Technical Memorandum

To: Khalil Alomari, Country Market

From: Krysta Krippaehne-Stein, PE

Date: July 18, 2025

Project No.:M2809.01.002

EXPIRES: 06/30/2027

This digital seal certifies the signatory and document content.

Re: Vapor Intrusion Mitigation System Design and Level 1 Risk Assessment, Country Market, 40490 Old Highway 30 (DEQ Site ID: 04-16-0669)

Introduction

Maul Foster & Alongi, Inc. (MFA), has prepared this technical memorandum on behalf of Country Market, formerly Hunt's Marketplace located at 40490 Old Highway 30 in Astoria, Oregon (the Site) to present the active vapor intrusion mitigation system design details and the results of the Level 1 Risk Assessment.

Background

The Site contamination is associated with a presumed gasoline underground storage tank located on the north side of the Country Market that was identified during a geophysical survey in June 2015. Extensive subsurface investigations have been conducted at the Site to assess the nature and extent of contamination associated with the underground storage tank, as summarized in the Oregon Department of Environmental Quality (DEQ) staff memorandum for Leaking Underground Storage Tank site 04-16-0669 (DEQ 2023). In its staff memorandum DEQ stated that "Barring further cleanup, an E&ES [Easement and Equitable Servitude] that prohibits the construction of any new buildings for human occupation without DEQ's prior written approval would be needed to mitigate unacceptable vapor intrusion risks to the occupants of future buildings constructed at the Site." DEQ subsequently became aware that around 2020 Clatsop County approved the remodeling of an on-site commercial building to include a residential living space. This residential use, which is ongoing, resulted in DEQ requiring a vapor intrusion assessment.

MFA completed a vapor intrusion assessment in July and August 2024 and summarized the results of the assessment in a technical memorandum (MFA 2025a). The detected concentrations of gasoline-range hydrocarbons and benzene in indoor air samples represent a hot spot that requires installation of an active vapor intrusion mitigation system. This technical memorandum was

prepared in accordance with the DEQ-approved work plan (DEQ 2025, MFA 2025b) to summarize the planned remedial action and evaluate associated emission risks.

Based on conversations with Country Market, it is MFA's understanding that the residence is built on 1.5-foot-high floor joists that rest on top of a concrete slab. The north portion of the residence, associated with three bedrooms and a study, rests on joists that are oriented east-west, and the south portion, associated with the kitchen and dining room area, rests on joists oriented north-south. The joist on top of slab configuration creates enclosed/isolated crawlspace "cells" between the concrete slab and the floor of the residence. The perimeter of the residence rests on a concrete stem wall, about 1.5 feet high, that prevents access to the cells.

Vapor Intrusion Mitigation System Design

MFA conducted a site visit to observe building construction and inform system design. An MFA Oregon-registered Professional Engineer prepared plans and specifications for an active vapor intrusion mitigation system (see Attachment A). The design for the vapor intrusion mitigation system follows draft DEQ *Guidance for Assessing and Remediating Vapor Intrusion into Building*s (DEQ 2024), City of Los Angeles Department of Building and Safety methane mitigation standards (LADBS 2006), Oregon Mechanical Specialty Code (ICC 2021a), and Oregon Fire Code (ICC 2021b). The system components include the following:

- 3-inch-diameter holes through the concrete stem wall on one side of each crawlspace cell.
- 2-inch-diameter Schedule 80 polyvinyl chloride (PVC) pipe manifold connecting each crawlspace cell on the south half of the residence to a single 2-inch-diameter Schedule 80 PVC vent riser equipped with an inline centrifugal fan (Fantech Rn 4EC-3 inline radon fan or engineer-approved equivalent, see Attachment B) capable of providing a minimum exhaust rate of 42 cubic feet per minute (cfm). Calculations used to determine fan sizing are included in Attachment C.
- 2-inch-diameter Schedule 80 PVC pipe manifold connecting each crawlspace cell on the north half of the residence to a single 2-inch-diameter Schedule 80 PVC vent riser equipped with an inline centrifugal fan (Fantech Rn 4EC-3 inline radon fan or engineer-approved equivalent, see Attachment B) capable of providing a minimum exhaust rate of 63 cfm. Calculations used to determine fan sizing are included in Attachment C.
- All aboveground Schedule 80 PVC pipes and fittings will be painted with water-based latex paint formulated for outdoor use to reduce ultraviolet degradation.
- Each vent riser will be equipped with a monitoring port and a manometer to facilitate performance monitoring.

Level 1 Risk Assessment

MFA conducted a Level 1 Risk Assessment following draft DEQ *Guidance for Assessing and Remediating Vapor Intrusion into Building*s (DEQ 2024) to evaluate potential risks from remedial system emissions. MFA used DEQ's *Vapor Mitigation System Risk Evaluation Spreadsheet* to evaluate risks of air contaminant emissions from the vapor intrusion mitigation system against both Cleaner Air Oregon and Cleanup Program risk-based concentrations.

Emissions rates were calculated using the worst-case benzene, ethylbenzene, naphthalene, gasoline-range petroleum hydrocarbons concentrations detected from each crawlspace sample during MFA's July and August 2024 vapor intrusion assessment and the design fan exhaust rates of

42 and 63 cfm (MFA 2024). MFA also conducted a sensitivity analysis to evaluate potential risks across different commercially available fan speeds including 100, 150, and 200 cfm.

Distances from the stack emissions to possible residential, nonresidential child, nonresidential worker, and acute (24-hour) exposures were identified and are included in Figure 1. The on-site residence was considered for both residential and acute (24-hour) exposures; the Wickiup Water District office located adjacent south of the Site was considered for nonresidential worker exposure; and Hilda Lahti School was identified as the nearest possible nonresidential child exposure.

The Total Rounded Source Risk for Excess Cancer Risk and Hazard Indexes at each fan speed were calculated to be less than 0.01, falling below Cleaner Air Oregon and Cleanup Program risk levels. Because the Level 1 Risk Assessment results are below the DEQ's acceptable risk level, the proposed active vapor intrusion mitigation system is considered to be sufficiently protective of human health and further remedy is not required at this time. The Vapor Mitigation System Risk Assessment Spreadsheets are included in Attachment D.

Attachments

References

Limitations

Figure

A—Country Market Vapor Intrusion Mitigation System Plan Set

B—Fan Specification Sheet

C—Fan Sizing Calculations

D—Vapor Treatment System Risk Assessment Tables

References

DEQ. 2023. Letter re: *Hunt's Market, LUST # 04-16-0669; Staff Memorandum in support of a No Further Action determination*. From Rebecca Digiustino, Project Manager, DEQ Northwest Region to DEQ project file. June 14.

DEQ. 2024. *Draft Guidance for Assessing and Remediating Vapor Intrusion into Buildings*. Oregon Department of Environmental Quality. March.

DEQ. 2025. Letter re: *DEQ Approval of Vapor Intrusion Mitigation System Work Plan, Hunt's Market (04-16-0669), 40490 Old Highway 30, Astoria, Oregon 97103.* From Rebecca Digiustino, Project Manager, DEQ Northwest Region to Krysta Krippaehne-Stein. April 2.

ICC. 2021a. "2022 Oregon Mechanical Specialty Code. Chapter 5 Exhaust Systems." International Code Council, International Mechanical Code. Effective date October 1, 2022. Last updated September 2022. Accessed July 17, 2025. https://codes.iccsafe.org/content/ORMSC2022P1/chapter-5-exhaust-systems#ORMSC2022P1_Ch05_Sec512

ICC. 2021b. "2022 Oregon Fire Code. Chapter 57 Flammable and Combustible Liquids." International Code Council, International Fire Code. Effective date October 1, 2022. Last updated September 2022. Accessed July 17, 2025. https://codes.iccsafe.org/content/ORFC2022P1/chapter-57-flammable-and-combustible-liquids

LADBS. 2006. *Standard Plan: Methane Hazard Mitigation*. City of Los Angeles Department of Building and Safety. June 16. Revised March 8, 2010.

MFA. 2025a. Technical Memorandum re: *Vapor Intrusion Assessment Results, Country Market, 40490 Old Highway 30 (DEQ Site ID: 04-16-0669)*. From Julie Pace to Khalil Alomari, Country Market. February 7.

MFA. 2025b. Technical Memorandum re: *Vapor Intrusion Mitigation System Work Plan Assessment Results, Country Market, 40490 Old Highway 30 (DEQ Site ID: 04-16-0669)*. From Krysta Krippaehne-Stein to Khalil Alomari, Country Market. March 28.

Limitations

The services undertaken in completing this technical memorandum were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This technical memorandum is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this technical memorandum apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this technical memorandum.

Figure

MAUL
FOSTER
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LEGEND

1. NONRESIDENTIAL WORKER EXPOSURE LOCATION
2. NONRESIDENTIAL CHILD EXPOSURE LOCATION
3. ACUTE (24-HOUR) EXPOSURE LOCATION

MAUL FOSTER ALONGI
971.544.2139 (phone) | www.maulfoster.com

0 1000' 2000'

NOTE: BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALE ACCORDINGLY.

Figure 1

Level 1 Risk Assessment - Exposure Locations

Country Market Vapor Intrusion Mitigation System
Astoria, Oregon

Attachment A

Country Market Vapor Intrusion Mitigation System Plan Set

MAUL FOSTER ALONGI

MAUL FOSTER ALONGI
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PORTLAND, OR 97232
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www.maulfoster.com

REGISTERED PROFESSIONAL ENGINEER
10497SPE
Krysta Krippaehne-Stein
OREGON
MARCH 11, 2015
KRYSTA KRIPPAEHNE-STEIN

EXPIRES: 06/30/2027
This digital seal certifies the signatory and document content.

COUNTRY MARKET VAPOR INTRUSION MITIGATION SYSTEM

COUNTRY MARKET
ASTORIA, OREGON

ISSUE	DATE	DESCRIPTION
C	7/17/2025	UPDATE PER DEQ COMMENTS
B	6/20/2025	UPDATE FAN SPECIFICATION
A	4/10/2025	PLAN SET

PROJECT: M2809.01.002
DESIGNED: K. KRIPPAEHNE-STEIN
DRAWN: B. TACKETT
CHECKED: C. GOKCORA
SCALE

0 10' 20'

NOTE: BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALE ACCORDINGLY.

