vapor Intrusion: Odor Nuisance Levels, User's Guide: Derivation and Application of Environmental Screening Levels (ESLs)* , Interim Final, January 24, 2019. These ESLs were established for commercial/industrial and residential property use.

Tables 1 and 2 from

Path Forward's February 23, 2020 Subsurface Investigation

PATH FORWARD

Table 1. Groundwater Sampling Results vs. Vapor Intrusion Screening Levels

Analyte / Sample ID: / Boring: / Depth (ft bgs): / Date Collected:	Units	Screening Levels		B-19-GW	B-20-GW
		Maximum Contaminant Level	Commercial Vapor Intrusion	B-19	B-20
				NA	NA
				2020-02-23	2020-02-23
Acetone	µg/L	None	9.8E+07	<10	18
Amyl methyl ether, tert-	µg/L	None	None	<0.50	<0.50
Benzene	µg/L	1.0	1.9	0.089 J	0.064 J
Bromobenzene	µg/L	None	2,600	<0.50	<0.50
Bromochloromethane	µg/L	None	3,000	<0.50	<0.50
Bromodichloromethane	µg/L	None	3.8	<0.50	<0.50
Bromoform	µg/L	None	500	<0.50	<0.50
Bromomethane	µg/L	None	73	<0.50	<0.50
Butanone, 2-	µg/L	None	9.5E+06	13	9.5
Butyl alcohol, tert-	µg/L	None	None	<5.0	<5.0
Butylbenzene, n-	µg/L	None	1,400	<0.50	<0.50
Butylbenzene, sec-	µg/L	None	2,500	<0.50	<0.50
Butylbenzene, tert-	µg/L	None	3,300	<0.50	<0.50
Carbon disulfide	µg/L	None	5,300	<0.50	<0.50
Carbon tetrachloride	µg/L	0.50	1.8	<0.50	<0.50
Chlorobenzene	µg/L	70	1,700	<0.50	<0.50
Chloroethane	µg/L	None	97,000	<0.50	<0.50
Chloroform	µg/L	None	3.5	0.091 J	<0.50
Chloromethane	µg/L	None	1,100	<0.50	<0.50
Chlorotoluene, 2-	µg/L	None	2,400	<0.50	<0.50
Chlorotoluene, 4-	µg/L	None	2,000	<0.50	<0.50
Dibromochloromethane	µg/L	None	18	<0.50	<0.50
Dibromochloropropane, 1,2-, 3-	µg/L	0.20	0.33	<0.20	<0.20
Dibromoethane, 1,2-	µg/L	0.050	0.75	<0.50	<0.50
Dibromomethane	µg/L	None	540	<0.50	<0.50
Dichlorobenzene, 1,2-	µg/L	600	11,000	<0.50	<0.50
Dichlorobenzene, 1,3-	µg/L	None	None	<0.50	<0.50
Dichlorobenzene, 1,4-	µg/L	5.0	11	<0.50	<0.50
Dichlorodifluoromethane	µg/L	None	31	<0.50	<0.50
Dichloroethane, 1,1-	µg/L	5.0	34	<0.50	<0.50
Dichloroethane, 1,2-	µg/L	0.50	9.7	<0.50	<0.50

Table 1. Groundwater Sampling Results vs. Vapor Intrusion Screening Levels

Sample ID:	Units	Screening Levels		B-19-GW	B-20-GW
Boring:		Maximum Contaminant Level	Commercial Vapor Intrusion	B-19	B-20
Depth (ft bgs):				NA	NA
Analyte Date Collected:				2020-02-23	2020-02-23
Dichloroethene, 1,1-	µg/L	6.0	290	<0.50	<0.50
Dichloroethene, 1,2-, cis-	µg/L	6.0	210	<0.50	<0.50
Dichloroethene, 1,2-, trans-	µg/L	10	910	<0.50	<0.50
Dichloropropane, 1,2-	µg/L	5.0	29	<0.50	<0.50
Dichloropropane, 1,3-	µg/L	None	8,800	<0.50	<0.50
Dichloropropane, 2,2-	µg/L	None	None	<0.50	<0.50
Dichloropropene, 1,1-	µg/L	None	None	<0.50	<0.50
Dichloropropene, 1,3-, cis-	µg/L	0.50	None	<0.50	<0.50
Dichloropropene, 1,3-, trans-	µg/L	0.50	None	<0.50	<0.50
Diisopropyl ether	µg/L	None	30,000	<0.50	<0.50
Ethyl tert-butyl ether	µg/L	None	None	<0.50	<0.50
Ethylbenzene	µg/L	300	15	<0.50	<0.50
Hexachlorobutadiene	µg/L	None	1.3	<0.50	<0.50
Hexachloroethane	µg/L	None	6.9	<0.50	<0.50
Hexanone, 2-	µg/L	None	34,000	2.7	0.79 J
Isopropylbenzene	µg/L	None	3,800	<0.50	<0.50
Isopropyltoluene, p-	µg/L	None	None	<0.50	<0.50
Methyl tert-butyl ether	µg/L	13	2,000	<0.50	<0.50
Methylene chloride	µg/L	0.0E+00	90	<2.0	<2.0
Methylpentanone, 4-, 2-	µg/L	None	2.3E+06	<0.50	<0.50
Naphthalene	µg/L	None	20	<1.0	<1.0
Propylbenzene, n-	µg/L	None	10,000	<0.50	<0.50
Styrene	µg/L	100	35,000	<2.0	<2.0
Tetrachloroethane, 1,1,1,2-	µg/L	None	17	<0.50	<0.50
Tetrachloroethane, 1,1,2,2-	µg/L	1.0	14	<0.50	<0.50
Tetrachloroethene	µg/L	5.0	2.8	<0.50	0.67
Toluene	µg/L	150	4,800	<0.50	<0.50
Trichlorobenzene, 1,2,3-	µg/L	None	270	<0.50	<0.50
Trichlorobenzene, 1,2,4-	µg/L	5.0	29	<0.50	<0.50
Trichloroethane, 1,1,1-	µg/L	200	6,300	<0.50	<0.50
Trichloroethane, 1,1,2-	µg/L	5.0	23	<0.50	<0.50

Table 1. Groundwater Sampling Results vs. Vapor Intrusion Screening Levels

Analyte / Sample ID: / Boring: / Depth (ft bgs): / Date Collected:	Units	Screening Levels		B-19-GW	B-20-GW
		Maximum Contaminant Level	Commercial Vapor Intrusion	B-19	B-20
				NA	NA
				2020-02-23	2020-02-23
Trichloroethene	µg/L	5.0	7.4	<0.50	<0.50
Trichlorofluoromethane	µg/L	150	1,300	<0.50	<0.50
Trichloropropane, 1,2,3-	µg/L	0.0050	0.11	<0.50	<0.50
Trichlorotrifluoroethane, 1,1,2-, 1,2,2-	µg/L	1,200	1,000	<0.50	<0.50
Trimethylbenzene, 1,2,4-	µg/L	None	1,000	<0.50	<0.50
Trimethylbenzene, 1,3,5-	µg/L	None	730	<0.50	<0.50
Vinyl chloride	µg/L	0.50	0.14	<0.50	<0.50
Xylene, m,p-	µg/L	1,750	1,500	<0.50	<0.50
Xylene, o-	µg/L	1,750	2,100	<0.50	<0.50
Xylene, o,m,p-	µg/L	1,750	1,600	<0.50	<0.50

Table 1. Groundwater Sampling Results vs. Vapor Intrusion Screening Levels

Notes:

(1) Less-than sign (<) indicates analyte was not detected above indicated laboratory reporting limit. En-dash (–) indicates sample was not analyzed for compound.

(2) Abbreviations:
- ft bgs – feet below ground surface
- mg/kg – milligrams per kilogram
- °F – degrees Fahrenheit
- TPH-g – total petroleum hydrocarbons in the gasoline range
- TPH-d – total petroleum hydrocarbons in the diesel range
- TPH-mo – total petroleum hydrocarbons in the motor oil range

(3) Data qualifiers:
- J – Result is less than the RL/ML but greater than the MDL. The reported concentration is an estimated value.

(4) Sampling results are compared to Department of Toxic Substances Control (DTSC)-recommended groundwater vapor intrusion screening levels for commercial/industrial land use (DTSC 2020, USEPA 2020, DTSC and SWRCB 2020).

(5) Highlighting key:
- – Detected concentration exceeds one or more screening levels.

Table 2. Soil Gas Sampling Results vs. Risk-Based Screening Levels

Analyte / Sample ID:	Units	Commercial/Industrial RBSLs		B-13-5	B-13-15	B-14-5	B-14-15	B-15-8	B-15-18	B-16-4	B-17-7	B-17-17
Boring:				B-13	B-13	B-14	B-14	B-15	B-15	B-16	B-17	B-17
Depth (ft bgs):		Cancer	Noncancer	5	15	5	15	8	18	4	7	17
Date Collected:				2019-12-14	2019-12-14	2019-12-14	2019-12-14	2019-12-14	2019-12-14	2019-12-15	2019-12-15	2019-12-15
Volatile Organic Compounds (VOCs)												
Acetone	µg/m³	None	4.70E+06	29	39	60	87	31	<28	<27	<27	<25
Benzene	µg/m³	1.40E+04	4.30E+05	<3.9	<4.0	<3.7	<3.8	24	<3.7	5.5	<3.6	<3.4
Benzyl chloride	µg/m³	8.30E+00	1.50E+02	<6.3	<6.4	<6.0	<6.1	<5.6	<6.0	<5.9	<5.9	<5.5
Bromodichloromethane	µg/m³	1.10E+01	1.20E+04	<8.1	<8.3	<7.7	<7.9	<7.2	<7.8	<7.7	<7.6	<7.1
Bromoform	µg/m³	3.70E+02	1.20E+04	<12	<13	<12	<12	<11	<12	<12	<12	<11
Bromomethane	µg/m³	None	7.30E+02	<47	<48	<45	<46	<42	<45	<44	<44	<41
Butanone, 2-	µg/m³	None	7.30E+05	<14	20	<14	21	<13	<14	20	<13	<12
Carbon disulfide	µg/m³	None	1.00E+05	<15	<16	<14	<15	<13	<14	<14	<14	<13
Carbon tetrachloride	µg/m³	6.70E+01	6.00E+03	<7.6	<7.8	<7.3	<7.4	<6.8	<7.3	<7.2	<7.2	<6.7
Chlorobenzene	µg/m³	None	7.30E+03	<5.6	<5.7	<5.3	<5.4	<5.0	<5.3	<5.3	<5.2	<4.9
Chloroethane	µg/m³	None	1.50E+06	<13	<13	<12	<12	<11	<12	<12	<12	<11
Chloroform	µg/m³	1.80E+01	1.40E+04	<5.9	9.2	<5.6	<5.7	5.4	<5.7	<5.6	7.9	<5.2
Chloromethane	µg/m³	None	1.30E+04	<25	<26	<24	<24	<22	<24	<24	<24	<22
Chloropropene, 3-	µg/m³	6.70E+01	1.50E+02	<15	<16	<14	<15	<14	<14	<14	<14	<13
Cyclohexane	µg/m³	None	8.70E+05	<4.2	6.3	<4.0	<4.0	<3.7	<4.0	<3.9	<3.9	<3.7
Dibromochloromethane	µg/m³	1.90E+01	1.20E+04	<10	<11	<9.8	<10	<9.2	<9.9	<9.8	<9.7	<9.1
Dibromoethane, 1,2-	µg/m³	6.70E-01	1.20E+02	<9.3	<9.6	<8.9	<9.0	<8.3	<8.9	<8.8	<8.8	<8.2
Dichlorobenzene, 1,2-	µg/m³	None	2.90E+04	<7.3	<7.5	<6.9	<7.1	<6.5	<7.0	<6.9	<6.8	<6.4
Dichlorobenzene, 1,3-	µg/m³	None	None	<7.3	<7.5	<6.9	<7.1	<6.5	<7.0	<6.9	<6.8	<6.4
Dichlorobenzene, 1,4-	µg/m³	3.70E+01	1.20E+05	<7.3	<7.5	<6.9	<7.1	<6.5	<7.0	<6.9	<6.8	<6.4
Dichlorodifluoromethane	µg/m³	None	1.50E+04	<6.0	<6.2	<5.7	<5.8	<5.3	<5.7	<5.7	<5.6	<5.3
Dichloroethane, 1,1-	µg/m³	2.60E+02	1.20E+05	<4.9	<5.0	<4.7	<4.8	<4.4	<4.7	<4.6	<4.6	<4.3
Dichloroethane, 1,2-	µg/m³	1.60E+01	1.00E+03	<4.9	<5.0	<4.7	<4.8	<4.4	<4.7	<4.6	<4.6	<4.3
Dichloroethene, 1,1-	µg/m³	None	1.00E+04	<4.8	<4.9	<4.6	<4.6	<4.3	<4.6	<4.5	<4.5	<4.2
Dichloroethene, 1,2-, cis-	µg/m³	None	1.20E+03	<4.8	<4.9	<4.6	<4.6	<4.3	<4.6	<4.5	<4.5	<4.2
Dichloroethene, 1,2-, trans-	µg/m³	None	1.20E+04	<4.8	<4.9	<4.6	<4.6	<4.3	<4.6	<4.5	<4.5	<4.2
Dichloropropane, 1,2-	µg/m³	1.10E+02	6.00E+02	<5.6	<5.8	<5.3	<5.4	<5.0	<5.4	<5.3	<5.3	<4.9
Dichloropropene, 1,3-, cis-	µg/m³	None	None	<5.5	<5.6	<5.2	<5.3	<4.9	<5.3	<5.2	<5.2	<4.8
Dichloropropene, 1,3-, trans-	µg/m³	None	None	<5.5	<5.6	<5.2	<5.3	<4.9	<5.3	<5.2	<5.2	<4.8
Dichlorotetrafluoroethane, 1,2-, 1,1,2,2-	µg/m³	None	None	<8.4	<8.7	<8.1	<8.2	<7.6	<8.1	<8.0	<8.0	<7.4

Table 2. Soil Gas Sampling Results vs. Risk-Based Screening Levels

Analyte / Sample ID:	Units	Commercial/Industrial RBSLs		B-13-5	B-13-15	B-14-5	B-14-15	B-15-8	B-15-18	B-16-4	B-17-7	B-17-17
Boring:				B-13	B-13	B-14	B-14	B-15	B-15	B-16	B-17	B-17
Depth (ft bgs):		Cancer	Noncancer	5	15	5	15	8	18	4	7	17
Date Collected:				2019-12-14	2019-12-14	2019-12-14	2019-12-14	2019-12-14	2019-12-14	2019-12-15	2019-12-15	2019-12-15
Dioxane, 1,4-	µg/m³	8.30E+01	4.30E+03	<17	<18	<17	<17	<16	<17	<16	<16	<15
Ethanol	µg/m³	None	None	26	14	13	19	140	9.6	<8.6	<8.6	<8.0
Ethylbenzene	µg/m³	1.60E+05	1.50E+08	<5.2	<5.4	<5.0	<5.1	38	<5.0	<5.0	<4.9	<4.6
Ethyltoluene, 4-	µg/m³	None	None	<5.9	<6.1	<5.7	<5.8	29	<5.7	<5.6	<5.6	<5.2
Heptane, n-	µg/m³	None	6.00E+04	<5.0	7.3	<4.7	<4.8	8.6	<4.8	<4.7	<4.7	<4.4
Hexachlorobutadiene	µg/m³	1.90E+01	6.00E+02	<52	<53	<49	<50	<46	<49	<49	<49	<45
Hexane, n-	µg/m³	None	1.00E+05	<4.3	13	<4.1	<4.1	<3.8	<4.1	<4.0	<4.0	<3.8
Hexanone, 2-	µg/m³	None	4.30E+03	<20	<20	<19	<19	<18	<19	<19	<19	<17
Isopropanol	µg/m³	None	2.90E+04	<12	<12	<11	<12	<11	<11	<11	<11	<10
Isopropylbenzene	µg/m³	None	6.00E+04	<5.9	<6.1	<5.7	<5.8	<5.3	<5.7	<5.6	<5.6	<5.2
Methyl tert-butyl ether	µg/m³	1.60E+03	4.30E+05	<17	<18	<17	<17	<16	<17	<16	<16	<15
Methylene chloride	µg/m³	4.00E+02	6.00E+04	<42	<43	<40	<41	<38	<40	<40	<40	<37
Methylpentanone, 4-, 2-	µg/m³	None	4.30E+05	<5.0	<5.1	<4.7	<4.8	<4.4	<4.8	<4.7	<4.7	<4.4
Naphthalene	µg/m³	1.20E+04	4.30E+05	<13	<13	<12	<12	<11	<12	<12	<12	<11
Propylbenzene, n-	µg/m³	None	1.50E+05	<5.9	<6.1	<5.7	<5.8	<5.3	<5.7	<5.6	<5.6	<5.2
Styrene	µg/m³	None	1.30E+05	<5.2	<5.3	<4.9	<5.0	<4.6	<4.9	<4.9	<4.8	<4.5
Tetrachloroethane, 1,1,2,2-	µg/m³	7.00E+00	1.20E+04	<8.3	<8.5	<7.9	<8.1	<7.4	<8.0	<7.9	<7.8	<7.3
Tetrachloroethene	µg/m³	6.70E+01	6.00E+03	380	790	100	590	48	380	240	520	900
Tetrahydrofuran	µg/m³	None	2.90E+05	<3.6	<3.7	<3.4	<3.5	<3.2	<3.4	5.6	<3.4	<3.1
Toluene	µg/m³	None	4.30E+07	<4.6	10	9.3	<4.4	250	<4.4	33	<4.3	<4.0
Trichlorobenzene, 1,2,4-	µg/m³	5.70E+01	2.90E+02	<36	<37	<34	<35	<32	<34	<34	<34	<32
Trichloroethane, 1,1,1-	µg/m³	None	1.50E+05	<6.6	<6.8	<6.3	<6.4	<5.9	<6.3	<6.2	<6.2	<5.8
Trichloroethane, 1,1,2-	µg/m³	2.60E+01	2.90E+01	<6.6	<6.8	<6.3	<6.4	<5.9	<6.3	<6.2	<6.2	<5.8
Trichloroethene	µg/m³	1.00E+02	2.90E+02	<6.5	<6.7	<6.2	<6.3	<5.8	<6.2	<6.2	<6.1	<5.7
Trichlorofluoromethane	µg/m³	None	1.80E+05	<6.8	<7.0	<6.5	<6.6	<6.1	<6.5	<6.4	<6.4	<6.0
Trichlorotrifluoroethane, 1,1,2-, 1,2,2-	µg/m³	None	7.30E+05	<9.3	<9.5	<8.8	<9.0	<8.3	<8.9	<8.8	<8.7	<8.2
Trimethylbenzene, 1,2,4-	µg/m³	None	8.70E+03	<5.9	<6.1	<5.7	<5.8	24	<5.7	<5.6	<5.6	<5.2
Trimethylbenzene, 1,3,5-	µg/m³	None	8.70E+03	<5.9	<6.1	<5.7	<5.8	12	<5.7	<5.6	<5.6	<5.2
Trimethylpentane, 2,2,4-	µg/m³	None	None	<5.6	<5.8	<5.4	<5.5	29	<5.4	<5.3	<5.3	<5.0
Vinyl chloride	µg/m³	5.30E+00	1.50E+04	<3.1	<3.2	<3.0	<3.0	<2.8	<3.0	<2.9	<2.9	<2.7
Xylene, m,p-	µg/m³	None	None	<5.2	<5.4	<5.0	<5.1	160	<5.0	11	<5.0	<4.6

Table 2. Soil Gas Sampling Results vs. Risk-Based Screening Levels

Analyte / Sample ID: / Boring: / Depth (ft bgs): / Date Collected:	Units	Commercial/Industrial RBSLs		B-13-5	B-13-15	B-14-5	B-14-15	B-15-8	B-15-18	B-16-4	B-17-7	B-17-17
				B-13	B-13	B-14	B-14	B-15	B-15	B-16	B-17	B-17
		Cancer	Noncancer	5	15	5	15	8	18	4	7	17
				2019-12-14	2019-12-14	2019-12-14	2019-12-14	2019-12-14	2019-12-14	2019-12-15	2019-12-15	2019-12-15
Xylene, o-	µg/m³	None	1.50E+07	<5.2	<5.4	<5.0	<5.1	54	<5.0	<5.0	<5.0	<4.6
Fixed Gases												
Carbon dioxide	%	None	None	0.60	0.71	0.70	0.82	1.0	0.64	0.36	0.47	0.52
Carbon monoxide	%	None	None	<0.024	<0.025	<0.023	<0.024	<0.022	<0.023	<0.021	<0.023	<0.021
Helium	%	None	None	<0.12	<0.12	<0.12	<0.12	<0.11	<0.12	<0.11	<0.11	<0.11
Methane	%	None	None	<0.00024	<0.00025	<0.00023	<0.00024	0.00058	<0.00023	0.00025	0.00034	0.00038
Oxygen	%	None	None	20	20	20	20	20	20	19	20	20

Table 2. Soil Gas Sampling Results vs. Risk-Based Screening Levels

Notes:

(1) Sub-slab soil gas sampling results for VOCs reported in micrograms per cubic meter (µg/m³). Less-than sign (<) indicates analyte was not detected above indicated laboratory reporting limit.

(2) Sub-slab soil gas sampling results are compared to DTSC-recommended sub-slab soil gas risk-based screening levels which incorporate the following components.
- DTSC-recommended indoor air risk-based screening levels for commercial/industrial land use (DTSC 2020, USEPA 2020); and
- DTSC-recommended sub-slab soil gas-to-indoor air attenuation factor of 0.03 (DTSC and SWRCB 2020).

The attenuation factor for petroleum hydrocarbons (benzene, ethylbenzene, naphthalene, toluene, and xylenes) incorporates an additional factor of 0.001 to account for the bioattenuation that occurs under aerobic conditions (SWRCB 2012).

Screening levels are based on cancer (CA) or noncancer (NC) health effects.

Detected concentrations that exceed screening levels are highlighted.

Appendix B

Vapor Intrusion Mitigation System Operations and Maintenance Plan

VAPOR INTRUSION MITIGATION SYSTEM OPERATIONS AND MAINTENANCE PLAN

2550 Irving Street

San Francisco, California 94122

September 2, 2021

Prepared for:

Tenderloin Neighborhood Development Corporation (TNDC)
49 Powell Street, 3rd Floor
San Francisco, California 94102

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Project No.: 115-103-105

CONTENTS

Appendices

PROFESSIONAL CERTIFICATION

This *Vapor Intrusion Mitigation System Operations and Maintenance Plan* for the redevelopment project located at 2550 Irving Street in San Francisco, California has been prepared by a California Professional Geologist and/or California Professional Engineer. This document is based on information available to Path Forward Partners, Inc. and current laws, policies, and regulations as of the date of this document. The opinions expressed in this document are based upon the information available to Path Forward Partners, Inc. and are given in response to a limited assignment and should be considered and implemented only in light of that assignment. The services provided by Path Forward Partners, Inc. in completing this project were consistent with normal standards of the profession. No other warranty, expressed or implied, is made.

Neal Hughes, G.I.T.
Senior Staff Geologist

David A. Grunat, P.G., C.H.G.
Principal Geologist

Gregory S. Noblet, P.E.
Principal Engineer

1.0 INTRODUCTION

Path Forward Partners, Inc. (Path Forward) has prepared this *Vapor Intrusion Mitigation System Operations and Maintenance Plan* (O&M Plan) on behalf of the Tenderloin Neighborhood Development Corporation (TNDC) for the development located at 2550 Irving Street in San Francisco, California (the Site). Site soil gas is known to be impacted with the volatile organic compound (VOC) tetrachloroethene (PCE) (AllWest 2020). The new building incorporates a vapor intrusion mitigation system (VIMS) consisting of sub-slab passive venting system and vapor membrane. This mitigation measure is the selected remedy for the Site, as described in the *Final Response Plan* (Path Forward 2021). As-built plans are included in Appendix A. This O&M Plan describes post-occupancy confirmation sampling and VIMS inspection and maintenance requirements to ensure the ongoing effectiveness of the remedy.

2.0 ROLES AND RESPONSIBILITIES

This O&M Plan defines three roles, consisting of Site Owner, Project Coordinator, and Environmental Professional. Their responsibilities under this O&M Plan are defined below.

2.1 Site Owner

The responsibilities of the Site Owner are to:

- Ensure implementation of the O&M Plan.
- Designate and retain the following O&M Plan personnel: Project Coordinator and Environmental Professional.
- Maintain relevant records.

2.2 Project Coordinator

The responsibilities of the Project Coordinator are to:

- Facilitate implementation of the O&M Plan.
- Be familiar with Site conditions and the VIMS components installed at the Site.
- Serve as the liaison for the Site Owner for communication with outside parties and the public, address/receive complaints etc.
- Evaluate work orders to determine if work will intrude into any component of the VIMS.
- Provide training to the contractor or other personnel retained to perform work on the Site, prior to working, about the hazards on-Site and the need to maintain integrity of the membrane system and other VIMS components.
- Require intrusive work at the Site be conducted in accordance with this O&M Plan.

- Coordinate, review, and submit permits or notifications to local agencies that may be necessary.
- Review, co-sign, and submit Annual Inspection Summary Reports, Unplanned Event Reports, and Intrusive Work Completion Reports.
- Facilitate communication of pertinent issues related to O&M of the Site vapor mitigation measures or maintenance of this O&M Plan.

2.3 Environmental Professional

The Site Owner will retain an Environmental Professional who is a California-registered professional civil engineer or professional geologist having experience with the vapor mitigation measures installed at the Site.

The responsibilities of the Environmental Professional are to:

- Conduct or supervise Site inspections.
- Provide recommendations to the Project Coordinator for maintenance or repair of mitigation measures.
- Prepare and co-sign Annual Inspection Summary Reports, Unplanned Event Reports, and Intrusive Work Completion Reports.
- Conduct the confirmation air sampling program herein.

3.0 COST ESTIMATE

For the purpose of cost estimating, it is assumed the operations and maintenance will be required for 30 years following the completion of the VIMS. Estimated costs (in current dollars) related to routine operations and maintenance activities are presented below.

Item	Number of Events	Avg Cost per Event	Cost
Annual inspection, reporting	24	$5,000	$120,000
Five-year review (including annual inspection)	6	$7,500	$45,000
Sampling Events	20	$10,000	$200,000
DTSC Annual review	24	$2,884	$69,216
DTSC five-year review	6	$7,042	$42,252
Total DTSC and O&M Cost Estimate			**$476,486**

4.0 INSPECTIONS

Inspections of the VIMS will be conducted on regular and as-needed bases to identify issues that require repair or maintenance, towards ensuring the long-term permanence and effectiveness of the remedy. Inspections will be conducted by the Environmental Professional, at the direction of the Project Coordinator. Inspection reports will be prepared and co-signed by the Environmental Professional; and will be reviewed, co-signed, and submitted to the Site Owner by the Project Coordinator.

4.1 Frequency

The VIMS shall be inspected at the following times:

- On a regular annual basis;
- Following a significant seismic event defined in the context of the USGS Shakemap Instrument Intensity scale, with inspections occurring after any event that registers an interpolated instrument intensity level of VII or greater at the Site or an instrument intensity level of VII or greater at the monitoring station nearest to the Site. Confirmation sampling consistent with Section 6.0 should occur after any event that registers an interpolated instrument intensity level of IX or greater at the Site or an instrument intensity level of IX or greater at the monitoring station nearest to the Site;
- Following an unexpected event (e.g., fire or flood) that, in the judgment of the Project Coordinator, may have damaged the membrane system; and
- Following planned intrusive work activity that breaches or damages the membrane or other VIMS elements.

Inspections shall continue until it is determined by DTSC to be no longer required.

4.2 Inspection Procedure

Inspections will be conducted by, or under supervision of, the Environmental Professional. Inspection objectives and procedures are generally the same, regardless of the reason for the inspection (e.g., routine annual inspection versus post-earthquake inspection). The inspection purpose is to confirm that VIMS components are intact and functioning as intended to mitigate vapor intrusion into the building. Inspections may be documented and reported to DTSC using the Inspection Checklist (see Appendix B) or an equivalent form.

The inspector will visually survey the accessible areas on the ground level of the building that overly the sub-slab VIMS for evidence of construction activity that involved drilling or sawing through the building slab; and will visually inspect the wind turbines that cap the exhaust risers to confirm the turbines are functioning as intended. The inspector will also interview the facility manager with relevant knowledge of Site activities to ascertain whether construction activities or other events that may have damaged the VIMS had occurred during the previous 12 months.

If during an inspection it is discovered that intrusive construction work breaching the building slab was performed without being reported, the inspection will investigate whether the VIMS components were repaired and restored consistent with the VIMS plans (Appendix A) and manufacturer's specifications.

The inspector will document the results of the inspection, including photographs of questionable or deficient areas/elements potentially in need of repair, on the Inspection Checklist (Appendix B) or equivalent.

