



**INDEPENDENT CLEANUP PATHWAY
FINAL REPORT**

Edgewood Shopping Center 350-390 E 40th
Avenue Eugene, Oregon 97405

April 18, 2023

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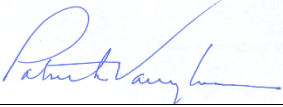
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Executive Summary

This document summarizes the assessment and remedial actions conducted at the Edgewood Shopping Center in Eugene, Oregon (the “Site”) and provides supporting information for determining if a No Further Action determination is warranted for the Site. The following table presents a summary of the important information regarding the Site.

SITE INFORMATION SUMMARY TABLE				
Site Location (See Figure 1)				
Size	Approximately 4.52 acres			
Township, Range, and Section	Section 18, Township 18 South, Range 3 West			
Tax Lot	A Portion of Lot 1 Block 3, Edgewood Estates			
Buildings (See Figure 2)	One, L-shaped, 2-story building plus one separate square building.			
Paving	Except for small, landscaped areas the Site is entirely paved with asphalt or concrete.			
Ecological Habitat	The Site is entirely covered with buildings and/or pavement and as such no ecological receptors or habitats are present.			
Future Site Use	Continued commercial use. Alternate future uses are possible (i.e., multi-family residential) are possible should the property be sold.			
Adjoining Properties	North	Duplexes addressed as 414-425, 435-45 East 40 th Avenue.		
	South	Single-family residences addressed as 315, 345, 375, and 395 E. 41 st Avenue.		
	East	Edgewood Condominiums addressed as 4023 and 4083 Donald Street.		
	West	Single family residences addressed as 4065-4095 Pearl Street.		
Neighborhood Characteristics	Except for the Edgewood Shopping Center, residential use (either single-family or multifamily).			
Property Owner	Edgewood Shopping Center LLC			
Public Water Supply	Site	Yes	Neighborhood	Yes
Aquifer Use	There is no beneficial use of the shallow groundwater on Site. A well installed about 2.5 miles away draws water from a depth between 180 and 349 feet below ground surface (bgs). The City of Eugene uses the McKenzie River as a drinking water source.			
Current Site Use	Commercial use building with multiple tenants.			
Site History	The Site was first developed in 1968 and has continued as Edgewood Shopping Center since that time. Before 1968 the Site was undeveloped bare land.			



1 Introduction

This document summarizes the assessment and remedial actions conducted at the Edgewood Shopping Center (the “Site”) and provides supporting information for determining if a No Further Action determination from the Oregon Department of Environmental Quality (DEQ) is warranted for the Site.

1.1 Site Location

Edgewood Shopping Center

350-390 E. 40th Avenue

Eugene, Oregon 97405

Latitude: 0 min 44 degrees 40.3 seconds

Longitude: 5 minutes 123 degrees 16.4 seconds

Township 18s Range 3W Section 18

A portion of Lot 1 Block3, Edgewood Estates

1.2 Site Description

The Site is in a residential and commercial area of Eugene, Lane County, Oregon (**Figure 1**). The Site consists of approximately 4.52 acres of land developed with an ‘L’ shaped partial two-story commercial building with multiple tenants. The building is located along the western and southern Site boundaries, and an additional single-story square commercial building with a single tenant is in the northeastern quadrant of the Site (**Figure 2**).

Adjacent land use consists of single-family residences addressed as 315, 345, 375 and 395 E. 41st Avenue to the south; single-family residences to the west, an electric utility substation and multi-family duplexes addressed as 414-425, 435-45 East 40th Avenue to the north and the Edgewood Condominiums addressed as 4023 and 4083 Donald Street to the east.

According to the City of Eugene Planning Division, the Site is zoned C-2, community commercial.

1.3 Site History

Prior to 1968 and extending to at least 1944, the Site was undeveloped land covered with native vegetation. In 1968, the Site was developed with an ‘L’ shaped building along the west and south side, two irregular-shaped buildings in the northeast corner, and a parking lot covering the remaining portion.

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1.3.1 OWNERSHIP HISTORY

The Site has been owned by the Breeden Family Limited Partnership and Edgewood Shopping Center since development in 1968.

1.3.2 OPERATING HISTORY

The Site has operated as the Edgewood Shopping Center since 1968. Safeway has been the anchor tenant since original construction.

1.4 Regulatory History

The Site listed as the McCool Property located at 4010 Donald Street was identified in DEQ databases as leaking underground storage tank (LUST) site 20-91-4095 and environmental cleanup site identification (ECSI) facility number 1209. Chlorinated solvents (i.e., PCE, TCE, etc.) were listed as present in the groundwater at the McCool Property at concentrations above the federal drinking water Maximum Contaminant Levels (MCLs).

