TRI Pointe HOMES

THINK RENEW INSPIRE

October 19, 2018

Mr. Keith Nowell
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Subject: *Design Basis for Vapor Intrusion Mitigation System*, Ellis at Central Station, 1708 Wood Street, Oakland, California (Case No.: RO3206).

Dear Mr. Nowell:

Please find enclosed the *Design Basis for Vapor Intrusion Mitigation System* prepared by Geokinetics for the Ellis at Central Station development project, 1708 Wood Street in Oakland, California (the "Site"). I have read and acknowledge the content, recommendations and/or conclusions contained in the attached document or report submitted on my behalf to the SWRCB's GeoTracker website.

Please call me at 925/804-2258 if you have any questions or wish to discuss this further.

Sincerely,

Michael Bowes
Project Manager

GeoKinetics
Geotechnical & Environmental Engineers

Design Basis for Methane Mitigation System
Ellis at Central Station Condominiums
Oakland, California

Prepared by

GeoKinetics

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Prepared for

Tri Pointe Homes

October 18, 2018

Table of Contents

1.0 **Introduction & Background:** This submittal provides the design basis for the methane gas mitigation system improvements for TriPointe Homes' Ellis at Central Station condominium project located at 1708 Wood Street in Oakland, California. The general site location is shown in Figure 1 while a recent aerial photograph of the property is provided as Figure 2. The subject ≈4.3-acre site consists of Alameda County Assessor's Parcel Numbers (APNs) 7-562-1 and 7-563-1. The property is zoned HBX-2 for a housing and business mix. The property is located approximately 500 feet to the east of the I-880 freeway. It is bounded by Wood Street on the west, Campbell Street on the east, 18th Street on the North, and 17th Street on the south.

The property is owned by TriPointe Homes Inc. and currently developed with a ≈24,400 Ft^2 office / warehouse / shop building at its southwest corner and a smaller ≈2,600 Ft^2 garage / shop building at its northwest corner. Most of the remainder of the site is covered with asphalt pavement. The buildings are currently unoccupied. They were most recently used by Three Rivers Trucking as a shipping, receiving, and maintenence facility. The site was previously used for various commercial and industrial purposes including automotive uses (California Motor Express / California Motor Transport, Circle Freight Line, Stockton Motor Express, Calko Transport Company, Roadway Express) and industrial uses (roofing, furniture warehousing, sheet metal / iron works).

2.0 **Environmental Conditions:** Recent investigations at the subject property by West Environmental have identified the presence of locally elevated concentrations of methane gas in the subsurface as well as low concentrations of Volatile Organic Compounds (VOCs) in the shallow groundwater. Most recently, groundwater was measured at depths between 16 and 22.5 feet bgs. Historically, groundwater has been reported at depths of approximately 5 feet bgs. The project geotechnical engineer has recommended that a minimum groundwater depth of two feet be adopted as a design parameter for the project. VOCs associated with fuel hydrocarbons (benzene, toluene, ethylbenzene, and xylenes) were detected in groundwater samples at concentrations up to approximately 5 μg/L in 2008 and 2011. West Environmental installed and monitored thirteen shallow (1 foot deep) soil gas probes at the site in 2016. Concentrations of methane gas in excess of its Lower Explosive Limit (LEL) of 55,000 ppm were detected in two of the probes. The maximum measured concentration of methane was 381,000 ppm. Low concentrations of methane below its LEL were detected in the remaining probes. Significant concentrations of VOCs were not identified in the soil gas samples.

Environmental reports related to the subject property are identified in the attached reference list. Potential concerns and exposure pathways relate to the migration of soil gas containing methane and/or VOCs to interior areas.

3.0 Proposed Redevelopment: The site is to be redeveloped with 128 multi-family and live / work townhome-style condominiums. The townhomes will be 3-story attached units with private at-grade garages. Some townhomes will also include flexible workspaces at ground level. A site plan illustrating the configuration of the proposed improvements is provided as Figure 3. Building footprint areas are indicated on the attached Methane Mitigation System Plans. Detailed development plans, including site utility plans, are provided in the construction plan set that has been prepared by Hunt / Hale / Jones (Ref. 57).

GeoKinetics has been retained to prepare plans and specifications for the methane gas mitigation system for the subject project. This system will also mitigate the potential for any impacts to indoor air from the low levels of VOCs previously detected in the groundwater samples. Quantitative objectives of the system include reducing the potential rate of soil gas to interior areas such that:

1. The concentration of methane in the interior air will be less than 10 ppm above the background (ambient air) level; and

2. Estimated incremental lifetime carcinogenic risk associated with the migration of VOCs from soil gas to indoor air will be less than 1×10^{-6}.

This represents a Basis of Design Report for the soil gas intrusion mitigation system. The Alameda County Health Services Agency (ACHCA) and the City of Oakland are the regulatory oversight agencies that will review and evaluate the proposed mitigation measures and building improvements. The soil gas mitigation plans have been prepared in accordance with the California Building Code and the current standard of practice within the industry. California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) and City of Los Angeles Department of Building & Safety (LADBS) guidelines have also been considered in the preparation of the soil gas intrusion mitigation plans. The relevant guidelines are identified in the attached reference list.

4.0 Proposed Methane Mitigation System Improvements: A copy of the methane mitigation system plans is provided as Attachment A. As indicated, the plans call for the installation of an engineered gas membrane beneath the floor slabs of the buildings. The membranes will extend continuously beneath the footprints of the buildings and be attached to the perimeter footings. They will also be sealed against any penetrations that extend through them. The specified gas membrane consists of a Liquid Boot multi-layer composite membrane that includes an upper protection course (UltraShield G-1000), an intermediate 60-mil spray-applied chloroprene modified asphalt core (Liquid Boot 500), and a lower 6 oz. Typar 3401 carrier fabric. This membrane system is shown in Detail A on Sheet D-1 of the attached plan set. The manufacturer's specification sheets for the membrane materials are provided in Attachment B. It has been our experience that the specified protection course will allow normal construction practices to take place without damage to the membrane as long as reasonable precautions are taken. As described in Section 7.0 of this submittal, inspection / testing activities will be performed during and after the system is installed to ensure it is undamaged and functioning as intended.

The methane mitigation plans also call for the installation of a passive sub-slab vent piping system beneath the gas membrane. The specified vent piping consists of low profile (12" wide x 1" high) Liquid Boot Geovent pipe installed within a 4-inch thick gravel layer beneath the membrane. The vent piping will be connected to non-perforated vent risers that extend to outlets at the roof level of the buildings. The number, sizes, and spacing of the vents risers are based on LADBS methane mitigation guidelines with a minimum of two vent risers provided per building. The vent risers will consist of cast iron piping in order to minimize the potential for inadvertent post-construction damage or penetrations by homeowners. Manufacturer's specification sheets for the vent system components are included in Attachment B. As indicated on the attached plans, warning labels will be provided on the vent risers to indicate their function and the fact that they may contain combustible gas. Non-restrictive rain guards will be provided at the vent riser outlets to prevent water intrusion into the system.

The methane gas that has been detected at the site appears to originate from the biodegradation of organic matter that is entrained in the Bay Mud deposits that underlie the property, as discussed in Section 5. This represents a relatively low volume source. It has been our experience that methane gas is generated at a slow rate by this mechanism. The gravel blanket and associated vent piping that

is to be installed beneath the gas membrane is intended to serve two functions. First, it will prevent elevated pressures (<0.5" of water) from developing beneath the membrane as a result of gas generation. Secondly, it will reduce the concentrations of methane gas that would otherwise develop within the gravel blanket. This venting or dilution largely occurs as a result of daily fluctuations in the barometric pressure. The barometric pressure typically falls slightly during the day time and rises slightly at night. These atmospheric pressure variations normally result in off-gassing from the vent system during the day and the recharge of fresh air into that system during the night. This flow cycling has a tendency to flush accumulated gases from the vent piping and gravel blanket. Mechanical ventilators are not necessary, called for on the plans, or recommended. The vent system is designed to function in all foreseeable wind and weather conditions and under all building HVAC operating modes. It is anticipated that the building HVAC systems will normally provide a minimum of 0.25 Air Exchanges per Hour (AEH) and not reduce the indoor air pressure to a level that is more than 1" of water less than atmospheric pressure.

The sub-slab vent system is designed to operate in a passive mode and provide a high level of redundancy and protection in that mode. In the unlikely event that the system was required to operate in an active or Sub-Slab Depressurization (SSD) mode, it has been configured such that it could easily be modified and operated in that mode. One of the vent risers at each of the buildings will extend through the wall of a utility closet. Those vent risers will be accessible and easily modified to accommodate a blower. Electrical power is available in the utility closets.

As shown on the attached plan set, soil gas sampling probes are to be installed within the gravel blanket at various locations to provide a means of measuring methane concentrations and pressures beneath the membrane. The soil gas sampling probes will be housed in secured housings in the foundation stemwalls and accessible from the exteriors of the buildings. The sampling ports incorporate gas-tight quick-connect fittings within a secured flush-mounted housing. Additional soil gas monitoring probes outside of the building footprints are not necessary or recommended.

We have designed and installed this type of methane mitigation system at several thousand buildings to date. In each case the system has performed as intended and provided a high level of protection to the buildings occupants. The

improvements have been designed for minimal maintenence and with provisions for simple / accessible monitoring. The gas mitigation system has been designed to function for the intended life of the building (50+ years).

Although relatively shallow groundwater is present at the site, supplemental subsurface drainage measures are not believed to be necessary for the soil gas mitigation system to function as intended. The proposed soil gas vent piping will be located a foot or more above the minimum design groundwater depth specified by the project geotechnical engineer. The proposed soil gas mitigation measures are consistent with the recommendations provided in the geotechnical design report for the project. Sufficient permeable / landscaped areas will be present around the perimeters of the buildings such that supplemental soil gas vent systems beyond the footprints of the buildings are not believe to be necessary. The proposed vent system will effectively eliminate any potential vertical migration of soil gas to interior spaces. It will also eliminate any potential horizontal migration of soil gas from beneath the buildings. As indicated on the attached plans, utility trench dams, conduit seals, and membrane penetration boots will be provided to mitigate the potential migration of soil gas from unprotected areas to the interior spaces.

We have not identified any cold joints or post curing modifications to foundation elements that will adversely impact the performance of the mitigation measures. We have not identified any atypical or unusual construction sequencing that will be necessary for the successful installation of the mitigation system. Inspection and testing sequencing for the system components is discussed in Section 7 of this submittal. We have not identified any constructability issues that will prevent the mitigation measures from being installed as specified on the attached plans.

Materials and set-back distances for the vent piping and risers are specified on the plans in accordance with the California Plumbing Code and the current standard of practice. Relevant guidelines are listed in the attached reference list. Manufacturer's specifications for the materials that have been specified are included in Attachment B. The specified materials are readily available from the indicated manufacturers.

5.0 Methane Gas Characteristics: The presence of methane gas in the subsurface is common within estuaries and other locations where organic material - such as grass, leaves, wood, manure, etc. - are present in the soil. Biogenic methane is

generated by the bacteriological digestion, or biodegradation, of organic matter in the absence of oxygen. Methane of thermogenic or petrogenic origin may also be present in surficial soils at some sites as a result of its upward migration from deeper oil and gas bearing zones. Petrogenic methane is not believed to be present at the subject site.

The methane gas that has been detected at the subject property is believed to be of biogenic origin and associated with the degradation of organic matter that is entrained within the underlying Bay Mud deposits. Up to approximately 16½ feet of recent Bay Mud deposits are reported to underlie the subject property (Ref. 62). It has been our experience that elevated concentrations of methane are routinely present in this environment. In contrast to sites located in areas of oil production and/or near municipal landfills, this represents a relatively low volume, low pressure, and low risk methane source.

Methane is not toxic, however, it is combustible and potentially explosive at concentrations above 55,000 ppm in the presence of oxygen. This concentration is referred to as its Lower Explosive Level or LEL. Methane is lighter than air and therefore has a natural tendency to rise to the ground surface where it typically dissipates into the atmosphere. The presence of non-pressurized methane at shallow depths beneath the ground surface is normally not problematic. The rates at which the methane is generated and/or migrates towards the ground surface are slow enough such that the gas dissipates naturally under normal circumstances. However, as methane migrates to the ground surface, the potential exists for its accumulation beneath slab-on-grade foundation systems or other relatively impermeable ground coverings. If the gas accumulates to high concentrations, and becomes pressurized, and a crack or other penetration is present in the floor slab of an unprotected structure, detectable levels of methane may enter the interior of that building. Improvements - such as sub-slab vent lines or gas membranes - are often installed as a precautionary measure for new structures at sites where high levels of methane gas have been detected in the subsurface.

6.0 Chemical Compatibility & Transmissivity Testing: GeoKinetics has performed chemical compatibility testing on the type of membrane that is specified for this project. Most of these tests have been performed under extremely high concentrations of methane (100% by volume) and VOC vapors (e.g. 90,000 μg/L for PCE) to ensure chemical compatibility of the membrane components in

environments where they may be exposed to various chemicals. We have found no degradation or deterioration of the membrane materials during extended exposure to these very high methane and VOC vapor levels.

GeoKinetics has performed tests to measure the rate at which methane gas permeates across Liquid Boot membranes under a pressure gradient. The configuration of these tests and typical results are shown in Attachment C. These test results, and associated field measurements, indicate the Liquid Boot membrane has extremely low methane gas permeability and will effectively prevent significant quantities from being transmitted to the interior of a protected structure.

GeoKinetics has also performed tests to measure the rates at which VOCs diffuse across Liquid Boot membranes under high concentration gradients. The diffusion test configuration and associated typical results are shown in Attachment D. These test results, and associated field measurements, indicate the Liquid Boot membrane has extremely low diffusion coefficients and will effectively prevent significant quantities of VOCs from being transmitted to the interior of a protected structure.

7.0 Construction Observation, Testing & Certification: Improper installation and/or construction-related damage to the gas membrane could reduce its effectiveness. Precautionary measures will therefore be taken at the time of construction to ensure the system is installed properly and the gas membrane is undamaged. The approved plans specify that rigorous inspection, certification, and testing activities be performed during the installation of that system. These services will be provided by, or under the direction of, a state-certified Civil Engineer (the Methane Mitigation System Engineer) with at least 20 years experience in the design and installation of methane mitigation systems. At a minimum this will include:

1. Inspection and approval of the construction materials, such as horizontal vent piping, vent sampling port fittings, gas membrane materials, gravel vent layer material, vent riser materials, placards, labels, etc., prior to the start of installation. Inspection of the prepared subgrade will also be performed prior to the start of the methane mitigation system installation.

2. Inspection and approval of the sub-slab ventilation system will occur prior to the installation of the sub-slab gas membrane.

3. Inspection, testing, and approval of the gas membrane and sub-slab ventilation piping will occur prior to placement of the concrete for the floor slab. Smoke testing of the barrier and vent piping system will be performed by the construction contractor (who will be hired by the developer) and observed by the Methane Mitigation System Engineer to confirm the connectivity / functionality of the sub-slab gravel blanket and vent piping and the integrity / continuity of the gas membrane. Any pinholes, perforations, or leaking seams will be identified, repaired, and re-tested. Smoke tests will be performed after the installation of the gas membrane and again after the reinforcing steel (post-tensioning cables) have been placed immediately prior to placement of the concrete for the floor slab. Placement of the foundation / floor slab concrete will not take place until the membrane has been approved and certified by the Methane Mitigation System Engineer.

4. Inspection, testing, and approval of the above-ground vent riser system. A third smoke test will be performed at this time to confirm the integrity and interconnection of the vent risers. The Smoke Testing Procedures will follow the standard GeoKinetics' protocol set forth in Attachment E. The test pressure limitation (less than 2 inches of water) for the initial smoke test will not apply to the test that is performed after the installation of concrete floor slab for the buildings. Post construction smoke testing may be performed at pressures of up to approximately 6 inches of water, when necessary, to facilitate the smoke test. Once the system has passed the final inspection, a certification letter will be issued by the Methane Mitigation System Engineer to confirm the system was installed in accordance with the approved plans and specifications.

5. Inspection of the utility trench dams and dry utility seals.

The measures outlined above reduce the potential for any significant damage to the gas membrane or vent components during the construction process. A copy of GeoKinetics' standard inspection summary form is included in Attachment E. As an additional precautionary measure, a post-construction combustible gas survey will be performed on the interior of each building. These surveys will involve screening for the presence of combustible gas throughout each building using a Flame Ionization Detector (FID). In addition to the interior air, conduit terminations, utility closets, and other barrier penetration locations will be tested for the presence of detectible levels of combustible gas. The detection limit of the FID will be 1 ppm or lower. Any detections of combustible gas on the interior of the buildings in excess of background levels will be identified. An incremental combustible gas screening level of 10 ppm will be utilized in this regard. Combustible gas concentrations and pressures will be measured concurrently in the sub-slab gas probes. Any differential pressures that exceed the initial design objective of 0.5" of water relative to atmospheric will be investigated and evaluated. At the successful completion of an installation to the satisfaction of the Methane Mitigation System Engineer, the system will be certified by that engineer. The results of the post-instruction interior air combustible gas survey and sub-slab probe measurements will be included in the building certification letter.

8.0 Post-Construction Modifications: The methane mitigation system, concrete floor slab, and foundations will be owned by the building homeowner's association (HOA). Restrictions in the form of CC&R's will be put in place with respect to any work that could penetrate or disturb any component of the methane mitigation system, concrete floor slabs, and/or foundations. Modification of portions of the mitigation and/or monitoring systems may be required after final installation due to a variety of factors, such as new facility construction, building and/or landscape remodeling, standard utility upgrades, repairs, and/or mitigation system modifications based upon changing site conditions. Any building modifications that require the penetration or removal of floor sections of a building will be performed with the approval of, and under the observation of, the Methane Mitigation System Engineer. The Methane Mitigation System Engineer will monitor construction activities and re-certify the integrity of the mitigation system at the completion of those activities. The Methane Mitigation System Engineer will perform any inspection, testing and/or monitoring activities deemed necessary to confirm the integrity and functionality of the system in conjunction with this

re-certification. A letter summarizing the building modifications and the mitigation system inspection and re-certification activities will be prepared and submitted to the permitting agency and ACHCA at the completion of any such project. The Methane Mitigation System Engineer will update the As-Built Plans for the methane mitigation system, as necessary, at the completion of the project. The permitting agency and ACHCA shall be provided with copies of any updated plans as part of any supplemental system certifications.

9.0 Summary & Conclusions: As outlined above, the proposed methane mitigation system represents a highly conservative and redundant design that has been successfully utilized at many thousands of buildings over the past decades. Extensive testing and documentation will be performed before, during, and after the installation of the methane mitigation improvements to ensure they provide a high level of protection to the building occupants.