4.3 Inspection Reports

Inspection reports shall include the following information, as applicable:

- Contact information and signatures of the Project Coordinator and Environmental Professional;
- Summary of inspection findings, including conclusion that mitigation systems are intact and effective, or recommendation for maintenance or repair;
- Dates, times, and names of those who conducted Site inspections;
- Descriptions of:
    - Actions taken during the reporting period such as maintenance and repair activities, including dates work was performed and the location of the work,
    - Completions, delays, or failures to complete recommended repairs or maintenance tasks,
    - Significant changes in Site conditions or usage, construction activity, or other information relevant to the mitigation systems, and
    - Actions planned or expected to be undertaken in the next year that may impact the mitigation systems;
- Photographs depicting Site conditions of concern, if identified, with brief identifying captions or descriptions;
- Data generated under the O&M Plan and significant findings from the data;
- Documentation of additional investigation, monitoring, and/or mitigation;
- Identification of O&M Plan requirements not completed; and
- Recommendations for O&M Plan modifications.

Inspection reports shall be prepared and co-signed by the Environmental Professional, reviewed and co-signed by the Project Coordinator, and submitted to the Site Owner by the Project Coordinator.

5.0 MAINTENANCE AND REPAIR

The VIMS generally has no moving parts and is physically inaccessible – an exception being the wind turbines that cap the vent risers at the building roof. There is no required routine maintenance for the VIMS components. The primary concern to the long-term effectiveness of the VIMS, once installed, is the possibility that intrusive construction activity or other event will damage system components.

The Site Owner shall be notified 14 calendar days in advance of tenant improvements or other construction project that involves cutting or drilling through the foundation slab in those areas of the building which overly the sub-slab membrane and piping systems.

In the event that the sub-slab piping system and/or membrane are breached or damaged, whether by planned intrusive activity or by other event, the piping system, membrane, and floor slab shall be repaired and restored consistent with the VIMS plans (Appendix A) and manufacturer's specifications.

Repairs made to the VIMS shall be documented (e.g., with photographs) to the Site Owner in an *Intrusive Work Completion Report* within 14 days.

6.0 CONFIRMATION SAMPLING PROGRAM

Confirmation sub-slab soil gas sampling will be conducted on a semi-annual basis to confirm the ongoing effectiveness of the sub-slab membrane and venting system. Semi-annual sampling will be conducted for at least two years (four semi-annual events). Following two years of semi-annual sampling, the need for sampling will be reassessed and, if necessary, sampling will continue on a biannual basis (once every two years) basis. Sample collection and data evaluation protocols are discussed below.

6.1 Sample Collection

Sub-slab soil gas samples will be collected from the sub-slab soil gas probes beneath the building. Sub-slab soil gas samples will be collected with the building heating ventilation and air conditioning (HVAC) systems in normal operation. Each sub-slab probe will be purged and sampled as follows. It is noted that the sub-slab probe sample lines terminate at sampling ports located within a restricted access cabinet.

- A shut-in test will be conducted to verify the integrity of sample train connections.
- A small amount of the leak-detection compound, 1,1-difluoroethane or 2-propanol, will be placed on a rag which will be placed near the sampling port connection.
- The probe (consisting of the sampling line internal volume) will be purged of three volumes at a rate of 100 to 200 milliliters per minute, using either a Summa canister with flow controller or a syringe.

- A sub-slab soil gas sample will be collected into a pre-cleaned, batch-certified, 1-liter Summa canister at a rate of 100 to 200 milliliters per minute. The time and canister pressure at the stop and start of sample collection will be recorded in field notes.

The collected sub-slab soil gas samples will be labeled and transported under chain-of-custody to the analytical laboratory.

6.2 Laboratory Analyses

Sub-slab soil gas samples will be analyzed by a State-certified analytical laboratory on standard turnaround time for:

- PCE, contingent PCE breakdown products (trichloroethene [TCE], 1,1-dichloroethene [1,1-DCE], cis-1,2-dichloroethene [cis-,1,2-DCE], trans-1,2-dichloroethene [trans-1,2-DCE], and vinyl chloride), and the leak-detection compound by USEPA Method TO-15; and
- Fixed gases by ASTM Method D1946.

6.3 Data Evaluation

Sub-slab soil gas sampling results for PCE and contingent PCE breakdown products (TCE, 1,1-DCE, cis-,1,2-DCE, trans-1,2-DCE, and vinyl chloride) will be compared to the DTSC-recommended sub-slab soil gas risk-based screening levels (RBSLs) as follows:

Compound (i.e., Chemical of Concern [COC], or Potential COC Degradation Product)	Sub-Slab Soil Gas RBSL for Ground-Level Commercial Occupancy (µg/m³)	Sub-Slab Soil Gas RBSL for Potential Ground-Level Residential/Day Care Occupancy (µg/m³)
PCE	67	15
TCE	3,300	16
1,1-DCE	10,000	2,400
cis-1,2-DCE	1,200	280
trans-1,2-DCE	12,000	2,800
Vinyl chloride	5.3	0.32

These sub-slab soil gas RBSLs incorporate DTSC-recommended indoor air RBSLs and the conservative default attenuation factor of 0.03 (DTSC 2020, DTSC and SWRCB 2020). See Section 5.3 of the Response Plan for further details. The sub-slab results may also be evaluated

in the context of a Site-specific attenuation factor as determined from concurrent sub-slab soil gas and indoor air sampling performed during the pre-occupancy confirmation sampling event or paired sub-slab soil gas and indoor air radon testing (see Section 7.3 of the Response Plan). Other attenuation factor derivation approaches may alternatively be considered and utilized with DTSC-approval.

If sub-slab soil gas sampling results are below sub-slab soil gas screening levels, the building would be demonstrated as safe for occupancy, with respect to vapor intrusion concerns. If any sub-slab soil gas sampling results exceed screening levels, further evaluation would be performed. Additional sub-slab soil gas sampling may be performed to confirm the results. If elevated PCE concentrations persist in sub-slab soil gas, indoor air sampling may be warranted to confirm that vapor intrusion is not occurring. Any additional sampling or action would be planned and implemented in consultation with DTSC.

7.0 VOLUNTARY FIVE-YEAR REVIEWS

The Operations and Maintenance Agreement between DTSC and the Site owner does not require Fire Year Reviews. As a voluntary measure, the Site Owner has agreed to conduct Five-year Reviews, to confirm the long-term permanence and effectiveness of the selected remedy. Five-year reviews will be conducted by the Environmental Professional at the direction of the Project Coordinator. Five-year reviews will be conducted in general accordance with USEPA guidance (USEPA 2001, 2012).

The Five-year Review shall comprise a technical assessment of the protectiveness of the remedy, by answering the following questions:

- Is the remedy functioning as intended by the decision documents?
- Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?
- Has any other information come to light that could call into question the protectiveness of the remedy?

The Five-year Review Report will include a protectiveness statement for each component of the selected remedy and for the Site as a whole. The Five-year Review will include a Financial Assurance Review by the Site owner to determine that sufficient funds are still available. If needed, the cost to implement the O&M Plan will be updated. The Site Owner will provide the necessary guarantee that the funds are available. The Five-year Review Report will provide a list of any recommendations, including follow-up actions to ensure protectiveness, with a schedule for completion.

The Five-year Review Report will be prepared and co-signed by the Environmental Professional; and will be reviewed, co-signed, and submitted to DTSC by the Project Coordinator.

8.0 RECORDKEEPING

The documentation records prepared under the O&M Plan will be maintained by the Site Owner consistent with the Operations and Maintenance Agreement. The records will be made available for inspection by the Project Coordinator and upon request by DTSC representatives.

The DTSC administrative Record for the Site is available for public inspection during office hours at the following DTSC location:

Department of Toxic Substances Control
Brownfields and Environmental Restoration Program
700 Heinz Avenue
Berkeley, California 94710-2721
Attention: Arthur Machado
Project Manager
(770) 500-5372
Arthur.Machado@dtsc.ca.gov

9.0 VARIANCE FROM, OR MODIFICATION OF, O&M PLAN

The Project Coordinator may seek variance and/or modification of the O&M Plan at any time during the life cycle of the remedy. “Variance” refers to possible release from specific individual O&M Plan requirements for a limited time period, while “modification” refers to permanent revision of specific individual O&M Plan requirements.

The Project Coordinator may apply to DTSC for a written variance from the provisions of the O&M Plan. DTSC will evaluate each request and will grand a variance request only after determining that such a request would be protective of human health and the environment.

When long-term performance of the mitigation measures has been confirmed, the Project Coordinator may apply to DTSC to modify the requirements of the O&M Plan based on Site-specific sampling results and conditions. Additionally, DTSC reserves the right to independently initiate appropriate O&M Plan modifications. As a result, DTSC may require the following O&M Plan modifications:

- Changes in the frequency of O&M activities;
- Modification, replacement, or addition of components to the O&M Plan if O&M activities fail to achieve the O&M objectives of protecting human health and the environment; and
- Evaluation, design, construction, and/or operation of additional measures to achieve the O&M objectives.

10.0 REFERENCES

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DTSC. 2020. *HERO HHRA Note Number: 3, DTSC-modified Screening Levels (DTSC-SLs)*. June.

DTSC and SWRCB. 2020. *Supplemental Guidance: Screening and Evaluating Vapor Intrusion*. Public Draft. February.

USEPA. 2001. *Comprehensive Five-year Review Guidance*. Office of Emergency and Remedial Response. EPA 540-R-01-007. OSWER No. 9355.7-038-P. June.

USEPA. 2012. *Assessing Protectiveness at Sites for Vapor Intrusion; Supplement to the "Comprehensive Five-Year Review Guidance".* OSWER Directive 9200.2-84.

Path Forward. 2021. *Final Response Plan, 2550 Irving Street Affordable Housing Project, San Francisco, California.* September 2.

Appendix A

Vapor Intrusion Mitigation Systems As-Built Plans
(to be inserted when available)

Appendix B

Vapor Intrusion Mitigation System Inspection Checklist

VAPOR INTRUSION MITIGATION SYSTEM (VIMS)
INSPECTION CHECKLIST

2550 Irving St, San Francisco CA

INSPECTION INFORMATION

INSPECTION DATE: _____

INSPECTOR'S NAME: _____

INSPECTOR'S ORGANIZATION: _____

DATE OF PREVIOUS INSPECTION: _____

INSPECTION TYPE:

□ ANNUAL

□ POST-INTRUSIVE CONSTRUCTION

□ POST-UNPLANNED EVENT (E.G. EARTHQUAKE)

INSTRUCTIONS: Check true (T), false (F), or not applicable (N/A) for each criterion. Provide explanation at right for any False responses. Document below corrective actions taken to address False responses.

INSPECTION CRITERION	T	F	N/A	EXPLANATION FOR FALSE RESPONSE
Wind turbines on vent risers are spinning freely	□	□	□	
No groundwater infiltration into building interior	□	□	□	
No intrusive activities through the building slab have been performed	□	□	□	
Prior approval of intrusive activities through the building slab was obtained from DTSC	□	□	□	
Sub-slab vapor barrier was repaired in accordance with Repair Specifications presented in VIMS Operations and Maintenance Plan	□	□	□	
Other component of VIMS (specify) was repaired in accordance with Repair Specifications presented in VIMS Operations and Maintenance Plan	□	□	□	

DESCRIBE CORRECTIVE ACTIONS TAKEN AND DATES COMPLETED

Appendix C

Cost Estimate Breakdown

COST ESTIMATE BREAKDOWN

2550 Irving Street
San Francisco, CA
Alternative 2 – Soil Excavation and off-Site Disposal

Description	Quantity	Units	Unit Cost	Cost
PRE-CONSTRUCTION				
Design Plans, Bid Documents				
Consulting Labor	1	LS	$20,000	$20,000
Remedial Design and Implementation Plan				
Consulting Labor	1	LS	$30,000	$30,000
			Pre-Construction Subtotal	**$50,000**
CONSTRUCTION - Excavation and Off-Site Disposal				
Pre Characterization Sidewall Survey				
Utility Clearance	1	daily	$2,000	$2,000
Project Engineer/Geologist	40	hrs	$150	$6,000
Geoprobe Rig	4	daily	$3,500	$14,000
Soil Sampling Analytical	20	Sample	$1,200	$24,000
				$46,000
Excavation & Off-Site Disposal				
Contractor Mob/Demob	1	LS	$250,000	$250,000
Excavation and Loading	10625	CY	$25	$265,625
Class 2 Disposal and Transportation (75% of Total)	13746	tons	$60	$824,766
Non-RCRA Disposal and Transportation (25% of Total)	4582	tons	$160	$733,125
Surveyor/GPS	5	daily	$2,500	$12,500
Construction Oversight - Labor	168	hrs	$150	$25,200
Daily Field Supplies	14	daily	$75	$1,050
				$2,112,266
Excavation Backfill Operations				
Import Clean Soil	10625	CY	$40	$425,000
Backfill Placement	10625	CY	$10	$106,250
Compaction Testing	40	ea.	$200	$8,000
				$539,250
Supplemental Plans				
SWPPP & Implementation	1	LS	$150,000	$150,000
HASP	1	LS	$5,000	$5,000
Traffic Management Plan	1	LS	$5,000	$5,000
Air and Dust Management Plan and Implementation	1	LS	$80,000	$80,000
				$240,000
			Construction Subtotal	**$2,937,516**
			15% Markup	**$348,758**
			Construction Subtotal	**$3,286,274**
PROJECT MANAGEMENT & REPORTING				
Project Management and Reporting				
Project Management	120	hrs	$235	$28,200
Remedial Action Completion Report	1	LS	$40,000	$40,000
Meetings	2	LS	$1,000	$2,000
			Project Management & Reporting Subtotal	**$70,200**
Estimated Capital Cost Subtotal				$3,406,474
20% Contingency				$681,295
Total Estimated Capital Cost and Contingency				**$4,088,000**

Notes and Assumptions:

(1) Excavation assumes 15 feet deep soil excavation across entire 19,125 SF Site
(2) Low concentrations of VOCs, organocholorine pesticides, and metals.
(3) 20% contingency added to account for failed sidewall step-outs in known areas
(4) Bank CY to CY conversion includes 15% fluff factor
(5) CY to Ton conversion factor of 1.5
(6) Estimate includes 25% non-RCRA disposal contingency to account for previously unantipicated discovery of contamination

Acronym/Abbreviations	Definition
LS	Lump Sum
hrs	Hours
SF	Square Feet
CY	Cubic Yards
RCRA	Resource Conservation and Recovery Act
Non-RCRA	California Hazardous Waste
Class I	Hazardous Waste
Class II	Non-Hazardous Waste
ea.	Each

COST ESTIMATE BREAKDOWN

2550 Irving Street
San Francisco, CA
Alternative 3 – Vapor Intrusion Mitigation Systems, Land Use Covenant, and Operations and Maintenance

Description	Quantity	Units	Unit Cost	Cost
VIMS Design and Installation				
VIMS Design	1	LS	$30,000	$30,000
Geovent Piping	825	LF	$24.73	$20,406
Vapor Barrier	15,000	SF	$5.62	$84,300
Vent Risers	3	Each	$12,700	$38,100
Gravel Layer	15,000	SF	$3.04	$45,600
Inspections	20	ea.	$1,350.00	$27,000
			Construction Subtotal	**$245,406**
			12% Markup	**$29,449**
			Construction Subtotal	**$274,855**
PROJECT MANAGEMENT, OPERATIONS & MAINTENANCE				
Project Management and Reporting				
Project Management	20	hrs	$235	$4,700
Response Plan Implementation Report and O&M Plan	1	LS	$15,000	$15,000
O&M Implementation				
Annual Inspections Reports	24	ea.	$5,000	$120,000
Five-Year Review Reports	6	ea.	$7,500	$45,000
Semi-Annual Sampling Event	4	ea.	$10,000	$40,000
Bi-Annual Sampling Event	14	ea.	$10,000	$140,000
DTSC Annual Inspection Review	24	ea.	$2,884	$69,216
DTSC Five Year Review	6	ea.	$7,042	$42,252
Unexpected Condition Sampling (i.e. Earthquake, VIMS Damage, etc.)		%	10%	$45,647
Meetings	2	LS	$1,000	$2,000
		Project Management & Reporting Subtotal		**$523,815**
Total Estimated Capital Cost and Contingency				**$799,000**

Notes and Assumptions:

(1) Gas Barrier: Liquid Boot Plus 60 mil over VI20 with (1) layer of G1000 below and (1) layer above barrier.
(2) Vent Piping: GeoVent low profile venting with (2) fresh air vent inlets
(3) Vent Risers: (3) 3” cast iron from slab through roof (offset only at roof level)
(4) 6” Gravel: ¾” gravel

Acronym/Abbreviations	Definition
LS	Lump Sum
yrs	Years
hrs	Hours
SF	Square Feet
ea.	Each
%	Percentage of Total O&M Activities

Appendix D

Vapor Intrusion Mitigation System Design Plans

NOTES:

The vapor intrusion mitigation system (VIMS) for the proposed development is being designed in accordance with the Department of Toxic Substances Control (DTSC) Vapor Intrusion Mitigation Advisory (VIMA).

VAPOR INTRUSION MITIGATION SYSTEM (VIMS)
A sub-slab venting system (SSV) will be installed below an impermeable vapor mitigation membrane barrier.

In accordance with the VIMA, the SSV system is intended to require minimal operations and maintenance activities. The SSV system will consist of a layer of permeable aggregate material that will be placed below an impermeable vapor mitigation membrane barrier. The impermeable membrane will be installed wherever the building is in contact with the earth, but not at foundation footings and grade beams. Above the impermeable membrane shall be a protection course. All elevator pits, sumps, tanks, and vaults shall be lined with the same impermeable membrane. This system shall double as the subterranean waterproofing membrane.

The SSV system vents soil gas from the sub-slab to the atmosphere. A series of horizontal vapor collection pipes will be installed within the sub-slab permeable aggregate layer. The horizontal vapor collection pipes will be connected to vertical ventilation pipes that terminate at roof level with wind-driven turbine fans. Each vertical ventilation pipe shall be fitted with a monitoring port to allow for post-construction operation and maintenance monitoring.

SMOKE TEST CRITERIA
All gas membranes shall be smoke tested in accordance with the following protocol and certified 'gas tight' by the engineer prior to approval:

1. The gas membrane shall be visually inspected. Any apparent deficiencies and/or installation problems shall be corrected prior to smoke testing.
2. The date, time, address, tract#, lot#, temperature, humidity, barometric pressure, wind speed/direction and cloud cover shall be recorded on the smoke test inspection form by the engineer. The ambient air temperature at the time of testing should be in excess of 45F and the wind speed at ground level should be 15 mph or less. (Note: Visual identification of leaks becomes more difficult with increasing wind speed)
3. Assemble/connect smoke testing system to sub-slab vent riser (Alternative A) OR configure smoke testing system to inject smoke beneath the membrane through a temporary gas tight boot or sleeve attached to the membrane (Alternative B). Only inert, non-toxic smoke is to be utilized for the membrane smoke test.
4. Activate smoke generator / blower system @ nominal 150 cfm to 50 cfm flow rate and 2.0" H2O minimum duct pressure with vent riser outlet(s) uncapped. Note: Minimum 2" H2O duct pressure should be measured at or near blower outlet. Continue to purge system for 60 seconds after smoke begins to emerge from vent outlet(s).
5. Cap vent outlet(s). Adjust smoke generator / blower control valve to .1" to 2" H2O over-pressure in vent piping system. Alternative A only. Blower / Smoke generator system should be capable of sufficient pressure and flow to induce slight (i.e. = -") lifting of membrane. Monitor membrane for lifting. Reduce pressure / flow rate if excessive lifting occurs.
6. Select one membrane coupon sampling location for every 500 ft2 of membrane area. Select sampling locations so as to (1) facilitate purging of fresh air pocket from beneath membrane; and (2) provide a representative test location for confirmation of membrane thickness. Not applicable for sheet good membrane.
7. Label membrane coupons. Mark coupon location/designation on floor plan. Marked-up floor plan to be included with smoke testing inspection form.
8. Confirm adequate flow of smoke from coupon sampling location. Low rate of smoke flow may be indicative of poor communication between vent piping gravel backfill and base of membrane for Alternative A (i.e. dirt placed above trench gravel). If low rate of smoke flow from coupon sampling location(s) occurs, use Alternative B described under item #3 above for smoke injection. (Note: At least localized continuity at the sand or gravel between the vent lines and the base of the membrane should be confirmed prior to membrane installation) (if applicable).
9. Temporary seal at the membrane sampling locations after purging mark coupon sampling location with fluorescent green paint. Repair sampling locations per manufacturer's specifications following completion of test.
10. Maintain operation of smoke generator/blower system for at least 15 minutes following purging of membrane. Thoroughly inspect the entire membrane surface. Use fluorescent green paint to mark/label any leak locations. Mark/label all leak locations on the floor plan which is to be included with the smoke testing inspection form.
11. Repair leak locations marked in step #10 per manufacturer's specifications.
12. Repeat step #10 and #11, as necessary, to confirm integrity of membrane.
13. For areas adjacent to where the existing and new membranes have been overlapped, the frequency of smoke testing shall be increased to sufficiently test the area. The testing frequency will be at the discretion of the VIMS inspector.
14. Prepare smoke testing inspection form. Notes to include date, tract#, lot#, name of VIMS engineer, name of person who performed the test, number of leaks identified, distribution of leaks identified (i.e. tears, pin-holes or thin sections, seam leaks, boot leaks, (etc.), and building floor plan with leak location, coupon locations and test perforation locations. The inspection form is to be signed and stamped by the engineer/inspector.
15. Install a permanent weather-proof tag on front-most vent rise confirming completion of smoke testing and approval of membrane (if applicable).
    Tag should include:
    "Smoke Test OK"
    <tract# and lot# or address>
    <date>
    <time>
    <name of tester>
16. Disassemble/load smoke testing hardware. Confirm no equipment, materials, trash, etc. left at site.

INSPECTIONS
The inspection and periodic observations of membrane and vapor control measures shall be performed by the vapor barrier engineer (i.e. the engineer or their designee). At a minimum, inspection/observation shall take place at the following stages of the installation:

- During the installation of the (sub-slab) horizontal vapor collection pipes.
- After backfilling of the (sub-slab) horizontal vapor collection pipes.
- During the installation of the (sub-slab) impermeable vapor mitigation membrane barrier.
- After the installation of the (sub-slab) impermeable vapor mitigation membrane barrier (prior to backfilling). The impermeable vapor mitigation membrane barrier shall be smoke tested at this time in accordance with note 7. These tests shall be documented in the as-built report.
- At all field repairs, including as assessment of any repaired liner for surrounding latent damage.
- During the placement of the protection course.
- Immediately prior to placement of foundation concrete.
- During, and at the completion of the vertical ventilation pipe installation.
- At the completion of construction prior to the issuance of the system certification and certification of occupancy.

ITEMS TO BE DESIGNED BY OTHERS AND COORDINATED WITH VAPOR INTRUSION PLAN

- Architect/plumbing engineer to design routing of vertical ventilation pipes through building to roof.
- Contractor shall coordinate in field with building design team regarding all underground utilities.

2550 IRVING STREET
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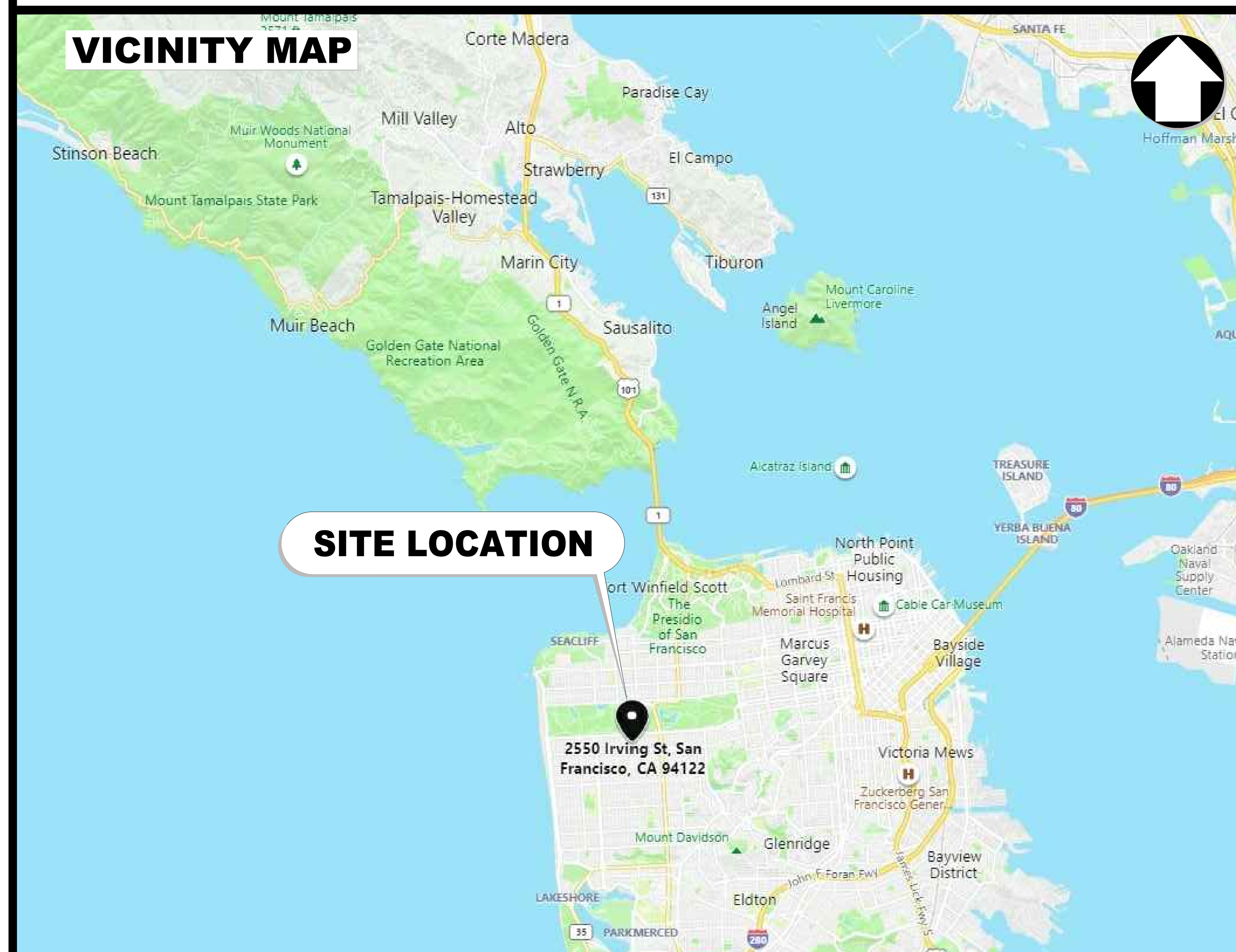
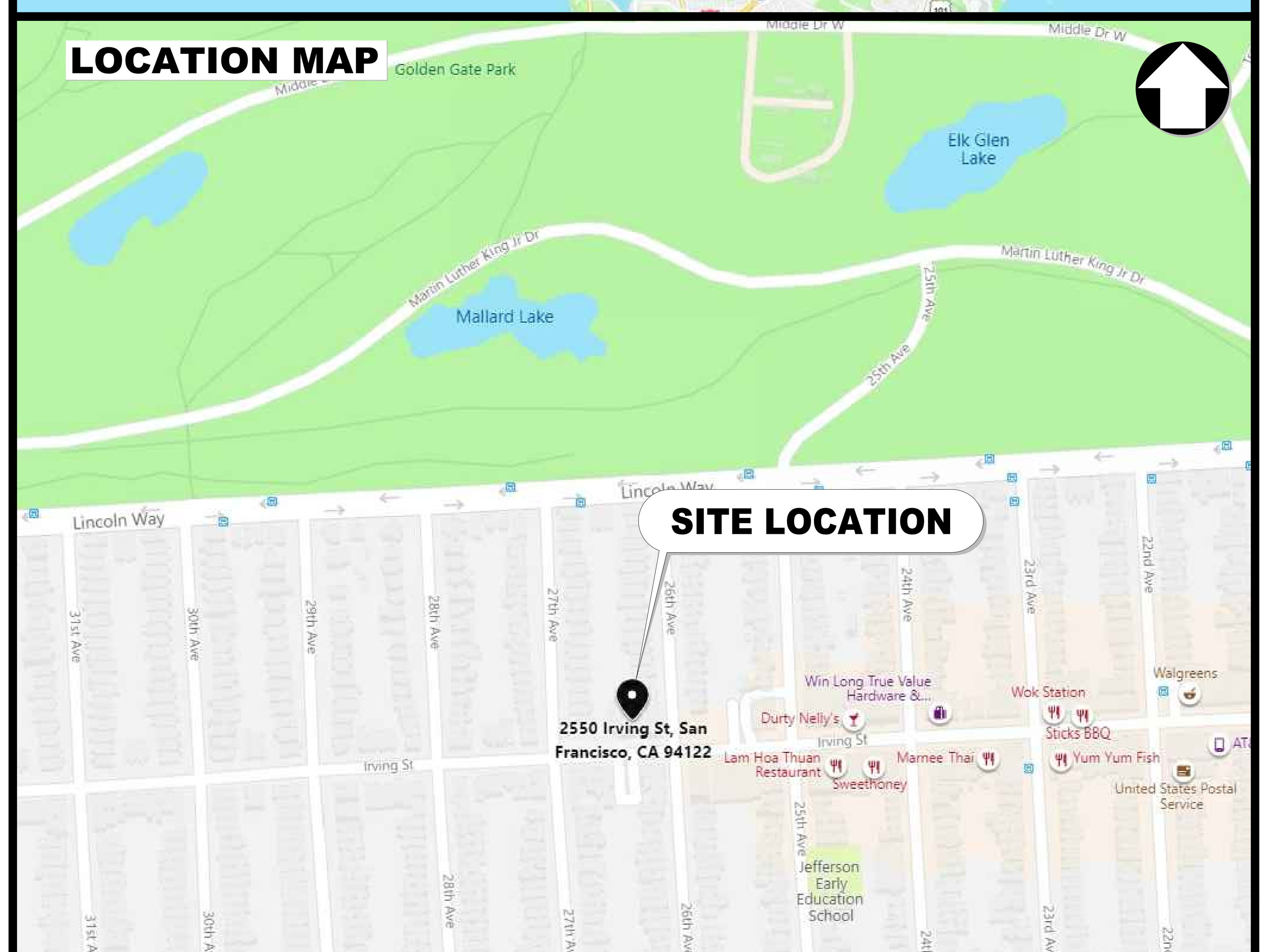
PROJECT DESCRIPTION: MIXED-USE
STORIES ABOVE GRADE: 7
STORIES BELOW GRADE: 0

