DRAFT

ENGINEERING EVALUATION:
D.R. HORTON CA3, INC., PLANT # 24116
APPLICATION NO: 29180
1501 Centre Pointe Drive Milpitas CA 95035

BACKGROUND

D.R. Horton CA3, Inc. has applied for an Authority to Construct and Permit to Operate an active sub-slab depressurization system at the Traditions and Contempo at Centre Pointe residential housing development project in Milpitas, California:

S-1 **Sub-Slab Vapor Intrusion Mitigation System, Active (30 vents), Buildings 1 through 30, RadonAway® Mitigation Fans, Model GP501, 60 cfm/fan maximum**

The sub-slab vapor intrusion mitigation system (VIMS) is being installed to prevent the migration of volatile organic compounds (VOCs) to indoor air resulting from accumulation of VOCs in the soil gas beneath on-site residences. The system is being constructed under each of the 30 residential townhome buildings on-site. According to the applicant, the S-1 VIMS consists of (a) sub-slab vapor collection piping and two vent riser pipes (risers terminate on the roof & are located at opposite ends of each building), (b) a complete vapor intrusion barrier beneath each building slab; and (c) an active sub-slab depressurization system with fan and monitoring capabilities.[1] In addition, the active[2] VIMS, as constructed, consists of the following equipment at each of the 30 buildings on-site: one RadonAway® Mitigation Fan (with a maximum exhaust rate of 66 cfm at 0.02" WC minimum vacuum) integrated into the venting mat circuit and a single exhaust stack (the other stack constructed at each building will be capped).

There are no known on-site sources of VOC contamination. According to the applicant, VOC contamination has migrated onto the site via a groundwater plume that originated from off-site, hydraulically upgradient source(s). VOCs in the groundwater partition into soil and soil vapor at the capillary fringe in the vadose zone; VOCs in soil vapor then have the potential to migrate upwards into the atmosphere and/or building features present (the rate of which is dependent on a variety of environmental factors). The VIMs is designed to prevent such vapor intrusion. Based on historical sampling efforts (groundwater, soil gas, and soil), pollutants of concern at the site are reported to include several chlorinated compounds tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-DCE, vinyl chloride, 1,1-DCE, 1,1-DCA, and 1,1,1-TCA. It should be noted that the VIMS was originally designed to passively vent accumulated sub-slab vapors to the atmosphere via the two riser pipes at each residential building. During construction of the passive VIMS, residential developers were directed by the Regional Water Quality Control Board - San Francisco Region, to convert to an active VIMS. The active VIMS will be subject to a Final Site Management Plan (SMP) for long-term monitoring, maintenance and reporting as well as an O&M Plan for routine maintenance and reporting; the SMP and O&M Plan will be subject to approval and enforcement by the RWQCB.

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[1] TetraTech, 2019. Report of Findings and Request for Project Exemption. Supplemental Pilot Tests – Subslab Venting Systems Buildings 2, 4, and 27 with Resample of Building 15. D.R. Horton CA3, Inc. Residential Redevelopment Traditions at Centre Point and Contempo at Centre Pointe. 1501 Centre Pointe Drive, Milpitas California 95035. BAAQMD Application No. 29180. August 27.
Note: The system was originally designed to passively vent accumulated sub-slab vapors to the atmosphere via the two riser pipes at each residential building (risers terminate on the roof & are located at opposite ends of each building). During construction of the passive VIMS, the site was directed by the Regional Water Quality Control Board - San Francisco Region, to convert to an active VIMS for increased protection of public health. Therefore, the site designed an active VIMs for the site.

[2] Per Regulation 8, Rule 47: an active system is defined as "a system which forcibly aerates soil by mechanically drawing air through the soil or applying heat to the soil" (Section 8-47-204).

A pilot test was completed in March 2018 at Building 15 for the active VIMS design, primarily to assess the *in-situ* performance of the RadonAway® Mitigation Fans. Soil gas samples were also collected during the Building 15 pilot test but were not deemed to be representative of site VOC soil gas concentrations due to PVC pipe cure material off-gassing from construction. The applicant later completed supplemental vent fan pilot testing in 2019 in response to BAAQMD comments; the testing was primarily conducted in order to collect more representative soil gas VOC concentrations present at the site. Supplemental testing was completed in areas of highest reported soil VOC contamination in order to represent worst-case soil gas concentrations that would be emitted.