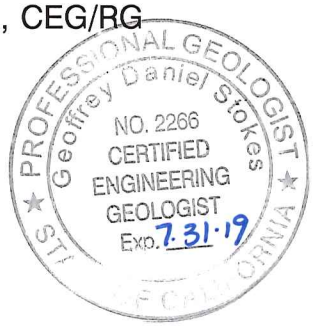
We hope this information is helpful to you. Please do not hesitate to contact either of the undersigned if you have any questions or comments.

Sincerely,
GEOKINETICS, INC.

Glenn D. Tofani, GE/RCE
Principal Engineer

Geoffrey D. Stokes, CEG/RG
Senior Geologist

Attachments



Selected References

(General References)

1. *Individual Volatile Organic Compound Prevalence and Concentrations in 56 Buildings of the Building Assessment Survey and Evaluation (Base) Study* by JR Girman, et al., dated 1999.

2. *A Comparison of Hydrocarbon Vapor Attenuation in the File with Predictions from Vapor Diffusion Models* by G. Todd Ririe, et al., dated 2002.

3. *The MTRANS Methane Gas Migration Model - Methane Geotechnical Working Group* prepared for Building Industry Association by Glenn Tofani, Hassan Amini, Gordon Alexander, Marlaigne Hudnall, and Brian Villalobas, June 2002.

4. *Volatile Organic Compounds in Indoor Air: A Review of Concentrations Measured in North America Since 1990* by Alfred T. Hodgson and Hal Levin dated April 21, 2003.

5. *Comparison of Personal, Indoor, and Outdoor Exposures to Hazardous Air Pollutants in Three Urban Communities* by Ken Sexton, et al., dated December 12, 2003.

6. *Los Angeles Department of Building & Safety Methane Mitigation Guidelines (Ordinance No. 175790)* dated February 12, 2004.

7. *Results of Solvent Diffusion Tests on Liquid Boot^{R} Membranes* by Glenn Tofani, November 2004.

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9. *Results of Benzene Diffusion Tests for Liquid Boot^{R} Membranes* by Glenn Tofani, October 2005.

10. *Lateral Gas Permeability Testing for Ultrashield G-1000 Geofabric* by Glenn Tofani, December 2006.

11. *Transmission of Methane Gas and VOC Vapors Through Membranes* by Glenn Tofani, February 2007.

12. *Results of Chemical Exposure Testing for Cetco Waterproofing Materials* by Glenn Tofani, March 2008.

13. *Chemical Compatibility of Liquid Boot® Membranes With Respect to Vapor Barrier Applications* by Glenn Tofani, April 2008.

14. *Estimation of Vapor Migration Rates to Building Interiors* by Glenn Tofani, et al. presented at the Sixth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, May 2008.

15. *Volatile Organic Compound Concentrations and Emission Rates in New Manufactured and Site-Built Homes* by A. Rudd, A.T. Hodgson, D. Beal, and S. Chandra dated 2008.

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18. *Chemical Compatibility of Liquid Boot® Membranes With Respect to Vapor Barrier Applications* by Glenn Tofani, May 2009.

19. *Results of Solvent Diffusion Tests on LB-500 Membranes* by Glenn Tofani, December 2009.

20. *Residential Indoor Air Concentrations of Common Volatile Organic Compounds* by T.R. Kline and N. Goers dated 2009.

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22. *Petroleum Vapor Intrusion: Fundamentals of Screening, Investigation and Management* by The Interstate Technology & Regulatory Council dated October 2010.

23. *Evidence for Increasing Indoor Sources of 1,2-Dicloroethane Since 2004 at Two Colorado Residential Vapor Intrusion Sites* by J.P. Kurtz, et al., dated 2010.

24. *Emissions of 1,2-Dichloroethane from Holiday Decorations as a Source of Indoor Air Contamination* by W.J. Doucette, A.J. Hall, and K.A. Gorder dated 2010.

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27. *Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences (1990 - 2005): A Compilation of statistics for Assessing Vapor Intrusion* by U.S. EPA dated June 2011.

28. *Results of Solvent Diffusion Tests for GeoSeal Membranes* by Glenn Tofani, August 2011.

29. *Vapor Intrusion Mitigation Advisory* by California Environmental Protection agency - Department of Toxic Substances Control dated October 2011.

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31. *Typical Indoor Air Concentrations of Volatile Organic Compounds in Non-Smoking Montana Residence Not Impacted by Vapor Intrusion* by Montana Department of Environmental Quality dated August 2012.

32. *Lessons-Learned from Four Years of Intensive Monitoring of a House over a Dilute Chlorinated Hydrocarbon Plume* by Kyle Gorder and Erik Dettenmaier dated March 2014.

33. *A Rational Approach to Methane Hazard Assessment* by John Sepich and Stephen Marsh, 2014.

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(Project Specific References)

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43. *Improvement Plans Parcel A* by Sandis dated January 20, 2017.

44. *Improvement Plans Parcel B* by Sandis dated January 20, 2017.

45. *Remedial Action Plan* by West Environmental Services & Technology dated February 2, 2017.

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47. *1708 Wood Street Parcel A Grading Permit Plans* by Sandis dated May 11, 2017.

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49. *Site Cleanup Case Letter* by Alameda County Health Care Services Agency dated July 16, 2017.

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57. *TriPointe Homes Ellis at Central Station Condominiums Plan Set Permit Submittal* by Hunt Hale Jones dated June 7, 2018.

58. *Ellis at Central Station Condominiums Site Improvements Parcel A* by Sandis dated June 19, 2018.

59. *Ellis at Central Station Condominiums Site Improvements Parcel B* by Sandis dated June 19, 2018.

60. *Updated Soil Gas Sampling Report. 1708 Wood Street, Oakland, California, Case No.: RO00023206* by West Environmental Services & Technology dated June 21, 2018.

61. *Soil Import Management Plan, 1708 Wood Street, Oakland, California, Case No.: RO0003206* by West Environmental Services and Technology dated June 29, 2018.

62. *Geotechnical Investigation* by Steven Ferrone & Bailey Engineering Company, Inc. dated July 16, 2018.

63. *Ground Improvement Plans* by Farrel Design-Build dated July 19, 2018.

64. *Ellis at Central Station Plan Set* by Hunt Hale Jones dated August 15, 2018.

65. *Remedial Design and Implementation Plan* by West Environmental Services & Technologies dated September 2018.

66. *Ellis at Central Station DDC Aggregate Cushion & Vapor Mitigation System (VMS) Interface* dated October 4, 2018.

67. *Methane Mitigation System Plans & Specifications for Ellis at Central Station Condominiums* by GeoKinetics dated October 18, 2018.

{ E N D }

Not to Scale

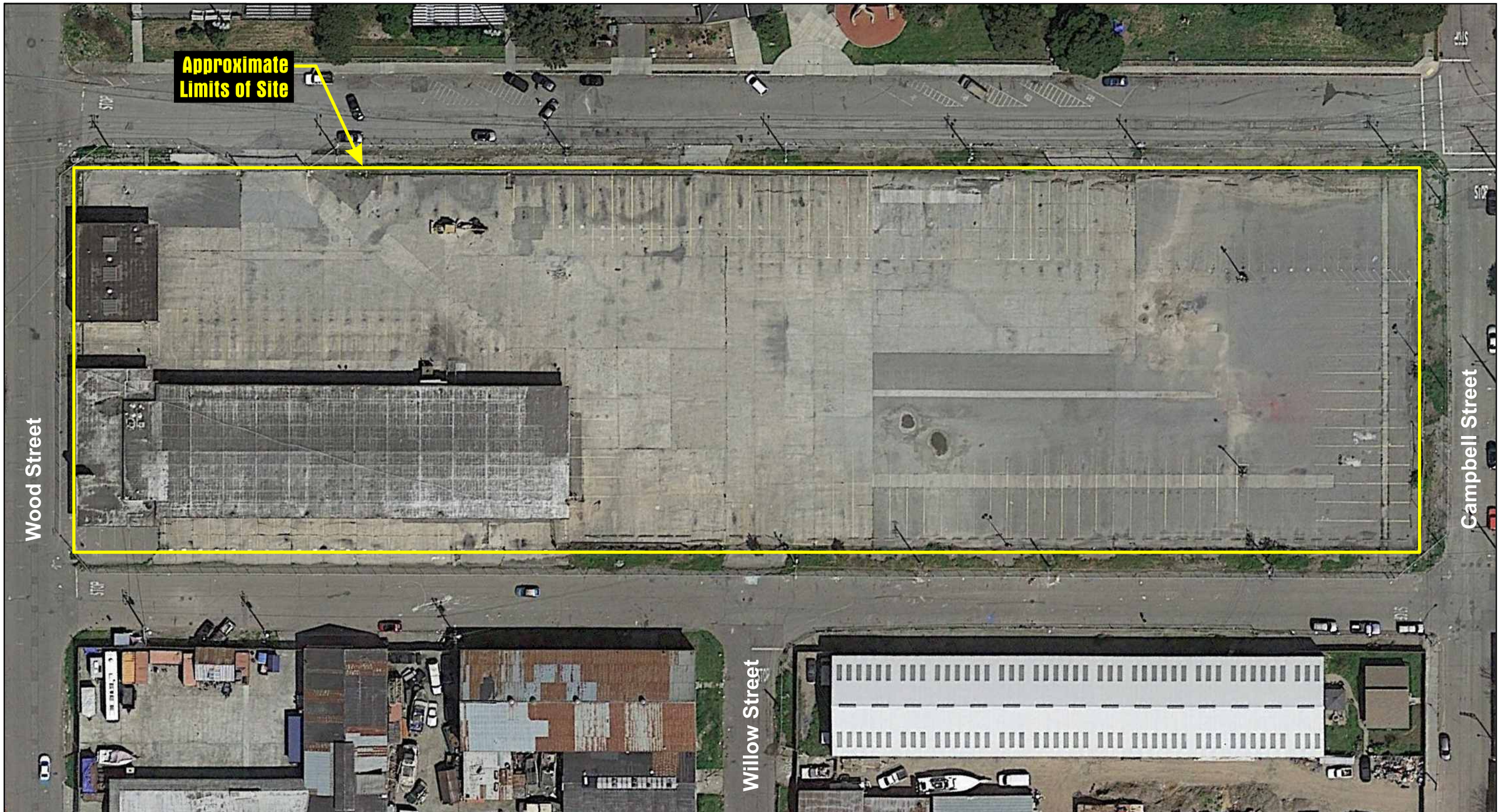
GeoKinetics
Geotechnical &
Environmental Engineers

Project Name: Ellis at Central Station Condominium

Date: October 2018

Site Location Map

Figure 1



GeoKinetics
Geotechnical & Environmental Engineers

Project Name: Ellis at Central Station Condominium

Date: October 2018

Recent Aerial Photograph of Site

Figure 2

LEGEND

Building Where Methane Mitigation Measures are to be Installed ***(Buildings 5, 10, 12, 17, & 18 This Submittal Only)***

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: Ellis at Central Station Condominium

Date: October 2018

Site Plan with Proposed Improvements

Figure 3

Attachment A

Methane Mitigation System Plans

Methane Mitigation System Plans & Specifications for

Ellis at Central Station

Condominiums

18th & Wood Streets, Oakland California – Alameda County

Project Site

Not to Scale

Index of Sheets

Design Team

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636 9th Street
Oakland, California 94607
P: 510.590.3415

Notice for Contractor

All contractors and subcontractors performing work shown on or related to these plans shall conduct their operations so that all employees are provided a safe place to work and the public is protected. All contractors and subcontractors shall comply with the "Occupational Safety and Health Regulations" of the U.S. Department of Labor and with the state of California Department of Industrial Relations' "Construction Safety Orders."

The Developer and the Project Methane Engineer shall not be responsible in any way for contractors' and subcontractors compliance with the "Occupational Safety and Health Regulations" of the U.S. Department of Labor or with the State of California Department of Industrial Relations' "Construction Safety Orders."

Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property, that this requirement shall apply continuously and not be limited to normal working hours, and that the contractor shall defend, indemnify and hold the owner and the Engineer harmless from any and all liability real or alleged, in connection with the performance of work on this project, excepting for liability arising from the sole negligence of the Owner or the Engineer.

Original Scale in Inches for Reduced Plans: 0 1 2 3

Date	By	Rev.	Description

Revisions

REGISTERED PROFESSIONAL ENGINEER — GLENN D. TOFANI — No. 044229 Exp. 6-30-19 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — GLENN D. TOFANI — No. GE 2496 Exp. 6-30-19 — GEOTECHNICAL — STATE OF CALIFORNIA

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Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Title Sheet

Sheet 1

October 18, 2018

General Notes

I. Applicability:

The Methane Gas Abatement details presented in these plans and specifications shall be utilized in the construction of buildings on the lot so designated on Sheet No. 3 of these plans.

II. Sub-Slab Passive Venting:

A. A passive venting system shall be installed beneath the slab / foundation of the designated building. General Specifications for this system are as follows:

B. Low profile sub-slab vent system vent lines shall be placed such that no portion of the foundation is more than 25 feet from a vent line. Low profile sub-slab vent system vent lines shall be covered with filter fabric and not less than 12" wide . A minimum length of one foot of slotted pipe will be required for every 75-ft^2 of slab area serviced by a low profile sub-slab vent system vent line.

C. Low profile vent piping shall be placed in 4-inch of gravel as shown in Detail O, Sheet D2. The lower sand layer shall contain no more than 5% fine (i.e. <5% passing #200 sieve).

D. Where piping transitions through building footings, the penetration shall be accomplished in compliance with the Uniform Building Code and with the approval of the Project Structural Engineer and the Building Official.

E. Perforated pipes shall be connected to solid vertical venting pipe. Vertical venting pipe shall not be less than 2-inch in diameter, and at least 15 square inches of cross sectional area over entire building and shall be constructed of materials that comply with the Uniform Plumbing and Mechanical Codes. All joints shall be gas tight sealed with approved materials.

F. Solid venting pipe may be located within the walls/chases or shall be similarly protected from physical damage.

G. Venting pipes shall terminate a minimum of 6-Inches above the roof-line adjacent to the vent and 3' from face of structure.

H. Venting pipes shall terminate at least 10 feet from any building opening or air intake located at or above the level of the vent pipe outlet, and at a distance of at least 4 feet from any property line.

I. Any venting pipe located within an open yard shall terminate at a height of not less than 10 feet above adjacent grade.

J. The termination of all venting pipes shall be provided with a TEE connection or other approved non-restricting rain cap to prevent the intrusion of rain water.

K. Venting pipe shall be clearly marked to indicate that the pipe may contain combustible gas. This may be accomplished through stencils, labels, or other permanent labeling method. Pipes shall be clearly and permanently labeled "Methane Gas", in 1/2" high letters, near their termination point and at approximately 5-foot intervals along the remainder of the venting pipe. This includes sections encased within walls or other enclosures.

L. Methane Vent outlet risers shall be constructed using 2" cast iron pipe with No-Hub coupling, or other piping approved by the Methane Engineer and Building Official in compliance with Section 1212 of the Uniform Plumbing Code. Risers located within building shall terminate at an approved outlet in accordance with Section 506 of the Uniform Building Code.

III. Gas Membrane Barrier:

A. General:

1. A gas membrane barrier shall be installed beneath the slab / foundation of the buildings designated on Sheets D1-D3 of these plans. General specifications for this system are as follows:

2. The gas membrane shall have a minimum cured thickness of 60-mils and consist of spray on chloroprene modified asphalt (CMA), or equivalent, approved by the Methane Engineer and County of Alameda. The gas membrane barriers at this project shall be constructed using Liquid Boot®, or an equivalent product, approved by the Project Methane Engineer and County of Alameda.

3. The gas membranes shall be placed between the bottom of the floor slab and the subgrade, and around or fastened to footings and trenches, in accordance with these plans and details. The membranes shall not be placed more than 6" below the bottom of the floor slab - except where the barrier may pass beneath a deepened interior or perimeter footings.

4. Seams shall be over lapped a minimum of 6-inches and sealed in accordance with the specifications set forth in these plans.

5. Prior to placing the layer of Ultrashield G-1000 protection fabric over the membrane, the Methane Engineer shall inspect and approve the gas membrane in accordance with these plans and specifications. Construction of the floor slab shall not proceed without written certification of the successful installation of the gas membrane system by the Contractor / Applicator and the Methane Engineer.

6. Where piping, electrical conduits, etc. penetrate the membrane, a 3" collar of Liquid Boot® shall be provided to create a gas-tight seal around the penetration in accordance with Detail H, Sheet D1.

7. The subgrade under the membrane shall be rolled smooth and well compacted.

8. The upper surface of membrane shall be protected by a layer of Ultrashield G-1000 protection fabric, placed between the floor slab and the membrane, as specified on these plans.

9. A 4" gravel layer shall be provided below the membrane in accordance with the details shown in these plans. The gradation of the gravel placed below the membrane shall meet the specifications shown in Detail B, Sheet D1.

10. Reinforcing steel, piping, forms, etc. shall not be supported directly on the membrane or protective covering and equipment shall not be driven over the membrane or its protective covering

11. All vent lines associated with the Subslab Passive Venting System shall be installed below the membrane, or shall be sealed using approved seals or boots in accordance with these plans, where they penetrate the membrane.

B. Quality Assurance:

1. The Gas Vapor Barrier Contractor / Applicator shall be trained and approved by the Gas Vapor Barrier Manufacturer (i.e. CETCO, Inc. for LIQUID BOOT®). The Contractor / Applicator shall provide the Project Methane Engineer with a letter from the manufacturer (a) confirming that the Contractor / Applicator is certified by the manufacturer for installation of the product; and (b) warranting its product to be free of defects when that product is installed by the Contractor / Applicator. This letter shall confirm that the manufacturer will replace, at no charge, any product not meeting the published specifications within 12 months of application, provided it has been applied in accordance with the manufacturers written directions. The following is a certified CETCO installer:

   Advanced Construction Technologies
   1819 Polk Street
   San Francisco, California 94104
   (415) 235-6551
   www.actoc.com

2. A pre-installation conference shall be held prior to the application of the gas barrier to assure proper substrate and installation conditions and procedures. The gas membrane Contractor / Applicator, the General Contractor, and the Engineer shall be present at this meeting.

3. The installation of the gas membranes shall be closely monitored by the Methane Engineer, or a designated representative of his office. Inspections shall typically be performed prior to, during, and subsequent to the application of the product.

4. All surfaces to receive gas vapor barriers shall be inspected and approved by the Contractor / Applicator and the Methane Engineer prior to commencing work.

C. Submittals:

1. The Gas Methane Barrier Contractor / Applicator shall submit any updates or revisions to the manufacturers product data and recommended installation procedures to the Project Methane Engineer for review and approval at least two weeks prior to the construction of the gas barriers.