VAPOR INTRUSION MITIGATION SYSTEM





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2550 IRVING STREET
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STATE OF CALIFORNIA

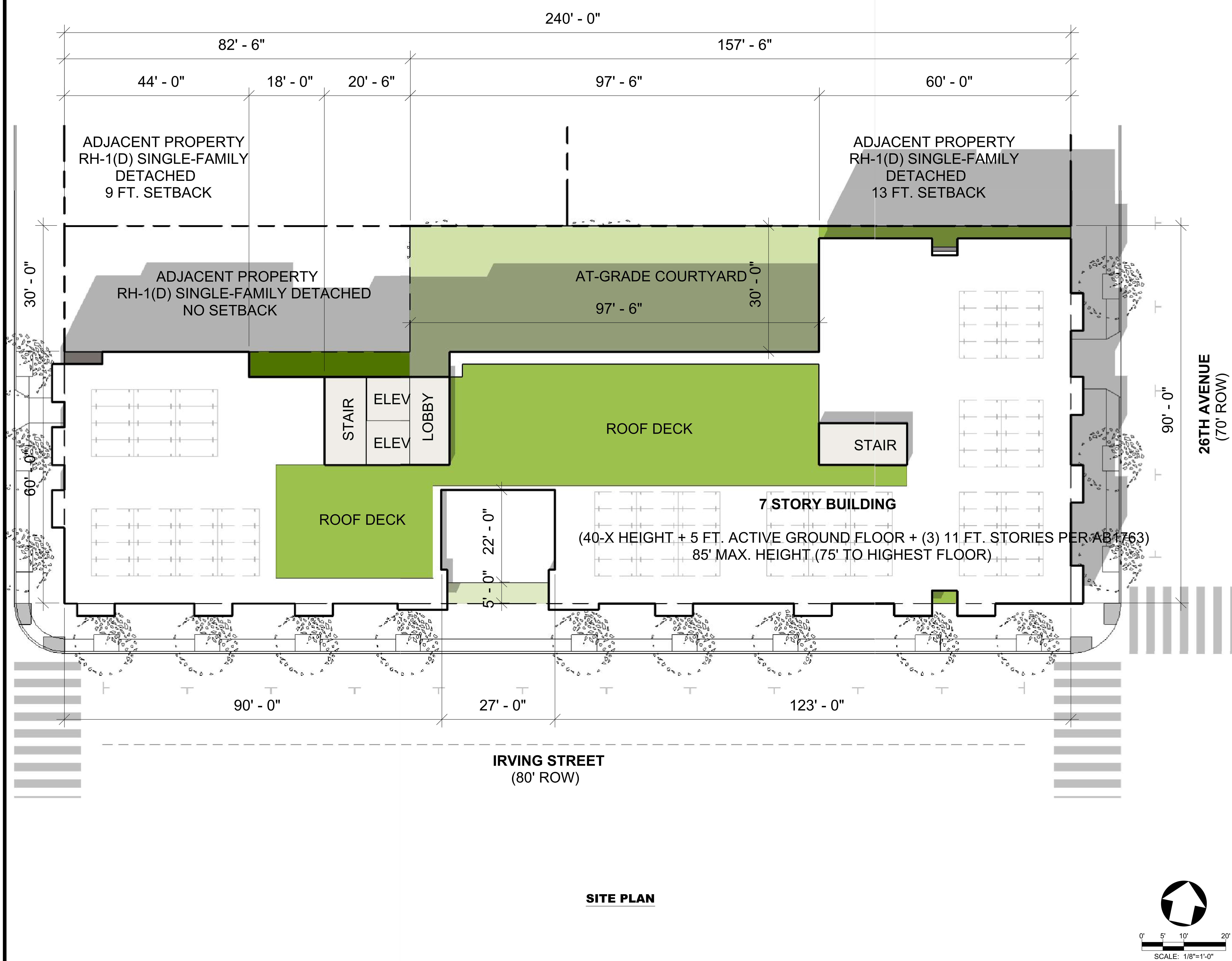
REVISIONS
Date

SHEET TITLE
TITLE SHEET, MAPS AND MITIGATION NOTES

DATE
MARCH 22, 2021

PROJECT NUMBER
2020-116

SHEET NUMBER
GM-1.0



SITE PLAN

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SITE PLAN
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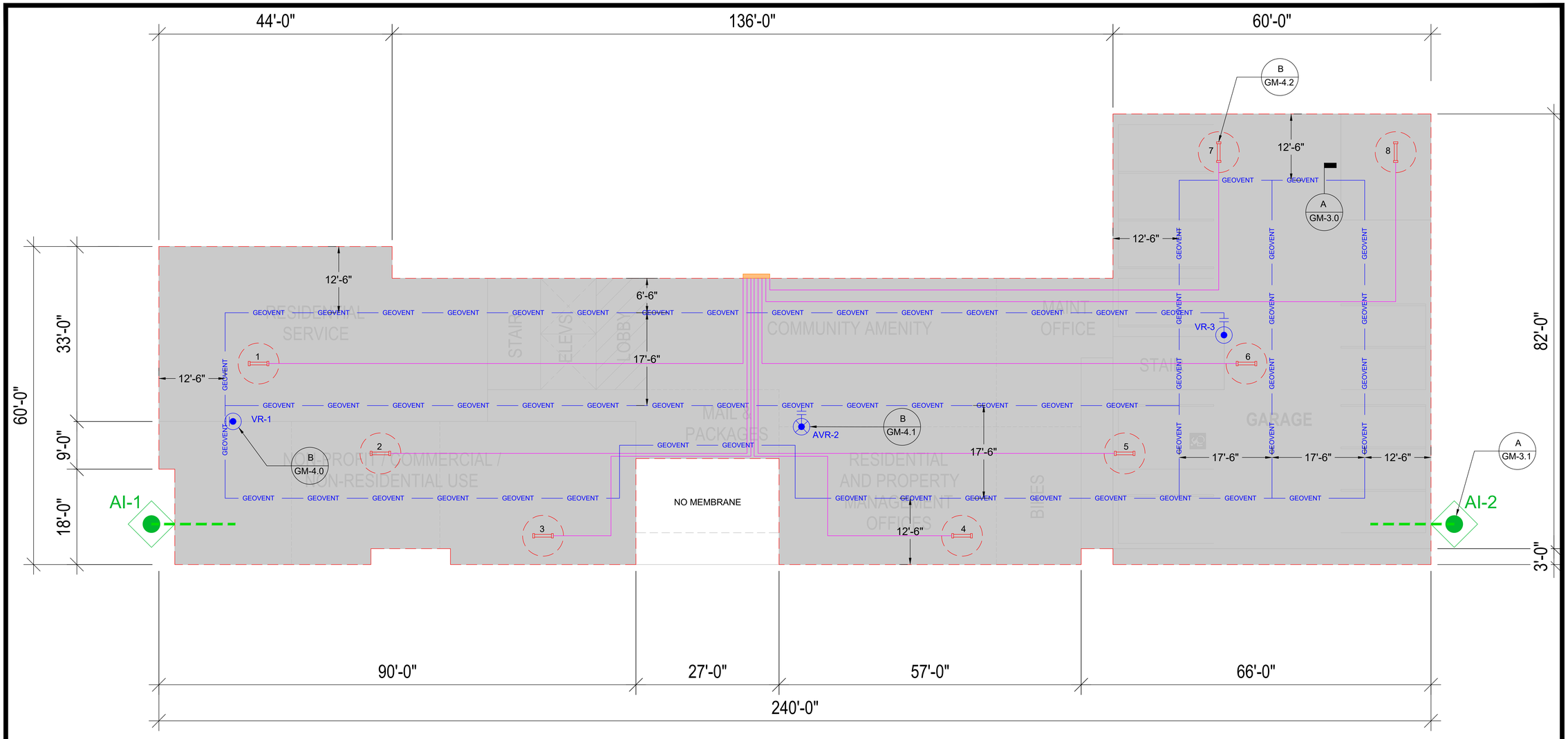
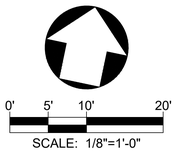
GM-2.0





SUBSLAB VENT PIPE AND VENT RISER PLAN

NOTE:

1. WRAP ALL PIPE AND FITTINGS EMBEDDED IN CONCRETE WITH 1/8" FOAM WRAP.
2. SEE ARCHITECTURAL/ PLUMBING PLANS FOR VENT RISER VENT PIPE ROUTING THROUGH BUILDING.
3. ALL VENT RISER LOCATIONS SHALL BE STUBBED UP 12" ABOVE SLAB.
4. CONTRACTOR TO VERIFY SUMPS, TANKS, VAULTS AND ELEVATORS QUANTITIES AND LOCATIONS.
5. ALL ELECTRICAL AND COMMUNICATION CONDUITS EMANATING FROM THE EARTH SHALL BE SEALED PER DETAIL A/GM-5.0

FRESH AIR INLET CALCULATIONS:

1 FRESH AIR INLET FOR EVERY 10,000 S.F. OF BUILDING FOOTPRINT AND 1 FOR EVERY 10,000 S.F. THEREAFTER.

BUILDING FOOTPRINT = 14,967 S.F.

TOTAL FRESH AIR INLETS REQUIRED = 2

QUANTITIES LEGEND:

BUILDING FOOTPRINT - 14,967 S.F.
MEMBRANE - 14,967 S.F.
VENT PIPE - 825' L.F.
VENT RISERS - 3
VAPOR PROBES - 8

VENT RISER CALCS:

2 VENT RISERS FIRST 10,000 SQ. FT. THEN 1 EVERY 10,000 SQ. FT. THEREAFTER.

BUILDING FOOTPRINT = 14,967 SQ. FT.

14,967 - 10,000 = 4,967 ÷ 10,000 = 0.49

MINIMUM NUMBER OF VENT RISERS REQUIRED - 3

LEGEND

- MEMBRANE FIELD
- VR-2 — 2" CAST IRON VENT PIPE
- AVR-1 — 2" CAST IRON VENT RISER WITH BLOWER (OPTIONAL)
- GEOVENT — FLAT PIPE TO ROUND PIPE TRANSITION
- GEOVENT — FLAT PIPE PRESSURE RELIEF, COLLECTION, AND VENTING SYSTEM
- 8 — SUB-SLAB SOIL GAS PROBE
- WALL-MOUNTED PROBE ENCLOSURE
- AI-2 — 4" PVC PIPE FRESH AIR INLET

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SUBSLAB VENT PIPE AND VENT RISER PLAN

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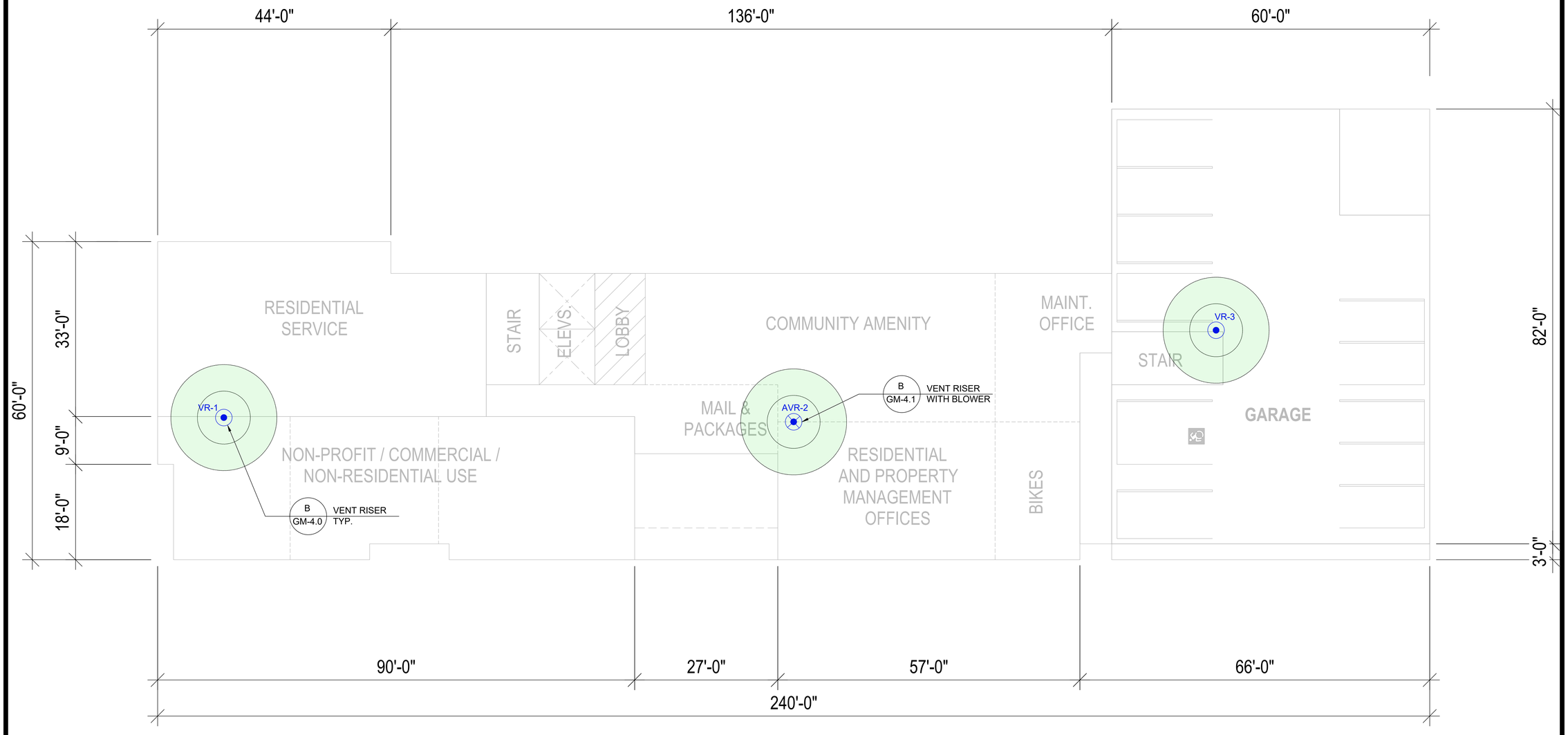
PROJECT NUMBER
2020-116

SHEET NUMBER
GM-2.1



VENT RISER ROOF TERMINATION PLAN

0' 5' 10' 20'

SCALE: 1/8"=1'-0"

NOTE:

1. WRAP ALL PIPE AND FITTINGS EMBEDDED IN CONCRETE WITH 1/8" FOAM WRAP.
2. SEE ARCHITECTURAL/ PLUMBING PLANS FOR VENT RISER VENT PIPE ROUTING THROUGH BUILDING.
3. ALL VENT RISER LOCATIONS SHALL BE STUBBED UP 12" ABOVE SLAB.
4. CONTRACTOR TO VERIFY SUMPS, TANKS, VAULTS, AND ELEVATORS QUANTITIES AND LOCATIONS.

LEGEND

VR-2 — 2" PASSIVE CAST IRON VENT RISER

AVR-1 — 2" ACTIVE CAST IRON VENT RISER WITH BLOWER

VENT RISER HORIZONTAL RUN FROM LEVEL BELOW

10' MIN. RADIUS FROM OPERABLE AIR INTAKES, DOORS OR WINDOWS

5' MIN. RADIUS FROM ELECTRICAL DEVICES

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VENT RISER ROOF TERMINATION PLAN

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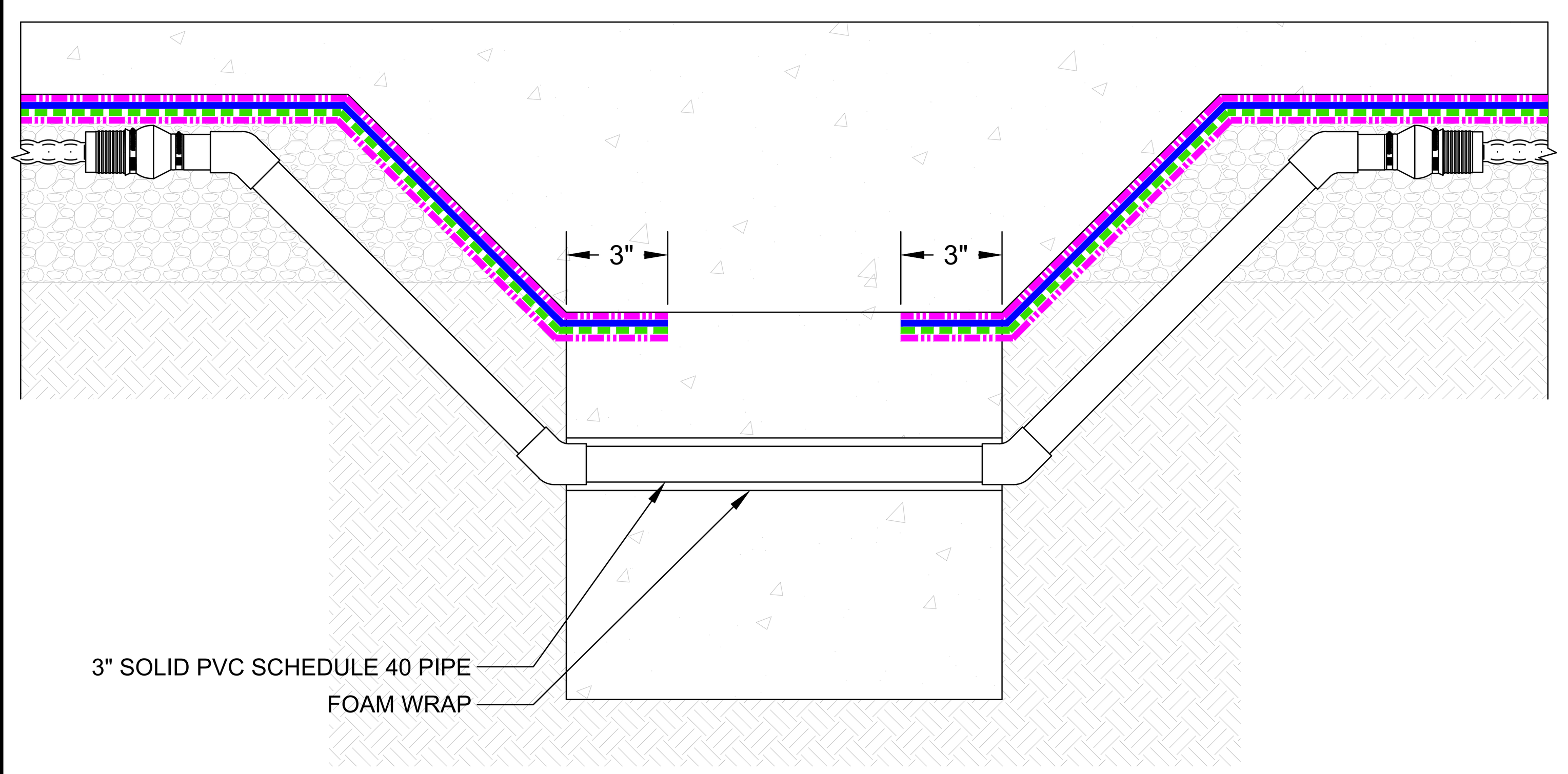
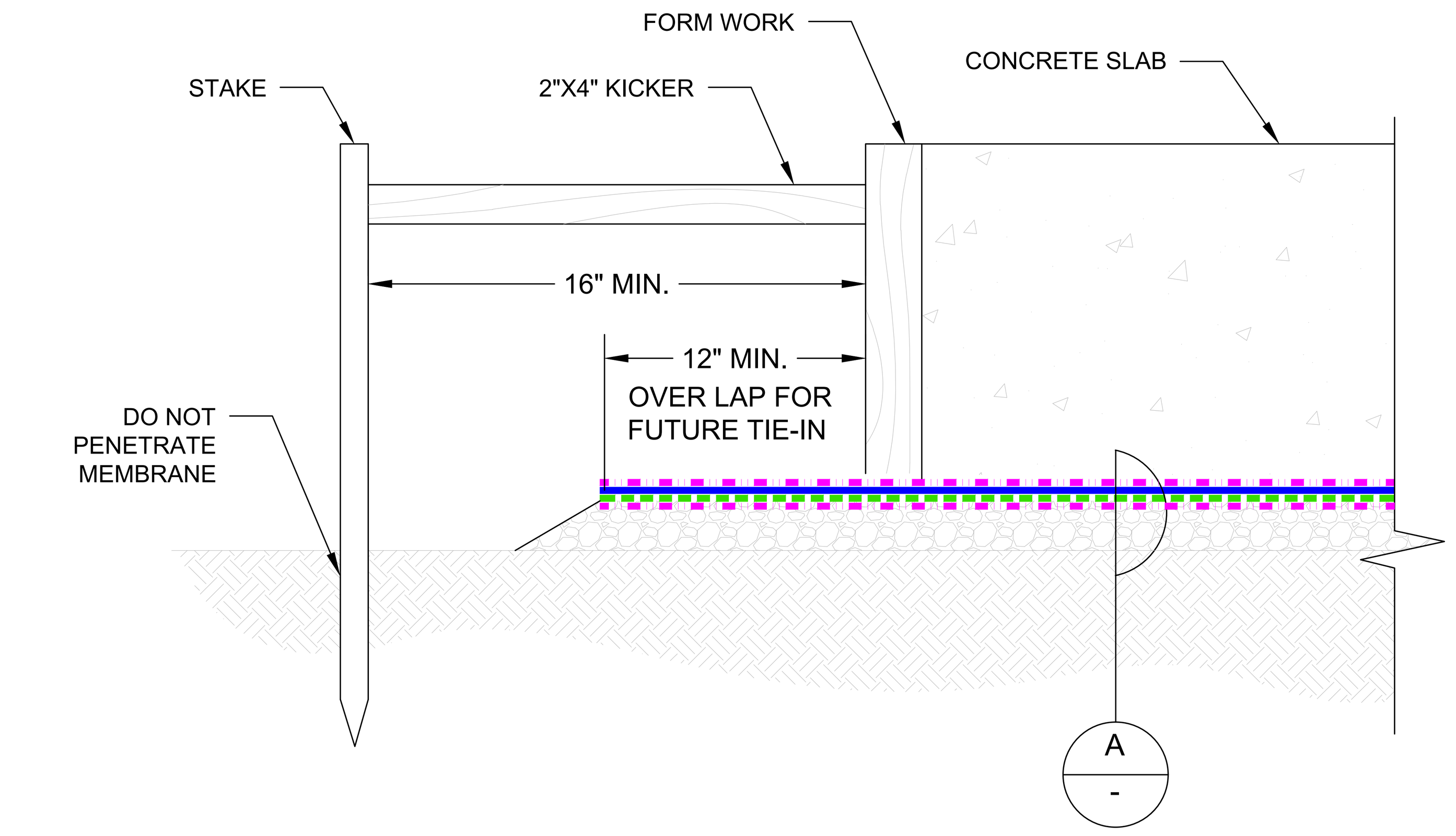
SHEET NUMBER
GM-2.2

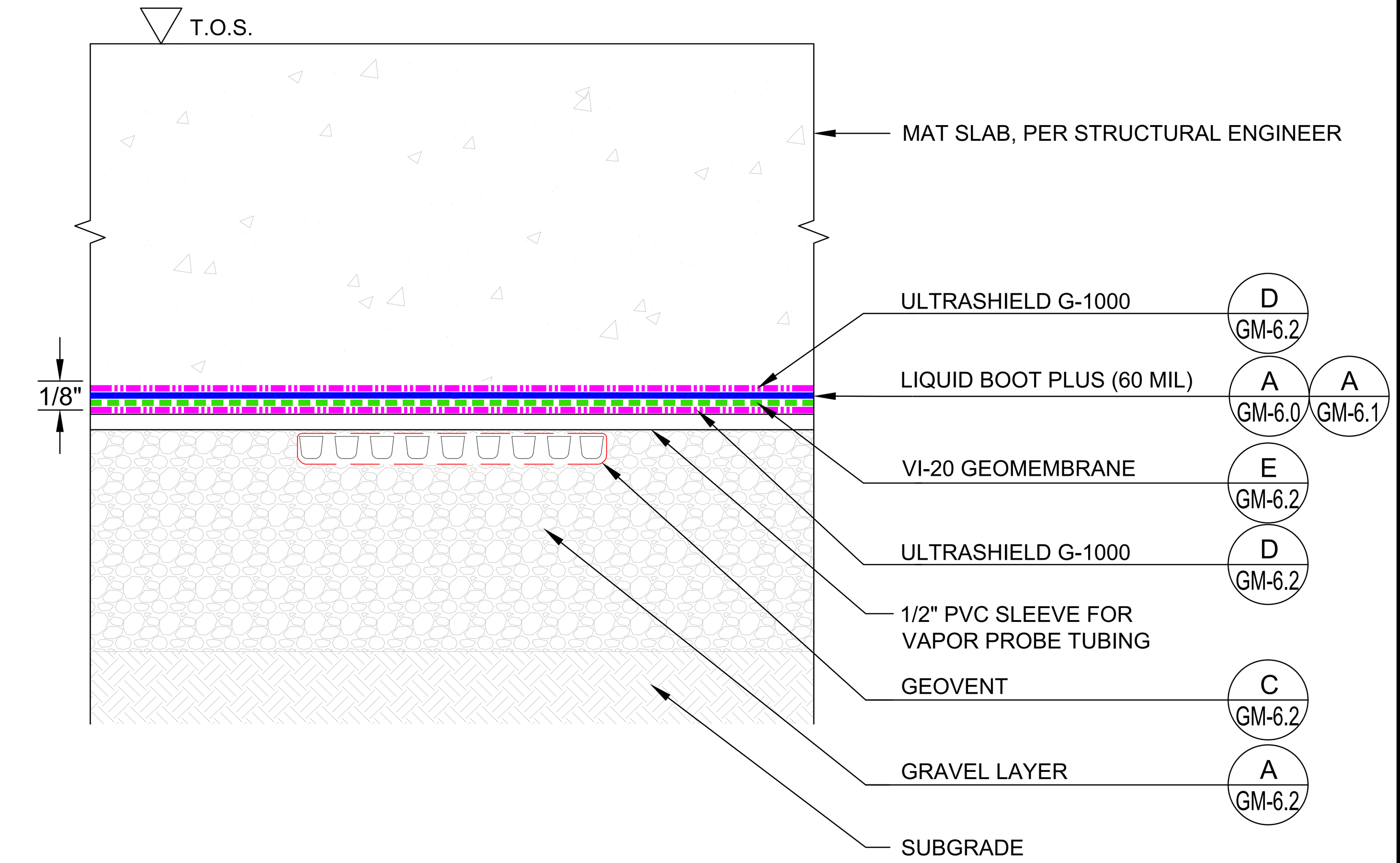


VENT PIPE THRU GRADE BEAM G



NOTES:
1. MINIMIZE PENETRATIONS THROUGH THE MEMBRANE WHENEVER POSSIBLE.
2. MEMBRANE SHALL BE PATCHED/ REPAIRED PER MANUFACTURER'S RECOMMENDATIONS WHEN FORM STAKES ARE REMOVED.
3. DETAILS ARE TYPICAL UNLESS NOTED OTHERWISE.