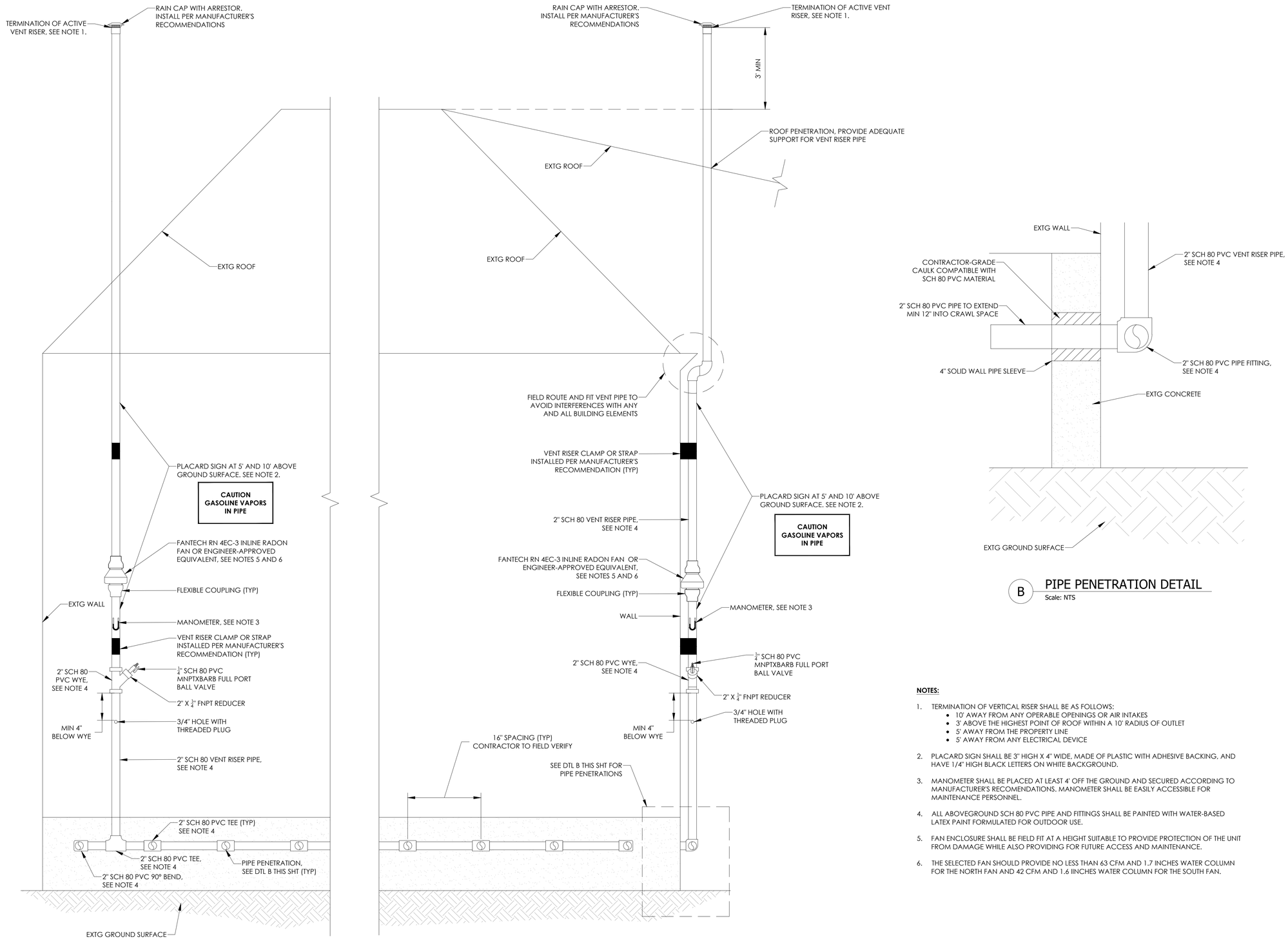
SHEET TITLE

FLOOR PLAN

SHEET

C1.0

PLOTTED ON: 2025-07-17 12:05 PM PLOTTED BY: Krysta Krippaehne-Stein FILENAME: G:\PROJECTS\M2809.01 Country Market\PLANS\C1.0 FLOOR PLAN.dwg



A BUILDING ELEVATION, FACING NORTHEAST

Scale: NTS

B PIPE PENETRATION DETAIL

Scale: NTS

NOTES:

1. TERMINATION OF VERTICAL RISER SHALL BE AS FOLLOWS:
   - 10' AWAY FROM ANY OPERABLE OPENINGS OR AIR INTAKES
   - 3' ABOVE THE HIGHEST POINT OF ROOF WITHIN A 10' RADIUS OF OUTLET
   - 5' AWAY FROM THE PROPERTY LINE
   - 5' AWAY FROM ANY ELECTRICAL DEVICE
2. PLACARD SIGN SHALL BE 3" HIGH X 4" WIDE, MADE OF PLASTIC WITH ADHESIVE BACKING, AND HAVE 1/4" HIGH BLACK LETTERS ON WHITE BACKGROUND.
3. MANOMETER SHALL BE PLACED AT LEAST 4' OFF THE GROUND AND SECURED ACCORDING TO MANUFACTURER'S RECOMENDATIONS. MANOMETER SHALL BE EASILY ACCESSIBLE FOR MAINTENANCE PERSONNEL.
4. ALL ABOVEGROUND SCH 80 PVC PIPE AND FITTINGS SHALL BE PAINTED WITH WATER-BASED LATEX PAINT FORMULATED FOR OUTDOOR USE.
5. FAN ENCLOSURE SHALL BE FIELD FIT AT A HEIGHT SUITABLE TO PROVIDE PROTECTION OF THE UNIT FROM DAMAGE WHILE ALSO PROVIDING FOR FUTURE ACCESS AND MAINTENANCE.
6. THE SELECTED FAN SHOULD PROVIDE NO LESS THAN 63 CFM AND 1.7 INCHES WATER COLUMN FOR THE NORTH FAN AND 42 CFM AND 1.6 IINCHES WATER COLUMN FOR THE SOUTH FAN.

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ISSUE	DATE	DESCRIPTION
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PROJECT: M2809.01.002
DESIGNED: K. KRIPPAEHNE-STEIN
DRAWN: B. TACKETT
CHECKED: C. GOKCORA
SCALE

SCALE AS NOTED

NOTE: BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALE ACCORDINGLY.

SHEET TITLE

DETAILS

SHEET

C1.1

PLOTTED ON: 2025-07-17 12:58 PM PLOTTED BY: Krysta Krippaehne-Stein FILENAME: G:\PROJECTS\M2809.01 Country Market\VI\ARCH\D1 FLOOR PLAN.dwg

Attachment B

Fan Specification Sheet

MAUL FOSTER ALONGI

Rn Radon fans

For Active Soil Depressurization (ASD) mitigation applications

- Designed specifically for Active Soil Depressurization (ASD) mitigation applications
- Air-tight housing - zero leakage
- UV-resistant resin housing
- UL Listed for safety and outdoor use
- HVI-certified fan performance
- 5-year factory warranty

Find more details in our online catalogue

Various Mitigation Scenarios

The suction and air range of Rn 1, Rn 2, and Rn 3 models covers the majority of Radon mitigation applications for both residential and commercial jobs.

Adjust suction on the go

Rn 2EC and Rn 4EC are equipped with a built-in speed controller, giving the user the option to adjust the fan speed to reach a desired level of suction with low power consumption.

Certifications

UL Listed

HVI Certified

Technical parameters

Nominal data		
Voltage (nominal)	120	V
Frequency	60	Hz
Phases	1~	
Input power	173	W
Input current	2.8	A
Impeller speed	4,303	rpm
Air flow	max 216	cfm

Protection/Classification		
Enclosure class, motor	IP54	
Insulation class	B	
Certificate	HVI, cULus	

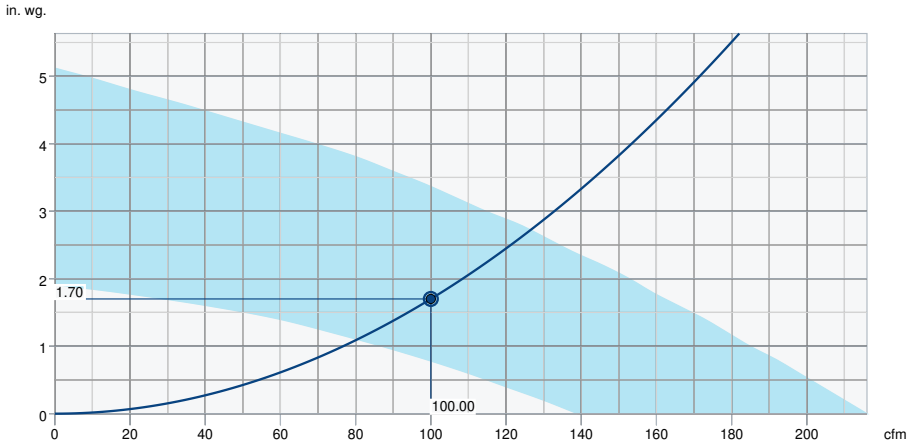
Applicable pipe sizes		
Pipe dimensions	3; 4	in.