2. The Gas Methane Barrier Contractor / Applicator shall submit representative samples of the following to the Project Methane Engineer for approval:

   o Gas Membrane Material
   o Gravel
   o Geotextiles
   o Perforated Vent Piping
   o Vent Riser Piping

3. At the completion of each installation, the Contractor / Applicator shall submit a letter to the Methane Engineer certifying that installation was completed in accordance with the project plans and specifications as well as the procedures recommended by the manufacturer. A separate letter shall be provided for each individual lot. Each letter shall reference the lot number and tract number to which it applies and indicate the dates on which the installation was completed and inspected.

D. Job Conditions:

1. The areas adjacent to the gas barriers are to be protected by the Contractor / Applicator during the installation process. Where necessary, masking or other protective measures shall be utilized to prevent staining of surfaces beyond the limits of the application.

2. Work is to be performed only when existing and forecasted weather conditions are within the manufacturers recommendations for the material and product used. The application of the gas membrane compounds shall be suspended if the ambient temperature falls below 45° F, or during periods of precipitation.

3. A minimum clearance of 24 inches is required for spray application of product.

4. All plumbing, electrical, mechanical and structural items that are located beneath, or that pass through, the methane barrier shall be positively secured in their proper positions and appropriately protected prior to application of the membrane.

5. The gas methane barrier shall be installed before placement of reinforcing steel. If reinforcing steel is present at the time of application, all exposed reinforcement shall be masked by the General Contractor prior to membrane application

E. Materials:

1. LIQUID BOOT® shall be sprayed on, or locally trowel applied, to a minimum cured thickness of 60-mils.

2. A 3/8-inch thick expanded polystyrene protection board; 4 oz/yd^2 geotextile; or other protection as approved by the manufacturer shall be utilized on vertical surfaces to protect the exposed surface of the gas barrier.

3. A 1/8-inch thick, asphalt impregnated felt and fiberglass protection mat; 30 lb. roofing cap sheet; 4 oz/yd^2 geotextile; two inches (2") of clean sand; or other protection as approved by the manufacturer shall be utilized on horizontal surfaces, where necessary, to protect the gas barrier.

4. Protective geotextile shall consist of non-woven polypropylene, 10 oz/yd^2 fabric. At least one side shall be heat-rolled. The heat-rolled side shall be used as the application surface.

5. All materials are to be delivered to the project site in their original unbroken packages bearing the manufacturers label showing brand, weight, volume and batch number. Materials are to be stored at the project site in strict compliance with the manufacturers instructions.

F. Installation:

1. For two pour foundations, concrete surfaces shall be light broom finished or smoother, free of any dirt, debris, loose material, release agents or curing compounds. All voids more than 1/4-inch in depth and 1/4-inch in width shall be properly filled. All penetrations shall be prepared in accordance with the manufacturers specifications.

2. A minimum 3/4" cant of LIQUID BOOT® Trowel Grade, or other suitable material, shall be applied at all horizontal to vertical transitions and other inside corners of 120° or less. The material shall be allowed to cure overnight before subsequent applications.

3. The sub-grade shall be moisture conditioned and compacted to a minimum relative compaction per Geotech in accordance with the recommendation of the Soils Engineer. The finished surface shall be smooth, uniform, free of debris and standing water. All stones or dirt clods greater than 1/4-inch in diameter shall be removed. Final sub-grade inspection/preparation shall not precede the membrane application by more than 72 hours.

4. All penetrations shall be prepared in accordance with manufacturers specifications. All form stakes that penetrate the membrane shall be re-bar which shall be bent over and left in the slab.

5. Trenches shall be cut oversize to accommodate the gas membrane and the protection course/layer.

6. The walls of footing or utility trenches shall be smooth and free of roots or protruding rocks.

7. If organic materials with potential for growth (i.e. seeds or grasses) are present within the subgrade, a soil sterilant shall be applied at the manufacturer's recommended rate prior to the construction of the gas barrier.

8. The protective geotextile shall be laid on the sub-grade with the heat-rolled side facing up. All seams shall be overlapped a minimum of six inches (6"). The geotextile shall be in integral contact with at all interior foundation corners. LIQUID BOOT® shall be spray applied at all overlapped seams to a thickness of 60-mils minimum.

9. Any open utility, footing, or other trench present at the time of application shall be lined with geotextile extending at least six inches (6") onto the adjoining sub-grade. Seams shall be overlapped a minimum of six inches (6"). The geotextile shall be in integral contact with the subgrade at all interior corners. LIQUID BOOT® shall be spray applied at any seam overlap to a thickness of 60-mils minimum.

10. Appropriate care shall be exercised to protect the membrane and prevent penetrations subsequent to its application. The membrane shall be kept free of dirt, debris and traffic until a protective cover is in place. It shall be the responsibility of the General Contractor to insure that the membrane and the protection system are not penetrated after the completion of the installation.

G. Sealing Penetrations:

1. All penetrations shall be cleaned, as necessary, to provide gas tight seal. All Metal penetrations shall be sanded clean with emery cloth.

2. LIQUID BOOT® shall be applied at an 60-mils minimum dry thickness in a three inch (3") wide ring around the penetration, and vertically up the penetration a minimum of three inches (3"). The application shall be allowed to cure completely before proceeding.

3. The penetration shall be wrapped with a polypropylene cable tie at a point two inches (2") above the base of the penetration. The cable tie shall be tightened firmly so as to squeeze the cured membrane collar.

H. Inspections and Testing

1. Field Quality Control is a very important part of all LIQUID BOOT® applications. The Contractor / Applicators shall check his own work for coverage, thickness, and all around good workmanship, before calling for inspections.

2. When thickness or integrity is in question, the membrane should be tested in the manner described below.

3. Samples to be inspected shall be cut from the membrane and geotextile composite to a maximum area of 2 square inches per 500 square feet of application by the Methane Engineer. The thickness of the composite layer shall be measured with a digital caliper having a resolution of 1 mils or better. The thickness of the plain geotextile (as determined from uncoated samples) shall be deducted from the composite thickness in order to determine the thickness of the LIQUID BOOT® membrane. The test area shall be marked for repair by the Methane Engineer.

4. Voids left by sampling shall be patched with geotextile by the Contractor / Applicator overlapping the void by a minimum of two inches (2"). A thin tack coat of LIQUID BOOT® shall be applied under the geotextile patch. Spray or trowel applied LIQUID BOOT® shall then be applied to an 40-mils minimum dry thickness, extending at least three inches (3") beyond the geotextile patch.

5. On concrete surfaces, the gas membrane shall be checked for coverage with a lightly oiled, needle nose depth gauge. Four (4) readings shall be taken over a one square inch area for every 500 square feet of application. The minimum reading shall be recorded and the test area shall be marked for repair by the Methane Engineer.

6. Concrete test areas shall be patched with LIQUID BOOT® to an 60-mils minimum dry thickness, extending a minimum of one inch (1") beyond the test perimeter.

7. Each completed Levels A membrane shall be smoke tested at the completion of the installation in accordance with standard GeoKinetics' protocol to confirm the integrity of the membrane system. Any leaks which are identified shall be repaired, and the membrane re-tested, until all leaks/perforations are eliminated.

IV. Slab Penetrations

1. All underground electrical conduits penetrating the slab or foundation of the building shall be provided with integral gas tight seal or a seal off device. This seal is intended to prevent the travel of gas into the occupied portion of the structure through conduit runs.

V. Electrical Notes:

A. Electrical conduits (both high voltage and low voltage) shall be provided with seals as required by the appropriate sections of Article 501 of the National Electrical Code for Class 1, Division 1, Group D locations, wherever conduit transitions from below grade to above grade.

B. Application of NFPA 70 (National Electrical Code) at this project:
   Class 1 Division 1 is an area where gas may be expected at least periodically;
   Class 1 Division 2 is an area where gas would only occur if protection systems fail;

C. Class 1 Division 1 at this project is the area under, or outside of, the enhanced vapor barrier. A gas tight seal is required on any electrical conduit that (a) passes through the enhanced vapor barrier into the structure; or (b) passes directly from the soil outside of the building footprint into the structure.

D. Class 1 Division 2 at this project includes all areas between the slab/foundation and the enhanced vapor barrier. Electrical cable can be run through a Class 1 Division 2 area without a gas tight seal, provided both of the following conditions are met.

   a. The cable is enclosed in a gas tight sheath of metallic or non-metallic material (i.e. plastic conduit is acceptable);

   b. The run originates outside of a classified area (such as inside the structure), and terminates uninterrupted again outside of the classified area (such as inside the structure).

E. All NFPA 70 requirements shall be met for all work in any classified area, given the above classifications at the project.

VI. Utility Trench Dams:

A. A enhanced vapor barrier shall be installed in all utility trenches that extend beneath the house foundation from areas outside the perimeter of the home.

B. The enhanced vapor barrier shall be installed in the utility trench immediately adjacent to the exterior perimeter of the house foundation.

C. The enhanced vapor barrier shall consist of one of the following:
   1. A minimum 2-foot continuous length of Slurry consisting of a 2-sack sand/cement. The slurry shall extend from the bottom of the trench to a level of 6- inches above the base of the adjacent footing,

   2. A minimum 5-foot continuous length of native soil backfill compacted to at least 90% Relative Compaction in accordance with ASTM D-1557 testing procedures. The compacted soil backfill shall extend from the bottom of the trench to a level at least 6" above the base of the adjacent footing

VII. Construction Inspection, Testing & Certification

1. The inspection of all gas control measures shall be performed by a Registered Professional Engineer (i.e. the Methane Engineer or his Designee). "As-Built" Certification of the installation of the Gas Abatement Measures shown in these plans shall be provided to the Client by the Methane Engineer at the completion of construction.

2. In order to properly document the inspection process, the following signed and stamped certification shall be submitted prior to it's final approval of the project: "I am a Registered Professional Engineer in the State of California and I am knowledgeable in the field of combustible soil gas control and mitigation system. The soil gas control and mitigation systems installed within this project have been constructed under my direct supervision and in accordance with the plans reviewed. As-built plans are included with this statement.

3. In order to facilitate the construction process, periodic correspondence may be required to be provided to the field inspector or to the respective buildings department in which the project is located. Such correspondence shall be provided at intervals required by the inspector and provide updated information regarding the status of inspection activities completed by the engineer responsible for the gas control system.

4. The following individual gas mitigation system components shall be inspected, certified and approved by the Methane Engineer:

   a. After the installation of the (sub-slab) vent piping and Vent Riser Stub ups;
   b. After backfilling of the (sub-slab) vent piping;
   c. After the installation of the (sub-slab) Methane barrier (Prior to backfilling). The Methane barrier shall be smoke tested at this time. These tests shall be documented in the as-built report;
   d. After the placement of the protective course;
   e. Conduct second smoke test(s) after the post-tension/rebar installation is complete (i.e. prior to pouring the slab(s);
   f. After the completion of the vent riser installation for the (sub-slab) vent piping.
   g. Utility Trench Dams; and
   h. Dry Utility Seals.
   i. At the completion of construction prior to the issuance of the system certification and certification of occupancy.

5. The Sub-Slab Vent Piping shall be inspected and approved by the Methane Engineer prior to the installation of the Gas Membrane.

6. The Gas Membrane shall be inspected, tested, and approved by the Methane Engineer prior to the construction of the floor slab.

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

Revisions

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Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

General Notes

Sheet 2

October 18, 2018

0 30 60 120 Feet

Approximate Scale

Site Plan

LEGEND

- Building Where Methane Mitigation Measures are to be Installed ***(Buildings 5, 10, 12, 17, & 18 This Submittal Only)***
- Building Not a Part of This Submittal

Original Scale in Inches for Reduced Plans 0 1 2 3

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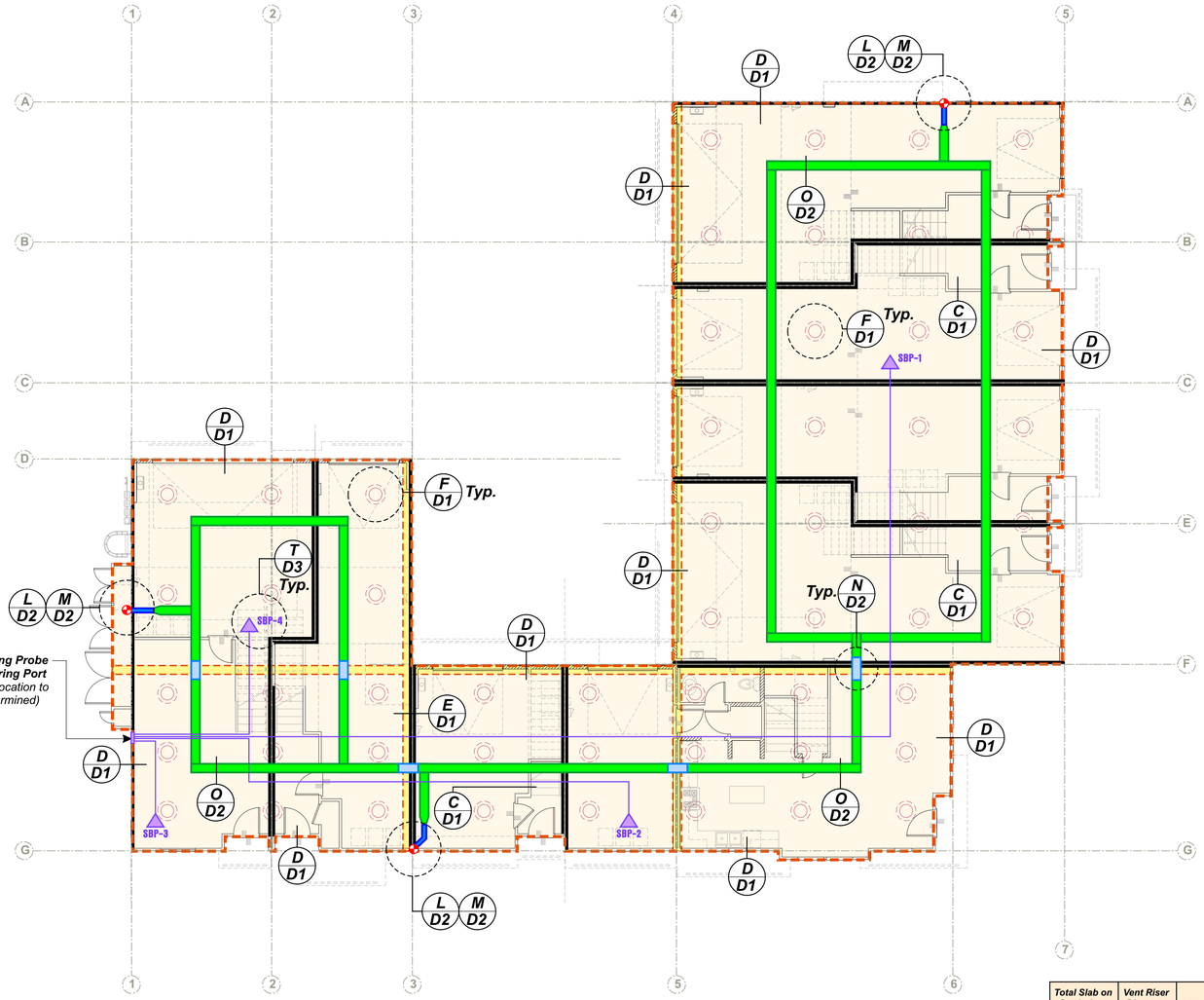
Site Plan

Sheet 3

October 18, 2018



Building 5 – Ground Floor Plan

Total Slab on Grade Area	Vent Riser Diameter	Maximum Horizontal Pipe Spacing	No. of Vent Risers Required Per LADBS Table 3	No. of Vent Risers Required
~5,639 Ft²	2"	25 Feet	1 Vent Riser Per 2,500 Ft² (Minimum of 2 Risers)	3

Legend

- Limits of Gas Membrane and Foundation Footing
- Approximate Location of Grade Beam
- 12" Wide Low Profile Vapor Vent Piping
- 12" Wide Low Profile Vapor Vent Transition Piping (If Deepened Footing is Encountered)
- SBP-1 — Sub-Slab Soil Gas Sampling Probe Below Vapor Barrier With Designation (***See Detail T, Sheet D3***)
- Vent Riser Extending Up to Roof Level with Transition Piping
- Indicates 1-Hour Fire Rated Wall
- Location of Drill Displacement Column Pile

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

Note: Sub-Slab Vent Piping System is Designed to Function as a Passive Ventilation System. However it is Configured Such That it Can be Operated as An Active System With Blowers Installed Should the Need Arise.