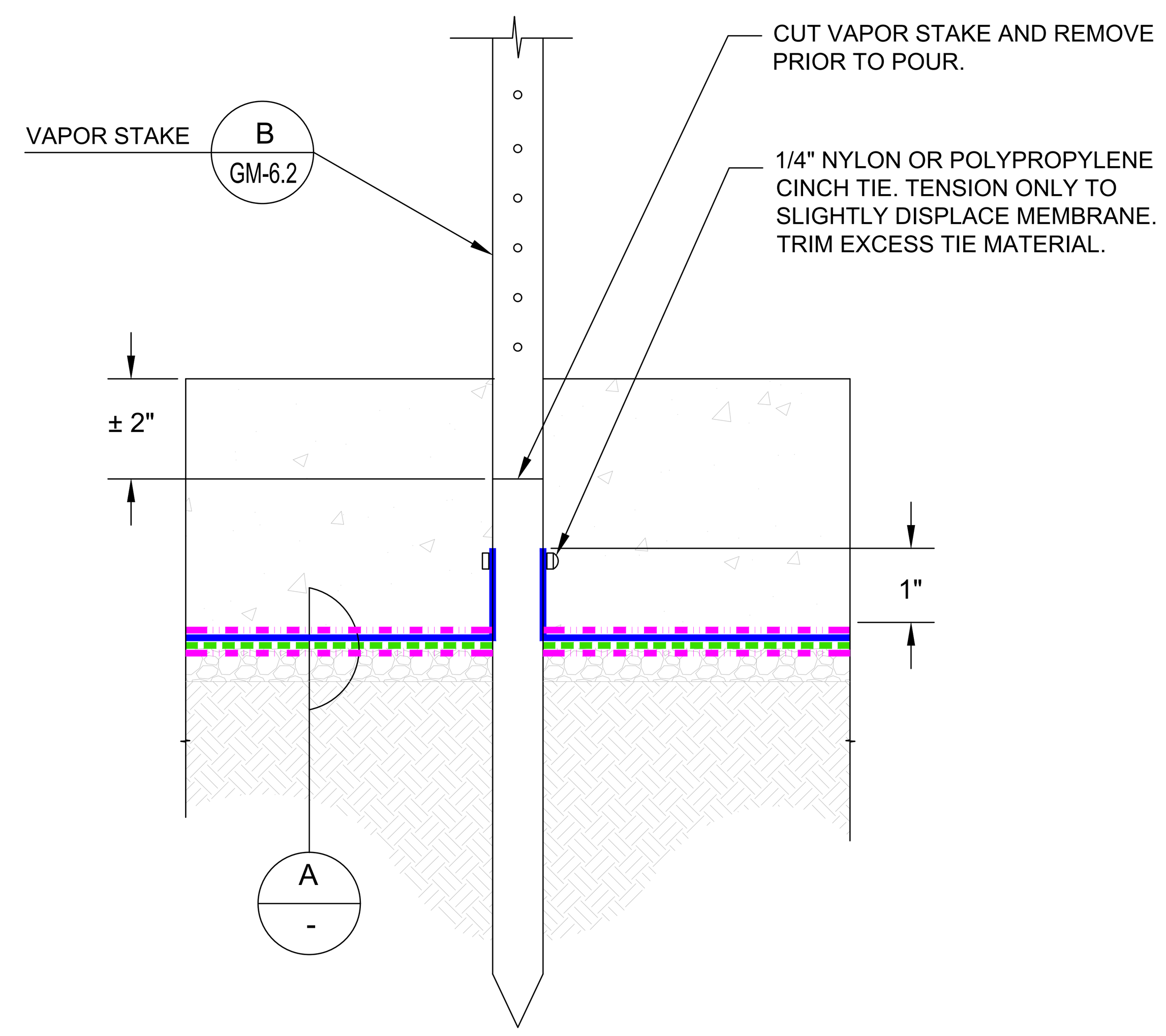
MEMBRANE AT FORM WORK D



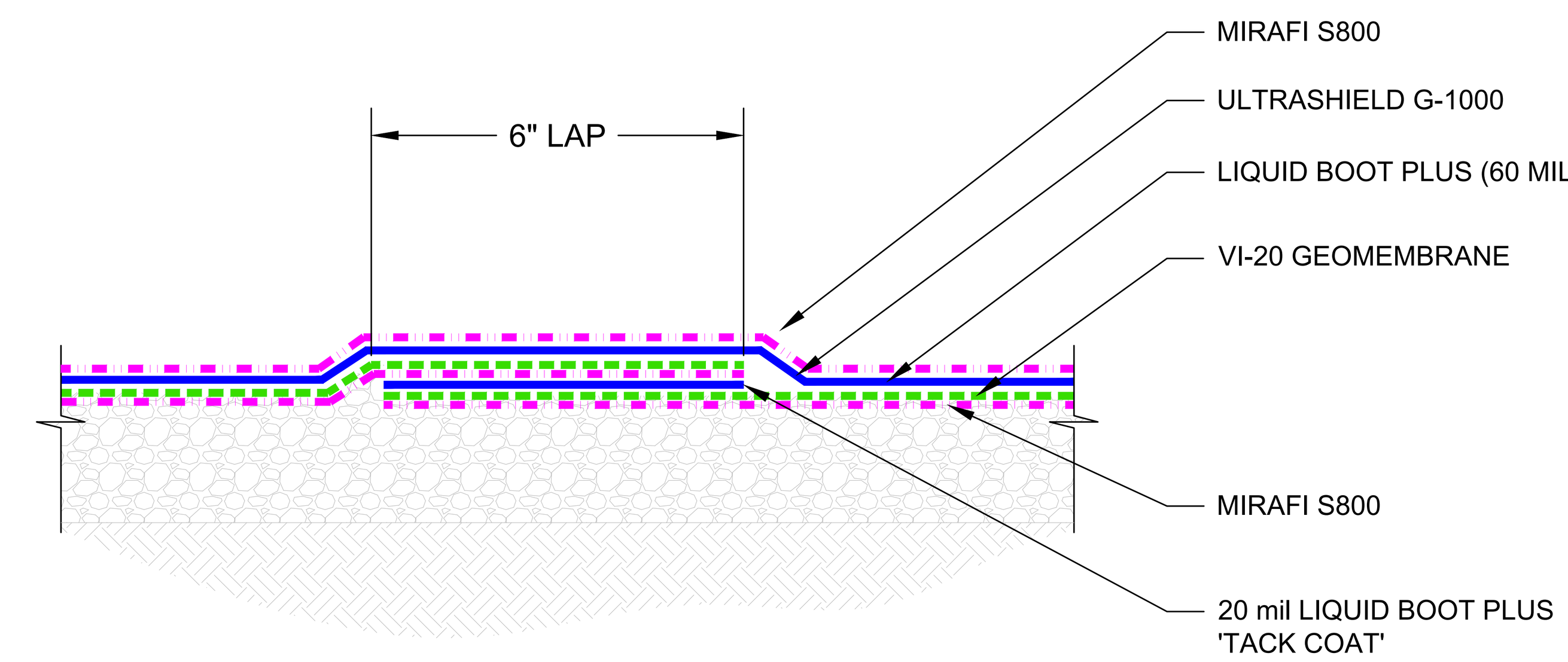
NOTES:
1. THERE SHALL BE NO PERFORATIONS WITHIN 12" OF ANY FOOTING/FOUNDATION UNLESS METAL CASING IS PROVIDED.
2. WHEN USING EQUIVALENT, REFERENCE MANUFACTURER SPECIFICATIONS FOR CORRECT DETAILING AND INSTALLATIONS.

SUBSLAB SECTION A

H



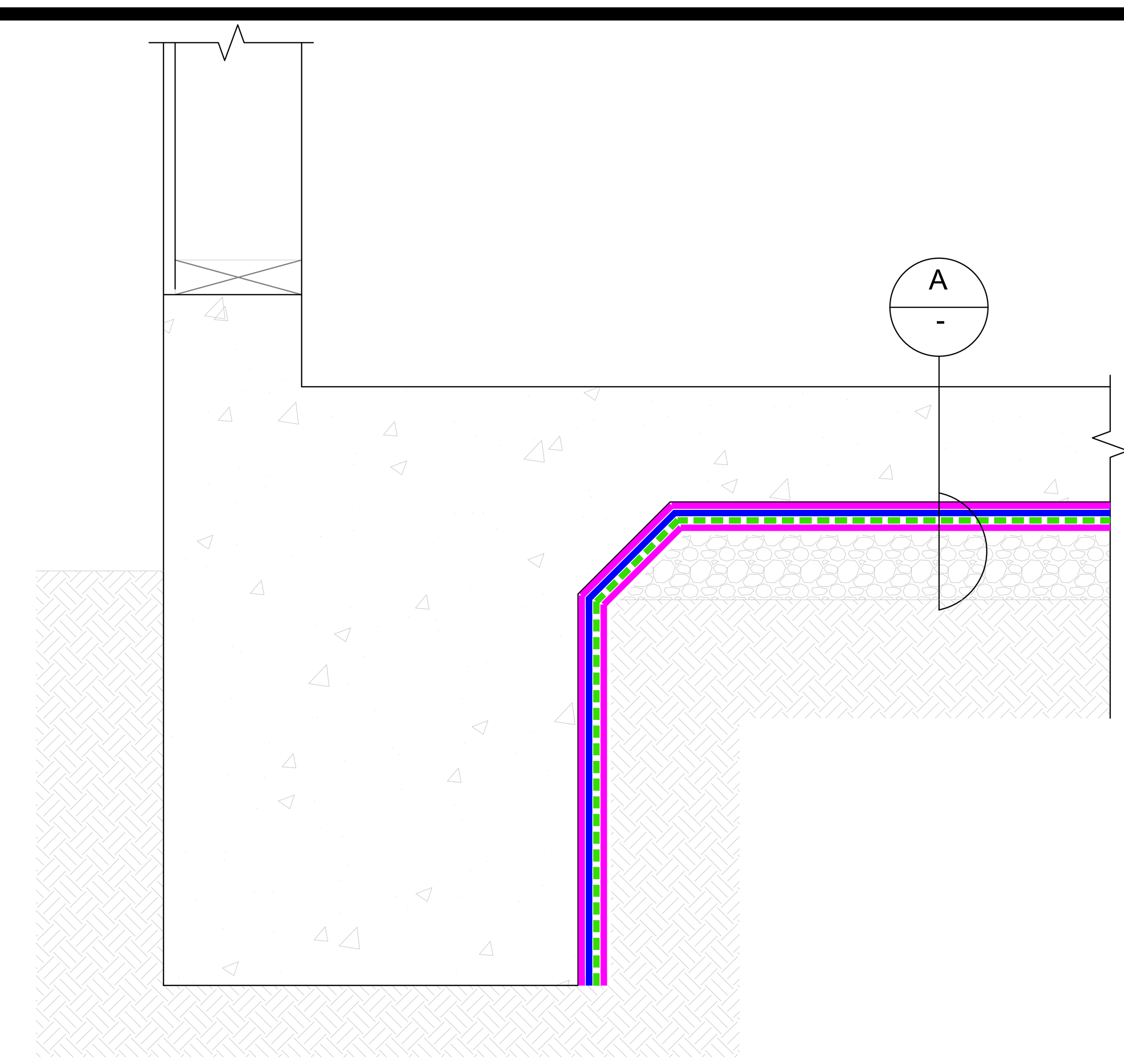
MEMBRANE AT VAPOR STAKE E



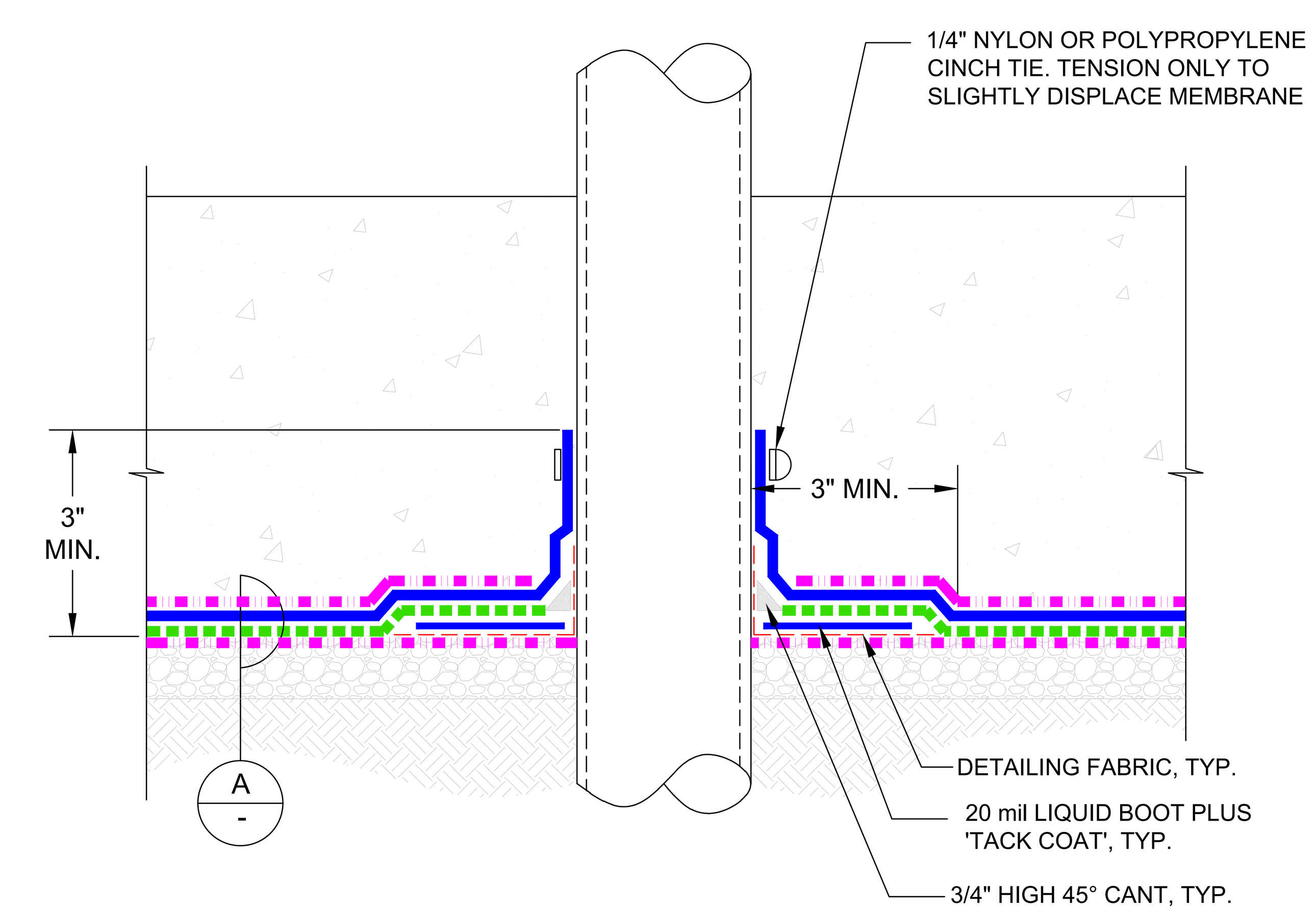
NOTES:
1. PROTECTION COURSE SEAMS MAY BE OVERLAPPED 4" MIN.
2. EVERY EFFORT SHOULD BE MADE TO STAGGER THESE SEAMS WITH MEMBRANE SEAMS.

MEMBRANE LAP AT SEAM B

J



MEMBRANE AT EXTERIOR FOOTING F



MEMBRANE AT PENETRATION C

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SHEET NUMBER
GM-3.0

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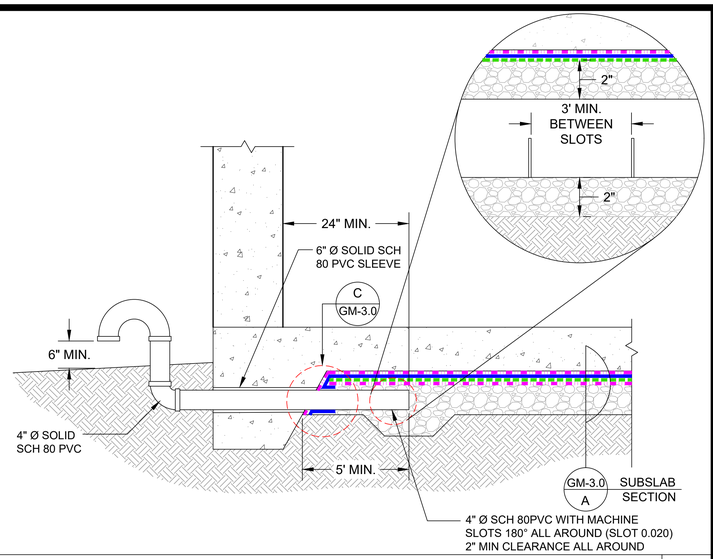
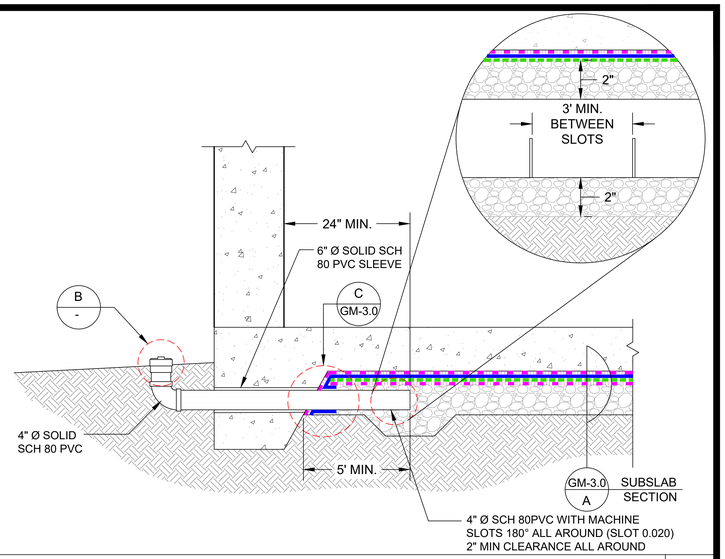


FRESH AIR INLET GOOSE NECK

D

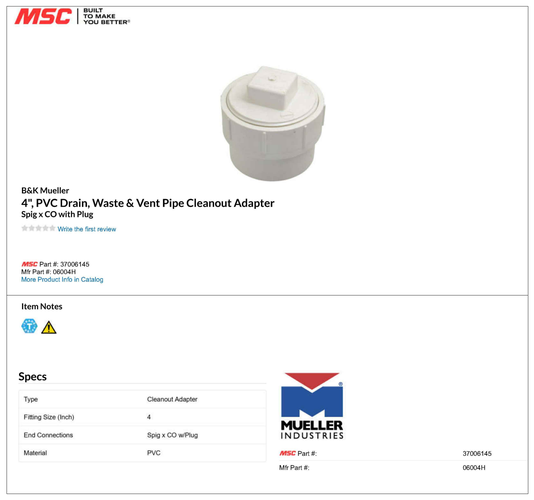


"CAPPED" FRESH AIR INLET

A

H

E



FRESH AIR INLET CAP

B

J

F

C

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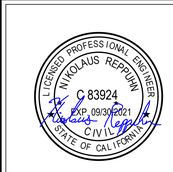

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FRESH AIR INLET DETAILS

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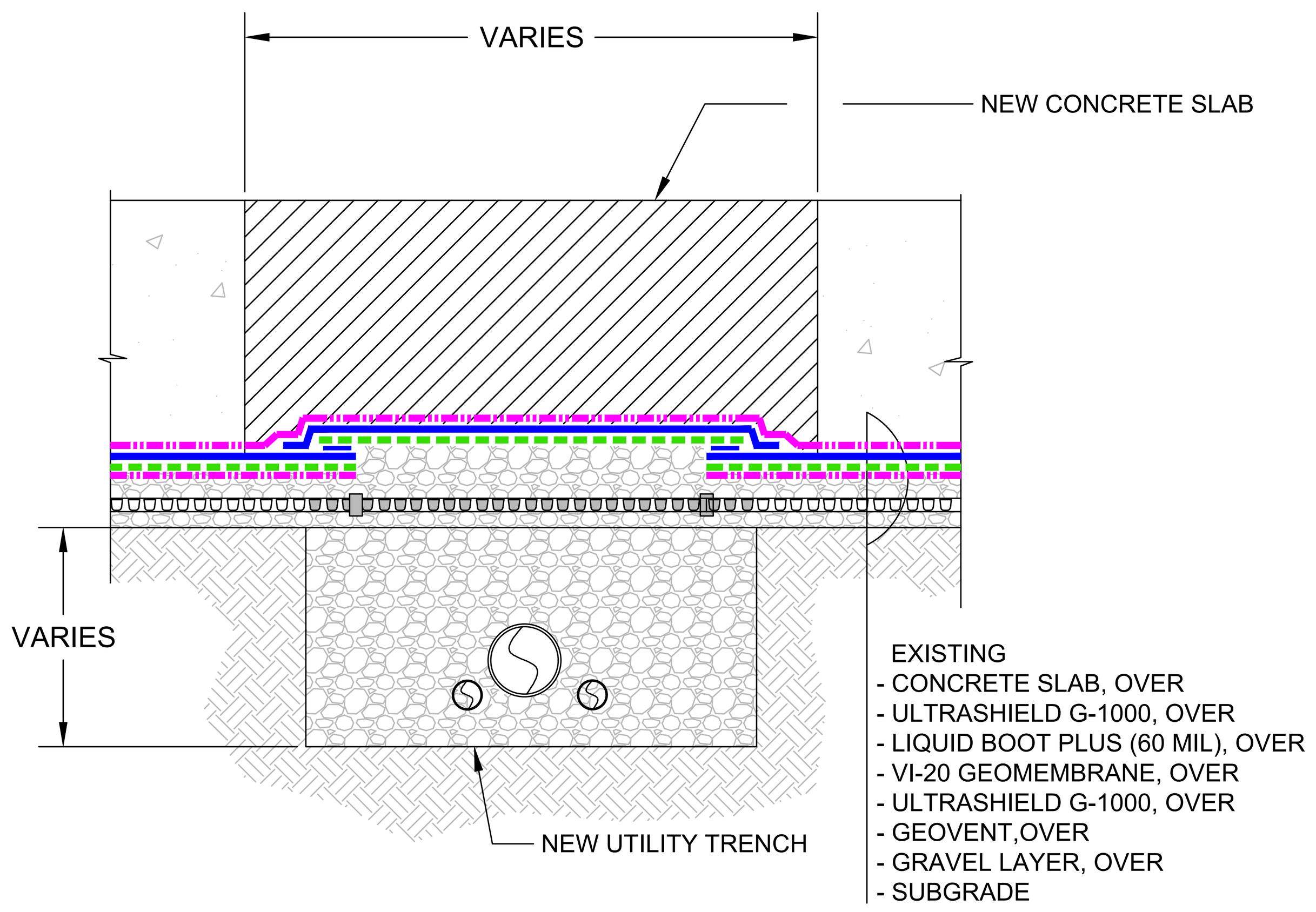
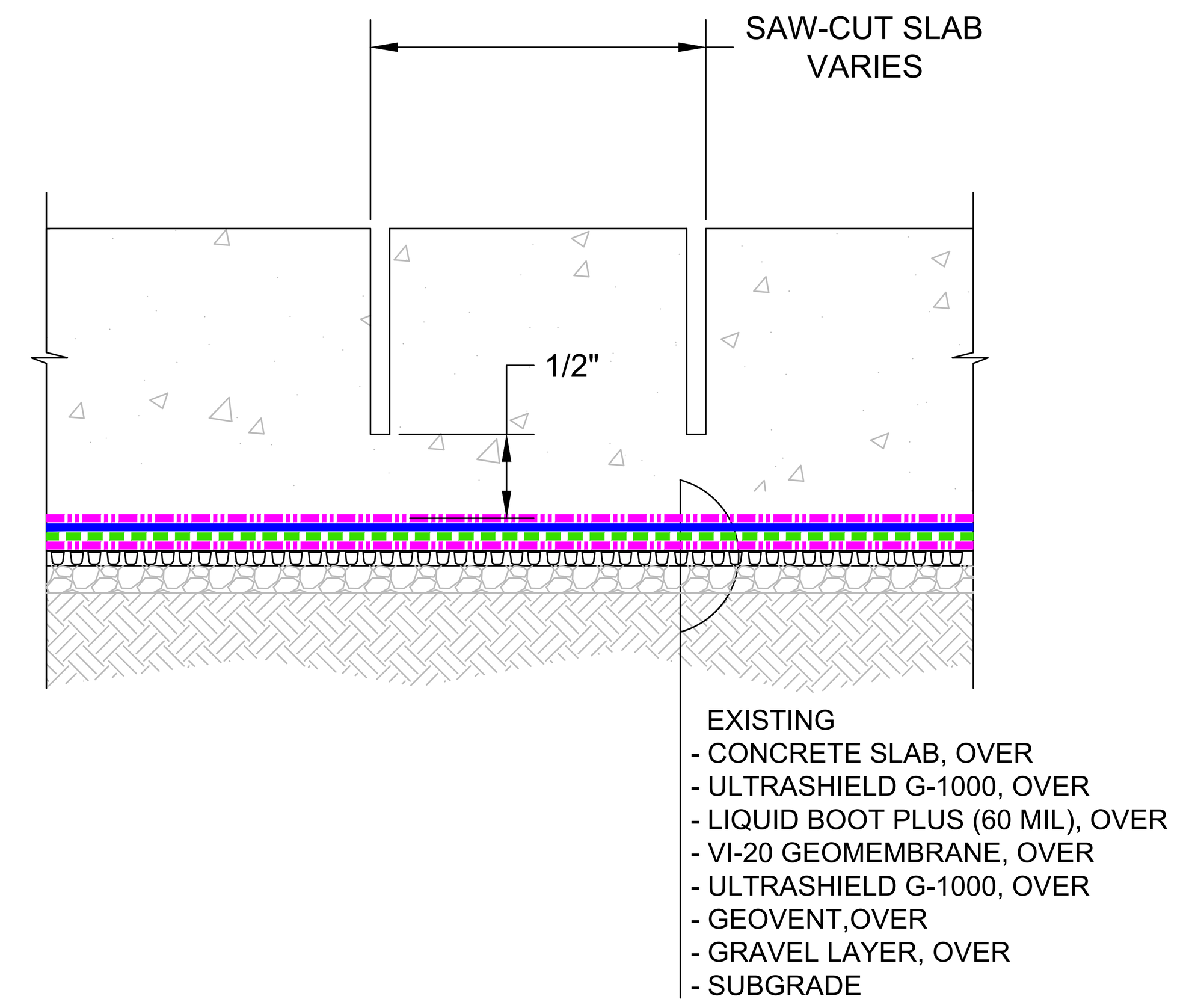