This application proposes a new source of toxic air contaminant (TAC) emissions and is located within 1,000 feet of the outer boundary of the nearest K-12 school. Therefore, public notification pursuant to BAAQMD Regulation 2-1-412 is required.

EMISSION CALCULATIONS

The following assumptions were used to estimate emissions associated with this application. These assumptions are consistent with the BAAQMD Permit Handbook Chapter 9.2 Soil Vapor Extraction.

1. Fan operation at each building is 24 hours per day, 365 days per year
2. Operating conditions: Pressure = 1 atm; Inlet Temperature = 21°C; 1 mole occupies 24.15L
3. Assume 100% of contaminants are stripped from the soil
4. Influent flow rate based on operational parameters of equipment. Per building, influent rate = 60 cfm per fan maximum (note that this is very conservative; field results show fan operation is limited to approximately 30 cfm per fan *in situ*; maximum per manufacturer's specifications is 66 cfm/fan)
5. VOC concentration at each emission point is based on 2019 laboratory analytical reports provided by applicant for individual organic compounds and toxics.
   - For groundwater pollutants of concern (PCE, TCE, cDCE, tDCE, VC), any non-detect values (i.e. not detected above the applicable reporting limit) are assumed to be equal to the reporting limit (R.L.) for conservative purposes. For groundwater plume-related VOC soil gas concentrations, see Table 1A, below.
   - For VOCs other than groundwater pollutants of concern (listed above), the site reports these result from off-gassing of PVC pipe cure materials (Freon11, ethanol, acetone, benzene, methyl ethyl ketone, tetrahydrofuran, chloroform, toluene, cumene) and not originating from the groundwater plume. Nevertheless, all VOCs are assumed to be emitted on a consistent basis for conservative purposes. The pipe cure off-gassing constituents are expected to attenuate over time, though the timeframe is not known. For PVC pipe cure material off-gassing VOC soil gas concentrations, see Table 1B, below.
6. No abatement device is installed in the active VIMS; all emissions are unabated.

Table 1A. Groundwater Plume-Related VOC Soil Gas Concentrations, Buildings 2, 4, 15, 27 (2019)

Sample Location	Date	TO-15 µ/m^3 (max at each location)				
		PCE	TCE	cDCE	tDCE	VC
Bldg2-P1	6/13/2019	< 8.3	< 6.6	< 4.8	< 4.8	< 3.1
Bldg4-P1	6/13/2019	< 8.3	**8.4**	< 4.9	< 4.9	< 3.1
Bldg27-P1	6/13/2019	< 8.3	< 6.6	< 4.8	< 4.8	< 3.1
Bldg15-P1	6/13/2019	< 8.3	< 6.6	< 4.8	< 4.8	< 3.1
Maximum		**< 8.3**	**8.4**	**< 4.9**	**< 4.9**	**< 3.1**

Table 1B. PVC Pipe Cure Off-gassing VOC Soil Gas Concentrations, Buildings 2, 4, 15, 27 (2019)

Sample Location	Date	TO-15 µ/m^3 (max at each location)								
		Freon11	EtOH	Acetone	Benzene	MEK	THF	CHCl3	Toluene	Cumene
Bldg2-P1	6/13/2019	9.2	11	130		15	32	22		
Bldg4-P1	6/13/2019		9.6	71		72	160		30	9.2
Bldg27-P1	6/13/2019		11	38			20			
Bldg15-P1	6/13/2019			45	46					53
Maximum		**9.2**	**11**	**130**	**46**	**72**	**160**	**22**	**30**	**53**

Abbreviations: EtOH = ethanol; MEK = methyl ethyl ketone, THF = tetrahydrofuran, CHCl3 = chloroform; non-detect R.L.'s are not shown.