0 8 16 32 Feet
Approximate Scale

Original Scale in Inches for Reduced Plans 0 1 2 3

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Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 5
Ground Floor Plan

Sheet 4.0

October 18, 2018

Building 5 – Second Floor Plan

Legend

Vent Riser Extending Up to Roof Level

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

0 8 16 32 Feet

Approximate Scale

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

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Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 5
Second Floor Plan

Sheet 4.1

October 18, 2018

Building 5 – Third Floor Plan

Legend

Vent Riser Extending Up to Roof Level

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

0 8 16 32 Feet

Approximate Scale

Original Scale in Inches for Reduced Plans 0 1 2 3

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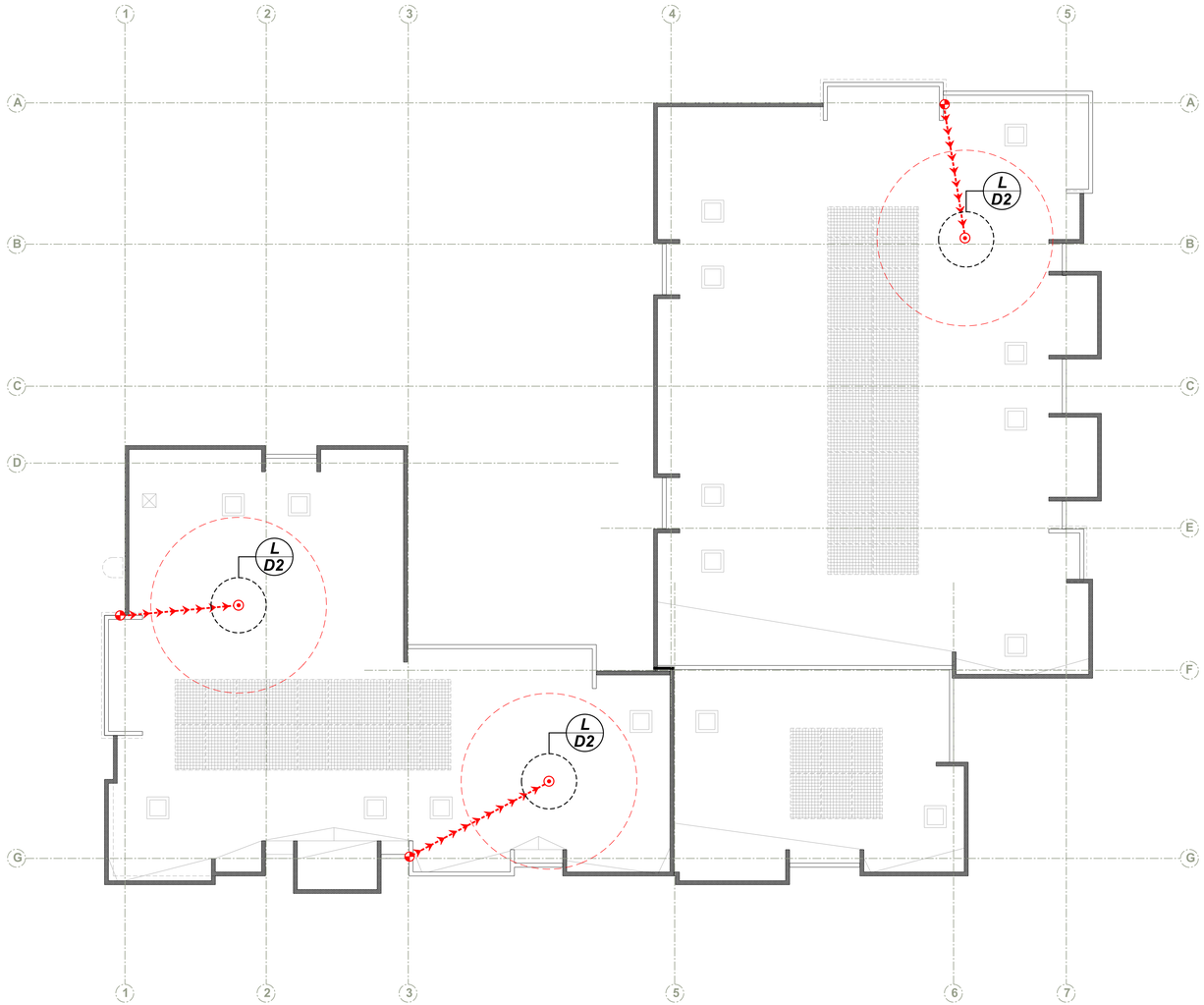
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 5
Third Floor Plan

Sheet 4.2

October 18, 2018



Building 5 – Roof Plan

Legend

- Vent Riser Extending Up to Roof Level
- Vent Riser Extending Above Roof Level
- Vent Riser Pipe Mounted Within Roof/Ceiling (Min. 2% Slope Upwards Towards Outlet)
- 10' Radius Clear From Any Roof Air Intakes

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

0 8 16 32 Feet
Approximate Scale

Original Scale in Inches for Reduced Plans 0 1 2 3

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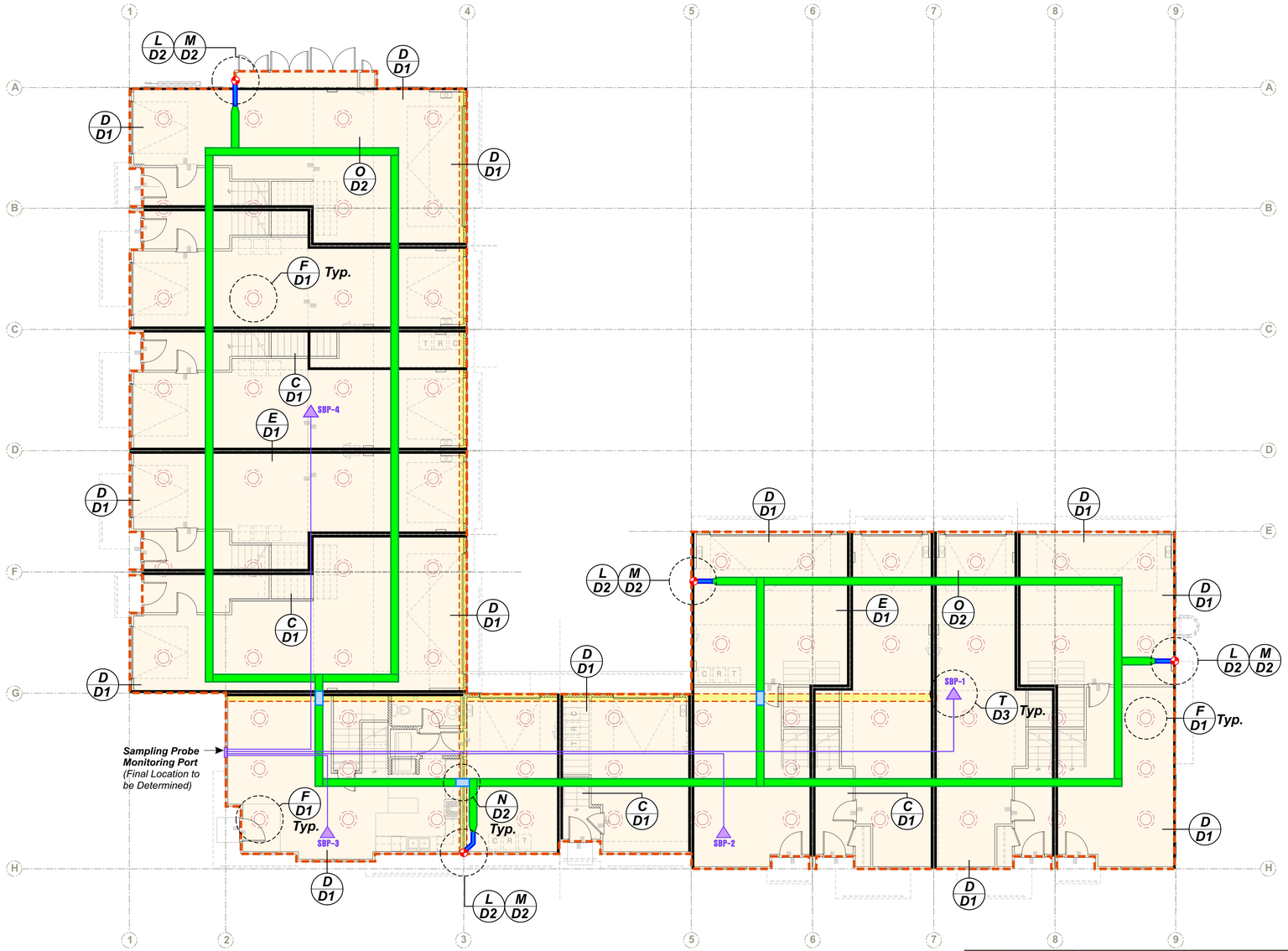
Building 5
Roof Plan

Sheet 4.3

October 18, 2018



Building 10 – Ground Floor Plan

Total Slab on Grade Area	Vent Riser Diameter	Maximum Horizontal Pipe Spacing	No. of Vent Risers Required Per LADBS Table 3	No. of Vent Risers Required
~7,800 Ft²	2"	25 Feet	1 Vent Riser Per 2,500 Ft² (Minimum of 2 Risers)	4

Note: Sub-slab Vent Piping System is Designed to Function as a Passive Ventilation System. However it is Configured Such That it Can be Operated as An Active System With Blowers Installed Should the Need Arise.

0 8 16 32 Feet
Approximate Scale

Legend

- Limits of Gas Membrane and Foundation Footing
- Approximate Location of Grade Beam
- 12" Wide Low Profile Vapor Vent Piping
- 12" Wide Low Profile Vapor Vent Transition Piping (If Deepened Footing is Encountered)
- SBP-1 — Sub-Slab Soil Gas Sampling Probe Below Vapor Barrier With Designation (***See Detail T, Sheet D3***)
- Vent Riser Extending Up to Roof Level with Transition Piping
- Indicates 1-Hour Fire Rated Wall
- Location of Drill Displacement Column Pile

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

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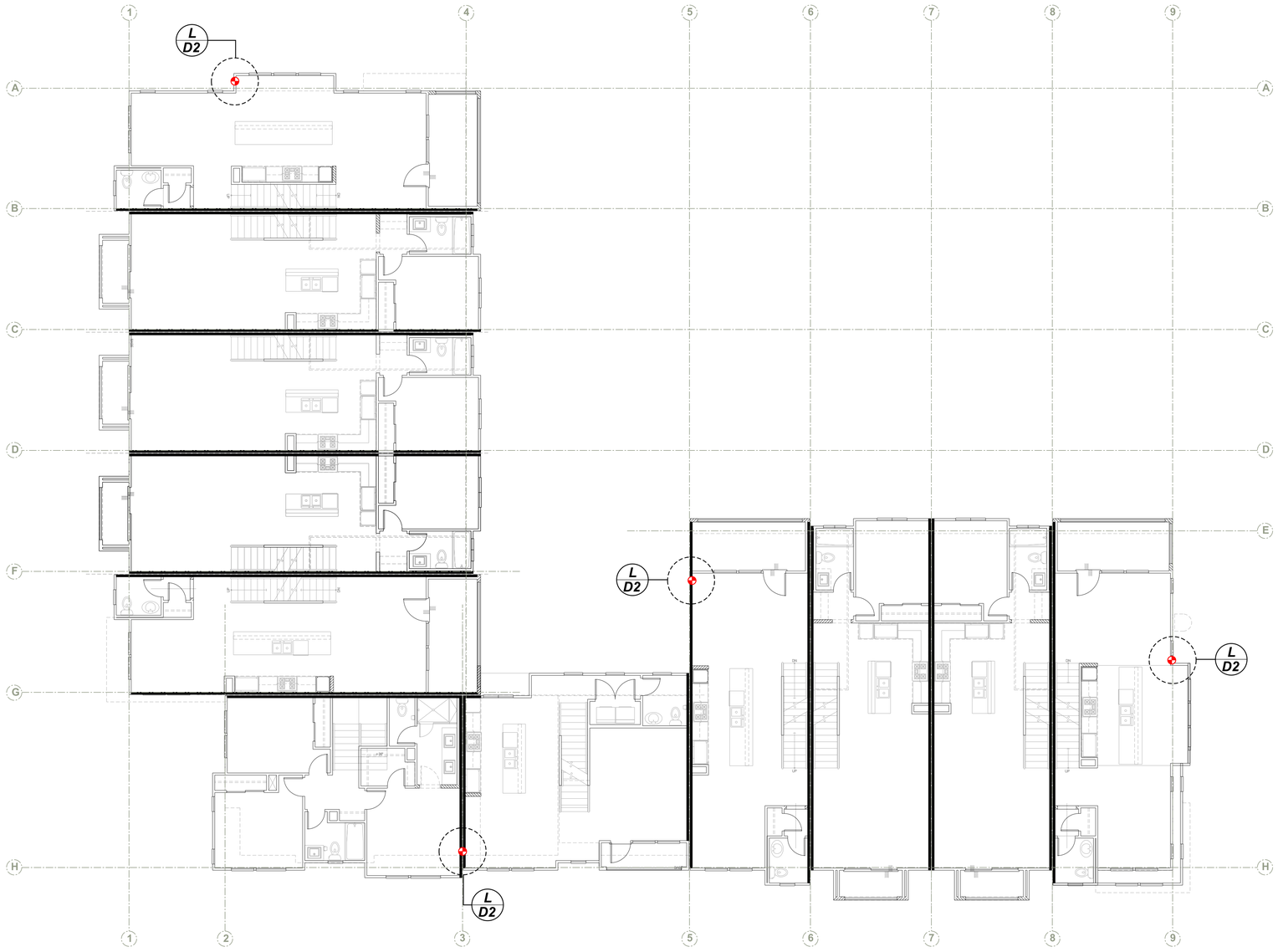
Building 10
Ground Floor Plan

Sheet 5.0

October 18, 2018



Building 10 – Second Floor Plan

Legend

Vent Riser Extending Up to Roof Level

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

0 8 16 32 Feet

Approximate Scale

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

Revisions

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Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 10
Second Floor Plan

Sheet 5.1

October 18, 2018

Building 10 – Third Floor Plan

Legend

Vent Riser Extending Up to Roof Level

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

0 8 16 32 Feet

Approximate Scale

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

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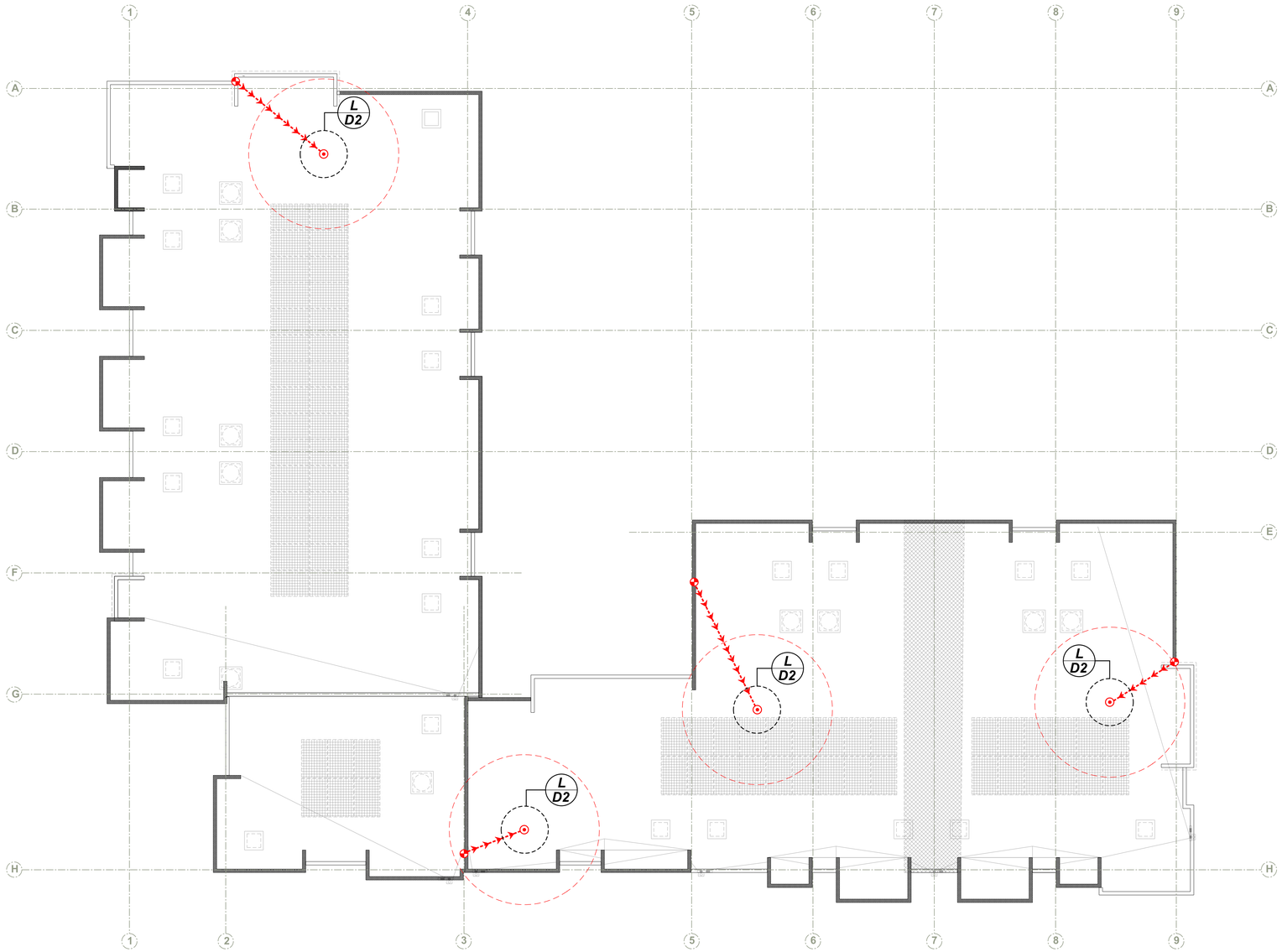
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 10
Third Floor Plan

Sheet 5.2

October 18, 2018



Building 10 – Roof Plan

Legend

- Vent Riser Extending Up to Roof Level
- Vent Riser Extending Above Roof Level
- Vent Riser Pipe Mounted Within Roof/Ceiling (Min. 2% Slope Upwards Towards Outlet)
- 10' Radius Clear From Any Roof Air Intakes

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

Original Scale in Inches for Reduced Plans 0 1 2 3

0 8 16 32 Feet

Approximate Scale

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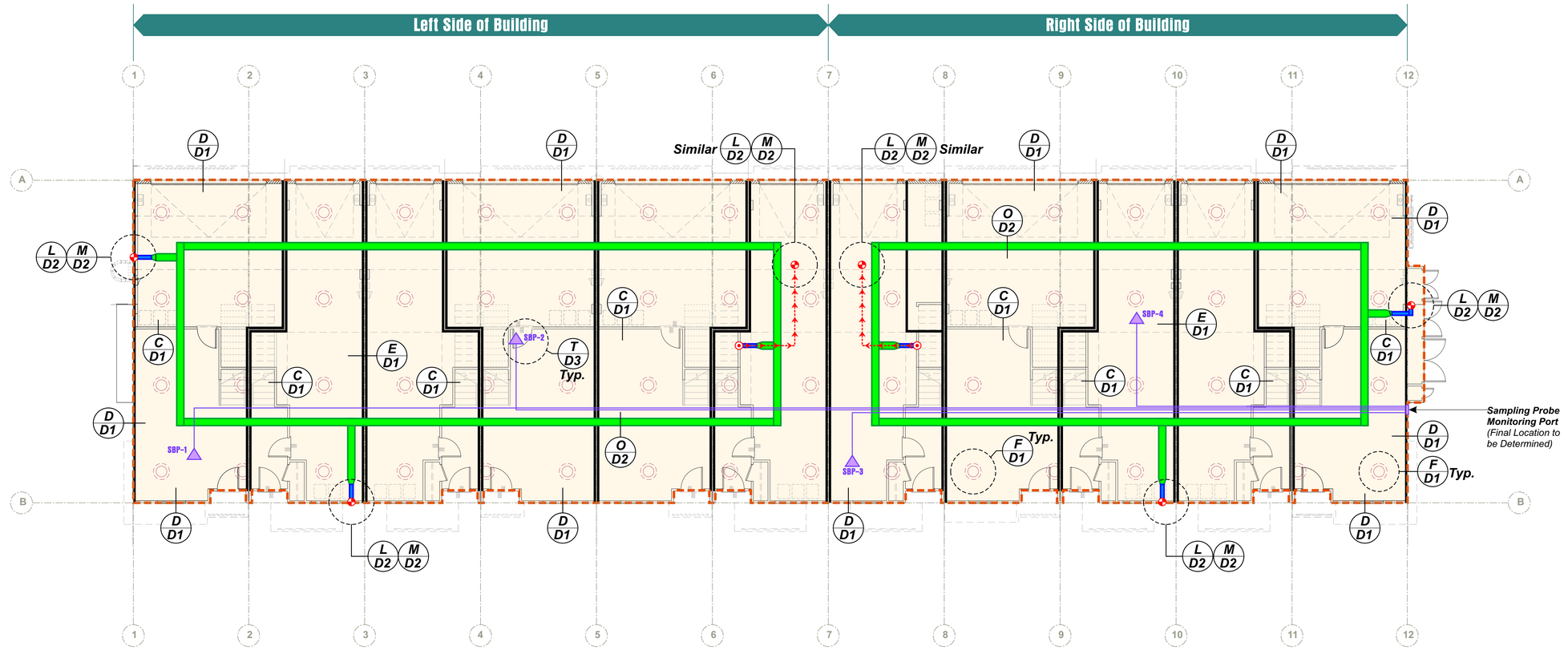
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 10
Roof Plan

Sheet 5.3

October 18, 2018



Building 12 – Ground Floor Plan

Legend

- Limits of Gas Membrane and Foundation Footing
- 12" Wide Low Profile Vapor Vent Piping
- 12" Wide Low Profile Vapor Vent Transition Piping (If Deepened Footing is Encountered)
- Vent Riser Extending Up to Roof Level with Transition Piping
- Vent Riser Extending Up to Ceiling of Ground Floor
- Vent Riser Pipe Mounted Within Ceiling of Ground Floor (Min. 2% Slope Upwards Towards Outlet)
- SBP-1 Sub-Slab Soil Gas Sampling Probe Below Vapor Barrier With Designation (***See Detail T, Sheet D3***)
- Indicates 1-Hour Fire Rated Wall
- Location of Drill Displacement Column Pile

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

Right Side of Building

Total Slab on Grade Area	Vent Riser Diameter	Maximum Horizontal Pipe Spacing	No. of Vent Risers Required Per LADBS Table 3	No. of Vent Risers Required
~3,641 Ft²	2"	25 Feet	1 Vent Riser Per 2,500 Ft² (Minimum of 2 Risers)	3

Left Side of Building

Total Slab on Grade Area	Vent Riser Diameter	Maximum Horizontal Pipe Spacing	No. of Vent Risers Required Per LADBS Table 3	No. of Vent Risers Required
~ Ft²	2"	25 Feet	1 Vent Riser Per 2,500 Ft² (Minimum of 2 Risers)	3

Note: Sub-slab Vent Piping System is Designed to Function as a Passive Ventilation System. However it is Configured Such That it Can be Operated as An Active System With Blowers Installed Should the Need Arise.