STEP 4

1. POUR NEW CONCRETE PATCH OVER NEW 10 oz. NON-WOVEN GEOTEXTILE.

MEMBRANE REPAIR DETAIL - STEP 4

D



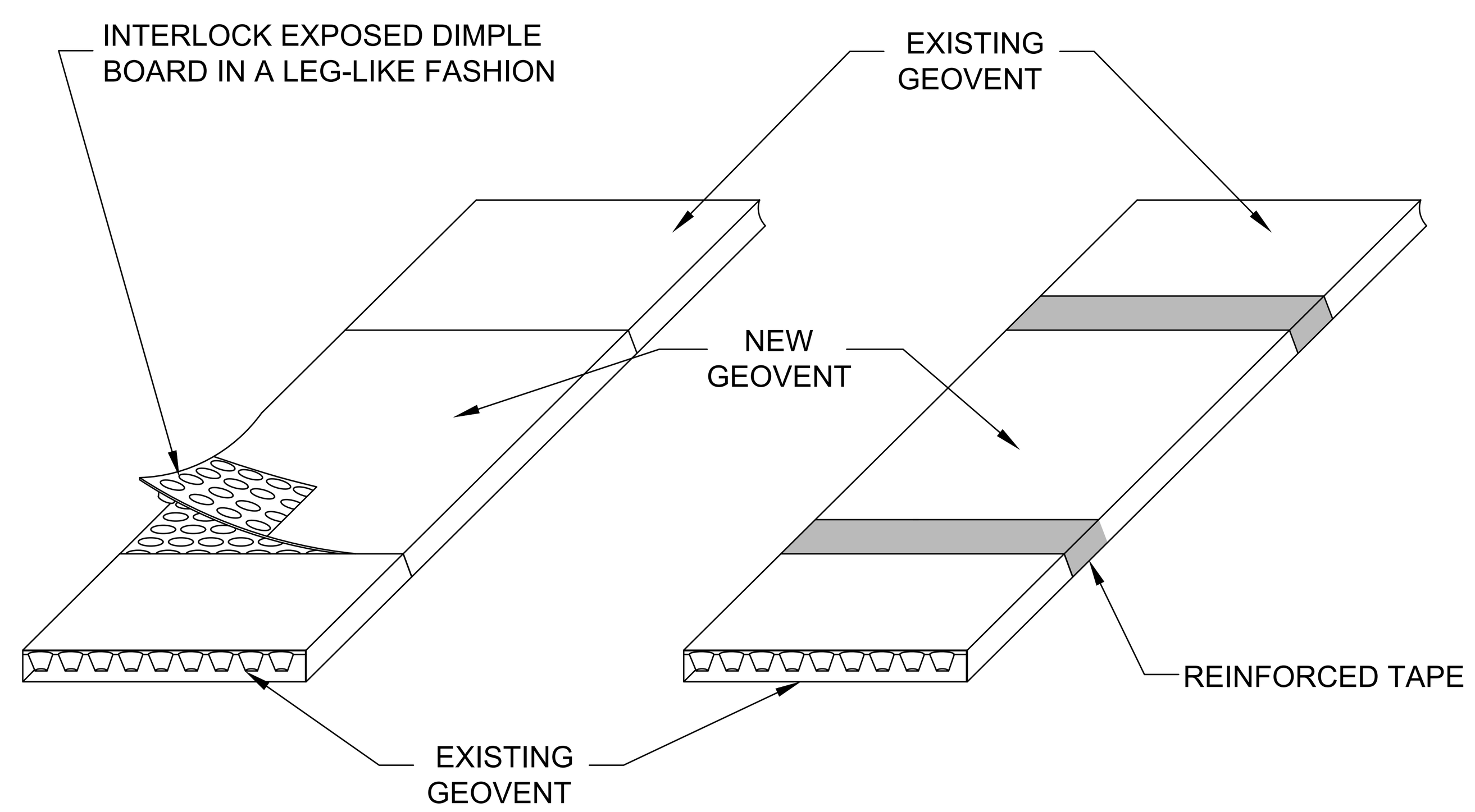
STEP 1

1. BREAK OUT CONCRETE AFTER SAW CUTTING SHORT OF FULL DEPTH OF SLAB.

MEMBRANE REPAIR DETAIL - STEP 1

A

G

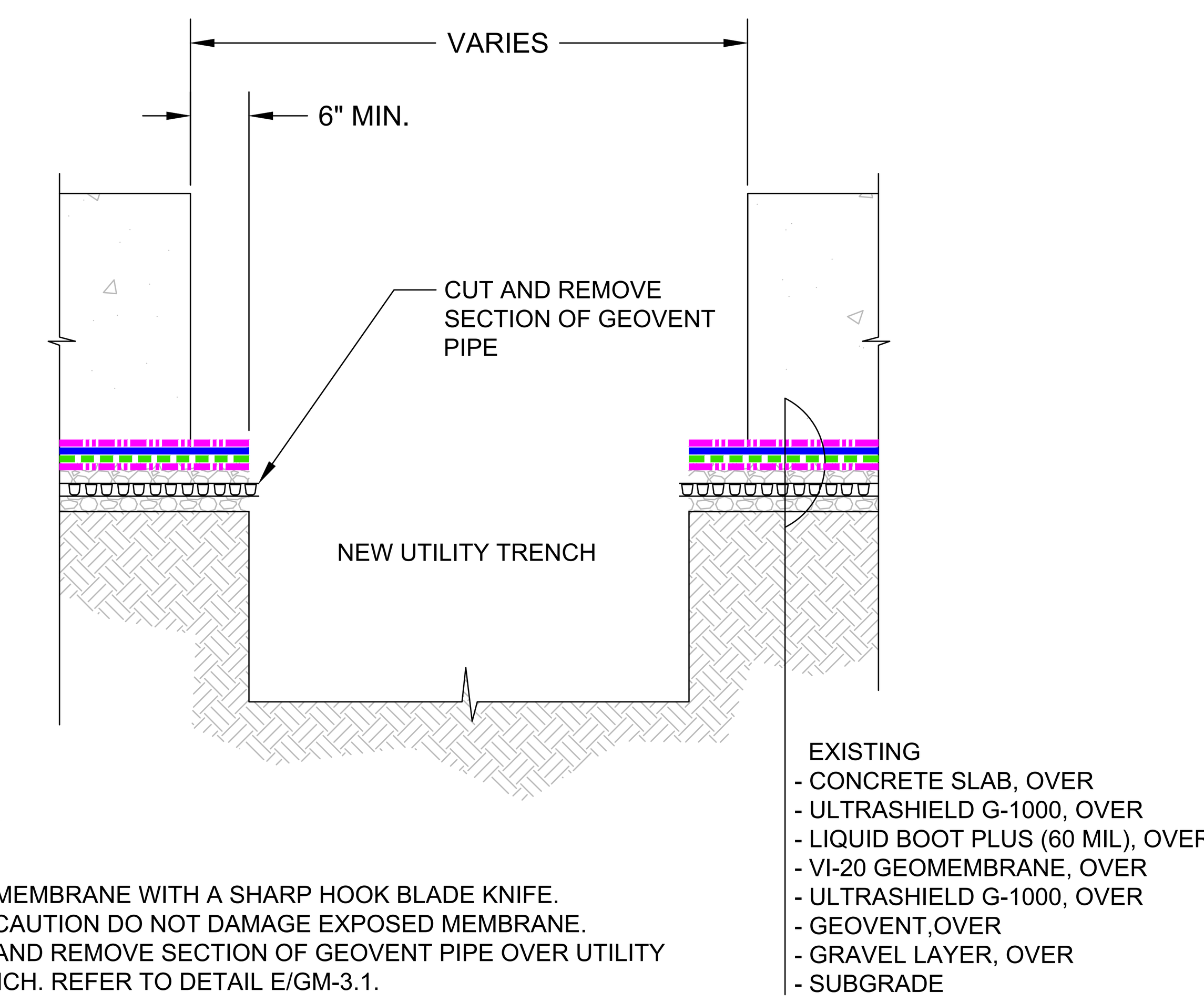


NOTES:

1. AT POINTS OF INTERSECTION, CUT AWAY GEOTEXTILE TO PRODUCE RECTANGULAR FLAPS.
2. INTERLOCK EXPOSED DIMPLE BOARD IN A LEGO-LIKE FASHION.
3. FOLD FLAPS OF GEOTEXTILE IN A MANNER SO THAT THE DIMPLE BOARD IS COVERED COMPLETELY AND SECURE GEOTEXTILE FOLDS WITH REINFORCED TAPE SO THAT THE GEOTEXTILE COMPLETELY IMPERMEABLE TO SAND FILL.

GEOVENT PIPE REPLACEMENT DETAIL

E



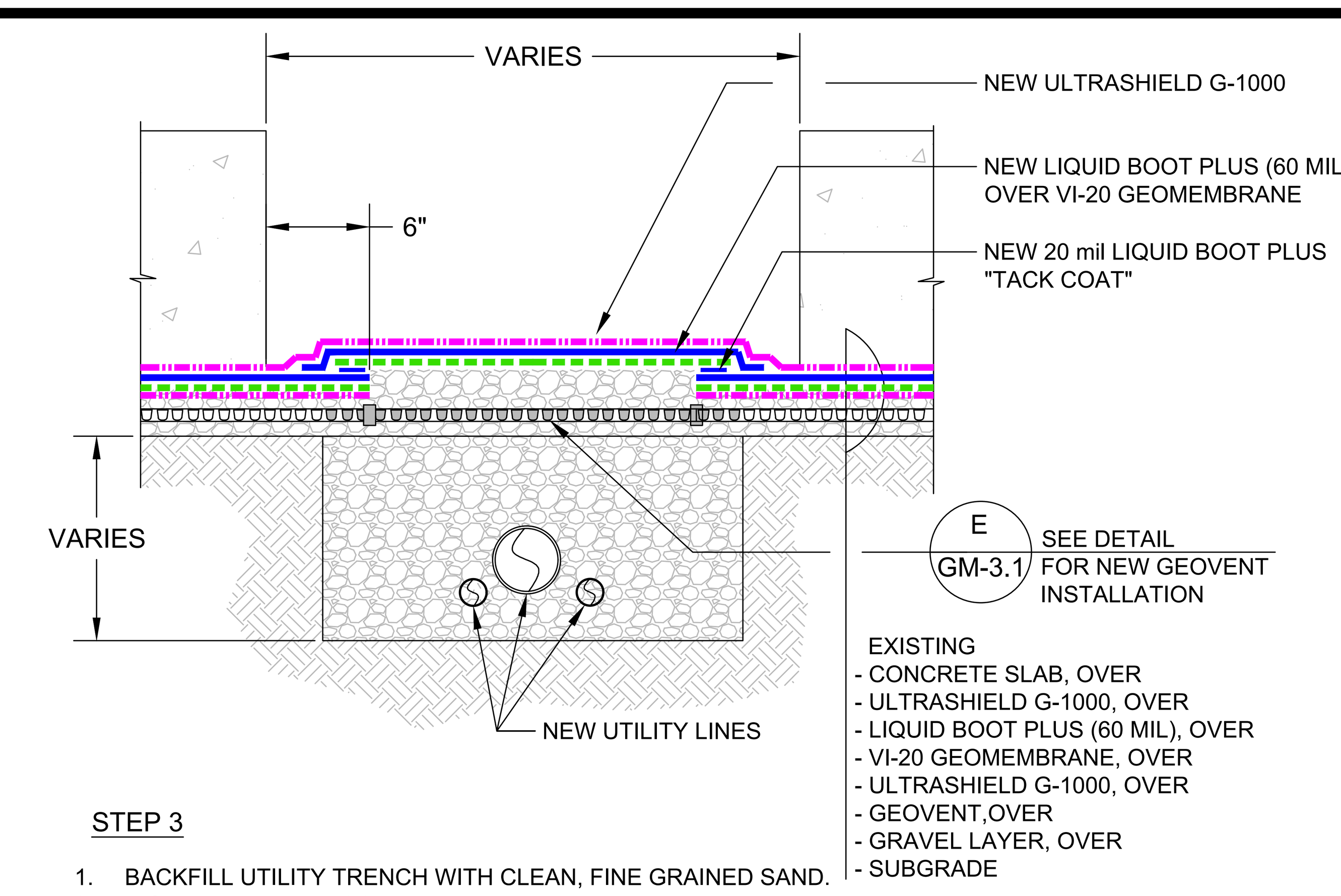
STEP 2

1. CUT MEMBRANE WITH A SHARP HOOK BLADE KNIFE.
2. USE CAUTION DO NOT DAMAGE EXPOSED MEMBRANE.
3. CUT AND REMOVE SECTION OF GEOVENT PIPE OVER UTILITY TRENCH. REFER TO DETAIL E/GM-3.1.

MEMBRANE REPAIR DETAIL - STEP 2

B

H



STEP 3

1. BACKFILL UTILITY TRENCH WITH CLEAN, FINE GRAINED SAND.
2. INSTALL NEW MEMBRANE.
3. INSTALL NEW GEOVENT PIPE. REFER TO DETAIL E/GM-3.1.
4. THE NEW MEMBRANE REQUIRES CONTINUOUS INSPECTIONS BY OTHERS THROUGHOUT INSTALLATION.

NOTES:
INSTALL NEW WET UTILITY LINES BELOW MEMBRANE PER ARCH. PLANS.
ANY NEW ELECTRICAL / COMMUNICATION CONDUIT LINES SHALL BE INSTALLED ABOVE THE MEMBRANE.

MEMBRANE REPAIR DETAIL - STEP 3

C

J

F

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NIKOLAUS REPPUHN
C 83924
EXP. 09/30/2021
CIVIL
STATE OF CALIFORNIA

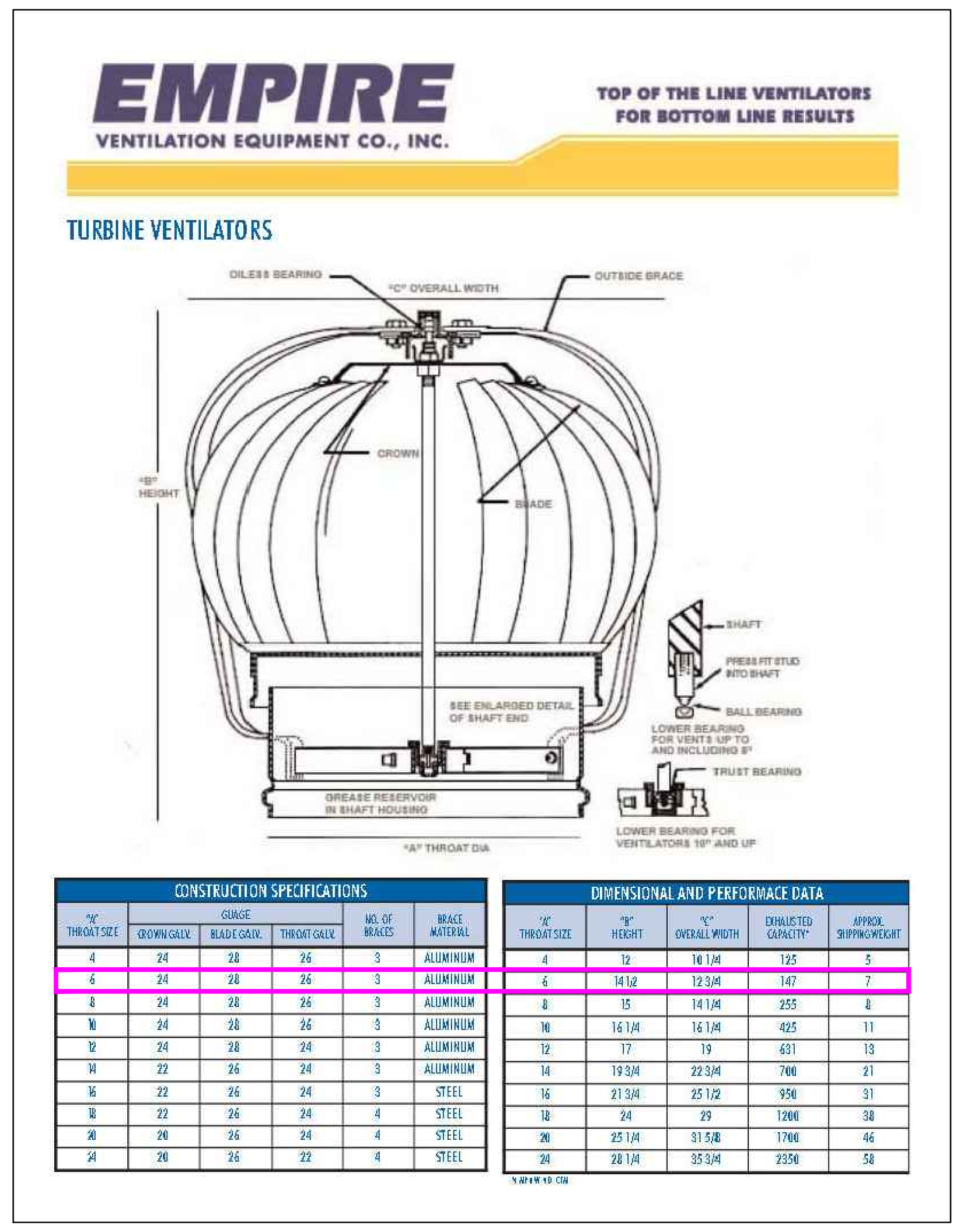
REVISIONS
Date

SHEET TITLE
SUBSLAB MEMBRANE REPAIR DETAILS

DATE
MARCH 22, 2021

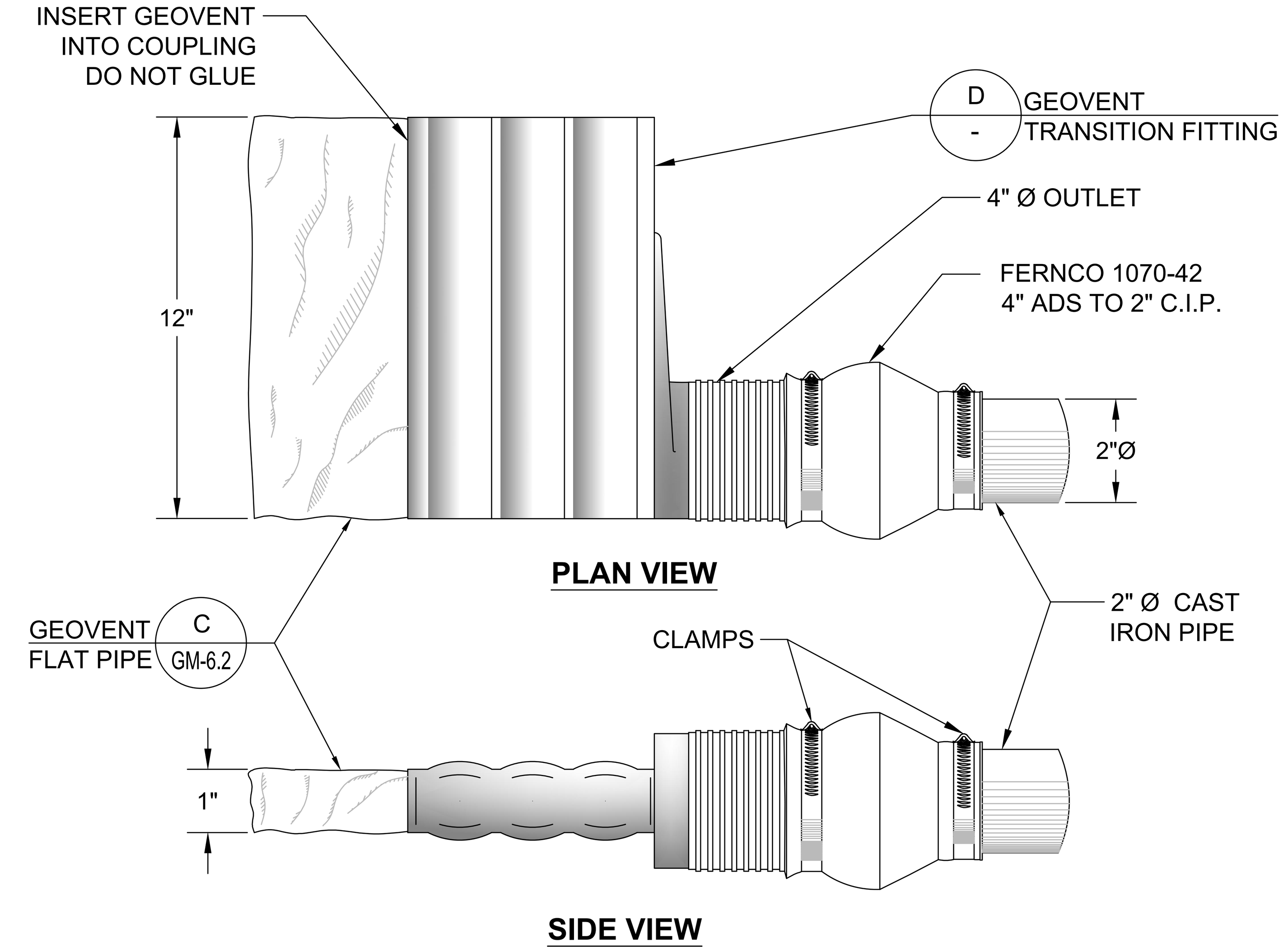
PROJECT NUMBER
2020-116

SHEET NUMBER
GM-3.2



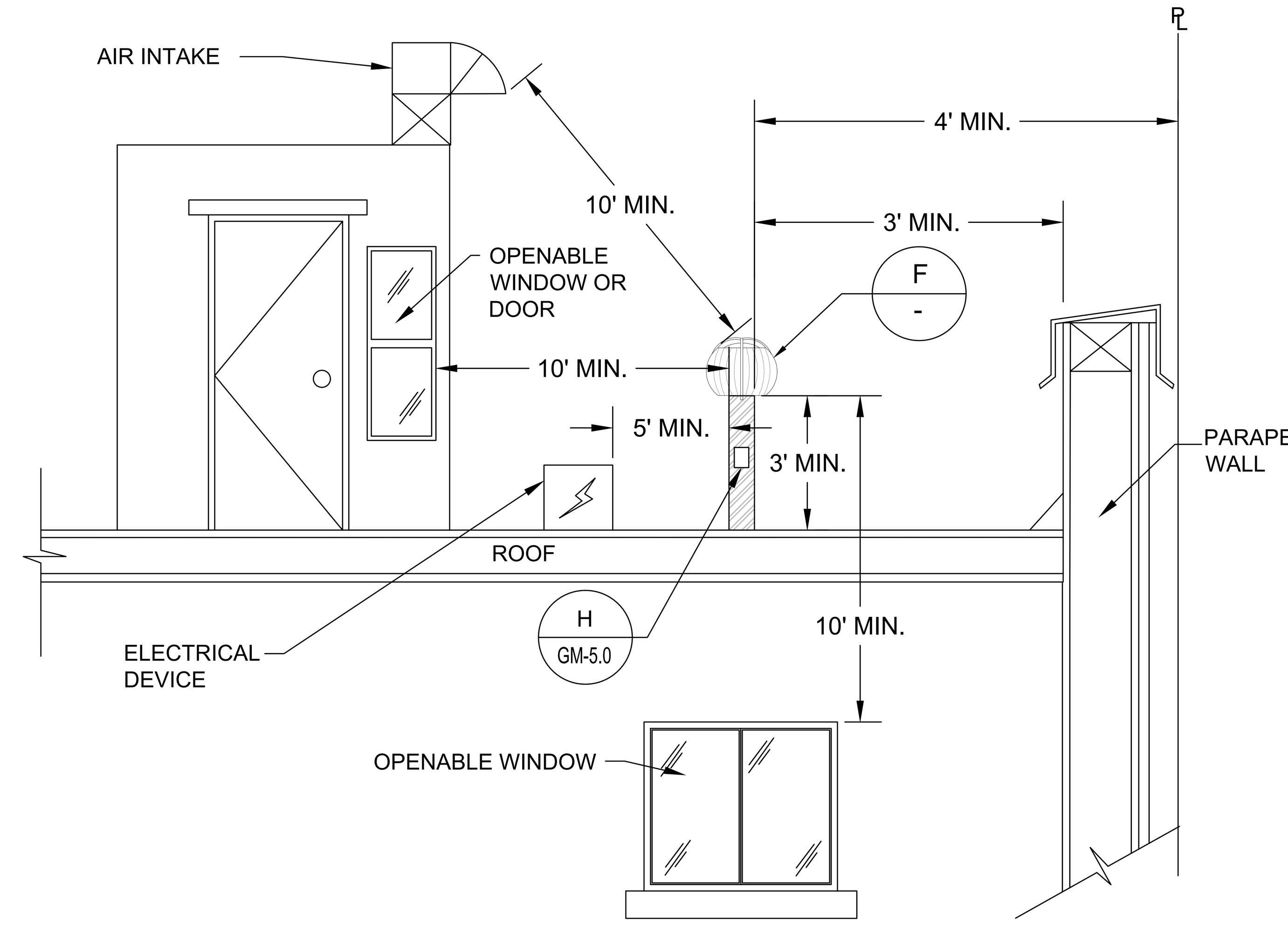
WIND TURBINE SPECIFICATIONS

F



TRANSITION FROM GEOVENT TO VENT RISER

C



VENT RISER ROOF TERMINATION REQUIREMENTS

A


gamut
A Grainger Company

HOME / PIPE, HOSE, TUBING, & FITTINGS / PIPE FITTINGS & PIPE / FLEXIBLE PIPE FITTINGS / FLEXIBLE PIPE REDUCING COUPLING: CONNECTING CAST I...

Flexible Pipe Reducing Coupling: Connecting Cast Iron to Plastic Pipe, 6 Pipe Size (Port 1), 2 Pipe Size (Port 2)

Item # 300K796

$38.78 Each

Product Specs

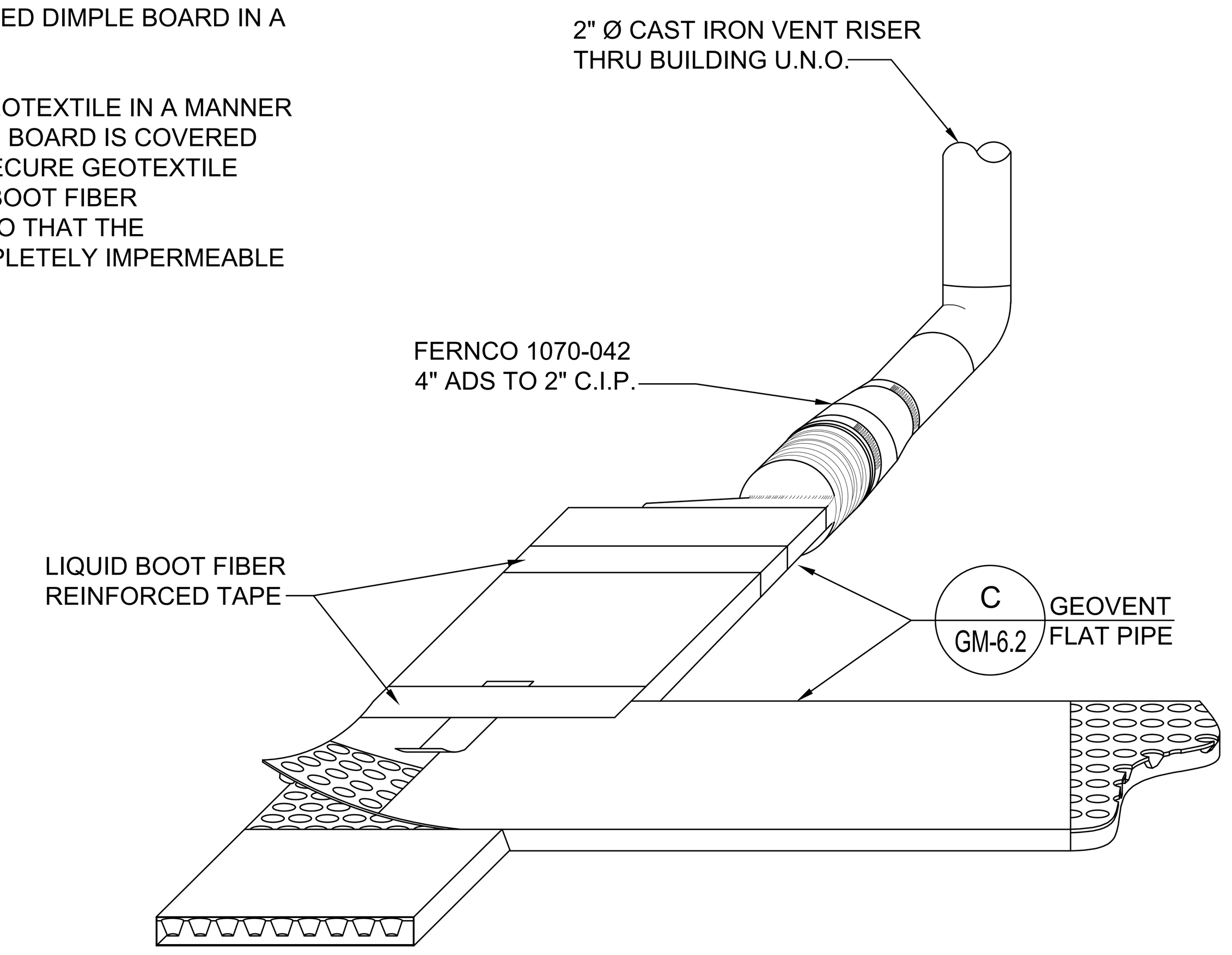
Type:	Coupling
Application:	Connecting Cast Iron to Plastic Pipe
Pipe Size (Port 1):	6
Pipe Size (Port 2):	2
Maximum Operating Pressure:	4.3 psi
Maximum Operating Temperature:	140 ° F
Body Material:	PVC Elastomer
Band Material:	300 Stainless Steel
Specifications Met:	ASTM C1173
Pipe Size:	2; 6
Color:	Black
For Substance Type:	Water
Minimum Operating Temperature:	-30 ° F
Overall Length:	6 in
Port 1 Gender:	Female
Port 2 Gender:	Female
Resistance Properties:	Normal Sewer Gases-Resistant; Fungus-Resistant; Ultraviolet Rays-Resistant; Chemical-Resistant

REDUCING COUPLING SPECIFICATIONS

G

NOTES:

1. AT POINTS OF INTERSECTION, CUT AWAY GEOTEXTILE TO PRODUCE RECTANGULAR FLAPS.
2. INTERLOCK EXPOSED DIMPLE BOARD IN A LEGO-LIKE FASHION.
3. FOLD FLAPS OF GEOTEXTILE IN A MANNER SO THAT THE DIMPLE BOARD IS COVERED COMPLETELY AND SECURE GEOTEXTILE FOLDS WITH LIQUID BOOT FIBER REINFORCED TAPE SO THAT THE GEOTEXTILE IS COMPLETELY IMPERMEABLE TO SAND FILL.



GEOVENT TO VENT RISER TRANSITION FITTING

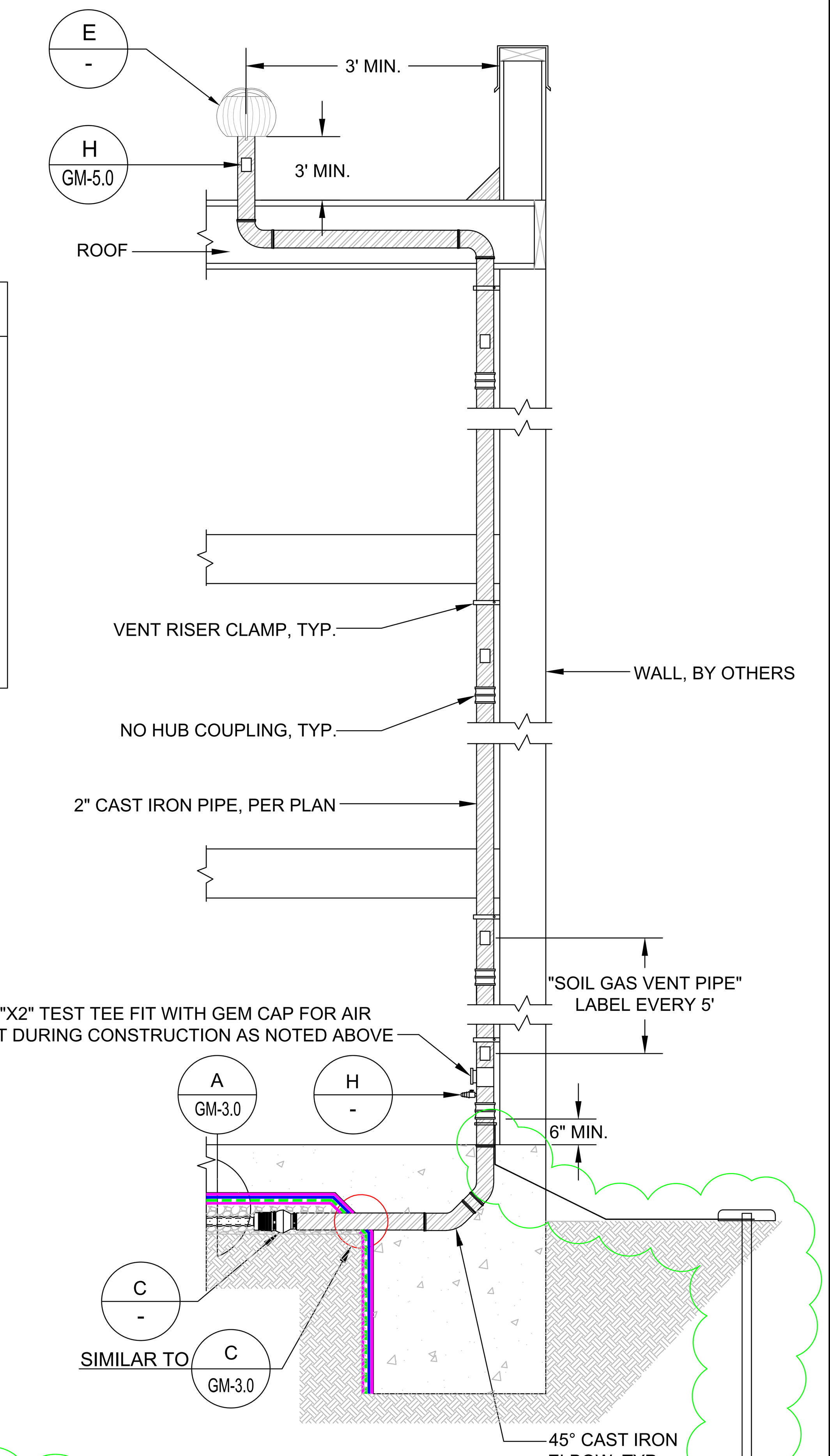
D

VENT RISER SHALL BE TESTED PER:

UPC Section 94.712.3

712.3 Air Test. The air test shall be made by attaching an air compressor testing apparatus to any suitable opening, and, after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gage pressure of five (5) pounds per square inch (34.5kPa) or sufficient to balance a column of mercury ten (10) inches (254mm) in height. The pressure shall be held without introduction of additional air for a period of at least fifteen (15) minutes.