Dimensions and weights		
Weight	7.8	lb

Optional		
Motor type	EC	

Performance

Performance curve



Hydraulic data	
Required air flow	100 cfm
Required static pressure	1.70 in. wg.
Working air flow	100 cfm
Working static pressure	1.70 in. wg.
Air density	0.075 lb/ft³
Power	89 W
Fan control - RPM	3,630 rpm
Current	1.51 A
Airflow efficiency	1.1 cfm/W
Control voltage	7.3 V
Supply voltage	120 V

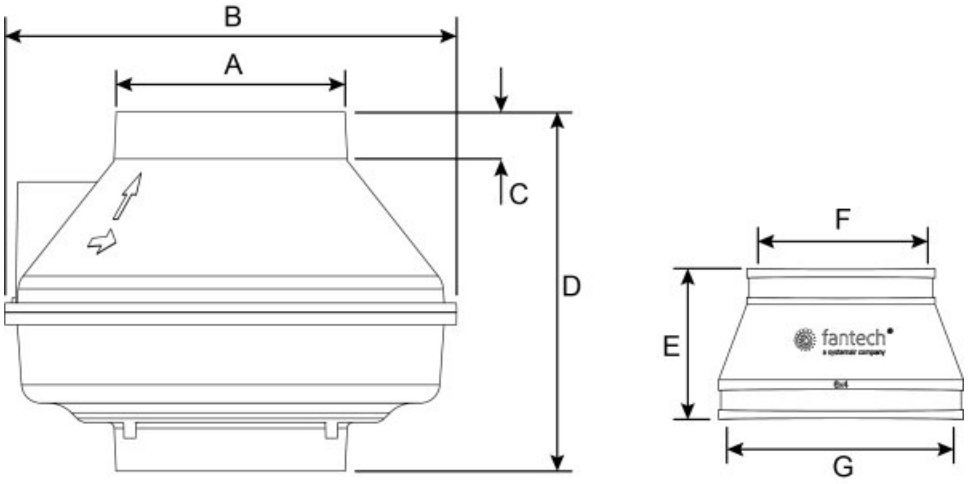
Performances

HVI Certified Rating(s)

Model	Speed	Ctrl Voltage	High Static/Low Flow			Low Static/High Flow		
			Inch WC	CFM	W	Inch WC	CFM	W
Rn4EC-3	100%	10V	4.5	36	146	0.2	210	173
	80%	8V	3.19	29	88	0.2	180	126
	60%	6V	1.75	20	40	0.2	130	57

NOTE: Performance is based on 3 inch diameter ducting.

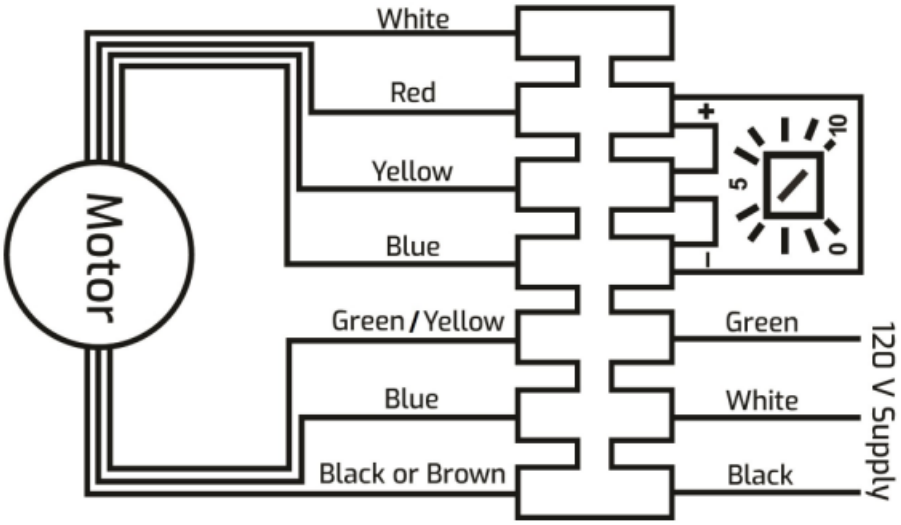
Dimensions



Model	A	B	C	D	E	F	G
Rn2EC	4 15/32 (114)	10 (254)	1 1/4 (32)	9 1/4 (235)	-	-	-
Rn4EC-3	5 7/8 (149)	11 1/2 (292)	1 1/4 (32)	9 1/4 (235)	4 (102)	3 1/2 (89)	6 (152)
Rn4EC-4	5 7/8 (149)	11 1/2 (292)	1 1/4 (32)	9 1/4 (235)	4 (102)	4 1/2 (114)	6 (152)

Dimensions in inches (mm).

Wiring


White
Red
Yellow
Blue
Green / Yellow
Blue
Black or Brown
Motor
+
10
5
0
–
Green
White
Black
120 V Supply

Accessories

- Radon Alarm (498290)

Documents

- E1989 Radon Brochure EN
- 142001 Rn2EC-Rn4-EC OIPM EN FR.PDF

Attachment C

Fan Sizing Calculations

MAUL FOSTER ALONGI

CALCULATION DOCUMENTATION FORM

Calculation Information: #01 - Country Market Vapor Intrusion Mitigation Fan Sizing Calculations

Client: Country Market
Project Name: Country Market - Vapor Mitigation System
P. Number: M2809.01.002

Calculation Number: #01
Revision No./Date: R.02 / July 8, 2025

Performed By/Date: A. Tronnes / July 8, 2025
Peer Review By/Date: K. Krippaehne-Stein / July 8, 2025
Senior Review By/Date: C. Gokcora / July 8, 2025

Calculation Description Vapor Intrusion Mitigation Fan Size Calculations

1: Objective

These calculations are being performed to determine the required air exhaust rate of inline centrifugal fans and associated friction losses as part of the active vapor intrusion mitigation system designed for the Country Market project. The results will inform our recommendations for sizing the components of the proposed active vapor intrusion mitigation system.

- The calculations below are performed considering two open crawlspace systems to be ventilated:
    - The first crawlspace system, referred to as the North Crawlspace, consists of the northern portion of the residence, where floor joists run in an east-west orientation.
    - The second crawlspace system, referred to as the South Crawlspace, consists of the southern portion of the residence, where floor joists run in a north-south orientation.

2: Procedure

The following outlines the steps which were followed to complete the calculations.

- Use the dimensions of the crawlspaces to determine the approximate total volumes of the crawlspaces to be ventilated.
- Determine the number of air changes per hour required for the active system.
- Use the volumes of the crawlspaces and the required air change rate to calculate the required fan flow rate for each crawlspace system.
- Evaluate friction losses based on the design piping arrangement for each crawlspace system.
- Determine the total fan pressure required for each crawlspace system.

3: Data Source/References

Flowserve 2018. *Cameron Hydraulic Data* Twentieth Edition. Flowserve Corporation. Irving, Texas.

LADBS. 2006. *Standard Plan: Methane Hazard Mitigation*. City of Los Angeles Department of Building and Safety. June 16. Revised March 8, 2010.

DEQ. 2024. *Draft Guidance for Assessing and Remediation Vapor Intrusion into Buildings.* Oregon Department of Environmental Quality. Revised March.

4: Existing/Proposed Site Conditions

The site consists of a 1,400 square foot residence attached to the southeast portion of the Country Market in Astoria, Oregon.

5: Definitions and Input Variables

Unit Definition

The following the units required to determine exhaust rate and fan application pressure.

$$CFH := \frac{ft^3}{hr} \qquad CFM := \frac{ft^3}{min} \qquad inwc := .036 \cdot psi$$

Variable Definition

The following are the input variable used to determine required exhaust rate.

North Crawlspace Footprint Area

$$A_{b\_north} := 840\ ft^2$$

North Crawlspace Depth

$$d_{crawl\_north} := 18\ in$$

Air Change Rate

$$ACH := 3 \cdot \frac{1}{hr}$$

South Crawlspace Footprint Area

$$A_{b\_south} := 560\ ft^2$$

South Crawlspace Depth

$$d_{crawl\_south} := 18\ in$$

The following are the input variable used to determine required fan application pressure.

2 Inch Schedule 80 PVC Pipe Inside Diameter

$$D_{in} := 1.913\ in$$

Selected Inline Centrifugal Fan Exhaust Rate

$$Q_s := 100\ CFM$$

Density of Air at Standard Temperature and Pressure

$$\rho := .0749 \cdot \frac{lbf}{ft^3}$$

Roughness Coefficient for Schedule 80 PVC.

$$\varepsilon := .000005 \cdot ft$$

Length of the Longest Pipe Run - North Crawlspace

$$L_N := 48\ ft$$

Length of the Longest Pipe Run - South Crawlspace

$$L_S := 45\ ft$$

Number of 90 Degree Bends Included in the Longest Pipe Run - North Crawlspace

$$N_{90\_N} := 1$$

Number of 90 Degree Bends Included in the Longest Pipe Run - South Crawlspace

$$N_{90\_S} := 1$$

Number of Branch Flow Tees Included in the Longest Pipe Run - North Crawlspace

$$N_{branch\_N} := 1$$

Number of Branch Flow Tees Included in the Longest Pipe Run - South Crawlspace

$$N_{branch\_S} := 1$$

Number of Through Flow Tees Included in the Longest Pipe Run - North Crawlspace

$$N_{thru\_N} := 16$$

Number of Through Flow Tees Included in the Longest Pipe Run - South Crawlspace

$$N_{thru\_S} := 15$$

Equivalent Length of a 2 Inch Diameter 90 Degree PVC Elbow (Flowserve 2018)

$$EL_{90} := 5.2\ ft$$

Equivalent Length of a 2 Inch Diameter Branch Flow PVC Tee (Flowserve 2018)

$$EL_{branch} := 12\ ft$$

Equivalent Length of a 2 Inch Diameter Through Flow PVC Tee (Flowserve 2018)

$$EL_{thru} := 2.8\ ft$$

Acceleration of Gravity

$$g = 32.2\ \frac{ft}{s^2}$$

Minimum Crawlspace Vacuum Pressure

$$\Delta s := 0.02\ inwc$$

6: Equations and Processes

6.1 Determine Crawlspace Volume

Use the dimensions of the crawlspace to determine the approximate total volume of the crawlspace to be ventilated.

$$V_{crawl} = A_b \cdot d_{crawl}$$

Equation Definition

$$V_{crawl}(A_b, d_{crawl}) := A_b \cdot d_{crawl}$$

Where:

V_{crawl} = Volume of the crawlspace (cubic feet)
A_b = Area of the building crawlspace footprint (square feet)
d_{crawl} = Depth of the crawlspace (feet)

6.2 Air Change Rate

Determine the number of air changes per hour required for the active system.