0 8 16 32 Feet
Approximate Scale

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

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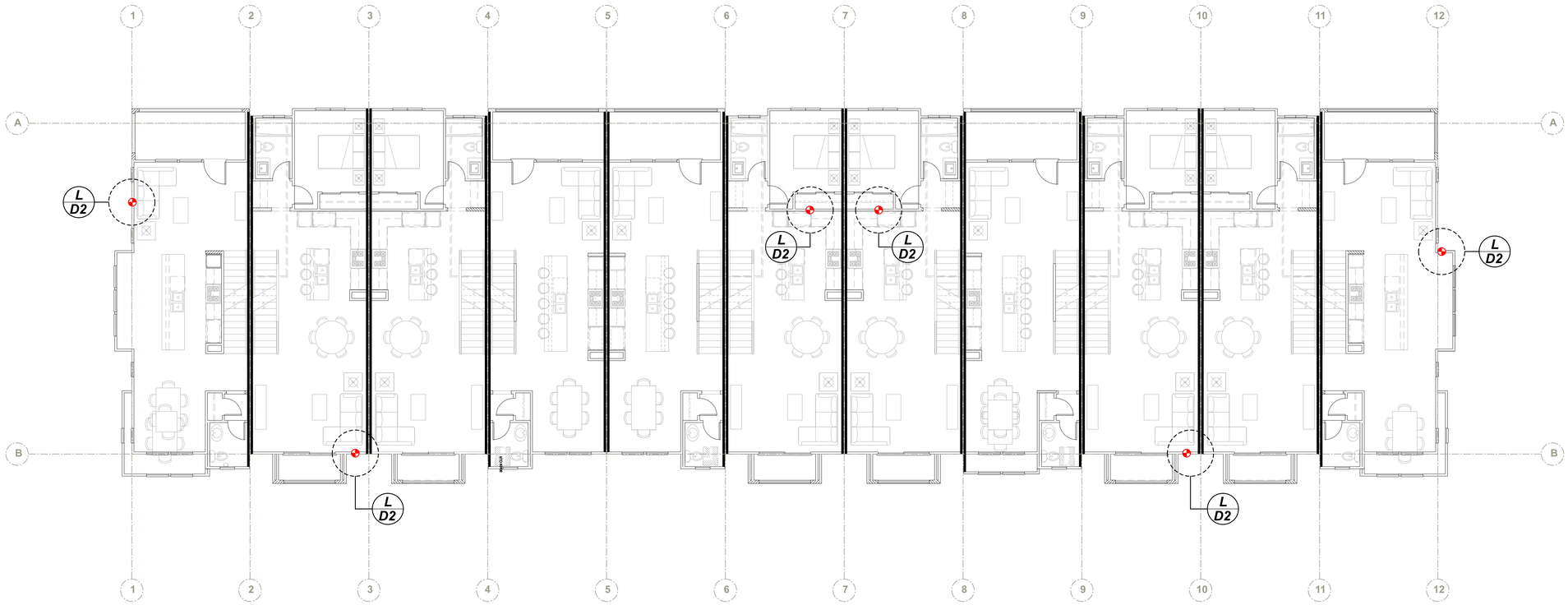
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 12
Ground Floor Plan

Sheet 6.0

October 18, 2018



Building 12 – Second Floor Plan

Legend

Vent Riser Extending Up to Roof Level

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

0 8 16 32 Feet

Approximate Scale

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

Revisions

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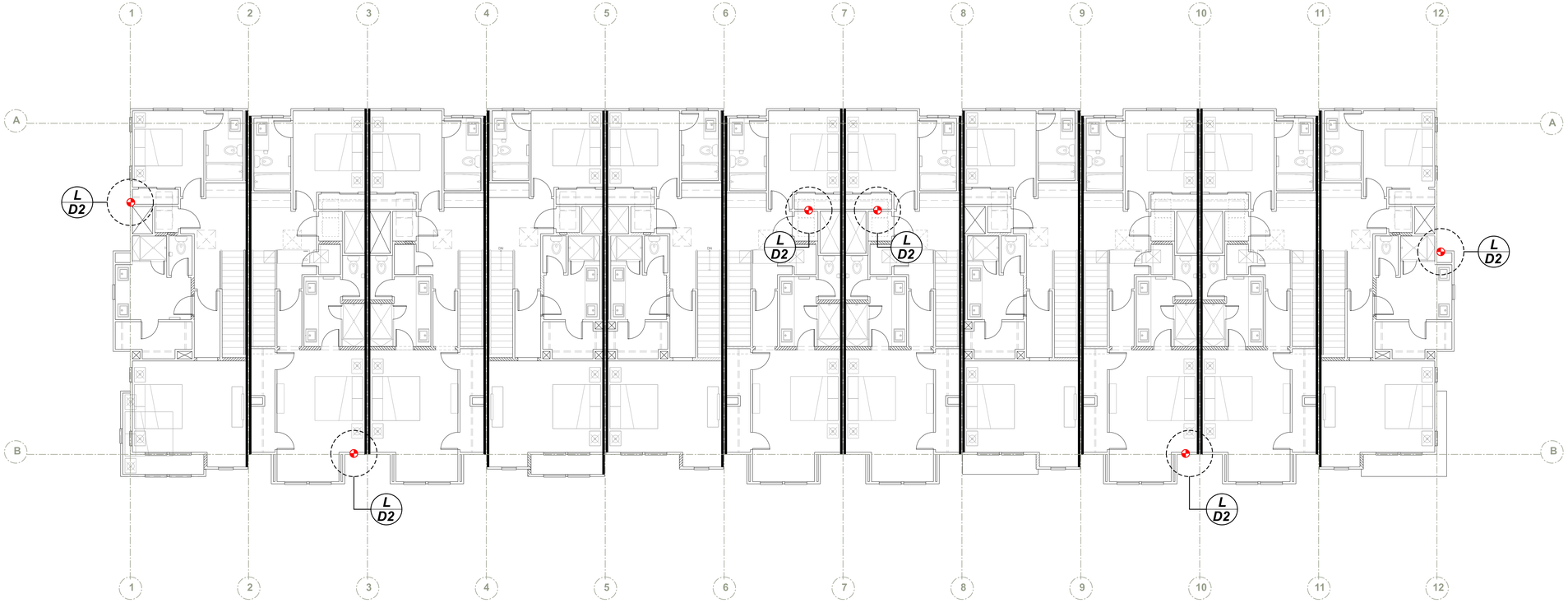
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 12
Second Floor Plan

Sheet 6.1

October 18, 2018



Building 12 – Third Floor Plan

Legend

Vent Riser Extending Up to Roof Level

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

0 8 16 32 Feet

Approximate Scale

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

Revisions

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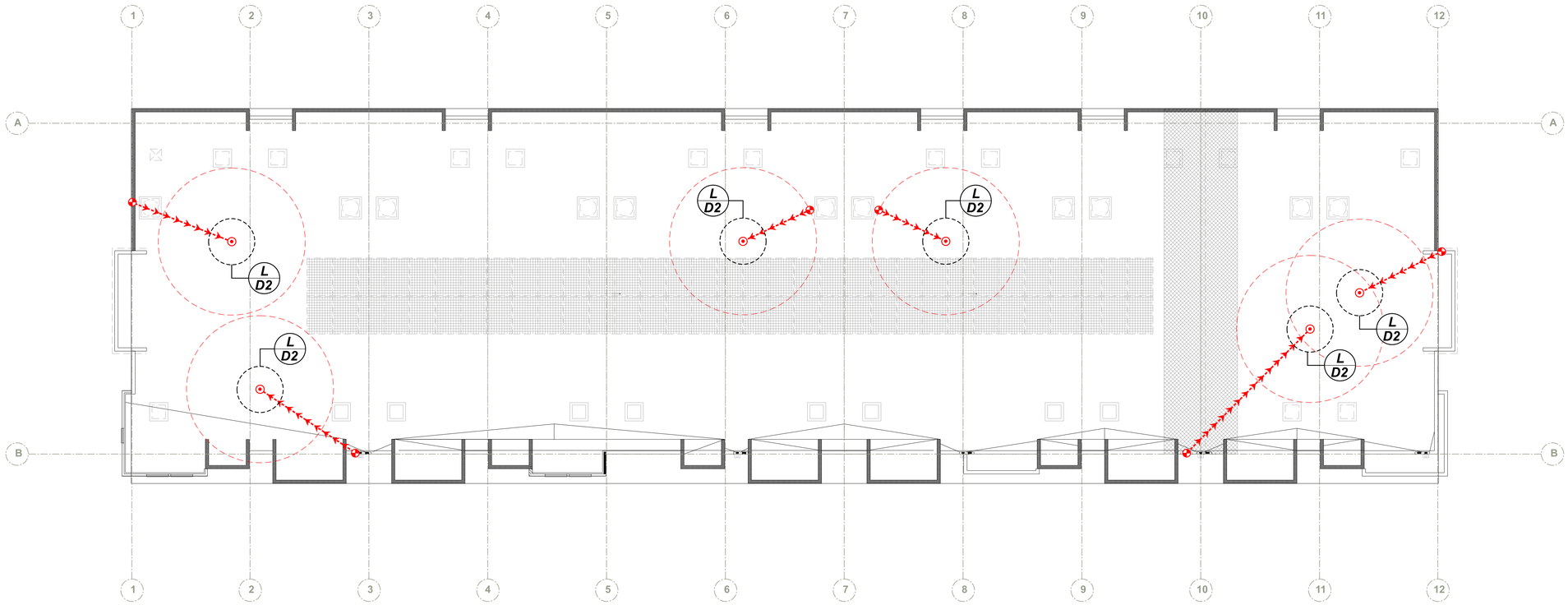
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 12
Third Floor Plan

Sheet 6.2

October 18, 2018



Building 12 – Roof Plan

Legend

- Vent Riser Extending Up to Roof Level
- Vent Riser Extending Above Roof Level
- Vent Riser Pipe Mounted Within Roof/Ceiling (Min. 2% Slope Upwards Towards Outlet)
- 10' Radius Clear From Any Roof Air Intakes

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

0 8 16 32 Feet

Approximate Scale

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

Revisions

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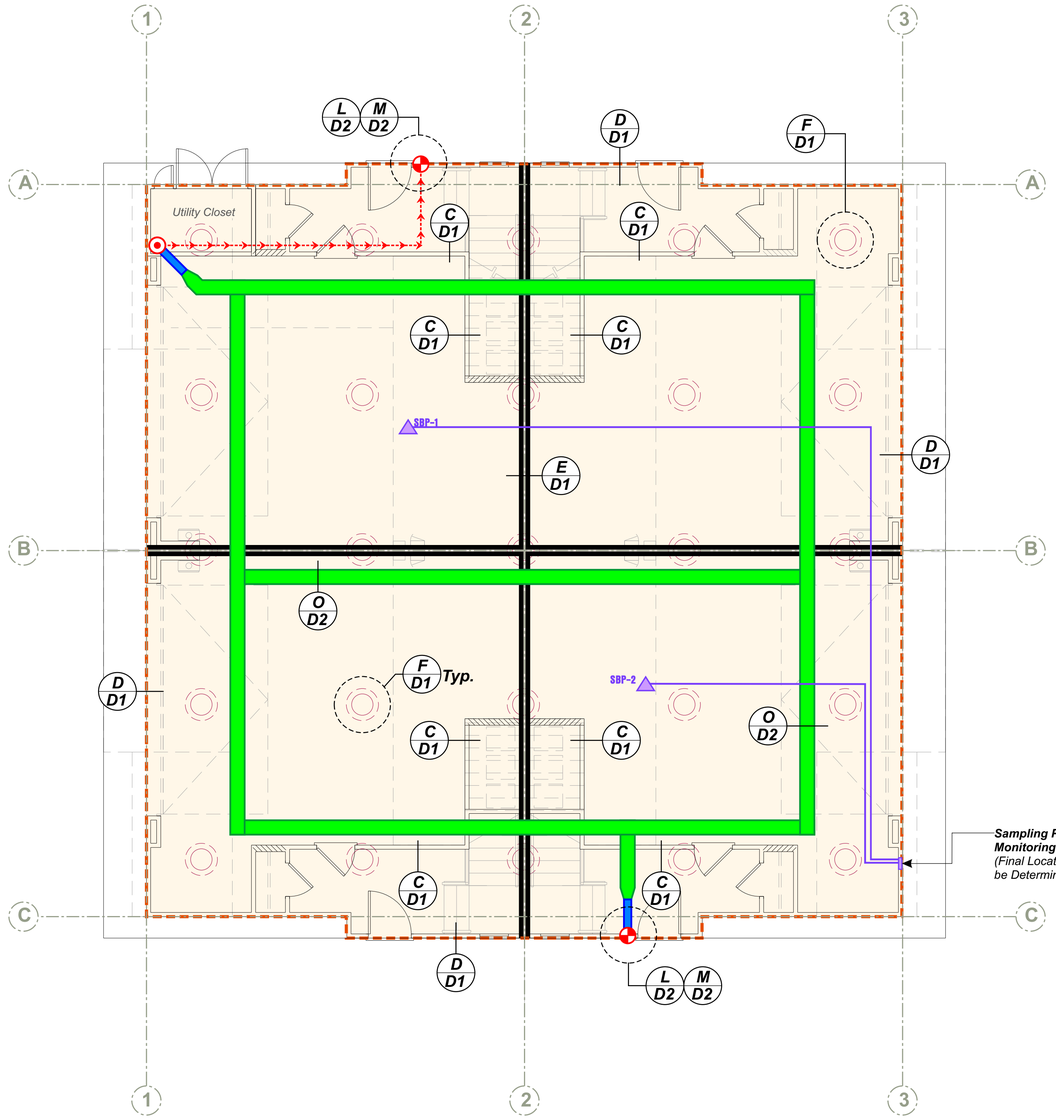
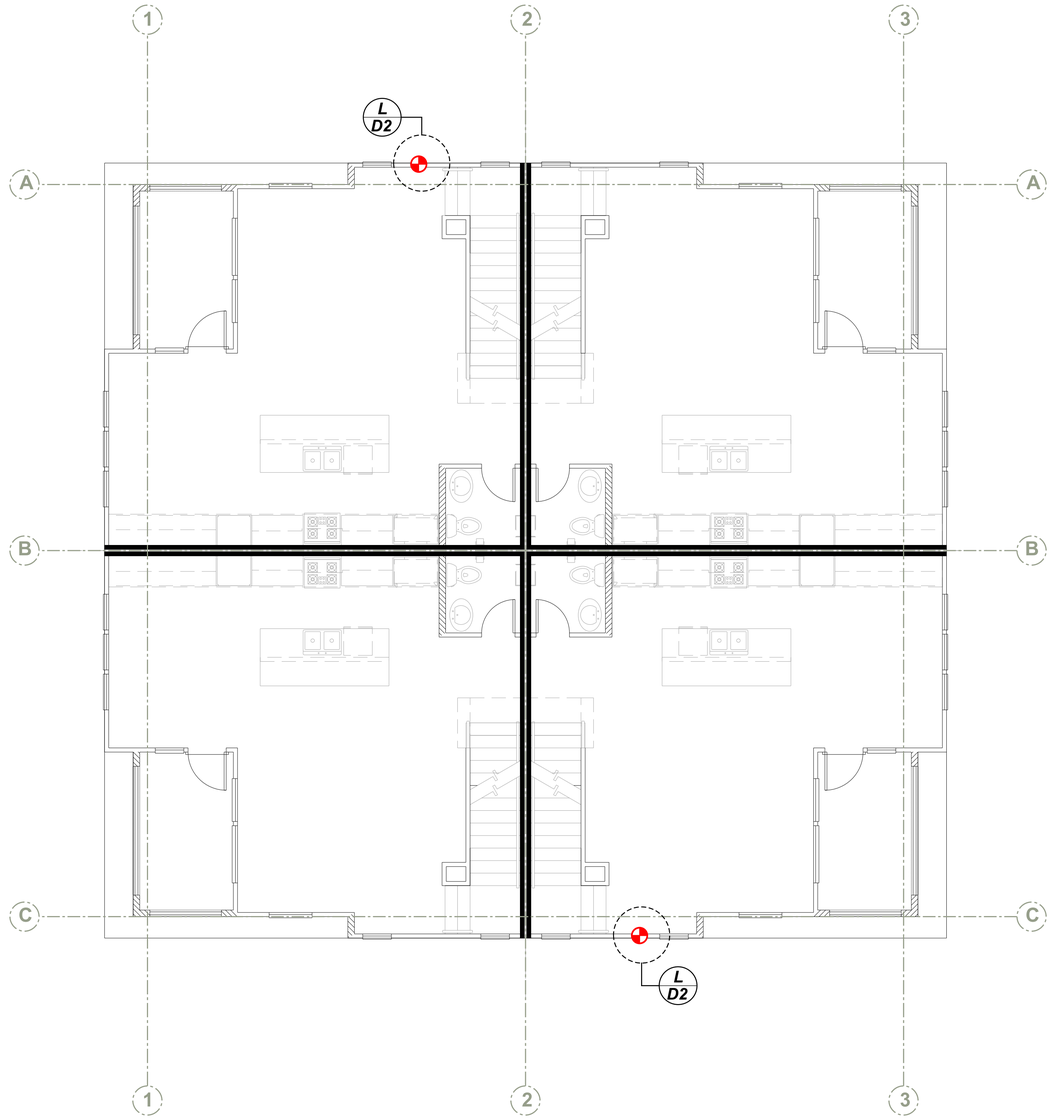
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 12
Roof Plan

Sheet 6.3

October 18, 2018





Building 17 & 18 – Ground Floor Plan

Building 17 & 18 – Second Floor Plan

Legend

- Limits of Gas Membrane and Foundation Footing
- Location of Drill Displacement Column Pile
- 12" Wide Low Profile Vapor Vent Piping
- Vent Riser Extending Up to Roof Level with Transition Piping
- Vent Riser Extending Up to Ceiling of Ground Floor
- Vent Riser Pipe Mounted Within Ceiling of Ground Floor (Min. 2% Slope Upwards Towards Outlet)
- SBP-1 Sub-Slab Soil Gas Sampling Probe Below Vapor Barrier With Designation (***See Detail T, Sheet D3***)
- Indicates 1-Hour Fire Rated Wall

Total Slab on Grade Area	*Vent Riser Diameter*	*Maximum Horizontal Pipe Spacing*	*No. of Vent Risers Required Per LADBS Table 3*	*No. of Vent Risers Required*
~2,773 Ft²	2"	25 Feet	1 Vent Riser Per 2,500 Ft² (Minimum of 2 Risers)	2

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work.*
Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.