SUPPORT ALL PIPING PER TABLE 3-2 OF THE U.P.C.

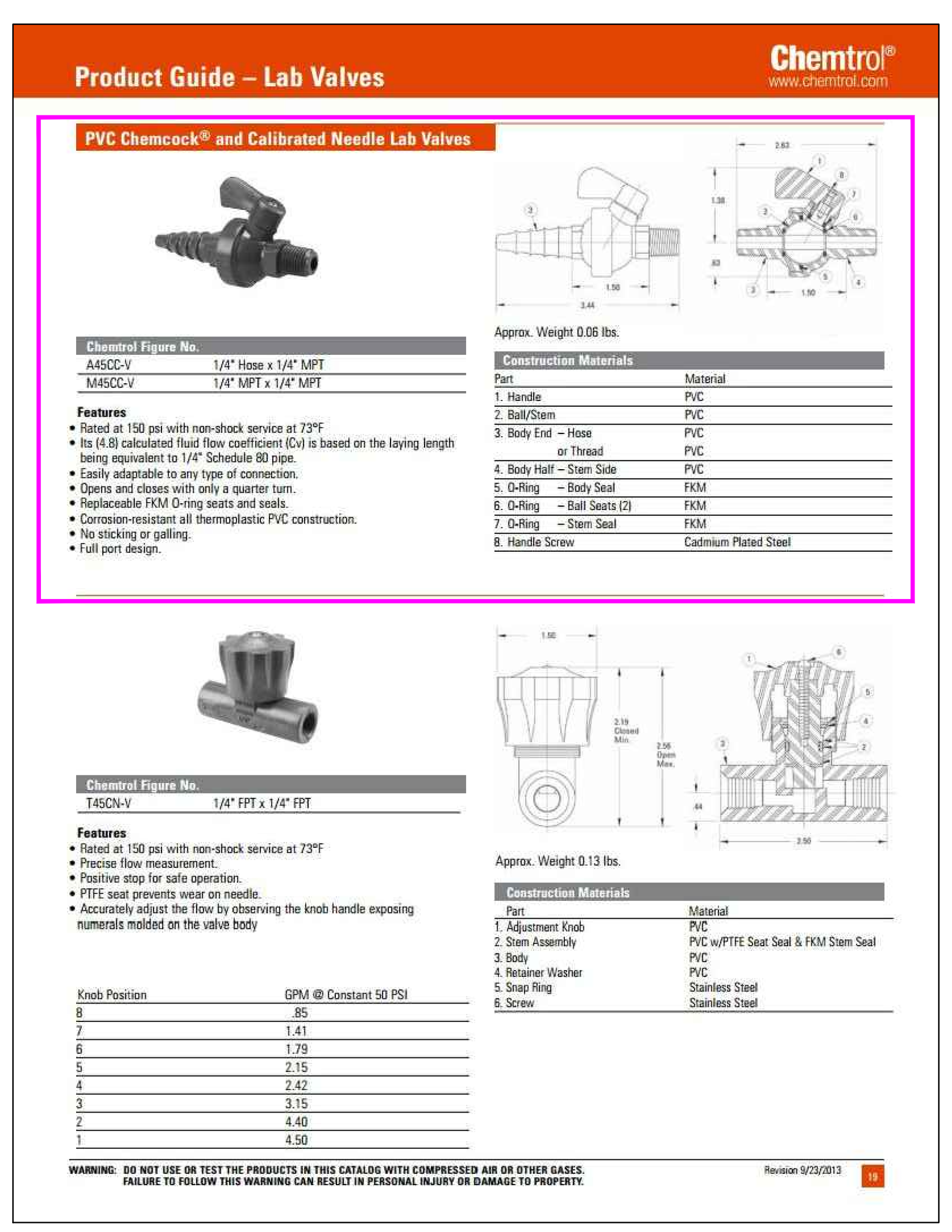


NOTES:

1. WRAP ALL PIPE AND FITTINGS EMBEDDED IN CONCRETE WITH 1/8" FOAM WRAP.
2. SEE DETAIL A/GM-4.0 FOR ROOF TERMINATION REQUIREMENTS.
3. CLAMP WIRE TO C.I. VENT RISER TO 5/8" Ø, 8' LONG GROUNDING ROD.

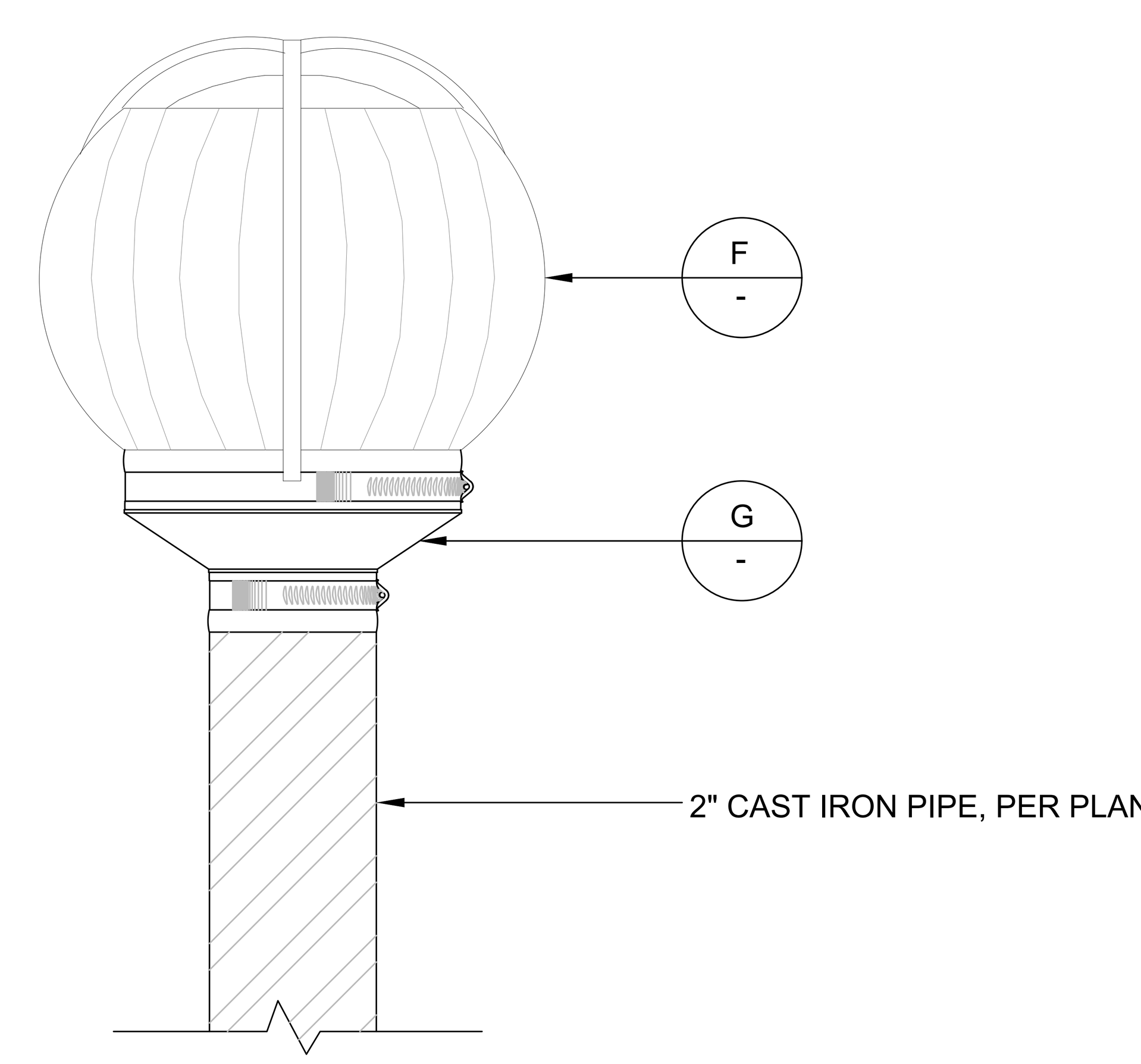
PASSIVE VENT RISER

B



LAB VALVE SPECIFICATIONS

H



TURBINE AND REDUCING COUPLING

E

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STATE OF CALIFORNIA

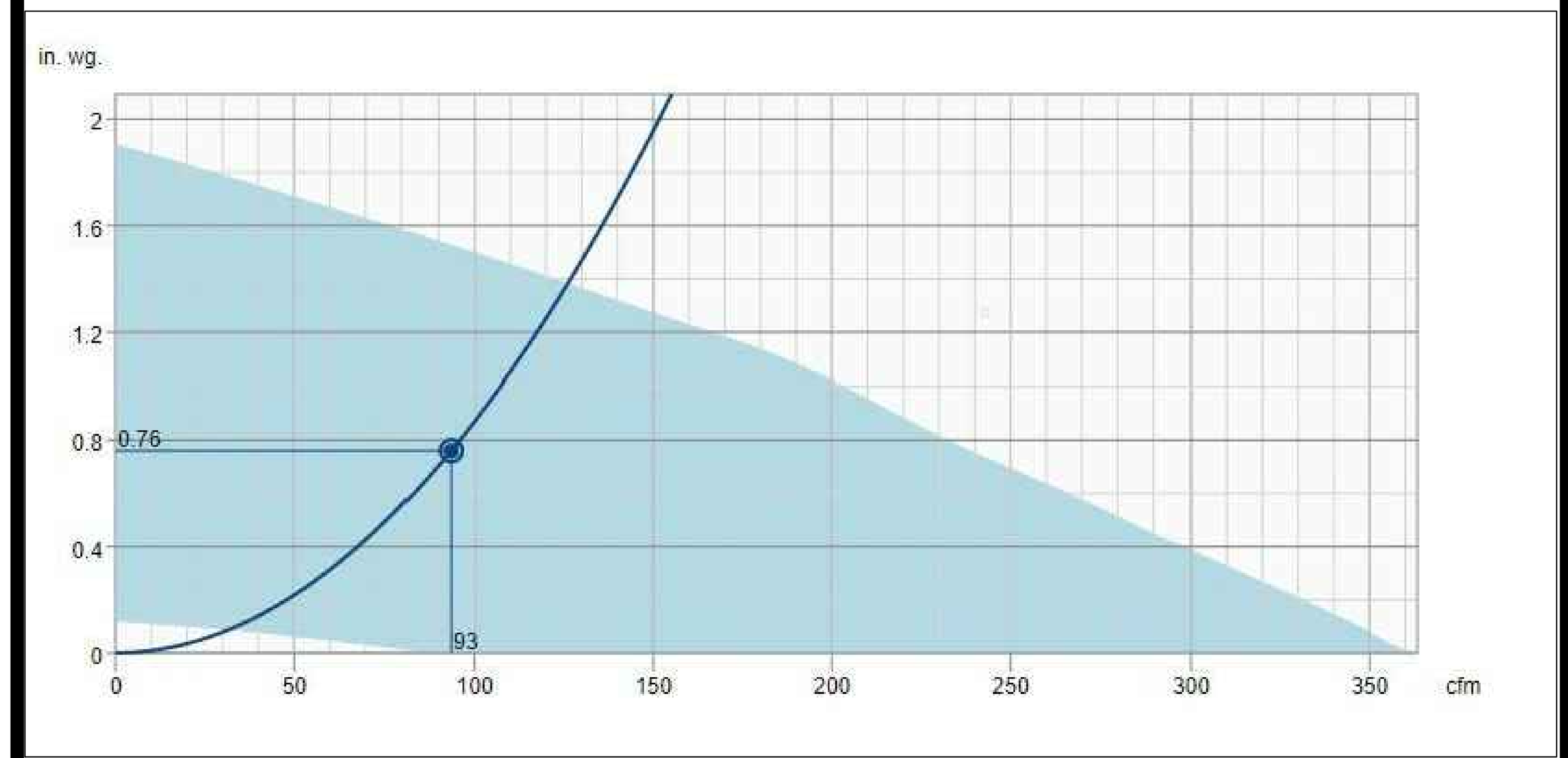
REVISIONS	Date	
1	5/11/21	GROUNDING ROD

SHEET TITLE
VENT RISER DETAILS

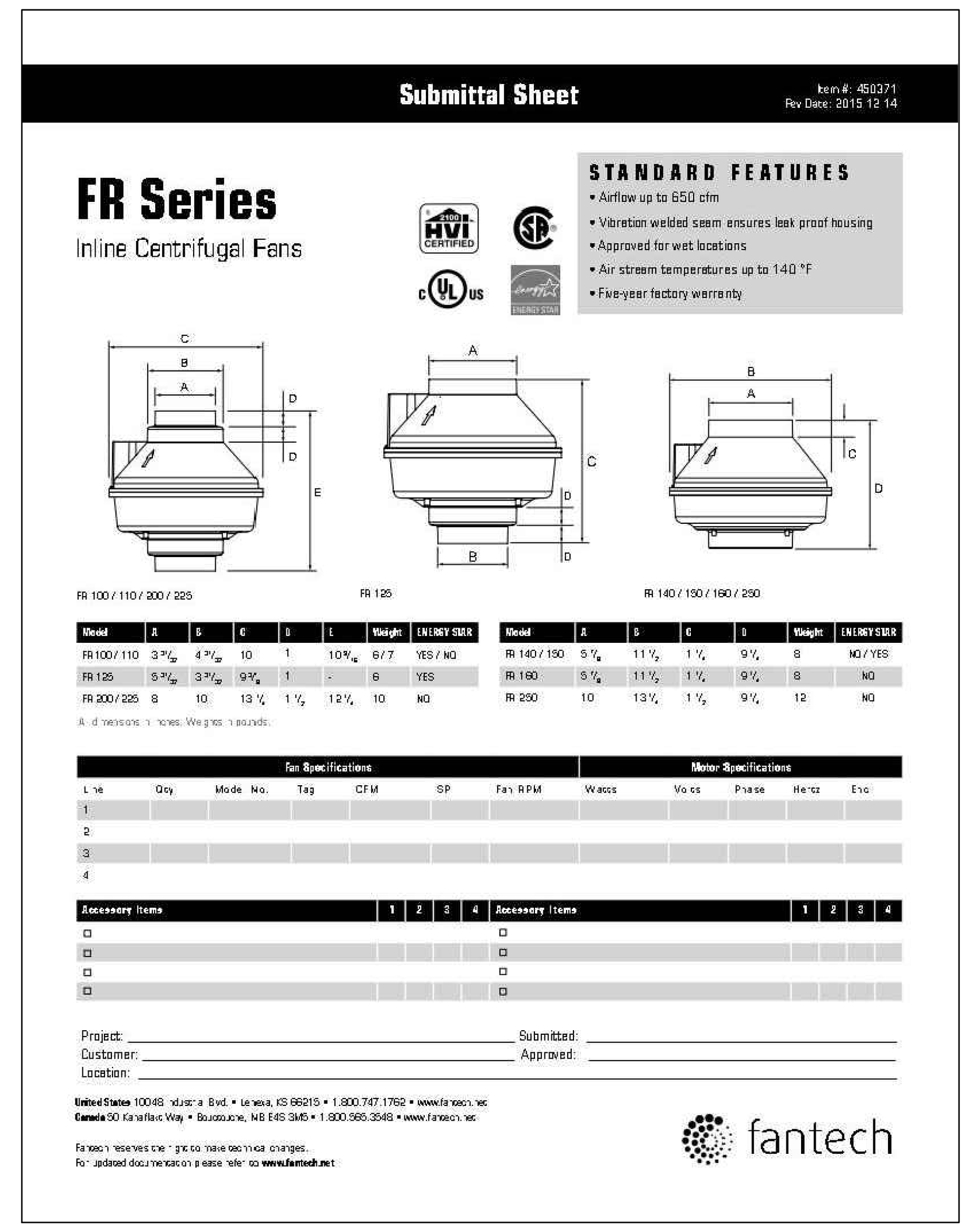
DATE
MARCH 22, 2021

PROJECT NUMBER
2020-116

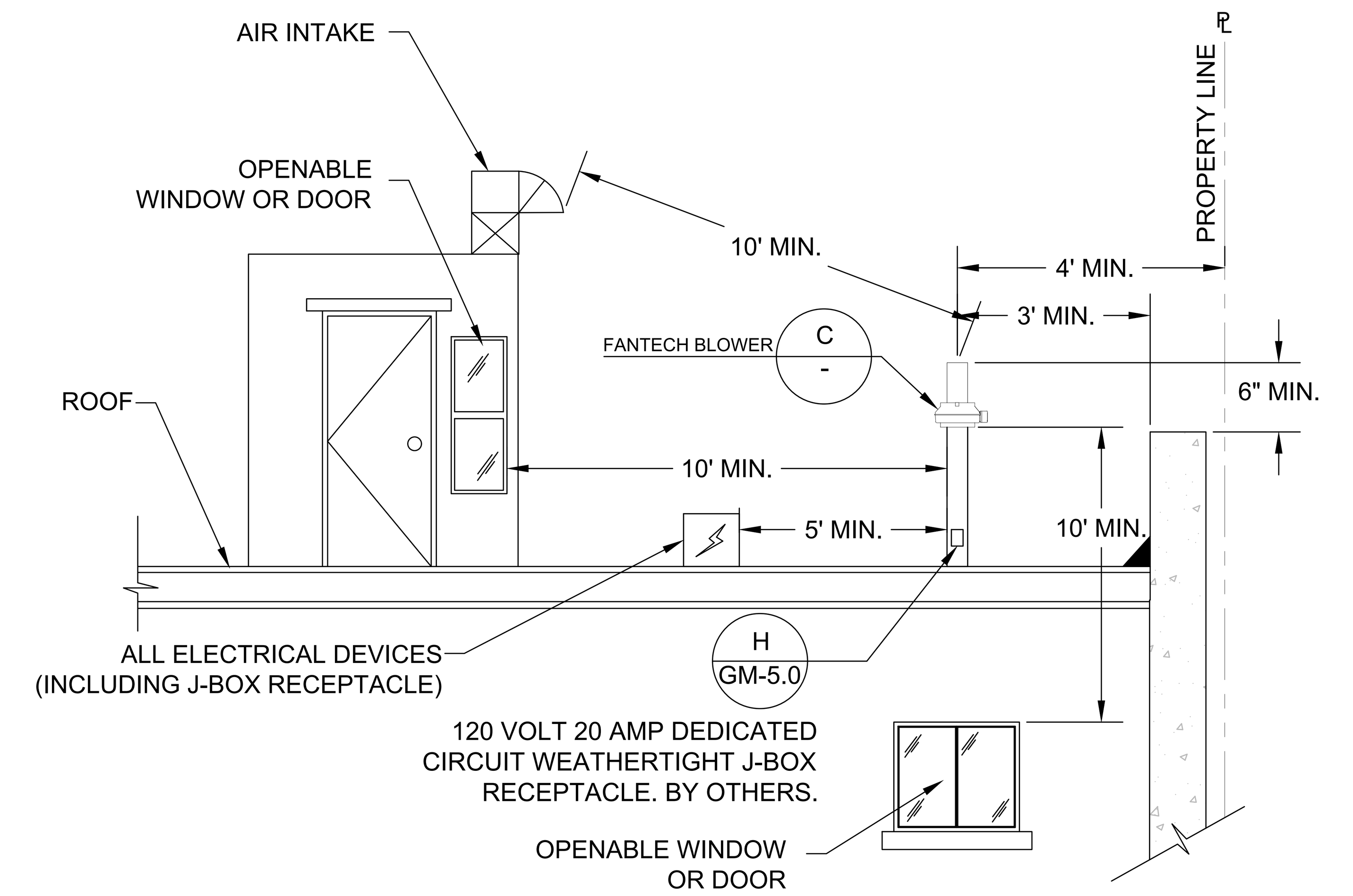
SHEET NUMBER
GM-4.0



BLOWER CURVE E



BLOWER SPECIFICATIONS C



VENT RISER ROOF TERMINATION REQUIREMENTS A

F

G

Discharge Calculations
for
Under slab Design

Step 1- Design Consideration

1a Design Factors

14967	= A-	Sq footage of area under slab for blower extraction
3	= E-	Required Number of air exchanges required per Hour
6	= Gt-	Venting Gravel thickness
0.25	= Av-	% of air voids in Gravel layer

1b Design Factors for Collection System (under slab)

825 = L - Length of collectin pipe /zone 825 LF of collection pipe

3	= 90-c	Number of 90 degree bends in longest single pipe run
0	= 45-c	Number of 45 degree bends in longest single pipe run
2	= Y-c	Number of 180* junctions in Longest single pipe run
4	= D-c	Diameter of collection pipe in inches

1c Design Factors for Discharge System (above slab)

80	= Ld -	Length of discharge pipe system
2	= 90d-	Number of 90 degree bends in discharge pipe system
3	= 45d-	Number of 45 degree bends in discharge pipe system
0	= Yd-	Number of 180* junctions in discharge pipe system
2	= Dd-	Diameter of discharge pipe in inches

1d Design Factors for Blower System

1 =Bz Number of blower zones designed for this project

Step 2- System Curve Head loss calculations

2a- Calculate air flow discharge, per zone. If Design calls for collection trenches add this calculation

Air Flow per zc AFz= ((A*E/60)*(Gt/12)*Av)/Bz **Calculate Air volumn in collection trenches**

Trench/iches 0 0

AFz= 93.5 CF/M Venting Gravel Vo 0 CF

2b- Calculate air flow per zone in collect =Afz*.4

Caf= 37.4 CF/M

2c- Calculate friction losses, per zone, for collection systen System Curve Friction Losses for collection (under slab) system

* Use Hart & Cooley Flexible Duct Fricton Loss Air Duct Calculator **Design Flow**

37.4

2d- Calculate fricton losses, per zone in Discharge System System Curve Friction Losses for Discharge (above slab system

* Use Hart & Cooley Duct Fricton Loss Air Duct Calculator **Design Flow**

93.5

Total System Curve Friction Loss*

System Curve flow calculations for CFM of	**Design Flow**
Below Slab	**37.4**
Above Slab (Total Flow)	**93.5**
Sub Slab Collection System Loss	**0.02**
Above Slab Discharge System Loss	**0.74**
Total System Loss in Inches of Water =	**0.76**

* Fricton Loss Values obtained from "Hart & Cooley- Air Duct Calculator"

Step 3- Blower selection

Blower selection

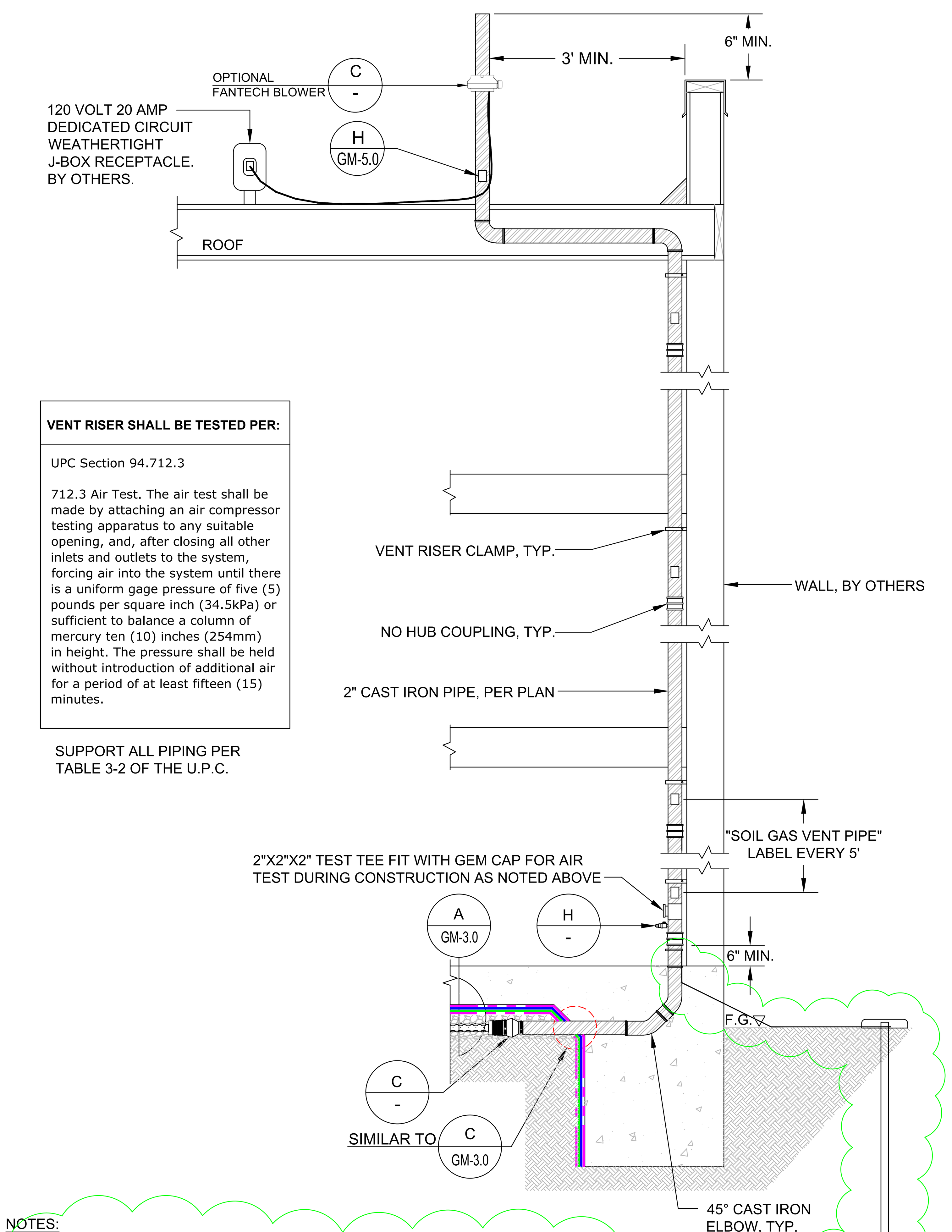
Design Factors

93.5 =Capacity in CFM

0.76 = System static pressure in inches of water

Blower- 1 Fantec FG 6M EC Centrigugal

BLOWER CALCULATIONS D



VENT RISER SHALL BE TESTED PER:

UPC Section 94.712.3

712.3 Air Test. The air test shall be made by attaching an air compressor testing apparatus to any suitable opening, and, after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gage pressure of five (5) pounds per square inch (34.5kPa) or sufficient to balance a column of mercury ten (10) inches (254mm) in height. The pressure shall be held without introduction of additional air for a period of at least fifteen (15) minutes.

SUPPORT ALL PIPING PER TABLE 3-2 OF THE U.P.C.

NOTES:
1. WRAP ALL PIPE AND FITTINGS EMBEDDED IN CONCRETE WITH 1/8" FOAM WRAP.
2. SEE DETAIL A/GM-4.0 FOR ROOF TERMINATION REQUIREMENTS.
3. CLAMP WIRE TO C.I. VENT RISER TO 5/8" Ø, 8' LONG GROUNDING ROD.
4. VENT RISER SIMILAR TO GM 4.0 DETAIL B, IF DEEMED NECESSARY TO CONVERT TO ACTIVE, THE OPTIONAL BLOWER IS TO BE INSTALLED PER THIS DETAIL.