- The required air change rate for gas extraction powered device systems is 3 air changes per hour (LADBS 2006).

6.3 Calculate Required Exhaust Rate

Use the volume of the crawlspace and the air change rate to calculate the required air exhaust rate.

$$Exhaust\_Rate = V_{crawl} \cdot ACH$$

Equation Definition

$$Exhaust\_Rate\left(V_{crawl}, ACH\right) := V_{crawl} \cdot ACH$$

Where:

Exhaust_Rate = Required exhaust rate (cubic feet per minute)
V_{crawl} = Volume of the crawlspace (cubic feet)
ACH = Air change rate (exchanges per hour)

6.4 Evaluate Friction Losses

Once an inline centrifugal fan is selected, evaluate friction losses based on the design piping arrangement. For systems with pipes arranged in parallel, the longest possible pipe run should be considered.

- Calculate the cross sectional area of the vapor intrusion mitigation system pipe.

$$A_{pipe} = \pi \cdot \left(\frac{D_{in}}{2}\right)^2$$

Equation Definition

$$A_{pipe} := \pi \cdot \left(\frac{D_{in}}{2}\right)^2$$

Where:

A_{pipe} = Cross sectional area of the vapor intrusion mitigation system pipe (in^2)
D_{in} = Inside diameter of the vapor intrusion mitigation system pipe (in)

- Based on performance characteristics of the selected inline centrifugal fan, calculate the gas velocity moving through the system.

$$v = \frac{Q_s}{A_{pipe}}$$

Equation Definition

$$v\left(Q_s\right) := \frac{Q_s}{A_{pipe}}$$

Where:

v = Gas velocity moving through the system (ft/s)
Q_s = Exhaust rate of the selected fan (cfm)
D_{in} = Inside diameter of the vapor intrusion mitigation system pipe (in)

- Calculate the Reynolds Number for the system.

$$R_e = \frac{D_{in} \cdot v}{\nu} \qquad \nu := .02264 \cdot \frac{in^2}{s}$$

Equation Definition

$$R_e\left(Q_s\right) := \frac{D_{in} \cdot v\left(Q_s\right)}{\nu}$$

Where:

Re = Reynolds Number
D_{in} = Inside diameter of the vapor intrusion mitigation system pipe (in)
v = Gas velocity moving through the system (ft/s)
ν = Kinematic viscosity of air (in^2/s)

- Calculate the friction factor based on velocity and pipe characteristics.

$$f = \frac{0.25}{\left(log\left(\frac{\varepsilon}{3.7 \cdot D_{in}} + \frac{5.74}{\left(R_e\right)^{0.9}}\right)\right)^2}$$

Equation Definition

$$f\left(Q_s\right) := \frac{0.25}{\left(\log\left(\frac{\varepsilon}{3.7 \cdot D_{in}} + \frac{5.74}{\left(R_e\left(Q_s\right)\right)^{0.9}}\right)\right)^2}$$

Where:

f = Pipe friction factor
ε = Roughness coefficient for the selected pipe type (ft)
Re = Reynolds Number
D_{in} = Inside diameter of the vapor intrusion mitigation system pipe (in)

- Calculate the total pipe length to account for the friction loss.

$$L_{Tot} = L + EL_{90} \cdot N_{90} + EL_{branch} \cdot N_{branch} + EL_{thru} \cdot N_{thru}$$

Equation Definition

$$L_{Tot}(L, N_{90}, N_{branch}, N_{thru}) := L + EL_{90} \cdot N_{90} + EL_{branch} \cdot N_{branch} + EL_{thru} \cdot N_{thru}$$

Where:

L_{Tot} = Total pipe length (ft)
EL_{90} = Equivalent length of a 2 inch PVC 90 degree elbow (ft)
N_{90} = Number of 90 degree elbows in the longest pipe run
EL_{branch} = Equivalent length of a 2 inch diameter branch flow PVC tee
N_{branch} = Number of branch flow tees included in the longest pipe run
EL_{thru} = Equivalent length of a 2 inch diameter through flow PVC tee
N_{thru} = Number of through flow tees included in the longest pipe run

- Calculate the total friction loss in the system.

$$P_f = \frac{\mu \cdot L_{Tot} \cdot v^2 \cdot \rho}{24 \cdot D_{in} \cdot g}$$

Equation Definition

$$P_f(Q_s, L, N_{90}, N_{branch}, N_{thru}) := \frac{f(Q_s) \cdot L_{Tot}(L, N_{90}, N_{branch}, N_{thru}) \cdot v(Q_s)^2 \cdot \rho}{24\ D_{in} \cdot g}$$

Where:

P_f = Friction loss (in wc)
f = Pipe friction factor
L_{tot} = Total pipe length (ft)
v = Gas velocity moving through the system (ft/s)
ρ = Density of air (lb/ft^3)
D_{in} = Inside diameter of the vapor intrusion mitigation system pipe (in^2)
g = acceleration of gravity (ft/s^2)

6.5 Determine Total Required Fan Application Pressure

Determine the total required application pressure for each fan by summing the total friction loss anticipated within the vapor conveyance system and the minimum required vacuum pressure at the crawlspace

- DEQ specifies a minimum vacuum of 0.02 inches of water as a commonly applied practical vacuum pressure (DEQ 2024).

$$Fan\_Pressure = P_f + \Delta s$$

Equation Definition

$$Fan\_Pressure(Q_s, L, N_{90}, N_{branch}, N_{thru}) := P_f(Q_s, L, N_{90}, N_{branch}, N_{thru}) + \Delta s$$

Where:

Fan_Pressure	= Total required fan application pressure (in wc)
P_f	= Friction loss (in wc)
Δs	= Minimum Crawlspace Vacuum Pressure

7: Final Calculations

7.1 Calculate Required Exhaust Rate

Calculations

North Crawlspace Volume

$$Volume\_North := V_{crawl}\left(A_{b\_north}, d_{crawl\_north}\right) = 1260\ ft^3$$

North Crawlspace Required Exhaust Rate

$$North\_Req\_Exhaust\_Rate := Exhaust\_Rate\left(Volume\_North, ACH\right) = 63\ CFM$$

South Crawlspace Volume

$$Volume\_South := V_{crawl}\left(A_{b\_south}, d_{crawl\_south}\right) = 840\ ft^3$$

North Crawlspace Required Exhaust Rate

$$South\_Req\_Exhaust\_Rate := Exhaust\_Rate\left(Volume\_South, ACH\right) = 42\ CFM$$

7.2 Calculate Friction Loss

Calculations

Pipe Cross Section Area

$$A_{pipe} = 2.9\ in^2$$

Gas Velocity

$$v\left(Q_s\right) = 83.5\ \frac{ft}{s}$$

Reynold's Number Across Exhaust Rates Specified by the Fan Manufacturer

$$R_e\left(Q_s\right) = 84666.4$$

Friction Factor Across Exhaust Rates Specified by the Fan Manufacturer

$$f\left(Q_s\right) = 0.0187$$

Total Pipe Length - North Crawlspace

$$L_{Tot\_N} := L_{Tot}\left(L_N, N_{90\_N}, N_{branch\_N}, N_{thru\_N}\right) = 110\ ft$$

Total Pipe Length - South Crawlspace

$$L_{Tot\_S} := L_{Tot}\left(L_S, N_{90\_S}, N_{branch\_S}, N_{thru\_S}\right) = 104.2\ ft$$

Friction Losses Across Exhaust Rates Specified by the Fan Manufacturer - North Crawlspace

$$Friction\_Loss\_North := P_f\left(Q_s, L_N, N_{90\_N}, N_{branch\_N}, N_{thru\_N}\right) = 1.68\ inwc$$

Friction Losses Across Exhaust Rates Specified by the Fan Manufacturer - South Crawlspace

$$Friction\_Loss\_South := P_f\left(Q_s, L_S, N_{90\_S}, N_{branch\_S}, N_{thru\_S}\right) = 1.59\ inwc$$

7.2 Calculate Total Required Fan Application Pressure

Total Required Fan Application Pressure - North Crawlspace

$$Fan\_Pressure\_North := P_f\left(Q_s, L_N, N_{90\_N}, N_{branch\_N}, N_{thru\_N}\right) + \Delta s = 1.7\ inwc$$

Total Required Fan Application Pressure - South Crawlspace

$$Fan\_Pressure\_South := P_f\left(Q_s, L_S, N_{90\_S}, N_{branch\_S}, N_{thru\_S}\right) + \Delta s = 1.6\ inwc$$

8: Conclusion

The required total exhaust capacity for each crawlspace area was calculated and is provided below.

Required Exhaust Rates

$$North\_Req\_Exhaust\_Rate = 63\ CFM$$

$$South\_Req\_Exhaust\_Rate = 42\ CFM$$

The estimated friction losses for each crawlspace area were calculated and are provided below.

$$Friction\_Loss\_North = 1.68\ inwc$$

$$Friction\_Loss\_South = 1.59\ inwc$$

The total required fan application pressure for each crawlspace area was calculated and is provided below.

$$Fan\_Pressure\_North = 1.7\ inwc$$

$$Fan\_Pressure\_South = 1.6\ inwc$$

Attachment D

Vapor Treatment System Risk Assessment Tables

MAUL FOSTER ALONGI

Table E-1. Toxics Emissions Unit Information and Dispersion Factors - Design Exhaust Rates

Remedial System Emissions Unit	Lookup Parameters[1] [meters]		Dispersion Factor[2] [conc. / emission rate]
Unit-1	Stack height	6	
	Distance to:		
	Residential	5	0.0033
	Nonresidential child	2642	0.000022
	Nonresidential worker	18	0.0033
	Acute (24-hour)	5	0.0033
Unit-2	Stack height	5	
	Distance to:		
	Residential	4	0.0033
	Nonresidential child	2653	0.000022
	Nonresidential worker	12	0.0033
	Acute (24-hour)	4	0.0033

Notes:

[1] - Lookup parameters include stack height and distance to nearest exposure location type.