Original Scale in Inches for Reduced Plans 0 1 2 3

Note: Sub-slab Vent Piping System is Designed to Function as a Passive Ventilation System. However it is Configured Such That it Can be Operated as An Active System With Blowers Installed Should the Need Arise.

0 5 10 20 Feet
Approximate Scale

Date	By	Rev.	Description

Revisions

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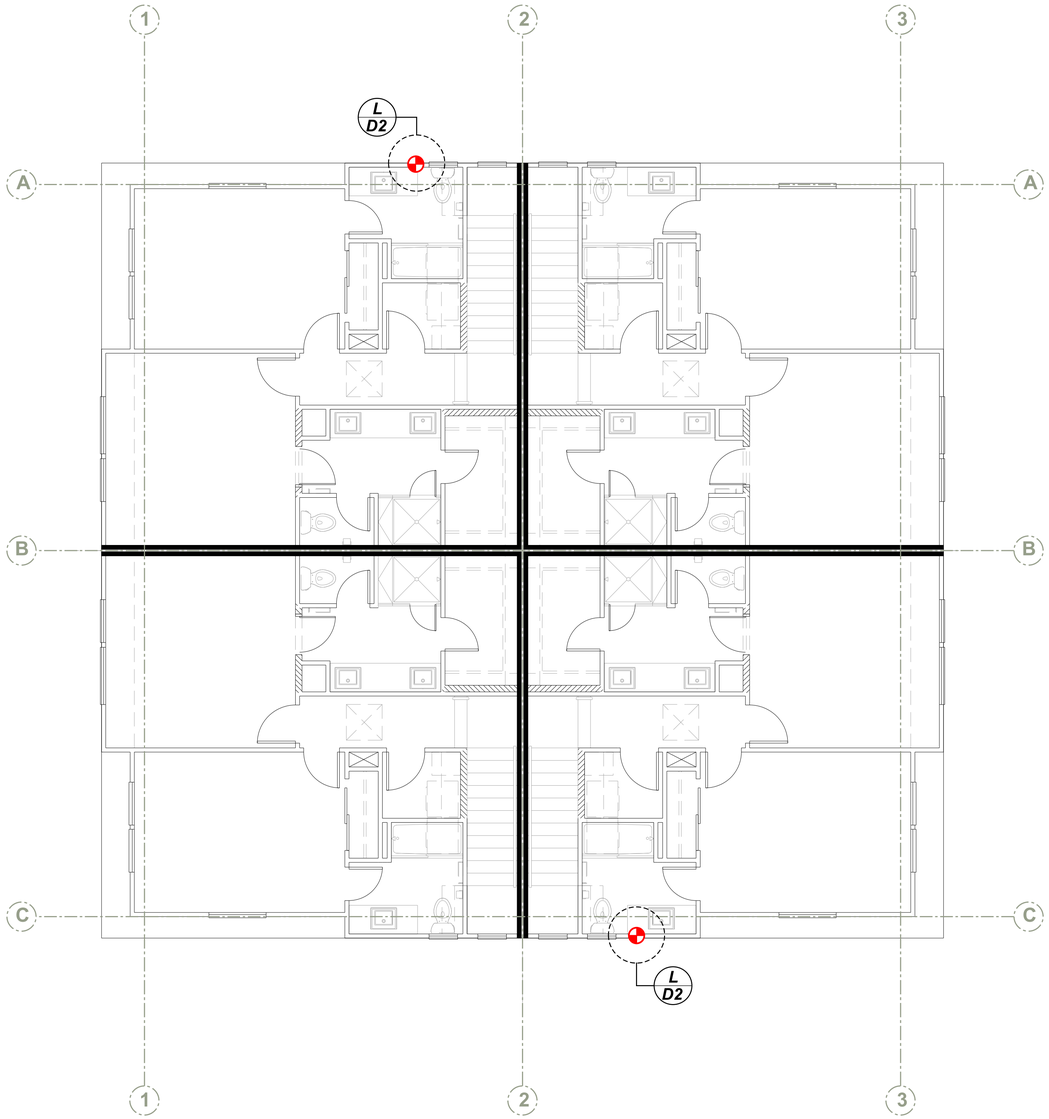
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

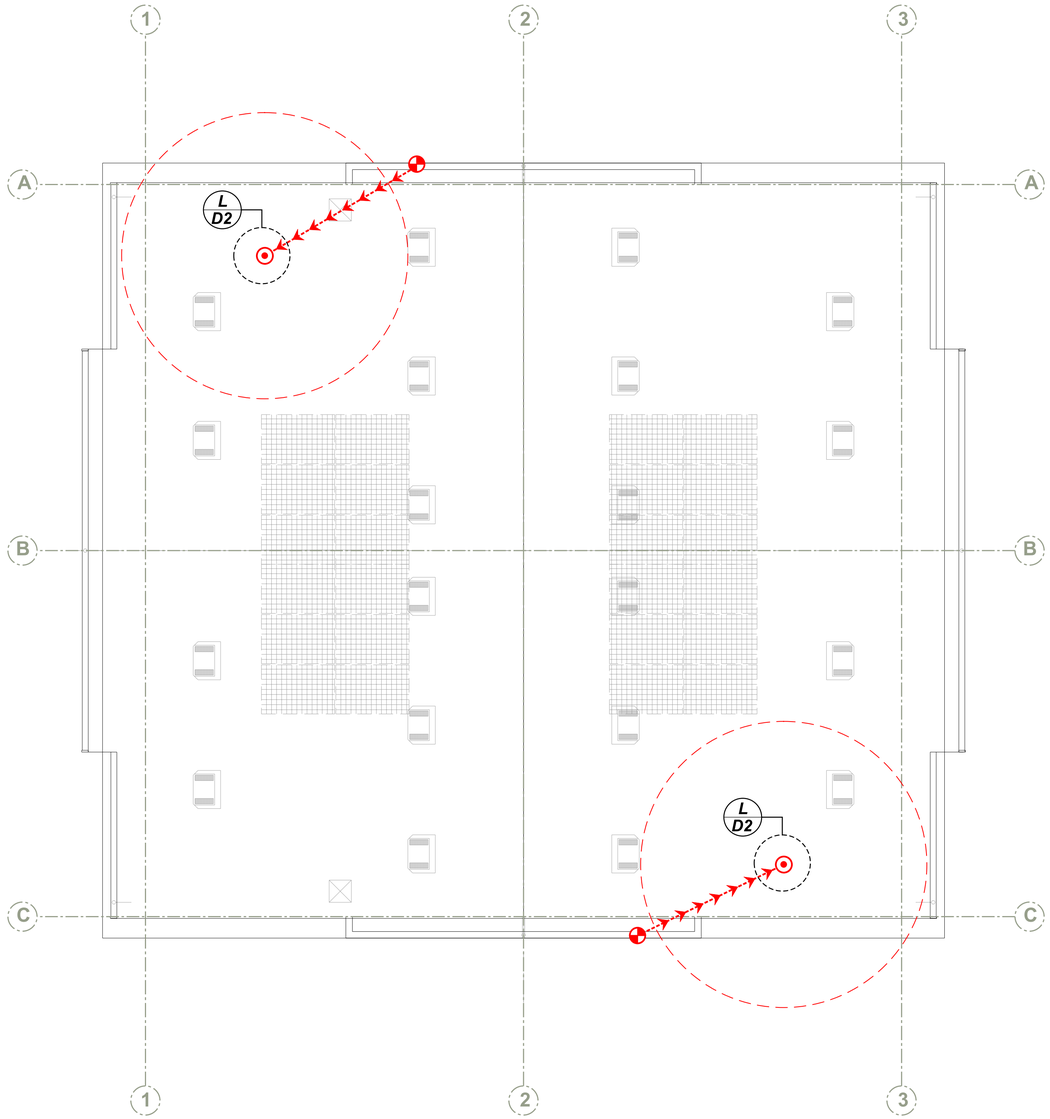
Building 17 & 18
Ground & Second Floor Plan

Sheet 7.0

October 16, 2018



Building 17 & 18 – Third Floor Plan



Building 17 & 18 – Roof Plan

Legend

- Vent Riser Extending Up to Roof Level
- Vent Riser Extending Above Roof Level
- Vent Riser Pipe Mounted Within Roof/Ceiling (Min. 2% Slope Upwards Towards Outlet)
- 10' Radius Clear From Any Roof Air Intakes

Note: *All Vent Piping and Riser Locations Should Be Coordinated With Architectural, Structural and Plumbing Plans Prior to Commencement of Work. Final Vent Stub-Up Locations Should be Coordinated with Site Superintendent for Position Within Wall Prior to Installation of Slab.*

Original Scale in Inches for Reduced Plans 0 1 2 3

0 5 10 20 Feet

Approximate Scale

Date	By	Rev.	Description

Revisions

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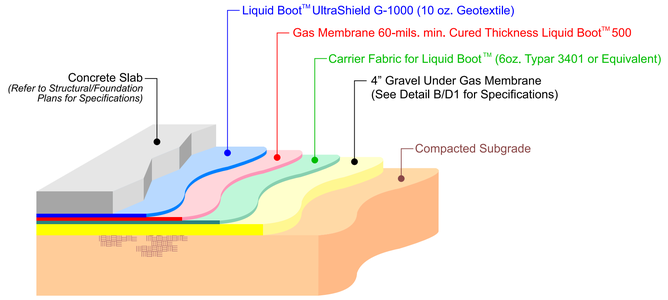
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Building 17 & 18
Third Floor & Roof Plan

Sheet 7.1

October 18, 2018



A Typical Gas Membrane - Liquid Boot® High Performance System Configuration

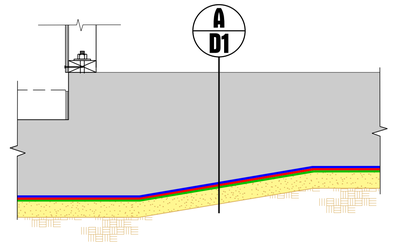
Not to Scale

Specifications For Gravel

SIEVE SIZE	PERCENTAGE PASSING SIEVE	
	3/4" Gravel*	3/8" Gravel*
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 (75 μm)	0-2	0-2
ASTM C 131 Test Grading	B	C

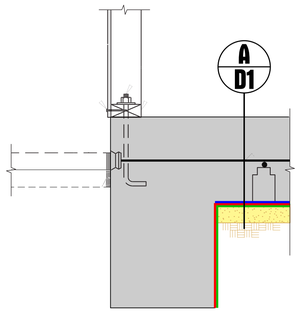
**Either 3/4" Or 3/8" Gravel is Acceptable for Methane Mitigation Purposes*

B Specifications for Gravel



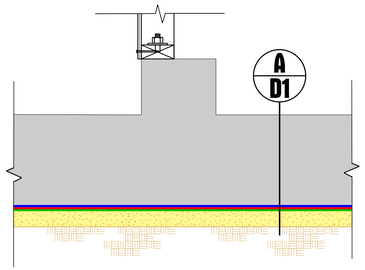
C Typical Gas Membrane at Slab Step

Not to Scale



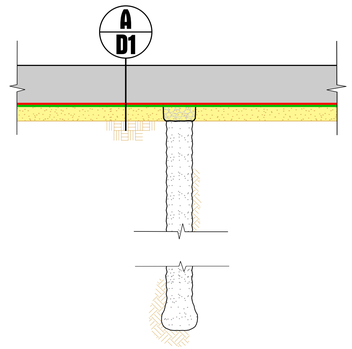
D Typical Gas Membrane at Perimeter Footing

Not to Scale



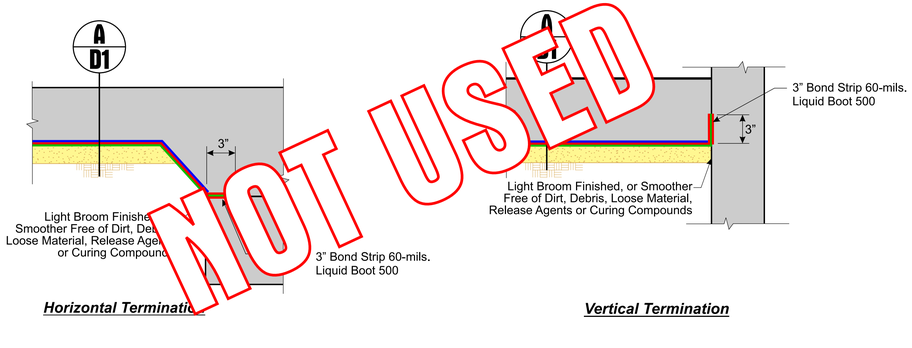
E Typical Gas Membrane at Interior Stem Wall

Not to Scale



F Typical Gas Membrane at DDC Pile

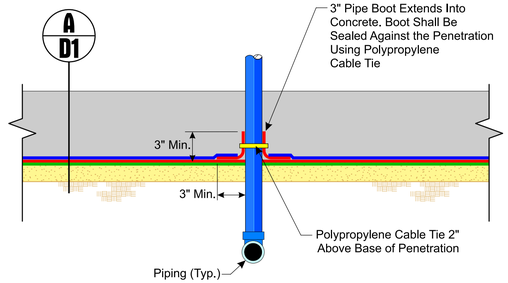
Not to Scale



NOT USED

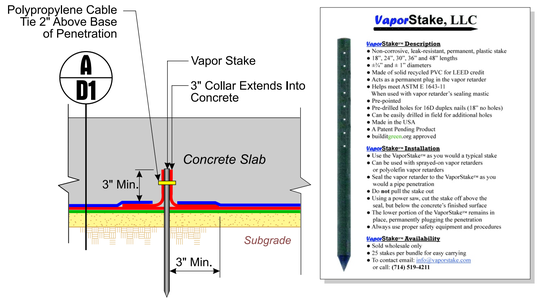
G Typical Gas Membrane Termination Detail

Not to Scale



H Typical Gas Penetration Detail

Not to Scale



I Typical Gas Plumbing Staking Detail (If Needed)

Not to Scale

CAUTION
METHANE GAS IN PIPE IF DAMAGED IMMEDIATELY NOTIFY
FIRE DEPARTMENT
NO SMOKING OR SPARKS WITHIN 10 FEET

3"x4" Wide

All Signs Plastic With Adhesive Backing,

Large Letters Min. 1/2" High

Red Letter on White or Yellow Background

3 Min. Required Per Vent Riser

This Sign Shall Be Posted On Each Vent Riser at Approximately 5-Foot Vertical Intervals (Max.) and at Roof Outlet

G Typical Placard at Vent Pipe Outlet

Not to Scale

WARNING
THIS BUILDING IS PROTECTED WITH A METHANE GAS CONTROL BARRIER. ANY PROPOSED PENETRATION OR ALTERATION OF FLOOR SLAB REQUIRES APPROVAL OF THE BUILDING DEPARTMENT AND INSPECTION BY A QUALIFIED ENGINEER

This Notification is to be Permanently Stamped or Etched in the Surface of Garage Slabs at the Time it is Poured

Location of Notification to be determined by Project Superintendent and Building Official

All Letters 1/2" (Min.) in Height

1 Required per Home

K Typical Gas Membrane Identification

Not to Scale

Notes:

Field Situations Not Specially Detailed Shall be Handled Per the Intent of These Plans and Specifications With the Approval of the Methane Engineer. The Applicator/Contractor May Submit Shop Drawings for Alternative Methods.

See Structural Foundation Plans for Complete Depth and Details of Footings. Depths of Footings Shown are Generalized, Actual Footing Depths May Vary.