OPTIONAL ACTIVE VENT RISER WITH BLOWER B

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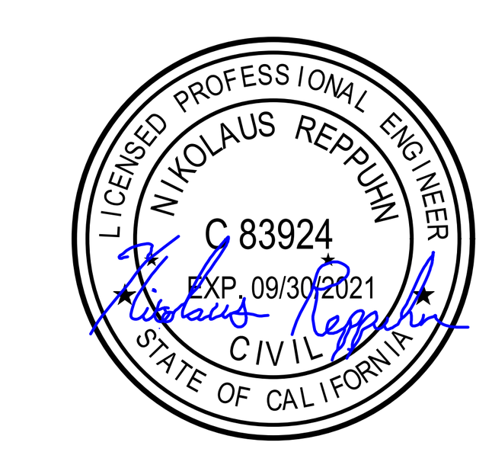


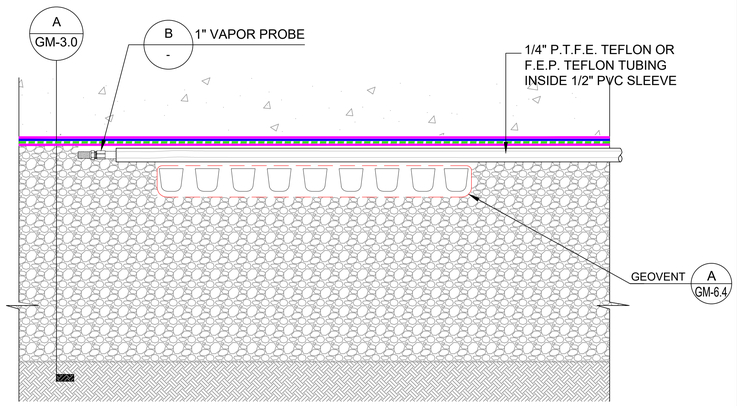
REVISIONS	Date	
1	5/11/21	GROUNDING ROD

SHEET TITLE
ACTIVE
VENT RISER DETAILS

DATE
MARCH 22, 2021

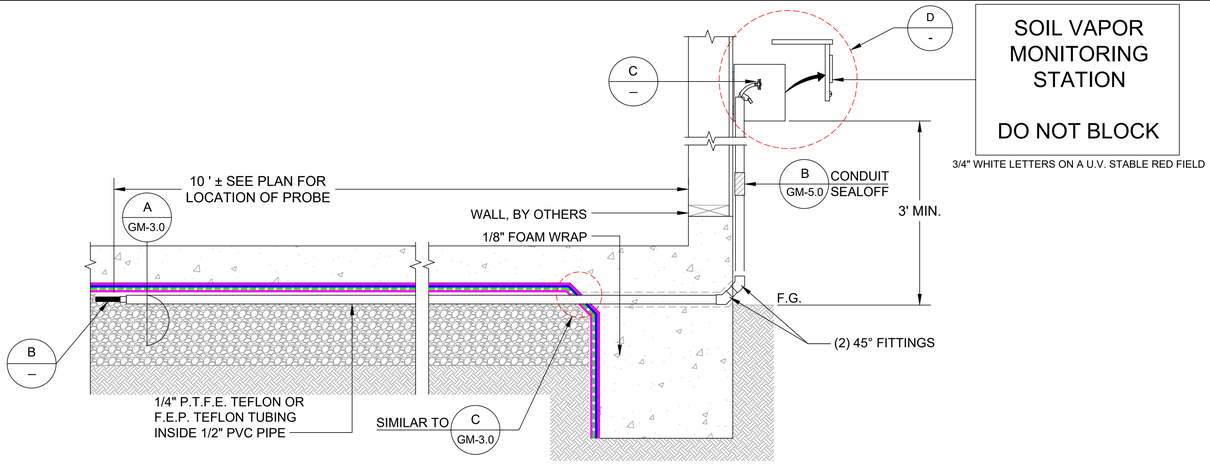
PROJECT NUMBER
2020-116

SHEET NUMBER
GM-4.1



PROBE AND VENT PIPE CONSTRUCTION TYPICAL

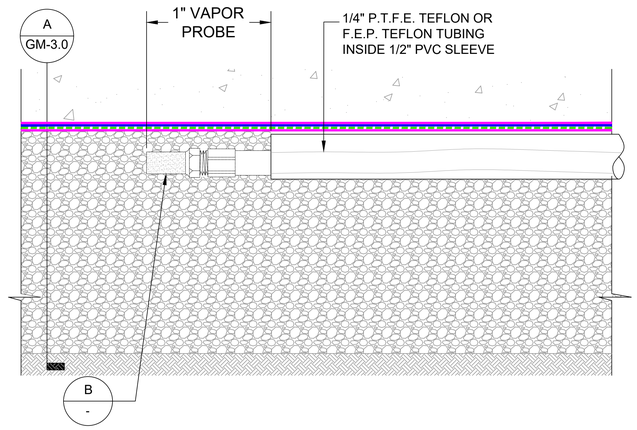
E



NOTES:
1. WRAP ALL PIPE AND FITTINGS EMBEDDED IN CONCRETE WITH 1/8" FOAM WRAP.
2. PROBES MUST BE IDENTIFIED WITH THE PROPER PROBE LOCATION NUMBER.
3. REFER TO ARCHITECTURAL PLANS FOR FINAL LOCATION.

SUBSLAB VAPOR PROBE WITH WALL ENCLOSURE

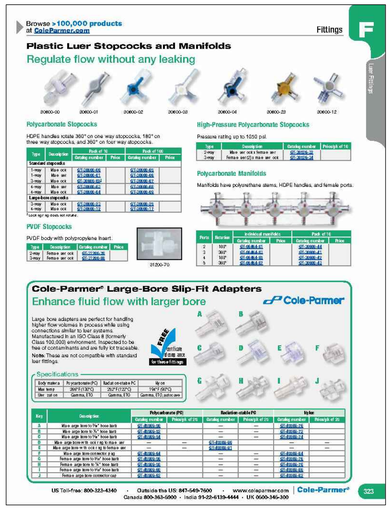
A



NOTES:
1. PRESSURE FIT ALL COMPONENTS - DO NOT GLUE.
2. PROBES MUST BE IDENTIFIED WITH THE PROPER PROBE LOCATION NUMBER.
3. PROBE RUNS TO BE INSTALLED BENEATH THE SLAB ABOVE VENT PIPE RUNS.

PROBE END SECTION

F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Regulate flow without any leaking

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High-Pressure Polycarbonate Stopcocks

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Cole-Parmer® Large-Bore Slip-Fit Adapters

Enhance fluid flow with larger bore

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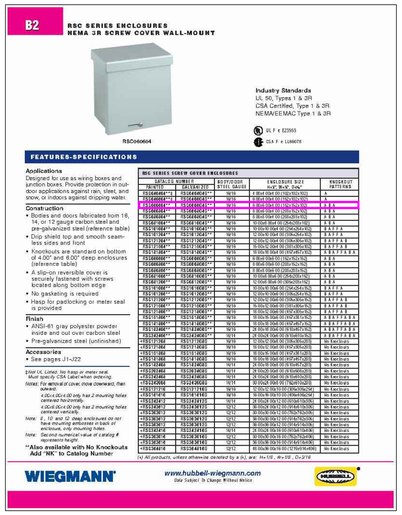
STOPCOCK SPECIFICATIONS

C


B2

RSC SERIES ENCLOSURES
NEMA 3R SCREW COVER WALL-MOUNT

RSC060604

Industry Standards
UL 50, Types 1 & 3R
CSA Certified, Type 1 & 3R
NEMA/EEI MAC Type 1 & 3R

FEATURES-SPECIFICATIONS

Applications
Designed for use as wiring boxes and junction boxes. Provides protection in outdoor applications against rain, sleet, and snow, or indoors against dripping water.

Construction
- Bodies and doors fabricated from 18, 14, or 12 gauge carbon steel and pre-galvanized steel (reference table)
- Drip shield top and smooth seamless sides and front
- Knockouts are standard on bottom of 4.00" and 6.00" deep enclosures (reference table)
- A slip-on reversible cover is securely fastened with screws located along bottom edge
- No gasketing is required
- Hasp for padlocking or meter seal is provided

Finish
- ANSI-61 gray polyester powder inside and out over carbon steel
- Pre-galvanized steel (unfinished)

Accessories
- See pages J1-J22

RSC SERIES SCREW COVER ENCLOSURES

WIEGMANN

www.hubbell-wiegmann.com

HUBBELL WIEGMANN

NOTE:
HUBBELL-WIEGMANN ENCLOSURE, SCREW COVER WALL-MOUNT, RSC SERIES NEMA 3R, MODEL # RSC060604

WALL ENCLOSURE SPECIFICATIONS

D

MATERIAL SPECIFICATIONS

B

Material Specifications

Sub-slab Vapor Implant
Material: Stainless Steel
Length: 1”
Connection: 1/4" Speed-fit Fitting
Example: ESP Supply # SVPT92-SF14 1" Implant 1/4" Speed-Fit Fitting
www.shop-esp.com

Sample Line
Material: Polytetrafluoroethylene (PTFE Teflon) or
fluorinated ethylene propylene (FEP Teflon) tubing
Outer diameter (OD): 1/4“
Inner diameter (ID): 3/16” or 5/32” or 1/8”
Examples: ESP Supply # T250TEF-187-250 FEP 3/16" ID x 1/4" OD (250ft); www.shop-esp.com
Cole Parmer # EW-06605-31
Cole-Parmer PTFE Tubing, 5/32" x 1/4", 25 Ft/Pk;
www.coleparmer.com

Sample Line Protective Conduit
3/4” I.D. PVC pipe
45 degree elbows (no 90 degree elbows) - this is to avoid pinching the sample line tubing, esp. if FEP which is relatively stiff
Dry fit or low-VOC adhesives only

Compression Fitting at Sampling Port
Each soil gas probe line should terminate at the sampling port with an 1/4" NPT(M) stainless steel fitting, to connect the sampling train using 1/4” O.D. tubing and 1/4" compression fittings.
Example of sampling train compression fitting:
Cole-Parmer # EW-03302-51; www.coleparmer.com
Parker Hannifin 4 BZ-SS-C Compression Fitting Ferrule Nut, 316SS, 1/4" OD. www.gamut.com

Sampling Port Label
Must be a Brass tag permanently affixed and permanently legible.

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REVISIONS

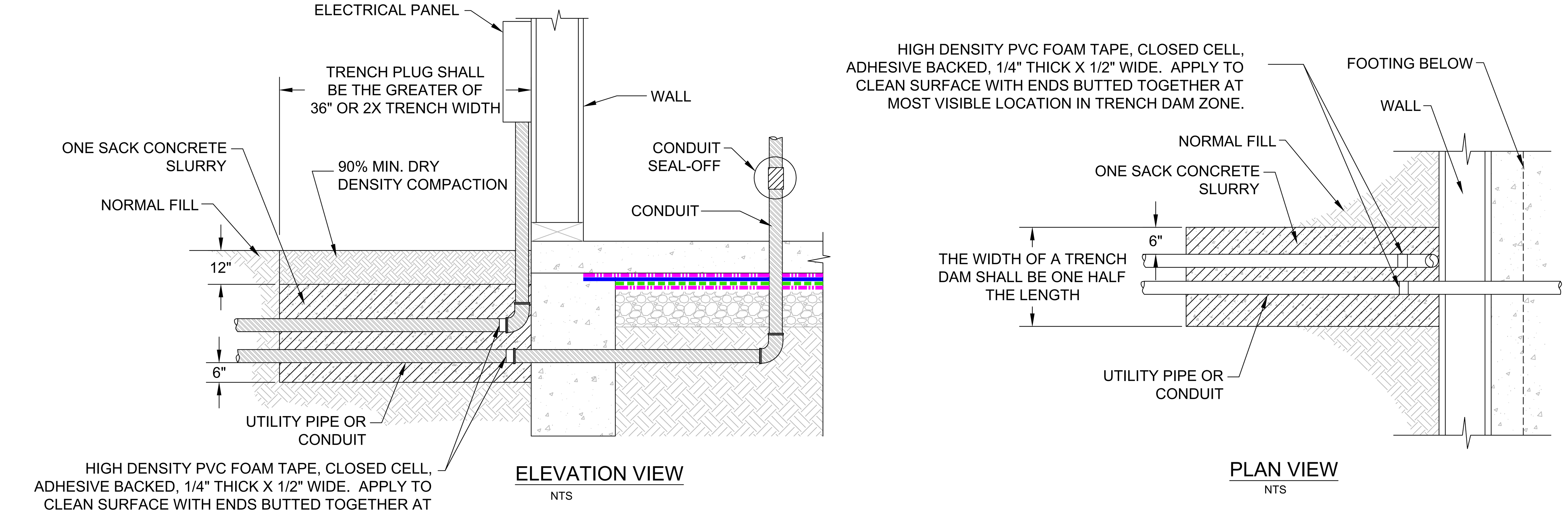
Date	
	A

SHEET TITLE
SUB-SLAB VAPOR PROBE DETAILS AND SPECIFICATIONS

DATE
MARCH 22, 2021

PROJECT NUMBER
2020-116

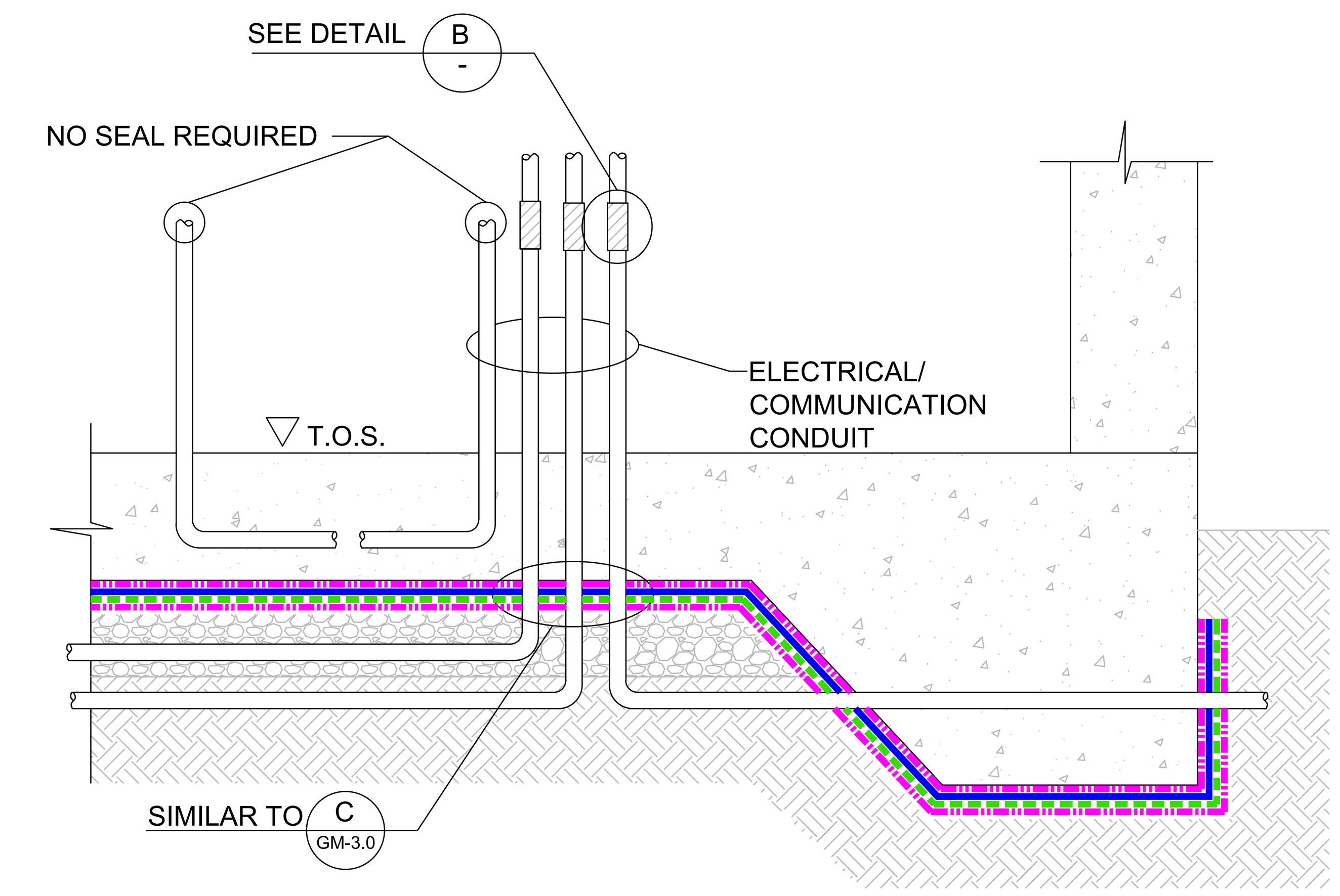
SHEET NUMBER
GM-4.2



NOTES:

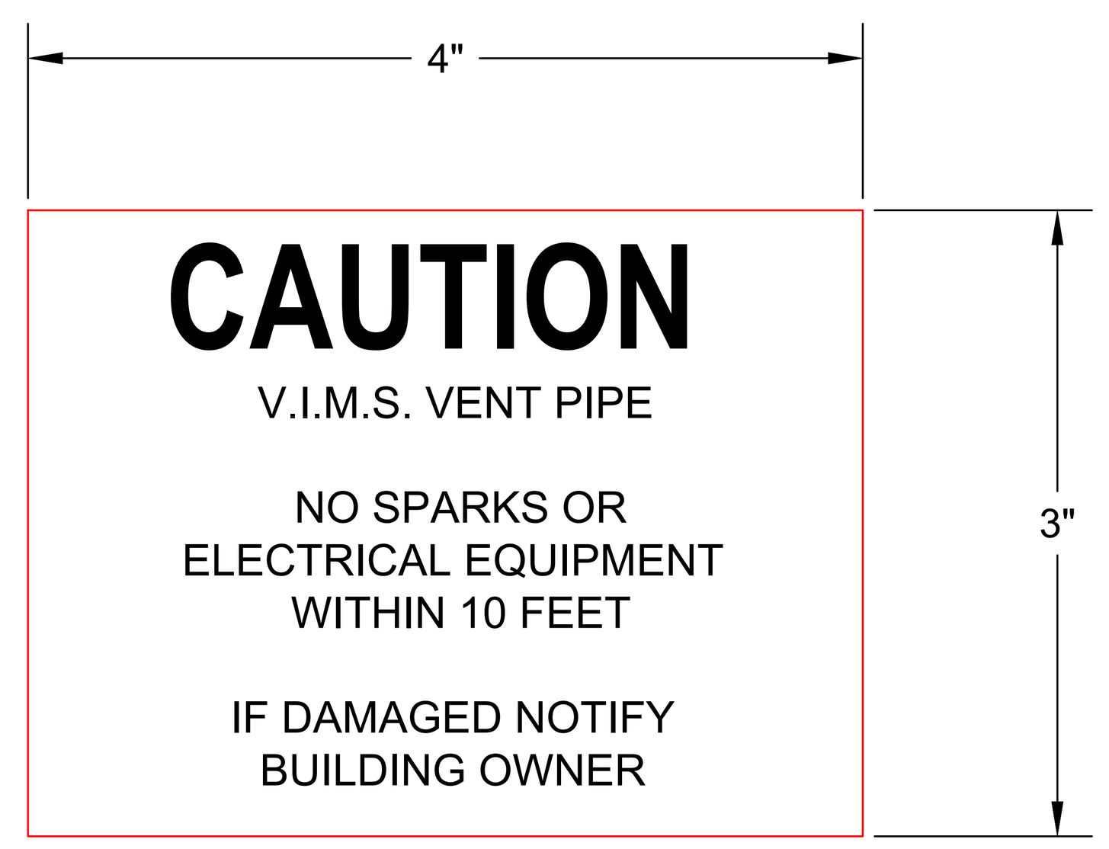
1. PIPING AND CONDUIT SHALL BE PROTECTED FROM CORROSION AND STRUCTURAL SETTLEMENT AS FOLLOW:
   TAPE SHALL BE APPLIED ON CONDUIT AND PIPING ENCASED IN CEMENT SLURRY OR CONCRETE.
   TAPE SHALL BE PS-37-90, BLACK PLASTIC PVC OR PE PRESSURE -SENSITIVE CORROSION PREVENTIVE TAPE.
2. ALL UNDERGROUND UTILITY LINES FEEDING INTO BUILDING SHALL HAVE A TRENCH DAM. ELECTRICAL SEAL OFF'S ARE REQUIRED AT ELECTRICAL CONDUIT ONLY.

TRENCH DAM
D



NOTE:
ELECTRICAL/ COMMUNICATION CONDUIT SPACING PER STRUCTURAL AND ELECTRICAL REQUIREMENTS

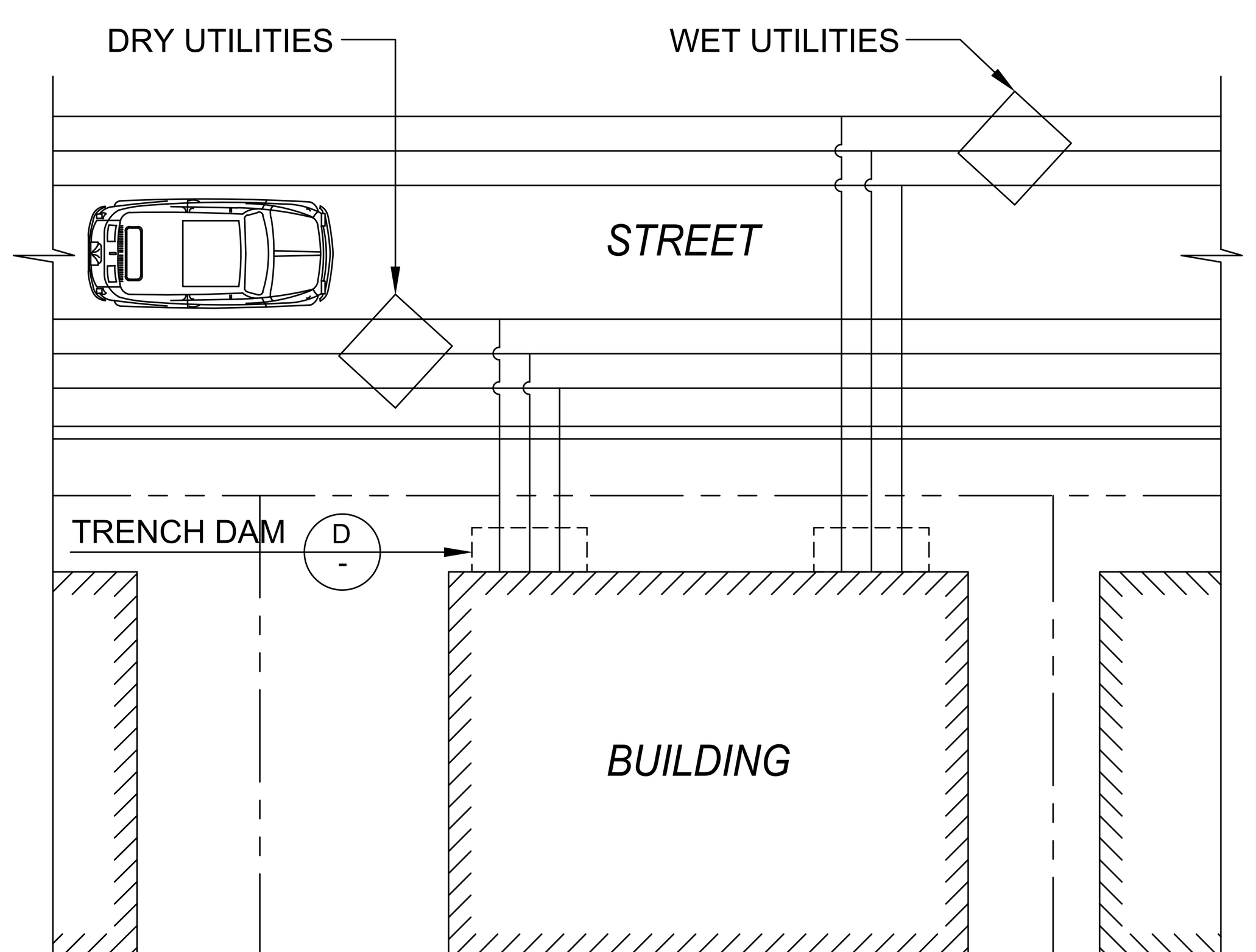
MEMBRANE CONDUIT PENETRATIONS
A



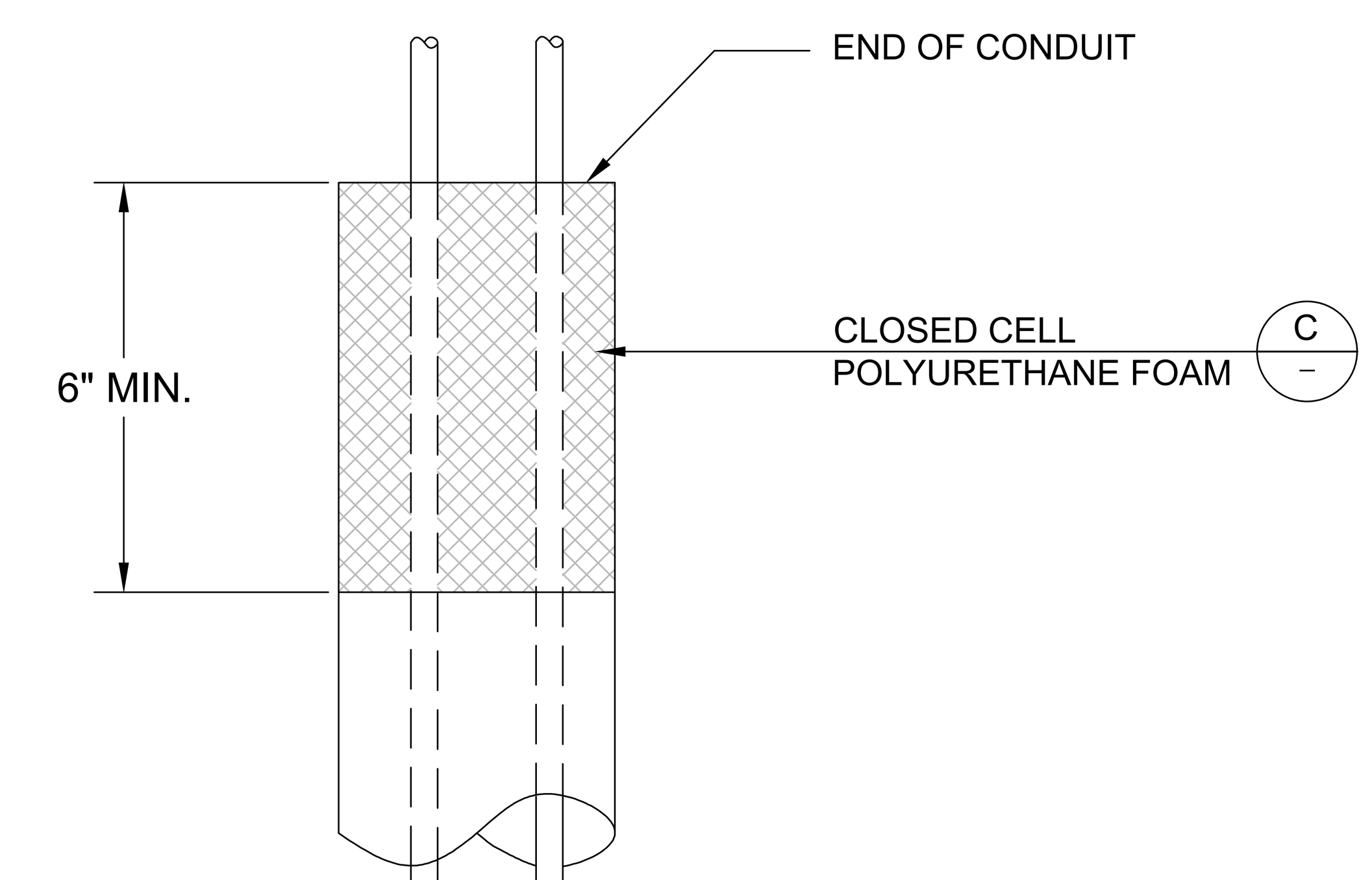
CAUTION LABEL AT VENT RISER EXIT LOCATIONS.
WHITE LETTERS ON A U.V. STABLE RED FIELD.

DETAIL FULL SCALE.