[2] - Dispersion factors from OAR 340-245-8010 Table 3.

Units for residential, nonresidential child, and nonresidential worker are [µg/m^3 per lb/yr].

Units for acute are [µg/m^3 per lb/day].

Table E-2. Level 1 Calculation of Air Concentrations - Design Exhaust Rates

Toxics Emissions Unit					Residential	Nonresidential Child	Nonresidential Worker	Acute (24-hour)
					Dispersion Factor[1]			
					Annual [µg/m³ per lb/yr]			Acute [µg/m³ per lb/day]
Unit-1					0.0033	0.000022	0.0033	0.0033
Unit-2					0.0033	0.000022	0.0033	0.0033
Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Emission Rate		Calculated Concentration[2]			
			Annual [lb/yr]	Acute[3] [lb/day]	Average Annual [µg/m³]			Max Acute [µg/m³]
Unit-1	71-43-2	Benzene	1.140E-03	3.110E-06	3.8E-06	2.5E-08	3.8E-06	1.0E-08
	100-41-4	Ethyl benzene	3.720E-03	1.020E-05	1.2E-05	8.2E-08	1.2E-05	3.4E-08
	91-20-3	Naphthalene	9.720E-03	2.660E-05	3.2E-05	2.1E-07	3.2E-05	8.8E-08
		TPH-Gasoline	4.340E+00	1.189E-02	1.4E-02	9.5E-05	1.4E-02	3.9E-05
Unit-2	71-43-2	Benzene	7.580E-04	2.080E-06	2.5E-06	1.7E-08	2.5E-06	6.9E-09
	100-41-4	Ethyl benzene	2.480E-03	6.800E-06	8.2E-06	5.5E-08	8.2E-06	2.2E-08
	91-20-3	Naphthalene	6.480E-03	1.770E-05	2.1E-05	1.4E-07	2.1E-05	5.8E-08
		TPH-Gasoline	2.890E+00	7.930E-03	9.5E-03	6.4E-05	9.5E-03	2.6E-05

Notes:

[1] - Dispersion factors from OAR 340-245-8010 Table 3. See Table 3a.

[2] - Concentration = Emission Rate * Dispersion Factor

[3] - Acute (24-hour) emission rate may be annual rate/365 days, or vary if operation is either less than 365 days/year, or a batch operation.

Legend:

blue = calculated cell

Table E-3-CAO. Summary Risk Table for Level 1 Risk Assessment -- Cleaner Air Oregon Program - Design Exhaust Rates

Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Noncancer Class	Residential Exposure					Non-Resident Child Exposure					Non-Resident Worker Exposure					Acute Exposure		
				Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]
Unit-1	71-43-2	Benzene	HI3	3.76E-06	0.13	0.000	3	1.3E-06	2.51E-08	3.3	0.0000	13	1.9E-09	3.76E-06	1.5	0.000	13	2.9E-07	1.03E-08	29	3.5E-10
	100-41-4	Ethyl benzene	HI3	1.23E-05	0.4	0.000	260	4.7E-08	8.18E-08	10	8.2E-09	1100	7.4E-11	1.23E-05	4.8	0.000	1100	1.1E-08	3.37E-08	22000	1.5E-12
	91-20-3	Naphthalene	HI3	3.21E-05	0.029	0.001	3.7	8.7E-06	2.14E-07	0.76	0.0000	16	1.3E-08	3.21E-05	0.35	0.000	16	2.0E-06	8.78E-08	200	4.4E-10
		TPH-gasoline		1.43E-02	--	--	--	--	9.55E-05	--	--	--	--	1.43E-02	--	--	--	--	3.92E-05	--	--
Unit-2	71-43-2	Benzene	HI3	2.50E-06	0.13	1.9E-05	3	8.3E-07	1.67E-08	3.3	5.1E-09	13	1.3E-09	2.50E-06	1.5	1.7E-06	13	1.9E-07	6.86E-09	29	2.4E-10
	100-41-4	Ethyl benzene	HI3	8.18E-06	0.4	2.0E-05	260	3.1E-08	5.46E-08	10	5.5E-09	1100	5.0E-11	8.18E-06	4.8	1.7E-06	1100	7.4E-09	2.24E-08	22000	1.0E-12
	91-20-3	Naphthalene	HI3	2.14E-05	0.029	7.4E-04	3.7	5.8E-06	1.43E-07	0.76	1.9E-07	16	8.9E-09	2.14E-05	0.35	6.1E-05	16	1.3E-06	5.84E-08	200	2.9E-10
		TPH-gasoline		9.54E-03	--	--	--	--	6.36E-05	--	--	--	--	9.54E-03	--	--	--	--	2.62E-05	--	--
Totals	Total Unrounded Source Risk					1.94E-03		1.66E-05			4.95E-07		2.56E-08			1.61E-04		3.84E-06			1.32E-09
	Total Rounded Source Risk					**0.002**		**0.000**			**0.000**		**0.000**			**0.000**		**0.000**			**0.000**

Risk Action Levels for New Sources	Cancer	Noncancer
Source Permit	*0.5*	*0.5*
Community Engagement	*5*	*1*
TLAER	*10*	*1*
Permit Denial	*25*	*1*

Notes:

[1] - CAS No. is shown unless the contaminant listed includes multiple TACs (such as PAHs), in which case a DEQ ID is shown.

[2] - Excess Cancer Risk = Annual conc. (µg/m^3) / Cancer RBC (µg/m^3) expressed as risk per million

[3] - Chronic Hazard Quotient = Annual conc. (µg/m^3) / Noncancer RBC (µg/m^3) x 1

[4] - Acute Hazard Quotient = 24-hr conc. (µg/m^3) / Acute RBC (µg/m^3) x 1

HI = Hazard Index
RAL = Risk Action Level
RBC = Risk Based Concentration

Legend:
blue = calculated cell

Table E-3-CU. Summary Risk Table for Level 1 Risk Assessment -- Cleanup Program - Design Exhaust Rates

Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Chronic Residential Exposure					Chronic Worker Exposure					Acute Residential and Urban Exposure			Acute Worker Exposure		
			Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]
Unit-1	71-43-2	Benzene	3.76E-06	0.36	0.0000	31	1.2E-07	3.76E-06	1.6	0.000	130	2.9E-08	1.03E-08	29	0.0000	1.03E-08	87	0.0000
	100-41-4	Ethyl benzene	1.23E-05	1.1	0.0000	1000	1.2E-08	1.23E-05	4.9	0.0000	4400	2.8E-09	3.37E-08	22000	1.5E-12	3.37E-08	66000	5.1E-13
	91-20-3	Naphthalene	3.21E-05	0.083	0.0004	3.1	1.0E-05	3.21E-05	0.36	0.000	13	2.5E-06	8.78E-08	200	4.4E-10	8.78E-08	600	1.5E-10
	0	TPH-gasoline	1.43E-02	--	--	300	4.8E-05	1.43E-02	--	--	1200	1.2E-05	3.92E-05	--	--	3.92E-05	--	--
Unit-2	71-43-2	Benzene	2.50E-06	0.36	0.0000	31	8.1E-08	2.50E-06	1.6	0.000	130	1.9E-08	6.86E-09	29	2.4E-10	6.86E-09	87	7.9E-11
	100-41-4	Ethyl benzene	8.18E-06	1.1	0.0000	1000	8.2E-09	8.18E-06	4.9	0.0000	4400	1.9E-09	2.24E-08	22000	1.0E-12	2.24E-08	66000	3.4E-13
	91-20-3	Naphthalene	2.14E-05	0.083	0.0003	3.1	6.9E-06	2.14E-05	0.36	0.000	13	1.6E-06	5.84E-08	200	0.000	5.84E-08	600	0.000
	0	TPH-gasoline	9.54E-03	--	--	300	3.2E-05	9.54E-03	--	--	1200	7.9E-06	2.62E-05	--	--	2.62E-05	--	--
Totals	Total Unrounded Source Risk				6.80E-04		9.70E-05			1.57E-04		2.40E-05			1.32E-09			4.41E-10
	Total Rounded Source Risk				**0.001**		**0.000**			**0.000**		**0.000**			**0.000**			**0.000**

Acceptable Risk Levels	Cancer	Non-Cancer
Individual Carcinogens	*1*	
Cummulative Carcinogens	*10*	
Individual Noncarcinogens		*1*
Cummulative Noncarcinogens		*1*

Notes:

[1] - CAS No. is shown unless the contaminant listed includes multiple TACs (such as PAHs), in which case a DEQ ID is shown.

[2] - Excess Cancer Risk = Annual conc. (µg/m^3) / Cancer RBC (µg/m^3) expressed as risk per million

[3] - Chronic Hazard Quotient = Annual conc. (µg/m^3) / Noncancer RBC (µg/m^3) x 1

[4] - Acute Hazard Quotient = 24-hr conc. (µg/m^3) / Acute RBC (µg/m^3) x 1

HI = Hazard Index

RBC = Risk Based Concentration

Chronic RBCs taken from DEQ's RBDM spreadsheet table

Acute residential RBCs taken from Cleaner Air Oregon Program acute RBCs in OAR 340-245-8010, Table 2.

Acute occupational RBCs calculated by multiplying residential RBCs by a factor of 24 hrs / 8 hrs = 3.

>Pv = The air concentration exceeds the vapor pressure of the pure chemical.

Legend:

blue = calculated cell

Table E-1. Toxics Emissions Unit Information and Dispersion Factors - 100 cfm Exhaust Rate

Remedial System Emissions Unit	Lookup Parameters[1] [meters]		Dispersion Factor[2] [conc. / emission rate]
Unit-1	Stack height	6	
	Distance to:		
	Residential	5	0.0033
	Nonresidential child	2642	0.000022
	Nonresidential worker	18	0.0033
	Acute (24-hour)	5	0.0033
Unit-2	Stack height	5	
	Distance to:		
	Residential	4	0.0033
	Nonresidential child	2653	0.000022
	Nonresidential worker	12	0.0033
	Acute (24-hour)	4	0.0033

Notes:

[1] - Lookup parameters include stack height and distance to nearest exposure location type.