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

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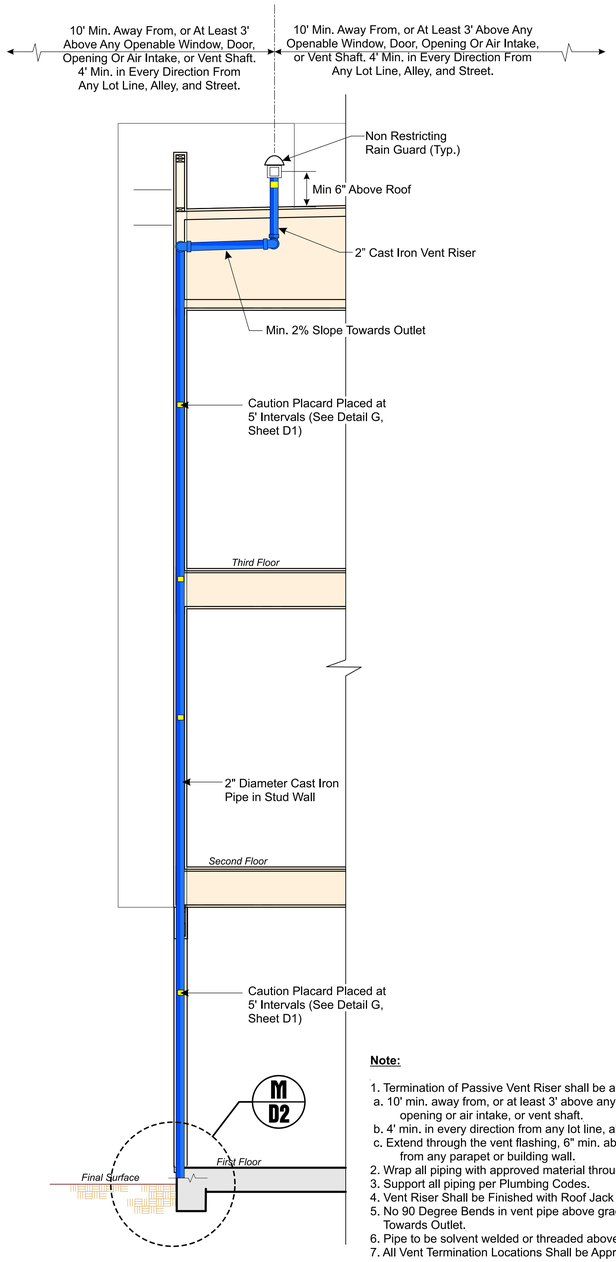
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Gas Membrane and Vent Piping Details

Sheet D1

October 18, 2018

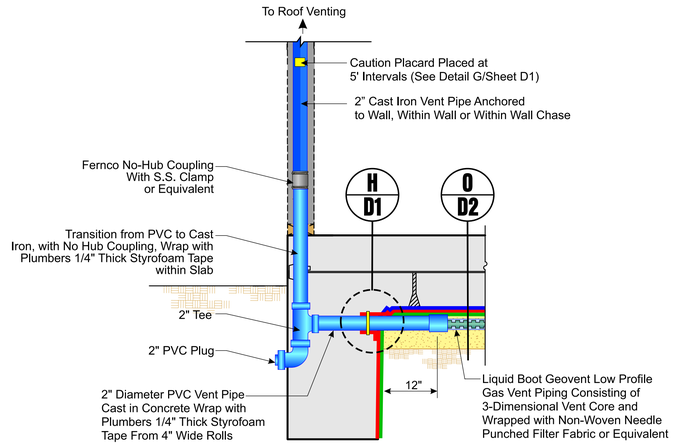


Note:

1. Termination of Passive Vent Riser shall be as follows
   a. 10' min. away from, or at least 3' above any openable window, door, opening or air intake, or vent shaft.
   b. 4' min. in every direction from any lot line, alley, and street.
   c. Extend through the vent flashing, 6" min. above the roof, and 3' min. from any parapet or building wall.
2. Wrap all piping with approved material through the concrete slab or floor.
3. Support all piping per Plumbing Codes.
4. Vent Riser Shall be Finished with Roof Jack Similar to Sanitary Vent.
5. No 90 Degree Bends in vent pipe above grade, minimum 2% Slope Towards Outlet.
6. Pipe to be solvent welded or threaded above ground.
7. All Vent Termination Locations Shall be Approved by the Architect.

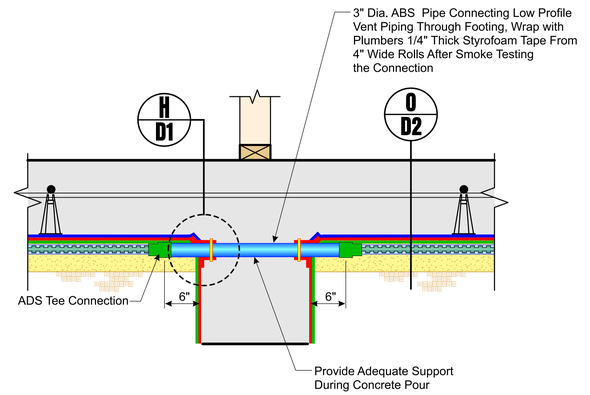
L Typical Vent Riser to Roof Transition

Not to Scale



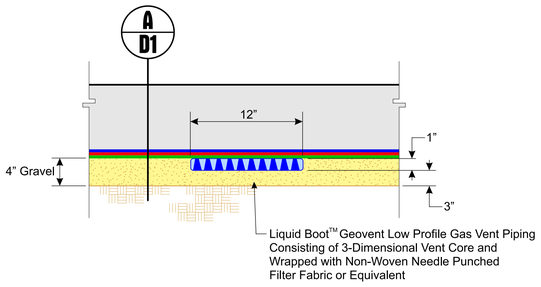
M Typical Vent Pipe to Vent Riser Transition

Not to Scale



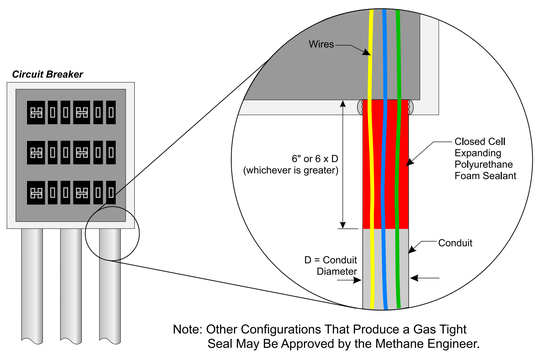
N Typical Vent Pipe Through Deepened Footing (If Encountered)

Not to Scale



O Typical Low Profile Sub-Slab Vent System

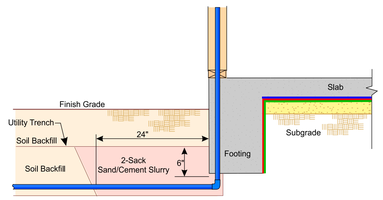
Not to Scale



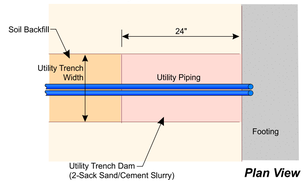
Note: Other Configurations That Produce a Gas Tight Seal May Be Approved by the Methane Engineer.

Q Typical Conduit Seal Detail

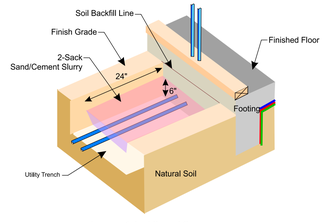
Not to Scale



Utility Trench Dams



Plan View



Isometric View View

Utility Trench Dams

A. A utility trench dam shall be installed in all utility trenches that extend beneath the house foundation from areas outside the perimeter of the home

B. The utility trench dam shall be installed in the utility trench immediately adjacent to the exterior perimeter of the house foundation.

C. The utility trench dam shall consist of one of the following:

1. A minimum 2-foot continuous length of Sand Slurry consisting of a mixture of 4% Type II Cement, and 2% powdered bentonite by weight. The slurry shall extend from the bottom of the trench to a level of 6-inches above the base of the adjacent footing.

2. A minimum 5-foot continuous length of native soil backfill compacted to at least 90% Relative Compaction in accordance with ASTM D-1557 testing procedures. The compacted soil backfill shall extend from the bottom of the trench to a level at least 6" above the base of the adjacent footing.

P Typical Utility Trench Dam

Not to Scale

Notes:

Field Situations Not Specially Detailed Shall be Handled Per the Intent of These Plans and Specifications With the Approval of the Methane Engineer. The Applicator/Contractor May Submit Shop Drawings for Alternative Methods.

See Structural Foundation Plans for Complete Depth and Details of Footings. Depths of Footings Shown are Generalized, Actual Footing Depths May Vary.

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

Revisions

REGISTERED PROFESSIONAL ENGINEER — GLENN D. TOFANI — No. 044229 Exp. 6-30-19 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — GLENN D. TOFANI — No. GE 2496 Exp. 6-30-19 — GEOTECHNICAL — STATE OF CALIFORNIA

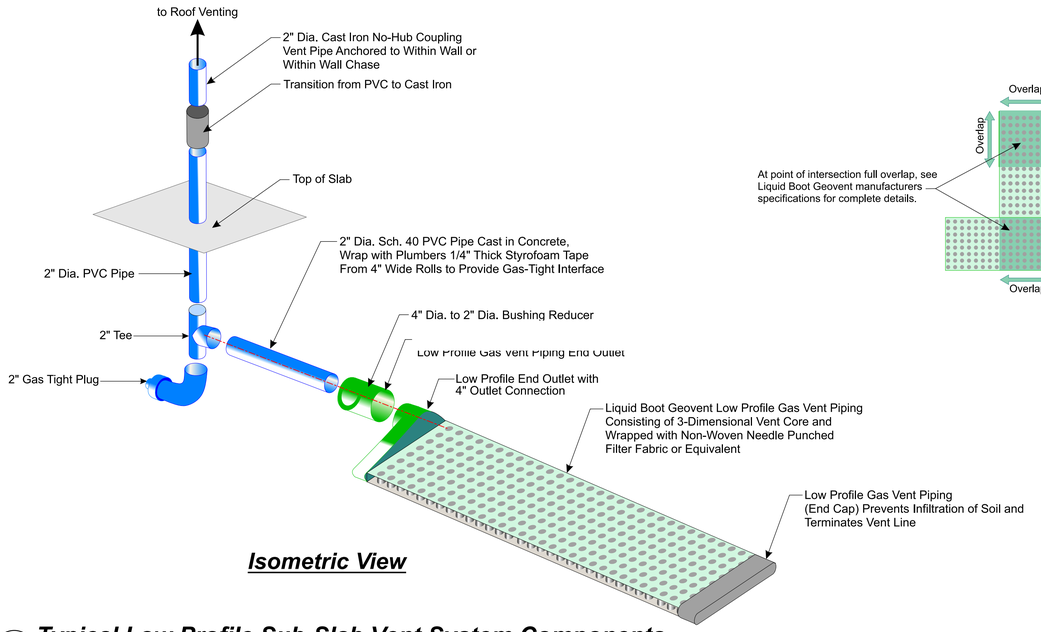
GeoKinetics
Geotechnical & Environmental Engineers
77 Bunsen
Irvine, CA. 92618
Tel 949.502.5353
Fax 949.502.5354

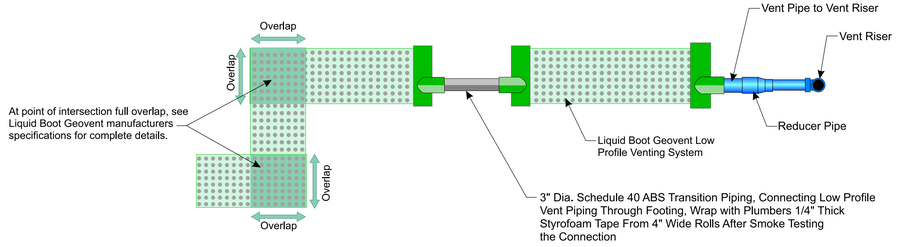
Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

Gas Membrane and Vent Piping Details

Sheet D2

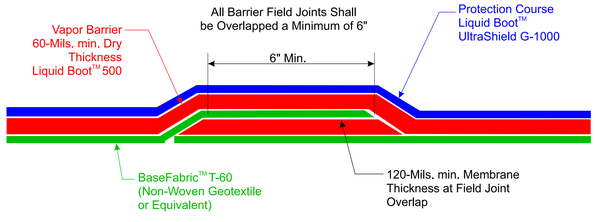
October 18, 2018





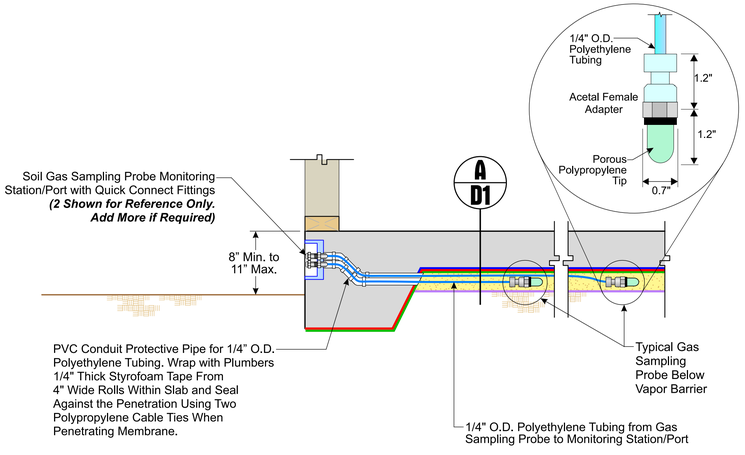
R Typical Low Profile Sub-Slab Vent System Components

Not to Scale



S Typical Methane Barrier Overlap Detail

Not to Scale



T Typical Sub-Slab Vapor/Gas Sampling Probe Detail

Not to Scale

Notes:

Field Situations Not Specially Detailed Shall be Handled Per the Intent of These Plans and Specifications With the Approval of the Methane Engineer. The Applicator/Contractor May Submit Shop Drawings for Alternative Methods.

See Structural Foundation Plans for Complete Depth and Details of Footings. Depths of Footings Shown are Generalized, Actual Footing Depths May Vary.

Original Scale in Inches for Reduced Plans 0 1 2 3

Date	By	Rev.	Description

Revisions

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Tri Pointe Homes - Ellis at Central Station - Condominiums - 18th & Wood Streets - Oakland, CA

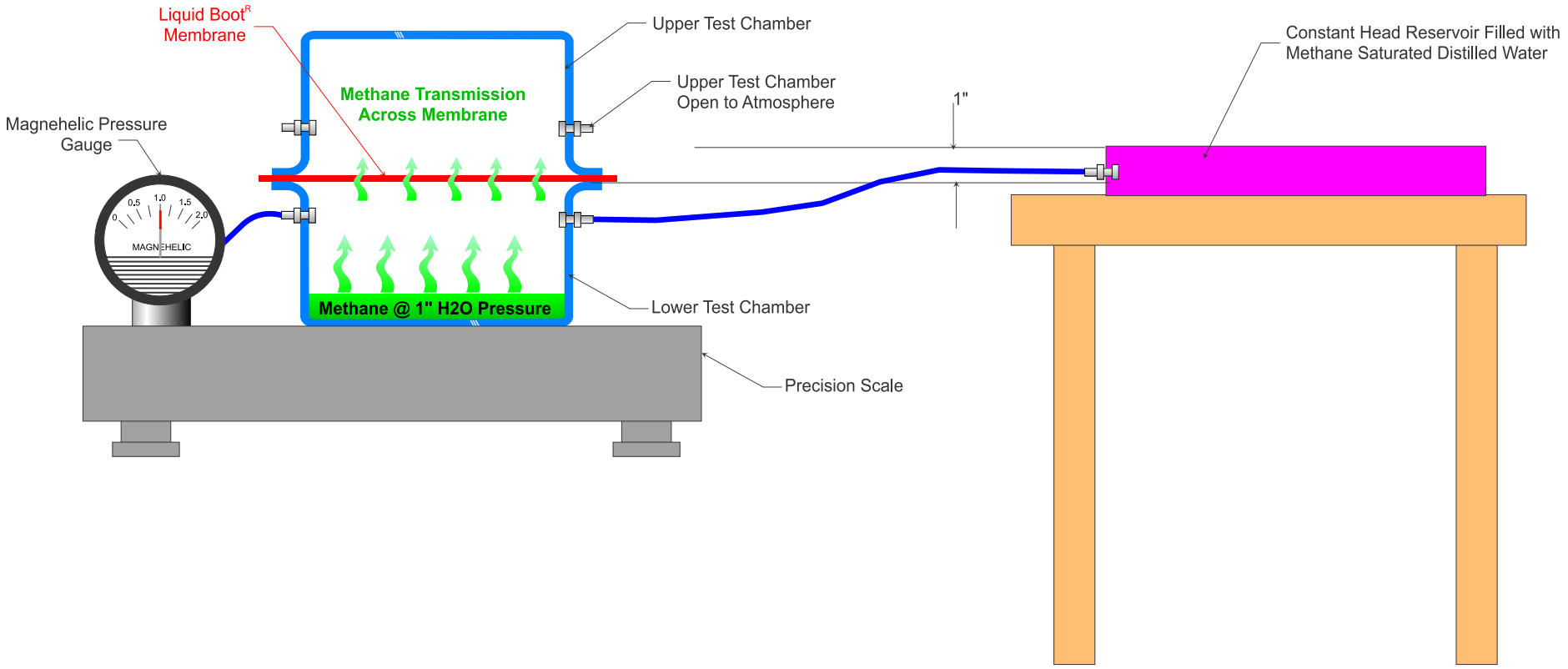
Gas Membrane and Vent Piping Details

Sheet D3

October 18, 2018

Attachment B

Liquid Boot Membrane
Methane Permeability Tests



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Project Name: Membrane Diffusion Testing

Date: October 2018

Membrane Permeability Test Configuration

Figure B-1

GeoKinetics Geotechnical & Environmental Engineers	**Membrane Permeability Test Configuration**
Project Name: Membrane Diffusion Testing	
Date: October 2018	Figure B-2

Test Number	Permeance	Membrane Thickness	Permeability
	moles / (m^2 x s x Pascal)	meters	moles / (m^2 x s x Pascal)
1	1.55×10^{-10}	1.55×10^{-3}	2.40×10^{-13}
2	3.49×10^{-10}	1.50×10^{-3}	5.24×10^{-13}
3	2.07×10^{-10}	1.55×10^{-3}	3.21×10^{-13}
4	4.91×10^{-10}	1.61×10^{-3}	7.91×10^{-13}
Average:	*3.01×10^{-10}*	*1.55×10^{-3}*	*4.69×10^{-13}*

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: Membrane Diffusion Testing