Influent vapor concentration unit conversion is assumed as:
(µg/m^3) * (1m^3/1000 L) = µg/L

Using Equation 1a from BAAQMD Permit Handbook Chapter 9.2 Soil Vapor Extraction (for units of µg/L):

EP = Cia * Q * Coa * (1-A), where:

EP = emissions (lbs/day), note that project emissions are unabated in this application
Cia = influent concentration (µg/L)
Q = flow rate (scfm; assume 60 scfm per fan, 30 fans)
Coa = Dimensional Constant (Conversion Factor) for Equation 1a,
= 1 lb/4.536E8 ug * 28.317 L/ft3 * 1440 min/day = 8.99E-5 lb-L-min/ug-ft3-day
A = Abatement efficiency (%wt), equals zero for this application

Table 2A shows the currently-proposed POC, NPOC and toxic air emissions associated with this application for a single building. Table 2B multiplies values in Table 2A by a factor of 30 to conservatively estimate the emissions for all 30 buildings. Note that on Tables 2A and 2B, **bold** values indicate maximum sample results detected above the reporting limit; *italic* values indicate non-detect sample results for which the maximum reporting limit is assumed.

Table 2A. VOC Emissions from Single Building

Source	Constituent	POC or NPOC	Influent vapor concentration [µg/m^3]	Influent vapor concentration (µg/L)	Unabated Emission [lb/hr]	Unabated Emission [lb/day]	Unabated Emission [lb/yr]	Unbated Emission [ton/yr]	Acute Trigger Level [lb/hr]	Acute Trigger Exceeded? [HRA Required]	Chronic Trigger Level [lb/yr]	Chronic Trigger Exceeded? [HRA Required]
Groundwater Plume	Tetrachloroethene (PCE)	NPOC	*8.3*	0.008	1.80E-06	4.32E-05	1.58E-02	7.88E-06	4.4E+01	No	1.4E+01	No
	Trichloroethene (TCE)	POC	**8.4**	0.008	1.80E-06	4.32E-05	1.58E-02	7.88E-06	NA	No	4.1E+01	No
	cis-1,2-dichloroethene (cDCE)	POC	*4.9*	0.005	1.12E-06	2.70E-05	9.84E-03	4.92E-06	2.7E+03	No	7.0E+01	No
	trans-1,2-dichloroethene (tDCE)	POC	*4.9*	0.005	1.12E-06	2.70E-05	9.84E-03	4.92E-06	2.7E+03	No	7.0E+01	No
	Vinyl chloride (VC)	POC	*3.1*	0.003	6.74E-07	1.62E-05	5.91E-03	2.95E-06	4.0E+02	No	1	No
PVC Pipe Cure Materials	Freon11	NPOC	**9.2**	0.009	2.02E-06	4.85E-05	1.77E-02	8.86E-06	NA	No	NA	No
	Ethanol (EtOH)	POC	**11**	0.011	2.47E-06	5.93E-05	2.17E-02	1.08E-05	NA	No	NA	No
	Acetone	NPOC	**130**	0.130	2.92E-05	7.01E-04	2.56E-01	1.28E-04	NA	No	NA	No
	Benzene	POC	**46**	0.046	1.03E-05	2.48E-04	9.06E-02	4.53E-05	6.0E-02	No	2.9E+00	No
	Methyl Ethyl Ketone (MEK)	POC	**72**	0.072	1.62E-05	3.88E-04	1.42E-01	7.09E-05	2.9E+01	No	NA	No
	Tetrahydrofuran (THF)	POC	**160**	0.160	3.60E-05	8.63E-04	3.15E-01	1.58E-04	NA	No	NA	No
	Chloroform (CHCl3)	POC	**22**	0.022	4.94E-06	1.19E-04	4.33E-02	2.17E-05	3.3E-01	No	1.5E+01	No
	Toluene	POC	**30**	0.030	6.74E-06	1.62E-04	5.91E-02	2.95E-05	8.2E+01	No	1.2E+04	No
	Cumene	POC	**53**	0.053	1.19E-05	2.86E-04	1.04E-01	5.22E-05	NA	No	NA	No
				Total POC	**9.33E-05**	**2.24E-03**	**8.17E-01**	**4.09E-04**				
				Total NPOC	**3.30E-05**	**7.93E-04**	**2.89E-01**	**1.45E-04**				
				Total Organics	**1.26E-04**	**3.03E-03**	**1.11E+00**	**5.53E-04**				