[2] - Dispersion factors from OAR 340-245-8010 Table 3.

Units for residential, nonresidential child, and nonresidential worker are [µg/m^3 per lb/yr].

Units for acute are [µg/m^3 per lb/day].

Table E-2. Level 1 Calculation of Air Concentrations - 100 cfm Exhaust Rate

Toxics Emissions Unit					Residential	Nonresidential Child	Nonresidential Worker	Acute (24-hour)
					Dispersion Factor[1]			
					Annual [µg/m³ per lb/yr]			Acute [µg/m³ per lb/day]
Unit-1					0.0033	0.000022	0.0033	0.0033
Unit-2					0.0033	0.000022	0.0033	0.0033
Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Emission Rate		Calculated Concentration[2]			
			Annual [lb/yr]	Acute[3] [lb/day]	Average Annual [µg/m³]			Max Acute [µg/m³]
Unit-1	71-43-2	Benzene	1.800E-03	4.940E-06	5.9E-06	4.0E-08	5.9E-06	1.6E-08
	100-41-4	Ethyl benzene	5.910E-03	1.620E-05	2.0E-05	1.3E-07	2.0E-05	5.3E-08
	91-20-3	Naphthalene	1.540E-02	4.230E-05	5.1E-05	3.4E-07	5.1E-05	1.4E-07
		TPH-Gasoline	6.890E+00	1.890E-02	2.3E-02	1.5E-04	2.3E-02	6.2E-05
Unit-2	71-43-2	Benzene	1.800E-03	4.940E-06	5.9E-06	4.0E-08	5.9E-06	1.6E-08
	100-41-4	Ethyl benzene	5.910E-03	1.620E-05	2.0E-05	1.3E-07	2.0E-05	5.3E-08
	91-20-3	Naphthalene	1.540E-02	4.230E-05	5.1E-05	3.4E-07	5.1E-05	1.4E-07
		TPH-Gasoline	6.890E+00	1.890E-02	2.3E-02	1.5E-04	2.3E-02	6.2E-05

Notes:

[1] - Dispersion factors from OAR 340-245-8010 Table 3. See Table 3a.

[2] - Concentration = Emission Rate * Dispersion Factor

[3] - Acute (24-hour) emission rate may be annual rate/365 days, or vary if operation is either less than 365 days/year, or a batch operation.

Legend:

blue = calculated cell

Table E-3-CAO. Summary Risk Table for Level 1 Risk Assessment -- Cleaner Air Oregon Program - 100 cfm Exhaust Rate

Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Noncancer Class	Residential Exposure					Non-Resident Child Exposure					Non-Resident Worker Exposure					Acute Exposure		
				Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]
Unit-1	71-43-2	Benzene	HI3	5.94E-06	0.13	0.000	3	2.0E-06	3.96E-08	3.3	0.0000	13	3.0E-09	5.94E-06	1.5	0.000	13	4.6E-07	1.63E-08	29	5.6E-10
	100-41-4	Ethyl benzene	HI3	1.95E-05	0.4	0.000	260	7.5E-08	1.30E-07	10	1.3E-08	1100	1.2E-10	1.95E-05	4.8	0.000	1100	1.8E-08	5.35E-08	22000	2.4E-12
	91-20-3	Naphthalene	HI3	5.08E-05	0.029	0.002	3.7	1.4E-05	3.39E-07	0.76	0.0000	16	2.1E-08	5.08E-05	0.35	0.000	16	3.2E-06	1.40E-07	200	7.0E-10
		TPH-gasoline		2.27E-02	--	--	--	--	1.52E-04	--	--	--	--	2.27E-02	--	--	--	--	6.24E-05	--	--
Unit-2	71-43-2	Benzene	HI3	5.94E-06	0.13	4.6E-05	3	2.0E-06	3.96E-08	3.3	1.2E-08	13	3.0E-09	5.94E-06	1.5	4.0E-06	13	4.6E-07	1.63E-08	29	5.6E-10
	100-41-4	Ethyl benzene	HI3	1.95E-05	0.4	4.9E-05	260	7.5E-08	1.30E-07	10	1.3E-08	1100	1.2E-10	1.95E-05	4.8	4.1E-06	1100	1.8E-08	5.35E-08	22000	2.4E-12
	91-20-3	Naphthalene	HI3	5.08E-05	0.029	1.8E-03	3.7	1.4E-05	3.39E-07	0.76	4.5E-07	16	2.1E-08	5.08E-05	0.35	1.5E-04	16	3.2E-06	1.40E-07	200	7.0E-10
		TPH-gasoline		0.00E+00	--	--	--	--	0.00E+00	--	--	--	--	0.00E+00	--	--	--	--	0.00E+00	--	--
Totals	Total Unrounded Source Risk					3.69E-03		3.16E-05			9.42E-07		4.87E-08			3.06E-04		7.30E-06			2.53E-09
	Total Rounded Source Risk					**0.004**		**0.000**			**0.000**		**0.000**			**0.000**		**0.000**			**0.000**

Risk Action Levels for New Sources	Cancer	Noncancer
Source Permit	*0.5*	*0.5*
Community Engagement	*5*	*1*
TLAER	*10*	*1*
Permit Denial	*25*	*1*

Notes:
[1] - CAS No. is shown unless the contaminant listed includes multiple TACs (such as PAHs), in which case a DEQ ID is shown.
[2] - Excess Cancer Risk = Annual conc. (µg/m^3) / Cancer RBC (µg/m^3) expressed as risk per million
[3] - Chronic Hazard Quotient = Annual conc. (µg/m^3) / Noncancer RBC (µg/m^3) x 1
[4] - Acute Hazard Quotient = 24-hr conc. (µg/m^3) / Acute RBC (µg/m^3) x 1

HI = Hazard Index
RAL = Risk Action Level
RBC = Risk Based Concentration

Legend:
blue = calculated cell

Table E-3-CU. Summary Risk Table for Level 1 Risk Assessment -- Cleanup Program - 100 cfm Exhaust Rate

Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Chronic Residential Exposure					Chronic Worker Exposure					Acute Residential and Urban Exposure			Acute Worker Exposure		
			Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]
Unit-1	71-43-2	Benzene	5.94E-06	0.36	0.0000	31	1.9E-07	5.94E-06	1.6	0.000	130	4.6E-08	1.63E-08	29	0.0000	1.63E-08	87	0.0000
	100-41-4	Ethyl benzene	1.95E-05	1.1	0.0000	1000	2.0E-08	1.95E-05	4.9	0.0000	4400	4.4E-09	5.35E-08	22000	2.4E-12	5.35E-08	66000	8.1E-13
	91-20-3	Naphthalene	5.08E-05	0.083	0.0006	3.1	1.6E-05	5.08E-05	0.36	0.000	13	3.9E-06	1.40E-07	200	7.0E-10	1.40E-07	600	2.3E-10
	0	TPH-gasoline	2.27E-02	--	--	300	7.6E-05	2.27E-02	--	--	1200	1.9E-05	6.24E-05	--	--	6.24E-05	--	--
Unit-2	71-43-2	Benzene	5.94E-06	0.36	0.0000	31	1.9E-07	5.94E-06	1.6	0.000	130	4.6E-08	1.63E-08	29	5.6E-10	1.63E-08	87	1.9E-10
	100-41-4	Ethyl benzene	1.95E-05	1.1	0.0000	1000	2.0E-08	1.95E-05	4.9	0.0000	4400	4.4E-09	5.35E-08	22000	2.4E-12	5.35E-08	66000	8.1E-13
	91-20-3	Naphthalene	5.08E-05	0.083	0.0006	3.1	1.6E-05	5.08E-05	0.36	0.000	13	3.9E-06	1.40E-07	200	0.000	1.40E-07	600	0.000
	0	TPH-gasoline	2.27E-02	--	--	300	7.6E-05	2.27E-02	--	--	1200	1.9E-05	6.24E-05	--	--	6.24E-05	--	--
Totals	Total Unrounded Source Risk				1.29E-03		1.85E-04			2.98E-04		4.58E-05			2.53E-09			8.42E-10
	Total Rounded Source Risk				**0.001**		**0.000**			**0.000**		**0.000**			**0.000**			**0.000**

Acceptable Risk Levels	Cancer	Non-Cancer
Individual Carcinogens	*1*	
Cummulative Carcinogens	*10*	
Individual Noncarcinogens		*1*
Cummulative Noncarcinogens		*1*

Notes:

[1] - CAS No. is shown unless the contaminant listed includes multiple TACs (such as PAHs), in which case a DEQ ID is shown.

[2] - Excess Cancer Risk = Annual conc. (µg/m^3) / Cancer RBC (µg/m^3) expressed as risk per million

[3] - Chronic Hazard Quotient = Annual conc. (µg/m^3) / Noncancer RBC (µg/m^3) x 1

[4] - Acute Hazard Quotient = 24-hr conc. (µg/m^3) / Acute RBC (µg/m^3) x 1

HI = Hazard Index

RBC = Risk Based Concentration

Chronic RBCs taken from DEQ's RBDM spreadsheet table

Acute residential RBCs taken from Cleaner Air Oregon Program acute RBCs in OAR 340-245-8010, Table 2.

Acute occupational RBCs calculated by multiplying residential RBCs by a factor of 24 hrs / 8 hrs = 3.

>Pv = The air concentration exceeds the vapor pressure of the pure chemical.

Legend:

blue = calculated cell

Table E-1. Toxics Emissions Unit Information and Dispersion Factors - 150 cfm Exhaust Rate

Remedial System Emissions Unit	Lookup Parameters[1] [meters]		Dispersion Factor[2] [conc. / emission rate]
Unit-1	Stack height	6	
	Distance to:		
	Residential	5	0.0033
	Nonresidential child	2642	0.000022
	Nonresidential worker	18	0.0033
	Acute (24-hour)	5	0.0033
Unit-2	Stack height	5	
	Distance to:		
	Residential	4	0.0033
	Nonresidential child	2653	0.000022
	Nonresidential worker	12	0.0033
	Acute (24-hour)	4	0.0033

Notes:

[1] - Lookup parameters include stack height and distance to nearest exposure location type.