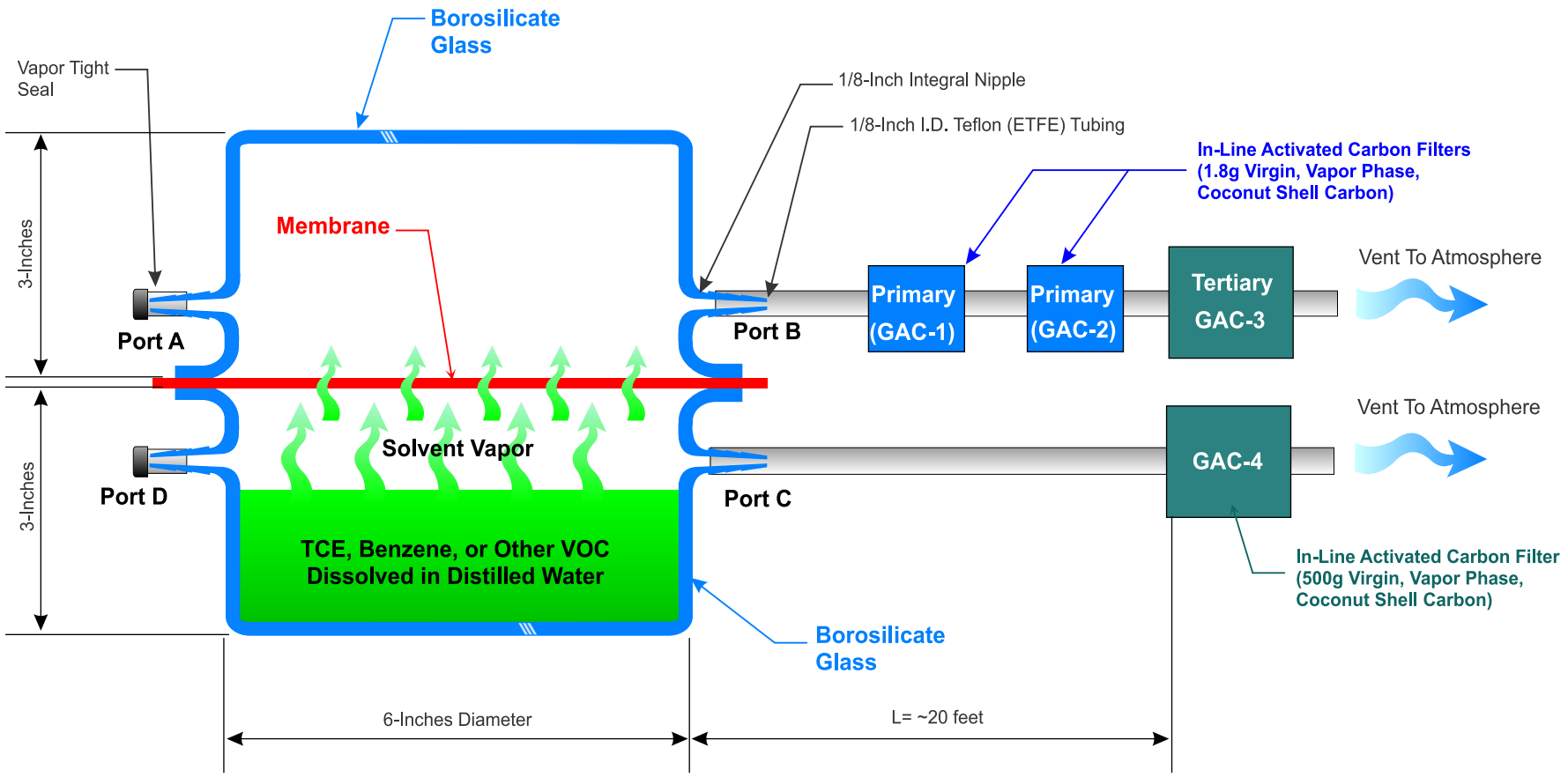
Date: October 2018

Summary of Measured Methane Permeance and Permeability Values

Figure B-3

Attachment C

Liquid Boot Membrane
VOC Diffusion Tests



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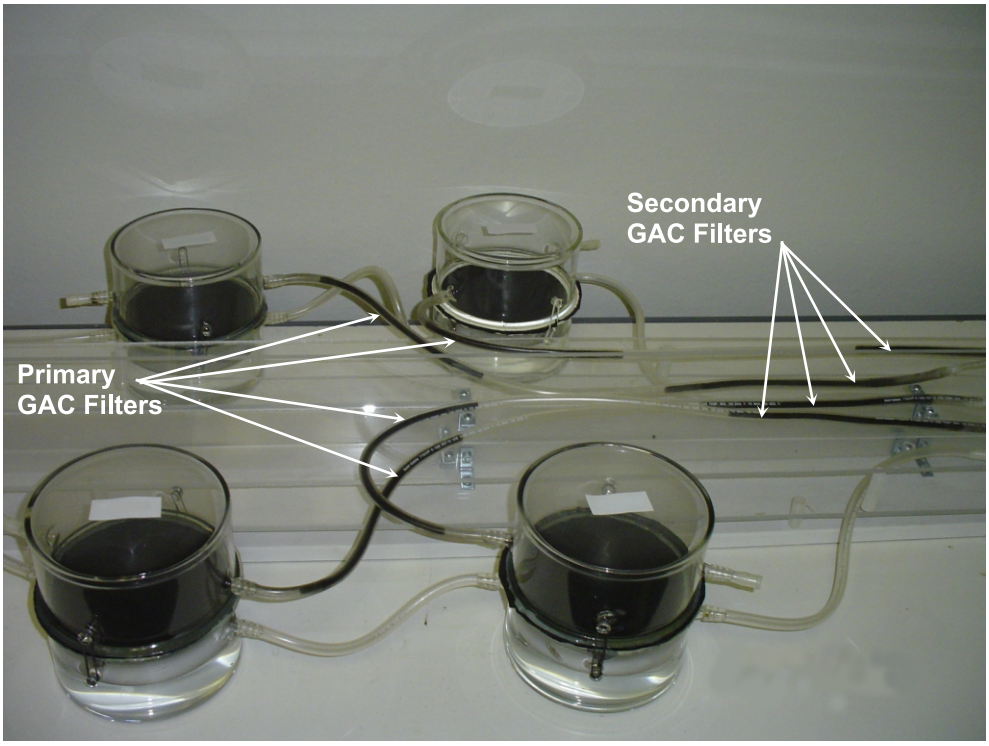
Geotechnical & Environmental Engineers

Project Name: Membrane Diffusion Testing

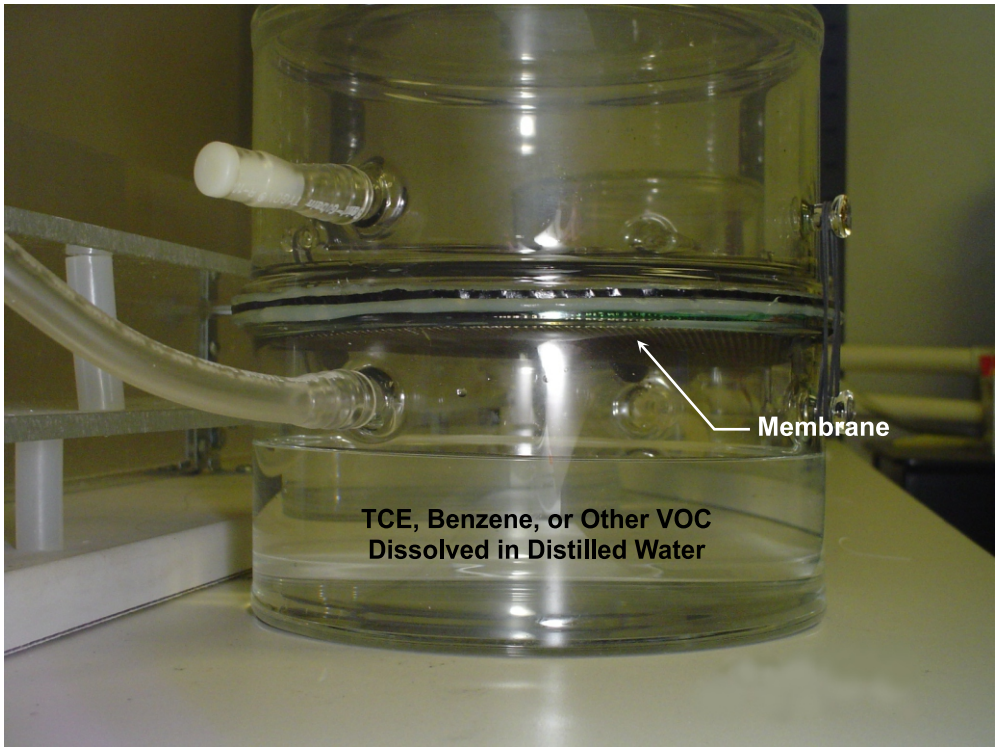
Date: October 2018

Membrane Diffusion Test Configuration

Figure C-1



Overview of Diffusion Test Chambers



Close-Up of Diffusion Test Chamber

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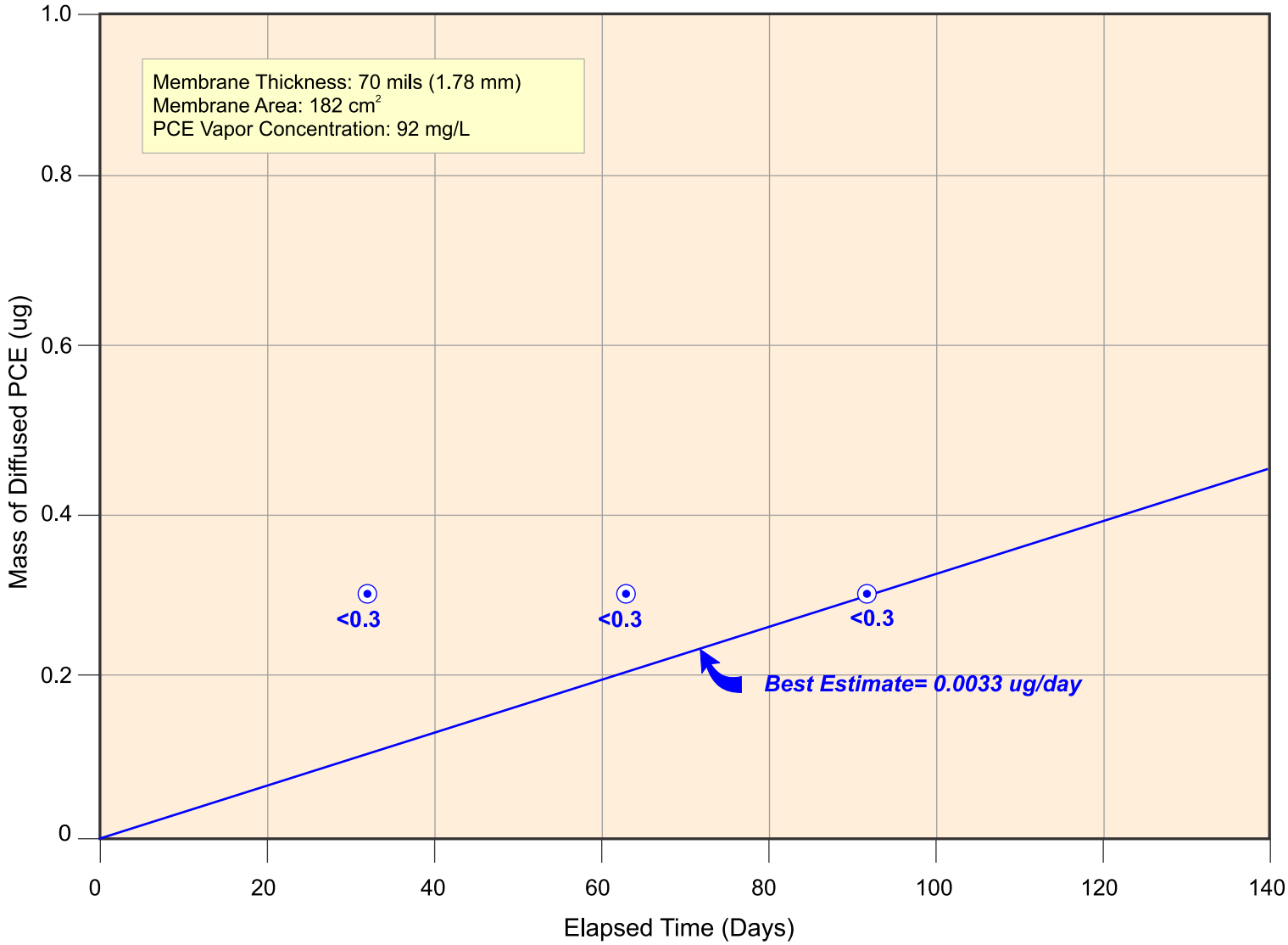
Environmental Engineers

Project Name: Membrane Diffusion Testing

Date: October 2018

Photographs of Membrane Diffusion Test

Figure C-2



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Project Name: Membrane Diffusion Testing

Date: October 2018

Measured PCE Vapor Diffusion Rates

Figure C-3

Attachment D

Gas Membrane
Smoke Test Protocol

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Gas Membrane or Vapor Barrier Smoke Testing Protocol

All Gas Membranes and Vapor Barriers shall be Smoke Tested in accordance with the following protocol and certified "gas tight" by the Design Engineer prior to approval:

1. The gas membrane / vapor barrier 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 Testing Inspection Form by the Design Engineer. The ambient air temperature at the time of testing should be in excess of 45° F 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 the smoke testing system to one of the sub-slab vent riser (Alternative A) OR configure the smoke testing system to inject smoke beneath 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 the smoke generator / blower system @ a nominal 150 cfm to 950 cfm flow rate and 2.0" H_2O minimum duct pressure with the outlet vent riser(s) uncapped. Note: Minimum 2" H_2O duct pressure should be measured at or near blower outlet. Continue to purge the system for 60 seconds after smoke begins to emerge from the vent outlet(s).

5. Cap vent outlet(s). Adjust the smoke generator / blower control valve to maintain 1" to 2" H_2O over-pressure in vent piping system (Alternative A only). The Blower / Smoke Generator system should be capable of sufficient pressure and flow to induce a slight (i.e. ≈¼" to ½") lifting of the membrane. Monitor the membrane for lifting. Reduce the pressure / flow rate if excessive lifting occurs.

6. Select one membrane coupon sampling location for every 500 to 1,000 ft^2 of membrane area. Select the sampling locations so as to (1) facilitate purging of fresh air pockets from beneath membrane; and (2) provide a representative test location for confirmation of membrane thickness.

7. Label the membrane coupons. Mark the coupon location / designation on the floor plan. A marked-up floor plan to be included with the Smoke Testing Inspection Form.

8. Confirm adequate flow of smoke from the coupon sampling locations. Low rate of smoke flow may be indicative of poor communication between vent piping gravel backfill and the base of membrane for Alternative A (i.e. dirt placed above trench gravel). If a low rate of smoke flow from coupon sampling location(s) occurs, use Alternative B described under Item #3 above for smoke injection. Connect smoke generator to injection boot and continue with smoke injection. (Note: Adequate continuity of the sand or gravel between the vent lines and the base of the membrane must be confirmed prior to membrane certification.)

9. Install a temporary seal at the membrane sampling locations after purging using HDPE with GSE double-sided butyl-asphaltic tape or other procedure approved by the Design Engineer. Mark the coupon sampling location(s) with fluorescent green paint. Repair the sampling locations using the gas membrane / vapor barrier manufacturer's protocol following completion of the test.

10. Select one 0.05" perforation test location for every 1,000 ft^2 of membrane area up to a maximum area of 2,000 ft^2 and one additional perforation test location for every 5,000 ft^2 thereafter. Select representative test locations dispersed somewhat uniformly across the surface of membrane. Perforate the membrane at test the locations using the 0.05" pin. Confirm / photograph the smoke emergence at each test location. Mark the test locations with fluorescent green paint. Temporarily repair test locations after verification using HDPE tape or other material approved by the Design Engineer. Repair the sampling locations using the gas membrane / vapor barrier manufacturer's protocol following completion of the test.

11. Maintain operation of smoke generator / blower system for at least 10 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.

12. Repair the leak locations marked in Step #11 using the gas membrane / vapor barrier manufacturer's protocol.

13. Repeat step #'s 11 and 12, as necessary, to confirm the integrity of the membrane.

14. Prepare the smoke testing Inspection Form. Notes should include the date, tract # and lot # and/or address, name of Methane or Vapor Barrier Engineer, name of person who performed the test, number of leaks identified, type and distribution of leaks identified (i.e. tears, pin-holes or thin sections, seam leaks, boot leaks, etc.), and the building floor plan with leak locations, coupon locations, and test perforation locations. The Inspection Form is to be signed and stamped by the Design Engineer / Inspector.

15. Install a weather-proof tag on front-most vent riser confirming the successful completion of the smoke testing and the approval of gas membrane or vapor barrier. The tag should include:

"Smoke Tested OK"
<tract # and lot # or address>
<date>
<time>
<name of tester>

{ E N D }

Methane Gas Mitigation

Inspection Form

Mitigation Plans Dated:

Lot No.: _____

Project No.: _____

Materials

	DESCRIPTION	APPROVED
Sub-slab vent pipe		
Sub-slab vent filter fabric		
Sub-slab vent trench back fill material		
Sub-slab vent pipe to concrete protection material		
Gas membrane		
Gas membrane bonding tape		
Gas membrane pipe boots		
Vent riser pipe		
Vent riser rain cap		
Conduit Sealant Material		
Utility Dam Material		

Sub-Slab Vent Piping

	INSPECTOR	OK	NOT	NOTE	INSPECTION	CORRECTION
Configuration of piping consistent with approved plans (Attach floor plan documenting any deviations)						
Proper transitions through footings						
Vent pipe installed in 2" sand layer						
End caps properly installed						
Proper connection for active venting system						
Filter fabric properly installed						
Vent piping foam taped through footings						
Vent risers properly secured to form boards						
Final sub-slab vent pipe inspection–Ok to pour footings and install sand on sub-grade						

Gas Membrane

Geofabric Placement Acceptable						
Proper stemwall/footing finish for membrane bonding						
Gas membrane continuously bonded to perimeter footings						
Gas membrane continuously bonded to Interior footings						
Gas membrane seems continuously sealed						
Pipe boots properly installed and sealed						
Membrane properly sealed to sewer backflow valve conduit						
Membrane smoke testing successfully completed						
Ok to install sand on membrane						
Sand above membrane: suitability and thickness of installation (_____ Inches)						
Final membrane inspection–Ok to pour slab						
Slab pouring/finishing protocol observed and acceptable with respect to protection of gas membrane						

Vent Risers

Vent riser location consistent with approved plans						
Vent risers (do not penetrate)(properly penetrate) studs						
Vent riser holes through sill plate and top plate properly placed & dimensioned						
Structural straps properly installed on sill & top plates where required						
Nail plate properly installed on blocking where required						
Vent pipe joints properly solvent welded						
Vent pipe properly secured/strapped where exposed						
Vent pipe properly stubbed through roof sheathing						
Vent pipe outlet has proper roof clearance						
Vent pipe outlet has proper clearance with respect to windows, etc.						
Vent pipe rain cap properly installed						
Vent pipe methane labels properly installed						

Utility Seals

Conduit Seals Properly Installed						
Cement And Bentonite Slurry						
Interior Air Space Combustible Gas Concentration ( )						

GeoKinetics

Geotechnical & Environmental Engineers

Final system approval

Engineer: _____

Engineer Signature: _____

(DOC.PUB.4.02.02)