VENT RISER CAUTION SIGN
H



UTILITIES - OVERVIEW
E



NOTES:

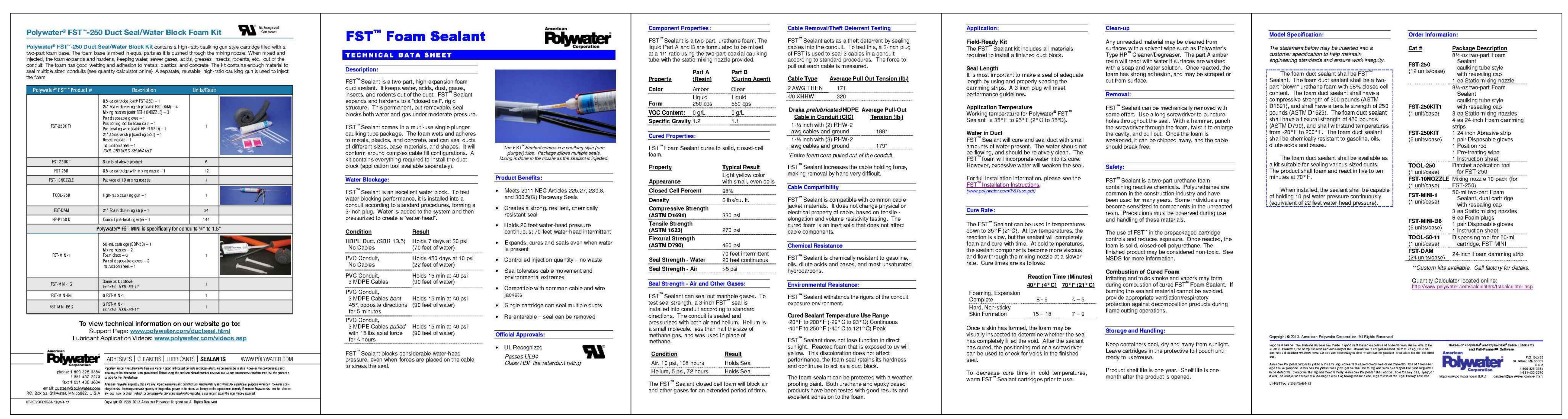
1. EXTEND A MINIMUM OF SIX CONDUIT DIAMETERS OR SIX INCHES, WHICHEVER IS GREATER, INTO THE CONDUIT.
2. SEALS SHOULD NOT BE USED FOR MAIN ELECTRICAL FEED LINES.
3. INSTALLATION OF CONDUIT SEALOFFS AND FOAM IS NOT THE RESPONSIBILITY OF THE VIMS CONTRACTOR.

CONDUIT SEALOFF
B

TWO-PLY ENGRAVED PLASTIC, WHITE LETTERS ON A RED FIELD.

"WARNING" = 3/4" HIGH LETTERS
BALANCE = 3/8" HIGH LETTERS

MEMBRANE WARNING SIGN
J



POLYWATER FST FOAM SEALANT SPECIFICATIONS
C

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STATE OF CALIFORNIA

REVISIONS
Date

SHEET TITLE
TRENCH DAM, ELECTRICAL SEAL-OFFS, AND SIGNAGE DETAILS

DATE
MARCH 22, 2021

PROJECT NUMBER
2020-116

SHEET NUMBER
GM-5.0

CITY OF LOS ANGELES
CALIFORNIA

CETCO
35 Highland Avenue
Bethlehem, PA 18017

Attn: Robert Valorio
(484) 403-7933

RESEARCH REPORT: RR 24860
(CSI #07120)

Expires: November 1, 2021
Issued Date: November 1, 2019
Code: 2017 LABC

GENERAL APPROVAL - Renewal - Liquid Boot Spray Applied Membrane for Below-Grade Waterproofing and Gas Barrier.

DETAILS

Liquid Boot membrane is a two component system of chloroprene modified asphaltic (CMA) emulsion. Both components are waterborne and are spray applied cold to provide a monolithic, single course, 80 mil minimum membrane thickness for below grade waterproofing and 60 mil minimum membrane thickness for gas barrier.

This product is approved for below-grade waterproofing and gas barrier subject to the following conditions:

1. The chloroprene modified asphaltic emulsion and catalyst shall be supplied in clearly marked containers bearing the brand name and product identification. Both components shall be supplied by the same source manufacturer.

2. The manufacturer shall provide quality assurance of the materials supplied as to their formulation.

3. Application of the product shall be accomplished by an applicator approved by the manufacturer. A written statement by the manufacturer stating that the applicator is an approved applicator is required prior to use of the product.

4. All surfaces to receive membrane shall be free of laitance, sharp projections, oil, dirt or other contaminants. Prepare surfaces in accordance with the manufacturer's instructions.

5. Installation of the materials shall be in accordance with the manufacturer's instructions, a copy of which shall be kept at the job site.

6. Complete details for the membrane system are submitted for plan check and a building permit is obtained.

7. The following field tests in accordance with the Liquid Boot Field Installation and Repair Procedure are required: (A copy of the Installation and Repair Procedures is on file with Engineering Research Section.)

   a) Perform Thickness Sample Test at every 500 square feet.
   b) For gas barrier application, perform Smoke Test for the entire site at the interval not more than 50,000 sq. ft. each.

8. Protection for the membrane shall be provided in accordance with the written instructions by the engineer of the record.

9. Prior to placing the concrete slab over the membrane, the membrane installer shall certify the membrane to be installed and tested in accordance with the manufacturer's specifications and to be free of leaks.

10. The membrane is not to be placed under the building footings.

11. For gas membrane installation, continuous inspection by a registered deputy inspector certified by CETCO Liquid Boot Company, and registered in accordance with the requirements specified in Section 91.1704.2 of the Los Angeles Municipal Code for special inspections is required.

DISCUSSION

The report is in compliance with the 2017 City of Los Angeles Building Code.

The use of Liquid Boot for a gas barrier is based on the tests in accordance with the methane barrier test criteria.

The approval is based on tests.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this Approval have been met in the project in which it is to be used.

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

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STATE OF CALIFORNIA

REVISIONS
Date

SHEET TITLE
LIQUID BOOT
LOS ANGELES
RESEARCH REPORT

DATE
MARCH 22, 2021

PROJECT NUMBER
2020-116

SHEET NUMBER
GM-6.0

LIQUID BOOT® PLUS - Brownfield Membrane and Vent Systems Specifications

Section 07 2623.19 – March 2010 (Supersedes All Previous Versions)

Version 5.0

This guide specification has been prepared according to the principles established in the Manual of Practice published by the Construction Specification Institute and may have changed. Therefore, please confirm that this specification is still current and has not been superseded by checking at www.cetco.com or by calling 1-714-384-0111 for the most recent version.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK SUMMARY

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. Soil vapor extraction piping and low profile venting system beneath the gas vapor membrane.

1.03 RELATED REQUIREMENTS:

A. Other specification Sections which directly relate to the work of this section include, but are not limited to, the following:
1. Division 03 Section "Cast-In-Place Concrete" for concrete slabs.
2. Division 07 Section "Self-Adhering Sheet Waterproofing."
3. Division 07 Section "Cold Fluid-Applied Waterproofing."
4. Division 07 Section "Crystalline Waterproofing."
5. Division 26 Section "Conduit and other Electrical Penetrations."
6. Division 31 Section "Earthwork, Excavation and Fill, Shoring."
7. Division 33 Section "Geocomposite Foundation Drainage."

1.04 SYSTEM DESCRIPTION

A. Provide gas/vapor barrier system with prefabricated composite venting system to mitigate the passage of gas or vapor and install without defects, damage or failure. Gas vapor barrier shall be high performance VI-20 with EVOH core technology, Liquid Boot®, UltraShield protection course and applicable accessory products

1.05 SUBMITTALS

A. General: Prepare and submit specified submittals in accordance with "Conditions of the Contract" and Division 1 Submittals Sections.

B. Product Data: Submit manufacturer's product data, with complete general and specific installation instructions, recommendations, and limitations.

C. Product Samples: Submit representative samples of the following for approval:
1. GeoVent – low profile vapor extraction system.
2. VI-20 – high density polyethylene (HDPE) and ethylene vinyl alcohol (EVOH) composite membrane.
3. Liquid Boot® Detailing Fabric – ethylene vinyl alcohol (EVOH) and polypropylene composite membrane.
4. BaseFabric T-40 or T-60 – thermally bonded non woven polypropylene fabric.
5. Liquid Boot® - asphalt latex spray applied gas vapor barrier membrane.
6. UltraShield G-1000 – polypropylene needle punched protection course.

D. Contractor Certificate: At time of bid, submit written certification that installer has current Approved Applicator status with gas vapor membrane manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Gas vapor membranes and all accessory products shall be provided by a single manufacturer with a minimum of 25 years experience in the direct production and sales of gas vapor systems. Manufacturer shall be approving an acceptable installer/applicator and recommending appropriate installation methods.

B. Installer Qualifications: A firm that is trained and approved by the gas vapor barrier system manufacturer for installation of the gas vapor barrier system required for this Project. The installing company should have at least three (3) years experience in work of the type required by this section, who can comply with manufacturer's warranty requirements.

C. Pre-installation Conference: A pre-installation conference shall be held at the site prior to commencement of field installation to establish procedures to maintain required working conditions and to coordinate this work with related and adjacent work. Verify that final gas vapor barrier components and system details comply with gas vapor barrier manufacturer's current installation requirements and recommendations. Pre-con meeting attendees should include representatives for the owner, architect, inspection firm, general contractor, gas vapor installer/applicator, concrete contractor, excavating/backfill contractor, and mechanical and electrical contractors if work penetrates the gas vapor membrane.

D. Independent Inspection: Owner shall make all arrangements and payments for an independent inspection service to monitor gas vapor membrane material installation compliance with the project contract documents and manufacturer's published literature and site specific details. Independent Inspection Firm shall be an approved company participating with the gas vapor membrane manufacturer's Certified Inspection Program. Inspection service shall produce reports and digital photographs documenting each inspection. Reports shall be made available to the Contractor, gas vapor membrane installer, gas vapor membrane material manufacturer, and Architect. Inspections should include substrate examination, beginning of gas vapor membrane installation, periodic intervals, and final inspection prior to concrete or backfill placement against the gas vapor barrier.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling: Deliver materials in factory sealed and labeled packaging. Sequence deliveries to avoid delays, while minimizing on-site storage. Handle and store following manufacturer's instructions, recommendations and material safety data sheets. Protect from construction operation related damage, as well as, damage from weather, excessive temperatures and prolonged sunlight. Remove damaged material from site and dispose of in accordance with applicable regulations.

B. Do not allow material to freeze in containers

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

1.08 JOB CONDITIONS

A. Environmental Limitations: Apply gas vapor barrier system within the range of ambient and substrate temperatures recommended by manufacturer. Do not apply gas vapor barrier system to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.

B. Do not apply gas vapor barrier system in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

C. Maintain adequate ventilation during application and curing of gas vapor barrier system materials.

D. Ambient temperature shall be within manufacturer's specifications. If winter conditions apply, we recommend the use of space 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. Surface preparation shall be per manufacturer's specification.

1.09 COORDINATION

A. Coordinate application of gas vapor barrier with installation of other construction.
1. Positively secure plumbing, electrical, mechanical, and structural items to be under or passing through the gas vapor barrier in their proper positions and appropriately protected prior to membrane application.
2. Install gas vapor barrier before placement of reinforcing steel. When not possible, mask all exposed reinforcing steel prior to membrane application.

1.10 PRODUCT WARRANTY

A. Upon delivery and acceptance by the Owner of material specified by this Section, the materials manufacturer will provide a written one year standard material indicating the material conforms to its product specifications and is free of material defects. Factors affecting the results obtained from using this product including weather, equipment utilized, construction, workmanship and other variables are all beyond the manufacturer's control.

Under this product warranty, manufacturer will provide replacement material, at no charge, for any product proven not to meet the material properties listed in the published product literature 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 manufacturer 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 MANUFACTURER

A. Provide Liquid Boot® Plus membranes, venting system and applicable accessories as manufactured by Colloid Environmental Technologies Company (CETCO), 2870 Forbs Ave, Hoffman Estates, IL 60192,, USA. Phone: (847) 851-1800; Fax: (847) 851-1899; Web-site: http://www.sedimentremediation.com.

2.02 QUALIFICATIONS

A. The gas vapor barrier manufacturer must have produced at least 22 million square feet (2 million square meters) of gas vapor barrier, with at least 22 million square feet (2,000,000 square meters) installed.

2.03 MATERIALS

A. VI-20® is a seven-layer co-extruded membrane made from ethylene vinyl alcohol (EVOH) and polyethylene to provide strength as well as resistance to VOC vapor transmission. VI-20 membrane is an under-slab barrier when used in conjunction with Liquid Boot® will inhibit volatile organic compound vapor migration through the concrete.

VI-20 geomembrane barrier physical properties:

PROPERTIES	TEST METHOD	VALUE
Thickness, nominal	ASTM D5199	0.51 mm
Weight	ASTM D5261	498 g/m^2
Tensile Strength	ASTM E154	258 N/cm (58 lb/in)
Methane Permeability	ASTM D 1434	< 5 x 10-10 m2/d•atm
Radon Diffusion Coefficient		< 0.25 x 10-12 m2/s

B. 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 in Santa Ana, CA and Cartersville, GA (714) 384-0111.

LIQUID BOOT® gas vapor barrier physical properties:

GAS VAPOR MEMBRANE	TEST METHOD	VALUE
Acid Exposure (10% H_2SO_4 for 90 days)	ASTM D543	Less than 1% weight change
Diesel (1000 mg/l), Ethylbenzene (1000 mg/l), Naphthalene (5000 mg/l) and Acetone (500 mg/l) Exposure for 7 days	ASTM D543	Less than 1% weight change, Less than 1% tensile strength 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,	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
Soil Burial	ASTM E154-88	Passed
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**
Hydrostatic Head Resistance	ASTM D751	Tested to 138 feet or 60 p.s.i
GENERAL INFORMATION	**TEST METHOD**	**VALUE**
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
Elongation	ASTM D412	1,332% - Ø reinforcement, 90% recovery
Tensile Strength	ASTM D412	58 p.s.i. without reinforcement
Tensile Bond Strength to Concrete	ASTM D413	2,707 lbs/ft^2 uplift force

*per City of Los Angeles approval for 100-mil Liquid Boot® gas vapor barrier.
**per NSF approval for 80-mil Liquid Boot® potable water containment membrane

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

C. ACCESSORY GAS VAPOR BARRIER PRODUCTS: All accessory gas vapor barrier materials shall be provided by the manufacturer or shall have manufacturer's written approval for substitution.

1. GeoVent – low profile vapor extraction system.
   i. Liquid Boot® GeoVent end outlet.
   ii. Liquid Boot® GeoVent interior Footing Sleeves.
   iii. Liquid Boot® GeoVent Fabric Reinforced Tape.
2. Liquid Boot® Detailing Fabric – ethylene vinyl alcohol (EVOH) and polypropylene composite membrane.
3. Optional - vertical applications, Liquid Boot® BaseFabric T-40 or T-60 – thermally bonded nonwoven polypropylene fabric
4. UltraShield – polypropylene needle punched protection mat.
5. Adhesive system for Liquid Boot® UltraShield and Liquid Boot® UltraDrain: Use Liquid Boot® UltraGrip.
6. Hardcast CRT 1602 Tape 3" wide – covering cold joints, cracks form tie holes, etc.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The installer, with the Owner's Independent Inspector present, shall examine conditions of substrates and other conditions under which this section work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected and are acceptable for compliance with manufacturer requirements. General substrate conditions acceptable for the gas vapor barrier installation are listed below. For conditions not covered in this Section, contact the gas vapor barrier manufacturer for guidance.

B. SOIL SUBSTRATES:

1. Moisture condition and compact sub-grade to a minimum relative compaction of 90 percent or as specified by civil/geotechnical engineer with finished surface smooth, uniform, free of debris and standing water.
2. Stones or dirt clods greater than 1/4 inch to be removed. Aggregate sub-bases shall be rolled flat, free from any protruding sharp edges.
3. Penetrations must 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.
4. Trenches oversize are to be cut to accommodate gas vapor barrier membrane and protection course with perpendicular to sloped sides and maximum obtainable compaction. Finish grade and compact the adjoining grade.
5. Provide excavated walls vertical or sloped back, free of roots and protruding rocks.
6. Soil sterilant applications should at the sterilant manufacturer's recommended rate.

C. WOOD TIMBER SHORING: Wood lagging shoring should extend to the lowest level of the gas vapor membrane installation with any voids or cavities exterior of the lagging timbers filled with compacted soil or cementitious grout. Interior surface of lagging boards should be planar and tight together with gaps less than 1" (25 mm). Gaps in excess of 1" should be filled with cementitious grout, compacted soil, wood, extruded polystyrene (40 psi min.) Do not use plywood or other surface treatment over large lagging gaps that leave the cavity void.

D. CUT ROCK FACE OR AUGER CAST CAISSON SHORING WALLS: Interior surface of cut rock and concrete auger pile retention walls should be planar without irregular surface conditions, voids, and sharp transitions that would leave a void space to the outside of the gas vapor barrier installation. Irregular rock, void pockets, cracks, sharp concave transitions should be completely filled or smoothed with cementitious grout, shotcrete, or other approved solid material

E. MECHANICAL OR OTHER PENETRATIONS: Mechanical, structural, or architectural materials that will pass through the plane of the gas vapor membrane shall be properly installed and secured in their final position prior to installation of the Liquid Boot® Plus system.

F CONCRETE: Concrete to be gas vapor proof shall be properly placed and consolidated. Reinforced structural slabs should be a minimum of 6" (150 mm) thick when placed on a working mud slab. Reinforced concrete slab(s) on compacted grade shall be a minimum of 4" (100 mm) thick.

1. At cast in place concrete surfaces, provide a light broom finish or smoother, free of any dirt, debris, loose material, release agents or curing compounds. Fill voids more than 1/4 inch deep and 1/4 inch wide.
2. At masonry joints, cold joints, and form joints, provide a struck smooth surface. Prepare penetrations in accordance with manufacturer's specifications.
3. 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 degrees or less. Allow to cure overnight before the application of Liquid Boot®.
4. Completely grout all cracks or cold joints greater than 1/16 inch with non-shrink grout. Install Hardcast reinforcing tape over all cold joints, cracks and form tie holes (after holes and cracks are grouted).

3.02 SURFACE PREPARATION-

A. 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:

B. Remove dirt, debris, oil, grease, cement laitance, or other foreign matter which will impair or negatively affect the performance of the gas vapor barrier and venting system.

C. Protect adjacent work areas and finish surfaces from damage or Liquid Boot® over spraying during product applications.

3.03 INSTALLATION OF GAS COLLECTION/VENT SYSTEM

A. Roll out Liquid Boot® GeoVent per approved layout
B. Provide prefabricated Liquid Boot® GeoVent Sleeves or GeoVent End Outlets where venting penetrates interior footing
C. At points of intersections, cut away geotextile to produce rectangular flaps. Interlock exposed dimple board in a Lego-like fashion. Fold flaps of geotextile in a manner so that the dimple board is covered completely. Secure geotextile folds with Liquid Boot® Fiber Reinforced Tape so that the geotextile is completely impermeable to sand fill
D. Use Liquid Boot® GeoVent End Outlet to attach to a solid (non-perforated 2" (inches) diameter PVC pipe at penetration through building foundation. Seal/grout piping at penetrations through foundation using approved methods.

3.04 INSTALLATION ON CONCRETE/SHOTCRETE/MASONRY

A. Seal around penetrations in accordance with manufacturer instructions.

B. Provide a ¾ 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®.

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. 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.

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. 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.

F. 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.

G. After membrane has cured and checked for proper thickness and flaws, install protection material pursuant to manufacturer's instructions.
1. Perform all testing or inspection prior to placing protection course.

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.

3.05 INSTALLATION ON DIRT SURFACES AND MUDSLABS

A. Roll out VI-20 geomembrane on sub-grade and overlap seams a minimum of 6 inches. Lay geomembrane tight at all inside corners. Apply a thin 20 mil Liquid Boot® spray applied within the seam overlap. Line trenches with geomembrane extending at least six inches (6") onto adjoining sub-grade if slab and footings are to be sprayed separately.

B. Minimize the use of nails to secure the geomembrane 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 Liquid Boot® Detailing Fabric or Hardcast reinforcing tape overlapping the nail head by a minimum of two inches (2"). Apply a 20 mil Liquid Boot® under the geomembrane patch, when patching with geomembrane.

C. Sealing around penetrations.

D. Spray apply Liquid Boot® onto VI-20 geomembrane 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.
1. Perform all testing or inspection to be performed prior to placing protection course.

3.06 SEALING AROUND PENETRATIONS

3.06.10 OPTION 1

A. Clean all penetrations. Sand metal penetrations clean with emery cloth.

B. For applications requiring VI-20, roll out geomembrane on sub-grade, overlapping seams a minimum of six inches (6"). Cut the geomembrane around penetrations so that it lays flat on the sub-grade. Lay geotextile tight at all inside corners. Apply a thin (20 mil) LIQUID BOOT® within the seam overlap then lap Liquid Boot® Detailing Fabric around penetrations extending 3 inches around the base of penetration.

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 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. Spray-apply Liquid Boot® to surrounding areas as specified for the particular application. (SEE MANUFACTURER'S STANDARD DETAIL)

E. Allow LIQUID BOOT® to cure completely before proceeding to step "F".

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

3.06.20 OPTION 2

A. Clean all penetrations. Sand metal penetrations clean with emery cloth.

B. For applications requiring VI-20, roll out geomembrane on sub-grade overlapping seams a minimum of six inches (6"). Cut the geomembrane around penetrations so that it lays flat on the sub-grade. Lay geomembrane tight at all inside corners. Apply a thin (20 mil) of Liquid Boot® within the seam overlap then lap Liquid Boot® Detailing Fabric around penetrations extending 3 inches around the base of penetrations.

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. (SEE MANUFACTURER'S STANDARD DETAIL)

E. Allow Liquid Boot® to cure completely before proceeding to step "F".

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.

3.07 FIELD QUALITY CONTROL

A. The membrane must be cured at least overnight before inspecting for dry-thickness, holes, shadow shrinkage, and any other membrane damage. 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.

B. **ON CONCRETE/SHOTCRETE/MASONRY & OTHER HARD SURFACES**

1. 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.
2. If necessary, test areas are to be patched over with Liquid Boot® to a 60 mils minimum dry thickness, extending a minimum of 1 inch beyond the test perimeter.

C. **ON DIRT AND OTHER SOFT SUBSTRATES**

1. Samples may be cut from the membrane and geomembrane sandwich to a maximum area of 2 square inches. Measure the thickness with a mil-reading caliper, per 500 sq. feet. Deduct the geomembrane thickness of 20 mils to determine the thickness of LIQUID BOOT® membrane. Mark the test area for repair.
2. Patch voids left by sampling with Detailing Fabric underlay beneath the existing membrane with HDPE side up and a minimum of 2 inches overlap. Apply a thin tack coat of Liquid Boot® under the geomembrane patch. Then spray or trowel-apply Liquid Boot® to a 60 mils minimum dry thickness, extending at least three inches (3") beyond geotextile patch.

D. **SMOKE TESTING FOR HOLES**

1. Smoke test the membrane for holes and other breaches in accordance with the manufacturer's written instructions.

END OF SECTION

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SHEET TITLE
LIQUID BOOT PLUS MEMBRANE SPECIFICATIONS

DATE
MARCH 22, 2021

PROJECT NUMBER
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SHEET NUMBER
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LIQUID BOOT PLUS MEMBRANE SPECIFICATIONS

A

G


TECHNICAL DATA

ULTRASHIELD™ G-1000

NON-WOVEN GEOTEXTILE FABRIC

ULTRASHIELD G-1000 SPECIFICATIONS

D

GRAVEL SPECIFICATIONS

SIEVE SIZE	PERCENTAGE PASSING SIEVE	
	3/4" GRAVEL	3/8" GRAVEL
1 -1 1/2" (37.5 mm)	100	-
1" (25.0 mm)	90 - 100	-
3/4" (19.0 mm)	55 - 85	100
3/8" (9.5 mm)	8 - 20	85 -100
No. 4 (4.75 mm)	0 - 5	0 - 30
No. 8 (2.36 mm)	0 - 5	0 - 10
No. 200 (75um)	0 - 2	0 - 2
ASTM C 131 TEST GRADING	B	C

SAND SPECIFICATIONS

SIEVE SIZE	PERCENTAGE PASSING SIEVE
3/8" (9.5 mm)	100
No. 4 (4.75 mm)	90 - 100
No. 8 (2.36 mm)	75 - 90
No. 16 (1.18 mm)	55 - 75
No. 30 (600um)	30 - 50
No. 50 (300um)	10 - 25
No. 100 (150um)	2 - 10
No. 200 (75um)	0 - 5

SAND/ GRAVEL SPECIFICATIONS

A

H


TECHNICAL DATA

VI-20™ GEOMEMBRANE

HIGH-PERFORMANCE VAPOR INTRUSION BARRIER

VI-20 GEOMEMBRANE SPECIFICATIONS

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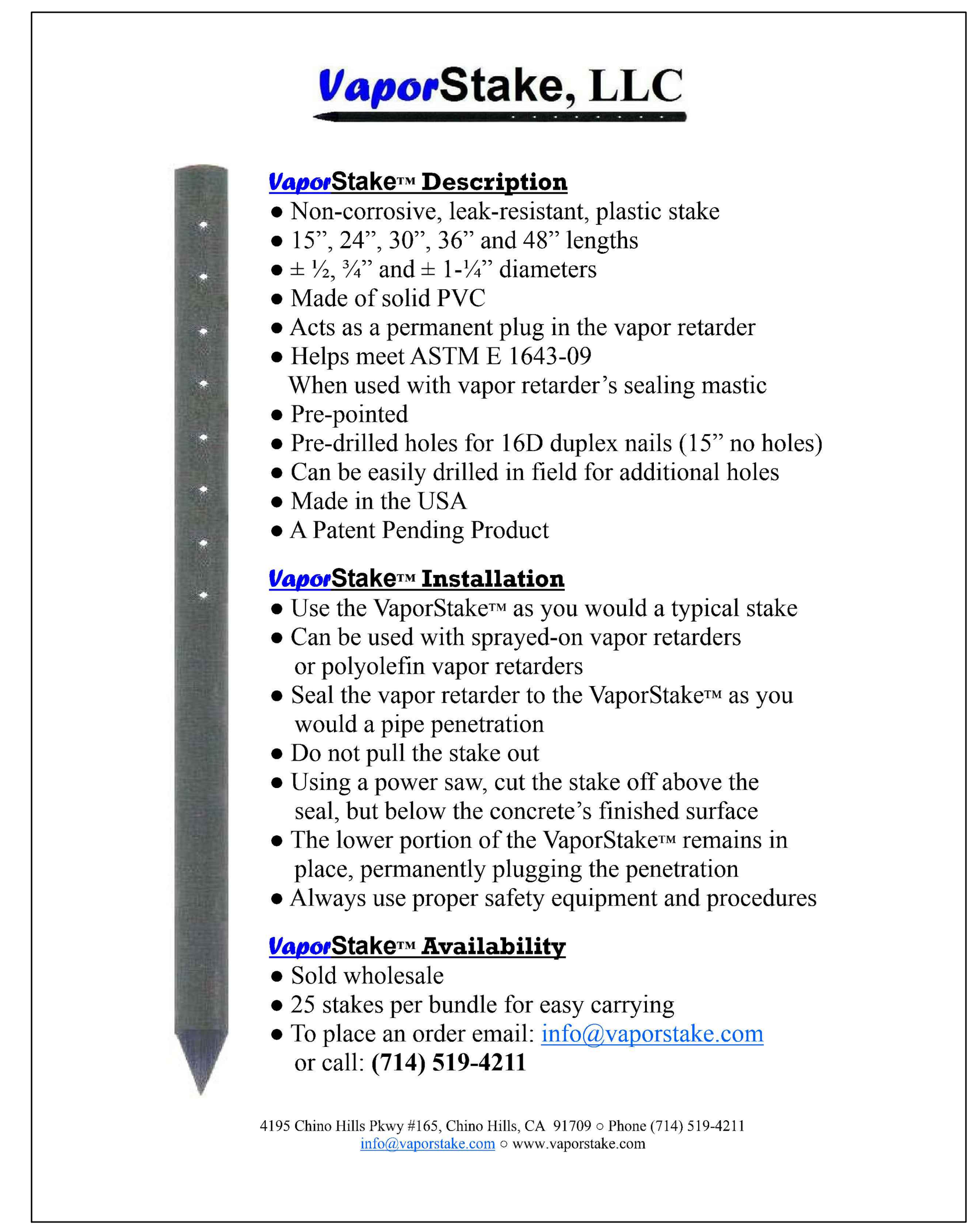
VaporStake, LLC

VaporStake™ Description

- Non-corrosive, leak-resistant, plastic stake
- 15", 24", 30", 36" and 48" lengths
- ± ½, ¾" and ± 1-¼" diameters
- Made of solid PVC
- Acts as a permanent plug in the vapor retarder
- Helps meet ASTM E 1643-09
  When used with vapor retarder's sealing mastic
- Pre-pointed
- Pre-drilled holes for 16D duplex nails (15" no holes)
- Can be easily drilled in field for additional holes
- Made in the USA
- A Patent Pending Product

VaporStake™ Installation

- Use the VaporStake™ as you would a typical stake
- Can be used with sprayed-on vapor retarders or polyolefin vapor retarders
- Seal the vapor retarder to the VaporStake™ as you would a pipe penetration
- Do not pull the stake out
- Using a power saw, cut the stake off above the seal, but below the concrete's finished surface
- The lower portion of the VaporStake™ remains in place, permanently plugging the penetration
- Always use proper safety equipment and procedures

VaporStake™ Availability

- Sold wholesale
- 25 stakes per bundle for easy carrying
- To place an order email: info@vaporstake.com or call: **(714) 519-4211**

VAPOR STAKE SPECIFICATIONS

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TECHNICAL DATA

GEOVENT™

ACTIVE/PASSIVE GAS VENTING SYSTEM

GEOVENT SPECIFICATIONS

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LICENSED PROFESSIONAL ENGINEER
NIKOLAUS REPPHUN
C 83924
EXP. 09/30/2021
CIVIL
STATE OF CALIFORNIA

REVISIONS
Date

SHEET TITLE
MATERIAL SPECIFICATIONS

DATE
MARCH 22, 2021

PROJECT NUMBER
2020-116

SHEET NUMBER
GM-6.2