[2] - Dispersion factors from OAR 340-245-8010 Table 3.

Units for residential, nonresidential child, and nonresidential worker are [µg/m^3 per lb/yr].

Units for acute are [µg/m^3 per lb/day].

Table E-2. Level 1 Calculation of Air Concentrations - 150 cfm Exhaust Rate

Toxics Emissions Unit					Residential	Nonresidential Child	Nonresidential Worker	Acute (24-hour)
					Dispersion Factor[1]			
					Annual [µg/m³ per lb/yr]			Acute [µg/m³ per lb/day]
Unit-1					0.0033	0.000022	0.0033	0.0033
Unit-2					0.0033	0.000022	0.0033	0.0033
Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Emission Rate		Calculated Concentration[2]			
			Annual [lb/yr]	Acute[3] [lb/day]	Average Annual [µg/m³]			Max Acute [µg/m³]
Unit-1	71-43-2	Benzene	2.710E-03	7.420E-06	8.9E-06	6.0E-08	8.9E-06	2.4E-08
	100-41-4	Ethyl benzene	8.860E-03	2.430E-05	2.9E-05	1.9E-07	2.9E-05	8.0E-08
	91-20-3	Naphthalene	2.310E-02	6.340E-05	7.6E-05	5.1E-07	7.6E-05	2.1E-07
		TPH-Gasoline	1.030E+01	2.830E-02	3.4E-02	2.3E-04	3.4E-02	9.3E-05
Unit-2	71-43-2	Benzene	2.710E-03	7.420E-06	8.9E-06	6.0E-08	8.9E-06	2.4E-08
	100-41-4	Ethyl benzene	8.860E-03	2.430E-05	2.9E-05	1.9E-07	2.9E-05	8.0E-08
	91-20-3	Naphthalene	2.310E-02	6.340E-05	7.6E-05	5.1E-07	7.6E-05	2.1E-07
		TPH-Gasoline	1.030E+01	2.830E-02	3.4E-02	2.3E-04	3.4E-02	9.3E-05

Notes:

[1] - Dispersion factors from OAR 340-245-8010 Table 3. See Table 3a.

[2] - Concentration = Emission Rate * Dispersion Factor

[3] - Acute (24-hour) emission rate may be annual rate/365 days, or vary if operation is either less than 365 days/year, or a batch operation.

Legend:

blue = calculated cell

Table E-3-CAO. Summary Risk Table for Level 1 Risk Assessment -- Cleaner Air Oregon Program - 150 cfm Exhaust Rate

Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Noncancer Class	Residential Exposure					Non-Resident Child Exposure					Non-Resident Worker Exposure					Acute Exposure		
				Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]
Unit-1	71-43-2	Benzene	HI3	8.94E-06	0.13	0.000	3	3.0E-06	5.96E-08	3.3	0.0000	13	4.6E-09	8.94E-06	1.5	0.000	13	6.9E-07	2.45E-08	29	8.4E-10
	100-41-4	Ethyl benzene	HI3	2.92E-05	0.4	0.000	260	1.1E-07	1.95E-07	10	1.9E-08	1100	1.8E-10	2.92E-05	4.8	0.000	1100	2.7E-08	8.02E-08	22000	3.6E-12
	91-20-3	Naphthalene	HI3	7.62E-05	0.029	0.003	3.7	2.1E-05	5.08E-07	0.76	0.0000	16	3.2E-08	7.62E-05	0.35	0.000	16	4.8E-06	2.09E-07	200	1.0E-09
		TPH-gasoline		3.40E-02	--	--	--	--	2.27E-04	--	--	--	--	3.40E-02	--	--	--	--	9.34E-05	--	--
Unit-2	71-43-2	Benzene	HI3	8.94E-06	0.13	6.9E-05	3	3.0E-06	5.96E-08	3.3	1.8E-08	13	4.6E-09	8.94E-06	1.5	6.0E-06	13	6.9E-07	2.45E-08	29	8.4E-10
	100-41-4	Ethyl benzene	HI3	2.92E-05	0.4	7.3E-05	260	1.1E-07	1.95E-07	10	1.9E-08	1100	1.8E-10	2.92E-05	4.8	6.1E-06	1100	2.7E-08	8.02E-08	22000	3.6E-12
	91-20-3	Naphthalene	HI3	7.62E-05	0.029	2.6E-03	3.7	2.1E-05	5.08E-07	0.76	6.7E-07	16	3.2E-08	7.62E-05	0.35	2.2E-04	16	4.8E-06	2.09E-07	200	1.0E-09
		TPH-gasoline		0.00E+00	--	--	--	--	0.00E+00	--	--	--	--	0.00E+00	--	--	--	--	0.00E+00	--	--
Totals	Total Unrounded Source Risk					5.54E-03		4.74E-05			1.41E-06		7.31E-08			4.60E-04		1.10E-05			3.79E-09
	Total Rounded Source Risk					**0.006**		**0.000**			**0.000**		**0.000**			**0.000**		**0.000**			**0.000**

Risk Action Levels for New Sources	Cancer	Noncancer
Source Permit	*0.5*	*0.5*
Community Engagement	*5*	*1*
TLAER	*10*	*1*
Permit Denial	*25*	*1*

Notes:

[1] - CAS No. is shown unless the contaminant listed includes multiple TACs (such as PAHs), in which case a DEQ ID is shown.

[2] - Excess Cancer Risk = Annual conc. (µg/m^3) / Cancer RBC (µg/m^3) expressed as risk per million

[3] - Chronic Hazard Quotient = Annual conc. (µg/m^3) / Noncancer RBC (µg/m^3) x 1

[4] - Acute Hazard Quotient = 24-hr conc. (µg/m^3) / Acute RBC (µg/m^3) x 1

HI = Hazard Index
RAL = Risk Action Level
RBC = Risk Based Concentration

Legend:
blue = calculated cell

Table E-3-CU. Summary Risk Table for Level 1 Risk Assessment -- Cleanup Program - 150 cfm Exhaust Rate

Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Chronic Residential Exposure					Chronic Worker Exposure					Acute Residential and Urban Exposure			Acute Worker Exposure		
			Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]
Unit-1	71-43-2	Benzene	8.94E-06	0.36	0.0000	31	2.9E-07	8.94E-06	1.6	0.000	130	6.9E-08	2.45E-08	29	0.0000	2.45E-08	87	0.0000
	100-41-4	Ethyl benzene	2.92E-05	1.1	0.0000	1000	2.9E-08	2.92E-05	4.9	0.0000	4400	6.6E-09	8.02E-08	22000	3.6E-12	8.02E-08	66000	1.2E-12
	91-20-3	Naphthalene	7.62E-05	0.083	0.0009	3.1	2.5E-05	7.62E-05	0.36	0.000	13	5.9E-06	2.09E-07	200	1.0E-09	2.09E-07	600	3.5E-10
	0	TPH-gasoline	3.40E-02	--	--	300	1.1E-04	3.40E-02	--	--	1200	2.8E-05	9.34E-05	--	--	9.34E-05	--	--
Unit-2	71-43-2	Benzene	8.94E-06	0.36	0.0000	31	2.9E-07	8.94E-06	1.6	0.000	130	6.9E-08	2.45E-08	29	8.4E-10	2.45E-08	87	2.8E-10
	100-41-4	Ethyl benzene	2.92E-05	1.1	0.0000	1000	2.9E-08	2.92E-05	4.9	0.0000	4400	6.6E-09	8.02E-08	22000	3.6E-12	8.02E-08	66000	1.2E-12
	91-20-3	Naphthalene	7.62E-05	0.083	0.0009	3.1	2.5E-05	7.62E-05	0.36	0.000	13	5.9E-06	2.09E-07	200	0.000	2.09E-07	600	0.000
	0	TPH-gasoline	3.40E-02	--	--	300	1.1E-04	3.40E-02	--	--	1200	2.8E-05	9.34E-05	--	--	9.34E-05	--	--
Totals	Total Unrounded Source Risk				1.94E-03		2.76E-04			4.47E-04		6.85E-05			3.79E-09			1.26E-09
	Total Rounded Source Risk				**0.002**		**0.000**			**0.000**		**0.000**			**0.000**			**0.000**

Acceptable Risk Levels	Cancer	Non-Cancer
Individual Carcinogens	*1*	
Cummulative Carcinogens	*10*	
Individual Noncarcinogens		*1*
Cummulative Noncarcinogens		*1*

Notes:

[1] - CAS No. is shown unless the contaminant listed includes multiple TACs (such as PAHs), in which case a DEQ ID is shown.

[2] - Excess Cancer Risk = Annual conc. (µg/m^3) / Cancer RBC (µg/m^3) expressed as risk per million

[3] - Chronic Hazard Quotient = Annual conc. (µg/m^3) / Noncancer RBC (µg/m^3) x 1

[4] - Acute Hazard Quotient = 24-hr conc. (µg/m^3) / Acute RBC (µg/m^3) x 1

HI = Hazard Index

RBC = Risk Based Concentration

Chronic RBCs taken from DEQ's RBDM spreadsheet table

Acute residential RBCs taken from Cleaner Air Oregon Program acute RBCs in OAR 340-245-8010, Table 2.

Acute occupational RBCs calculated by multiplying residential RBCs by a factor of 24 hrs / 8 hrs = 3.

>Pv = The air concentration exceeds the vapor pressure of the pure chemical.

Legend:

blue = calculated cell

Table E-1. Toxics Emissions Unit Information and Dispersion Factors - 200 cfm Exhaust Rate

Remedial System Emissions Unit	Lookup Parameters[1] [meters]		Dispersion Factor[2] [conc. / emission rate]
Unit-1	Stack height	6	
	Distance to:		
	Residential	5	0.0033
	Nonresidential child	2642	0.000022
	Nonresidential worker	18	0.0033
	Acute (24-hour)	5	0.0033
Unit-2	Stack height	5	
	Distance to:		
	Residential	4	0.0033
	Nonresidential child	2653	0.000022
	Nonresidential worker	12	0.0033
	Acute (24-hour)	4	0.0033

Notes:

[1] - Lookup parameters include stack height and distance to nearest exposure location type.