Table 2B. Total VOC Emissions from 30 Buildings (S-1 Grouping)

Source	Constituent	POC or NPOC	Influent vapor concentration [µg/m^3]	Influent vapor concentration (µg/L)	Unabated Emission [lb/hr]	Unabated Emission [lb/day]	Unabated Emission [lb/yr]	Unbated Emission [ton/yr]	Acute Trigger Level [lb/hr]	Acute Trigger Exceeded? [HRA Required]	Chronic Trigger Level [lb/yr]	Chronic Trigger Exceeded? [HRA Required]
Groundwater Plume	Tetrachloroethene (PCE)	NPOC	*8.3*	0.008	5.39E-05	1.29E-03	4.73E-01	2.36E-04	4.4E+01	No	1.4E+01	No
	Trichloroethene (TCE)	POC	**8.4**	0.008	5.39E-05	1.29E-03	4.73E-01	2.36E-04	NA	No	4.1E+01	No
	cis-1,2-dichloroethene (cDCE)	POC	*4.9*	0.005	3.37E-05	8.09E-04	2.95E-01	1.48E-04	2.7E+03	No	7.0E+01	No
	trans-1,2-dichloroethene (tDCE)	POC	*4.9*	0.005	3.37E-05	8.09E-04	2.95E-01	1.48E-04	2.7E+03	No	7.0E+01	No
	Vinyl chloride (VC)	POC	*3.1*	0.003	2.02E-05	4.85E-04	1.77E-01	8.86E-05	4.0E+02	No	1	No
PVC Pipe Cure Materials	Freon11	NPOC	**9.2**	0.009	6.07E-05	1.46E-03	5.32E-01	2.66E-04	NA	No	NA	No
	Ethanol (EtOH)	POC	**11**	0.011	7.42E-05	1.78E-03	6.50E-01	3.25E-04	NA	No	NA	No
	Acetone	NPOC	**130**	0.130	8.77E-04	2.10E-02	7.68E+00	3.84E-03	NA	No	NA	No
	Benzene	POC	**46**	0.046	3.10E-04	7.44E-03	2.72E+00	1.36E-03	6.0E-02	No	2.9E+00	No
	Methyl Ethyl Ketone (MEK)	POC	**72**	0.072	4.85E-04	1.17E-02	4.25E+00	2.13E-03	2.9E+01	No	NA	No
	Tetrahydrofuran (THF)	POC	**160**	0.160	1.08E-03	2.59E-02	9.45E+00	4.73E-03	NA	No	NA	No
	Chloroform (CHCl3)	POC	**22**	0.022	1.48E-04	3.56E-03	1.30E+00	6.50E-04	3.3E-01	No	1.5E+01	No
	Toluene	POC	**30**	0.030	2.02E-04	4.85E-03	1.77E+00	8.86E-04	8.2E+01	No	1.2E+04	No
	Cumene	POC	**53**	0.053	3.57E-04	8.58E-03	3.13E+00	1.57E-03	NA	No	NA	No
				Total POC	**2.80E-03**	**6.72E-02**	**2.45E+01**	**1.23E-02**				
				Total NPOC	**9.91E-04**	**2.38E-02**	**8.68E+00**	**4.34E-03**				
				Total Organics	**3.79E-03**	**9.09E-02**	**3.32E+01**	**1.66E-02**				

Table 3 shows the cumulative increase in POC and NPOCs for the project (30 buildings):

Table 3. Cumulative Emissions Increase

Pollutant	Existing (tpy)	New Increase with this application (tpy)	Total (tpy)
POC	0.000	0.012	0.012
NPOC	0.000	0.004	0.004

STATEMENT OF COMPLIANCE

Toxic Health Risk Assessment

Based on the calculations presented in Table 2A and 2B, TAC emissions at each building and for all 30 buildings do not exceed the District's Risk Screening trigger levels set forth in Table 1 of Reg. 2-5 (New Source Review for Toxic Air Contaminants). Therefore, a Health Risk Assessment (HRA) is not required.