[2] - Dispersion factors from OAR 340-245-8010 Table 3.

Units for residential, nonresidential child, and nonresidential worker are [µg/m^3 per lb/yr].

Units for acute are [µg/m^3 per lb/day].

Table E-2. Level 1 Calculation of Air Concentrations - 200 cfm Exhaust Rate

Toxics Emissions Unit					Residential	Nonresidential Child	Nonresidential Worker	Acute (24-hour)
					Dispersion Factor[1]			
					Annual [µg/m³ per lb/yr]			Acute [µg/m³ per lb/day]
Unit-1					0.0033	0.000022	0.0033	0.0033
Unit-2					0.0033	0.000022	0.0033	0.0033
Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Emission Rate		Calculated Concentration[2]			
			Annual [lb/yr]	Acute[3] [lb/day]	Average Annual [µg/m³]			Max Acute [µg/m³]
Unit-1	71-43-2	Benzene	3.610E-03	9.890E-06	1.2E-05	7.9E-08	1.2E-05	3.3E-08
	100-41-4	Ethyl benzene	1.180E-02	3.240E-05	3.9E-05	2.6E-07	3.9E-05	1.1E-07
	91-20-3	Naphthalene	3.080E-02	8.450E-05	1.0E-04	6.8E-07	1.0E-04	2.8E-07
		TPH-Gasoline	1.380E+01	3.780E-02	4.6E-02	3.0E-04	4.6E-02	1.2E-04
Unit-2	71-43-2	Benzene	3.610E-03	9.890E-06	1.2E-05	7.9E-08	1.2E-05	3.3E-08
	100-41-4	Ethyl benzene	1.180E-02	3.240E-05	3.9E-05	2.6E-07	3.9E-05	1.1E-07
	91-20-3	Naphthalene	3.080E-02	8.450E-05	1.0E-04	6.8E-07	1.0E-04	2.8E-07
		TPH-Gasoline	1.380E+01	3.780E-02	4.6E-02	3.0E-04	4.6E-02	1.2E-04

Notes:

[1] - Dispersion factors from OAR 340-245-8010 Table 3. See Table 3a.

[2] - Concentration = Emission Rate * Dispersion Factor

[3] - Acute (24-hour) emission rate may be annual rate/365 days, or vary if operation is either less than 365 days/year, or a batch operation.

Legend:

blue = calculated cell

Table E-3-CAO. Summary Risk Table for Level 1 Risk Assessment -- Cleaner Air Oregon Program - 200 cfm Exhaust Rate

Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Noncancer Class	Residential Exposure					Non-Resident Child Exposure					Non-Resident Worker Exposure					Acute Exposure		
				Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]
Unit-1	71-43-2	Benzene	HI3	1.19E-05	0.13	0.000	3	4.0E-06	7.94E-08	3.3	0.0000	13	6.1E-09	1.19E-05	1.5	0.000	13	9.2E-07	3.26E-08	29	1.1E-09
	100-41-4	Ethyl benzene	HI3	3.89E-05	0.4	0.000	260	1.5E-07	2.60E-07	10	2.6E-08	1100	2.4E-10	3.89E-05	4.8	0.000	1100	3.5E-08	1.07E-07	22000	4.9E-12
	91-20-3	Naphthalene	HI3	1.02E-04	0.029	0.004	3.7	2.7E-05	6.78E-07	0.76	0.0000	16	4.2E-08	1.02E-04	0.35	0.000	16	6.4E-06	2.79E-07	200	1.4E-09
		TPH-gasoline		4.55E-02	--	--	--	--	3.04E-04	--	--	--	--	4.55E-02	--	--	--	--	1.25E-04	--	--
Unit-2	71-43-2	Benzene	HI3	1.19E-05	0.13	9.2E-05	3	4.0E-06	7.94E-08	3.3	2.4E-08	13	6.1E-09	1.19E-05	1.5	7.9E-06	13	9.2E-07	3.26E-08	29	1.1E-09
	100-41-4	Ethyl benzene	HI3	3.89E-05	0.4	9.7E-05	260	1.5E-07	2.60E-07	10	2.6E-08	1100	2.4E-10	3.89E-05	4.8	8.1E-06	1100	3.5E-08	1.07E-07	22000	4.9E-12
	91-20-3	Naphthalene	HI3	1.02E-04	0.029	3.5E-03	3.7	2.7E-05	6.78E-07	0.76	8.9E-07	16	4.2E-08	1.02E-04	0.35	2.9E-04	16	6.4E-06	2.79E-07	200	1.4E-09
		TPH-gasoline		0.00E+00	--	--	--	--	0.00E+00	--	--	--	--	0.00E+00	--	--	--	--	0.00E+00	--	--
Totals	Total Unrounded Source Risk					7.39E-03		6.32E-05			1.88E-06		9.74E-08			6.13E-04		1.46E-05			5.05E-09
	Total Rounded Source Risk					**0.007**		**0.000**			**0.000**		**0.000**			**0.001**		**0.000**			**0.000**

Risk Action Levels for New Sources	Cancer	Noncancer
Source Permit	*0.5*	*0.5*
Community Engagement	*5*	*1*
TLAER	*10*	*1*
Permit Denial	*25*	*1*

Notes:

[1] - CAS No. is shown unless the contaminant listed includes multiple TACs (such as PAHs), in which case a DEQ ID is shown.

[2] - Excess Cancer Risk = Annual conc. (µg/m^3) / Cancer RBC (µg/m^3) expressed as risk per million

[3] - Chronic Hazard Quotient = Annual conc. (µg/m^3) / Noncancer RBC (µg/m^3) x 1

[4] - Acute Hazard Quotient = 24-hr conc. (µg/m^3) / Acute RBC (µg/m^3) x 1

HI = Hazard Index
RAL = Risk Action Level
RBC = Risk Based Concentration

Legend:
blue = calculated cell

Table E-3-CU. Summary Risk Table for Level 1 Risk Assessment -- Cleanup Program - 200 cfm Exhaust Rate

Toxics Emissions Unit	CASRN or DEQ ID[1]	Toxic Air Contaminant	Chronic Residential Exposure					Chronic Worker Exposure					Acute Residential and Urban Exposure			Acute Worker Exposure		
			Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	Annual Conc. [µg/m^3]	RBC Cancer [µg/m^3]	Excess Cancer Risk[2]	RBC Noncancer [µg/m^3]	Hazard Quotient or Index[3]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]	24-Hour Conc. [µg/m3]	RBC Acute [µg/m^3]	Hazard Quotient or Index[4]
Unit-1	71-43-2	Benzene	1.19E-05	0.36	0.0000	31	3.8E-07	1.19E-05	1.6	0.000	130	9.2E-08	3.26E-08	29	0.0000	3.26E-08	87	0.0000
	100-41-4	Ethyl benzene	3.89E-05	1.1	0.0000	1000	3.9E-08	3.89E-05	4.9	0.0000	4400	8.9E-09	1.07E-07	22000	4.9E-12	1.07E-07	66000	1.6E-12
	91-20-3	Naphthalene	1.02E-04	0.083	0.0012	3.1	3.3E-05	1.02E-04	0.36	0.000	13	7.8E-06	2.79E-07	200	1.4E-09	2.79E-07	600	4.6E-10
	0	TPH-gasoline	4.55E-02	--	--	300	1.5E-04	4.55E-02	--	--	1200	3.8E-05	1.25E-04	--	--	1.25E-04	--	--
Unit-2	71-43-2	Benzene	1.19E-05	0.36	0.0000	31	3.8E-07	1.19E-05	1.6	0.000	130	9.2E-08	3.26E-08	29	1.1E-09	3.26E-08	87	3.8E-10
	100-41-4	Ethyl benzene	3.89E-05	1.1	0.0000	1000	3.9E-08	3.89E-05	4.9	0.0000	4400	8.9E-09	1.07E-07	22000	4.9E-12	1.07E-07	66000	1.6E-12
	91-20-3	Naphthalene	1.02E-04	0.083	0.0012	3.1	3.3E-05	1.02E-04	0.36	0.000	13	7.8E-06	2.79E-07	200	0.000	2.79E-07	600	0.000
	0	TPH-gasoline	4.55E-02	--	--	300	1.5E-04	4.55E-02	--	--	1200	3.8E-05	1.25E-04	--	--	1.25E-04	--	--
Totals	Total Unrounded Source Risk				2.59E-03		3.70E-04			5.95E-04		9.17E-05			5.05E-09			1.68E-09
	Total Rounded Source Risk				**0.003**		**0.000**			**0.001**		**0.000**			**0.000**			**0.000**

Acceptable Risk Levels	Cancer	Non-Cancer
Individual Carcinogens	*1*	
Cummulative Carcinogens	*10*	
Individual Noncarcinogens		*1*
Cummulative Noncarcinogens		*1*

Notes:

[1] - CAS No. is shown unless the contaminant listed includes multiple TACs (such as PAHs), in which case a DEQ ID is shown.

[2] - Excess Cancer Risk = Annual conc. (µg/m^3) / Cancer RBC (µg/m^3) expressed as risk per million

[3] - Chronic Hazard Quotient = Annual conc. (µg/m^3) / Noncancer RBC (µg/m^3) x 1

[4] - Acute Hazard Quotient = 24-hr conc. (µg/m^3) / Acute RBC (µg/m^3) x 1

HI = Hazard Index

RBC = Risk Based Concentration

Chronic RBCs taken from DEQ's RBDM spreadsheet table

Acute residential RBCs taken from Cleaner Air Oregon Program acute RBCs in OAR 340-245-8010, Table 2.

Acute occupational RBCs calculated by multiplying residential RBCs by a factor of 24 hrs / 8 hrs = 3.

>Pv = The air concentration exceeds the vapor pressure of the pure chemical.

Legend:

blue = calculated cell