Best Available Control Technology (BACT)

The proposed project source S-1 will not emit criteria pollutants (POCs, NPOC, NOx, SO2, PM10, or CO) at rates of 10 lbs or more per highest day and is therefore not required to implement BACT per Regulation 2-2-301.

California Environmental Quality Act (CEQA)

This permit application was reviewed following the specific procedures, fixed standards and objective measurements set forth in BAAQMD Engineering Handbook Chapter 9.2 and is therefore classified as ministerial. As such, it is exempt from CEQA review per Regulation 2-1-311.

District Rules and Regulations

Regulation 8, Rule 47 Air Stripping and Soil Vapor Extraction Operations

Soil vapor extraction operations are subject to Regulation 8-47 (Air Stripping and Soil Vapor Extraction Operations), which requires at least 90% control of emissions unless the applicant meets exemptions 9-47-109 through 113. Based on the 2019 supplemental testing results, the applicant has requested exemption from 8-47-301 emission control requirements for specific compounds per exemption 8-47-113:

> ***8-47-113 Exemption, Air Stripping and Soil Vapor Extraction Operations Less Than 1 Pound per Day:*** *The provisions of Section 8-47-301 shall not apply to operations with total emissions of less than 1 pound per day of benzene, vinyl chloride, perchloroethylene, methylene chloride and/or trichloroethylene, provided the requirements of Section 8-47-402 are satisfied. Once an exemption pursuant to this section is granted, if the emissions of an operation exceed 1 pound per day, then that operation is subject to Section 8-47-301. The operator of the source may submit a petition to the APCO in writing requesting review under this exemption if uncontrolled emissions have been shown, due to sustained remediation activities, to have dropped to a constant emission rate of less than 1 pound per day.*
> > Based on the 2019 supplemental test results, only benzene and TCE are emitted from the above-cited compounds at a rate much lower than 1 pound per day. Therefore, emission control standards of 8-47-301 are not applicable and the exemption is granted. A permit condition will be imposed to ensure ongoing compliance with this requirement.

8-47-402 Less Than 1 Pound Per Day Petition: *Any person seeking to satisfy the conditions of Section 8-47-113 shall: 402.1 Submit a petition to the APCO in writing requesting review and written approval of a health risk screening analysis for the benzene, vinyl chloride, perchloroethylene, methylene chloride and/or trichloroethylene organic compound emissions that are less than 1 pound per day.*
> The applicant has fulfilled this requirement through application submittal. An HRA is not required because proposed TAC emissions are below the thresholds set forth in Regulation 2 Rule 5 Table 2-5-1.

Regulation 8-47-302 standards also require abatement for any soil vapor extraction operation with a total organic compound emission greater than 15 pounds per day. The proposed project does not emit above this threshold; therefore, abatement is not triggered for the non-TAC organic compound emissions.

Regulation 2, Rule 1 Permits – General Requirements

The applicant requested an exemption applicability review of Authority to Construct (AC) and Permit to Operate (PO) requirements of BAAQMD *Regulation 2 Permits, Rule 1 General Requirements*, Sections 301 and 302, respectively. The source is not excluded per Regulation 1-110 nor are there any applicable exemptions in Section 2-1-105, -113, or -114 to -128. Also, exemption 2-1-103 is not applicable because the site is subject to provision 8-47-402 (thereby the project fails to meet exemption criteria 2-1-103.1). Therefore, an AC and PO is required for the active VIMS system as proposed.

This application proposes a new source of TACs and is located within 1,000 feet of the outer boundary of the nearest K-12 school. Therefore, public notification pursuant to Reg. 2-1-412 is required. There are no additional schools (listed below) located within a ¼-mi. radius of the proposed project. The school public notice will therefore be distributed on Month DD, 2020 to the parents and guardians of the students of the following schools as well as to addresses located within 1,000 feet of the site:

- Stratford School, 341 Great Mall Parkway, Milpitas CA 95035
- Mabel Mattos Elementary School, 1750 McCandless Dr, Milpitas CA 95035

Regulation 2, Rule 2 New Source Review

Offsets are not required per Regulation 2-2-302 because the Plant's potential to emit POC and NO_x emissions are each less than 10 ton/yr.

Other

PSD, NSPS, and NESHAPS do not apply. While some TACs to be emitted are included on the US EPA list of Hazardous Air Pollutants [Clean Air Act Section 112(b)(1)], site operations are not included in any industry groups listed in the air toxics source categories. Therefore, maximum achievable control technology (MACT) standards, generally available control technology, and/or residual risk standards do not apply to this project.

PERMIT CONDITIONS

Application # 29180: D.R. Horton CA3, Inc; Plant # 24116

`Condition #27174:`

1. In no event shall toxic air contaminant emissions from any single building, or from all 30 buildings in aggregate total, exceed the corresponding Toxic Air Contaminant Trigger Level(s) as set forth in BAAQMD Regulation 2, Rule 5, Table 2-5-1. (Basis: Regulation 2-5)

2. Total emissions of benzene, vinyl chloride, perchloroethylene, methylene chloride and/or trichloroethylene shall not exceed 1 pound per day. [Basis: Regulation 8-47-113]

3. Emissions of precursor organic compounds shall not exceed 10 pounds per day. [Basis: 2-2-301]

4. Emissions of total organic compounds shall not exceed 15 pounds per day. [Basis: 8-47-302]

5. To determine compliance with the above parts, operator of this source shall:

    a. Analyze exhaust gas to determine the concentration of toxic air contaminants and total volatile organic compounds present for Buildings 2, 4, 15, and 27 on the first day of startup. Thereafter, these buildings will be sampled once annually. After two years of operation, the operator may propose for District review that the sampling schedule be reduced. Written authorization must be received from the District before any change in sampling frequency.
    b. Calculate emissions in pounds per day and pounds per year for each toxic air contaminant emitted, as well as for precursor organic compound and total organic compounds, per building and for all 30 buildings, based on the maximum-reported constituent concentrations (from part a, above).
    c. Submit to the District's Engineering Division the test results and emission calculations within 60 days of completion of annual testing. Samples shall be analyzed according to modified EPA test methods TO-15 or equivalent to determine the concentrations of all toxic air contaminants emitted as well as precursor and total organic compounds.

6. The owner/operator of this source shall maintain the following information in a District-approved log for each month of operation of the source:
    a. dates of fan operation per building;
    b. exhaust flow rate per building fan:
    c. exhaust sampling dates;
    d. sample analysis results;
    e. calculated emissions of all toxic air contaminants, precursor organic compounds, and total organic compounds (precursor + non-precursor organic compounds) in pounds per day.
    f. Demonstration of compliance with limits set forth in parts 1 though 4.

    Such records shall be retained and made available for inspection by the District for two years following the date the data is recorded. [Basis: Regulation 1-523]

7. Any non-compliance with these conditions shall be reported to the Compliance and Enforcement Division at the time that it is first discovered. The submittal shall detail the corrective action taken and shall include the data showing the exceedance as well as the time of occurrence.

8. The owner/operator shall maintain a file containing all measurements, records and other data that are required to be collected pursuant to the various provisions of this Authority to Construct/Permit to Operate. All measurements, records and data required to be maintained by the applicant shall be retained for at least two years following the date the data is recorded.

9. Upon final completion of the remediation project, the owner/operator of S-1 shall notify the district within two weeks of decommissioning the operation.

RECOMMENDATION

The District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of District, state and federal air quality-related regulations. The preliminary recommendation is to issue an Authority to Construct for the equipment listed below. However, the proposed source will be located within 1,000 feet of a school, which triggers the public notification requirements of District Regulation 2-1-412. After the comments are received and reviewed, the District will make a final determination on the permit.

I recommend that the District initiate a public notice and consider any comments received prior to taking any final action on issuance of an Authority to Construct/Permit to Operate for the following source:

S-1 **Sub-Slab Vapor Intrusion Mitigation System, Active (30 vents), Buildings 1 through 30, RadonAway® Mitigation Fans, Model GP501, 60 cfm/fan maximum**

Caryn Quist, P.E.
Air Quality Engineer

Date