In 2006, the Site identified as Siegmund's Cleaners located at 370 E 40th Avenue was listed on the ECSI database as facility number 4586 as a State Hazardous Waste Site.

In January 2009, the Siegmund's Cleaners Site was entered into the Voluntary Cleanup Program-Independent Cleanup Pathway.

1.5 Previous Investigations

Three monitoring wells were installed by Bergeson-Boese and Associates (BB&A) in 1993 associated with the 1991 underground storage tank (UST) removal at the former McCool Brothers gasoline station at the northeast corner of the Site. Since that time, PCE (a low of 740 micrograms per liter [$\mu\text{g/L}$] in MW-2 [2008] to a high of 5,300 $\mu\text{g/L}$ in MW- 4 [1993]) and trichloroethylene (TCE) (a low of 6.5 $\mu\text{g/L}$ in MW-2 [2008] to a high of 210 $\mu\text{g/L}$ in MW-4 [1993]) were detected in these wells at relatively stable concentrations. Subsequently, five groundwater monitoring wells (MW-1 through MW-5) were installed on the Site by BB&A (**Figure 2**).

In August 1993 BB&A collected soil samples in the sloped bank above MW-5. PCE was identified up to 450,000 $\mu\text{g/kg}$ at a depth of 1.5-feet in the sloped planter area and 39,000,000 $\mu\text{g/kg}$ at a depth of 3.5 feet below the ground surface near MW-5 and approximately 2 cubic yards of soil were removed by Chemical Waste Management, Inc. for offsite disposal by incineration.

In 2007, SECOR International, Inc. (now Stantec) conducted a limited subsurface investigation that included advancement of 10 soil borings in the location depicted on **Figure 2**: two through the concrete slab in the dry cleaner space; three borings to 15-feet in depth (B-1 through B-3) along the Site boundary with E. 40th Avenue; and five borings within the alleyway near MW-5, along with collection and laboratory analysis of soil samples. Groundwater monitoring well MW-6 was also installed near the northeast corner of the Site.

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No analytes were reported above laboratory reporting limits in soil borings B1 through B3. PCE was detected in soil collected from borings B-12 at 15-feet in depth (east of MW-5), B-13 at a depth of 18-feet (south of MW-5), and B-14 (east of MW-5). TCE was also detected in soil collected from boring B-12 at a depth of 10-feet, B-14 at a depth of 10-feet. Cis 1,2-dichloroethene 1,2-DCE) and vinyl chloride (10 µg/kg) were detected in soil collected from monitoring well boring MW-6.

In May 2011, Stantec advanced 15 Membrane Interface Probe (MIP) borings to further characterize chemicals of interest (COIs) in vicinity of the former dry-cleaner facility. Additionally, two hydraulic Profiling Tool (HPT) borings were advanced to identify the hydraulic properties of subsurface soils and identify potential preferential pathways for subsurface contaminant migration.

1.5.1 VAPOR INTRUSION INVESTIGATIONS

1.5.2 ON-SITE ASSESSMENT

On November 19, 2008, Stantec collected three time-integrated air samples from within the on-site management office (Breedon Office); one from the former dry cleaner tenant space; and one ambient air sample was collected near the parking lot. Laboratory analysis identified the presence of several chlorinated and petroleum hydrocarbons in both indoor and ambient air samples. Benzene (2.4 to 3.9 micrograms per cubic meter [$\mu\text{g}/\text{m}^3$]) and PCE (0.4 to 2.6 $\mu\text{g}/\text{m}^3$) were detected at concentrations exceeding the Risk-Based Concentrations (RBCs) established by DEQ for air (Occupational Exposure). PCE in the indoor air sample collected from the former dry cleaner space exceeded the then current RBC; however, it was unknown whether this was the result of volatile organic compounds (VOC) sinks (e.g., sheetrock) in the space that could have retained the formerly used dry cleaning chemical or from vapor intrusion (Stantec 2008).

On June 18, 2009, indoor air and sub-slab soil gas samples were subsequently collected in all tenant spaces where access was granted (**Figure 5** and **Table 9**). Except for the sample collected at the flowers and gift shop immediately adjacent to the former dry-cleaner, PCE was detected in all sub-slab soil gas samples at concentrations below the then-current occupational DEQ RBC for soil gas. PCE was detected in sub-slab soil gas (9,300 $\mu\text{g}/\text{m}^3$) above its then current DEQ occupational RBC at the flower and gift shop; however, a concurrent indoor air sample contained PCE at 0.44 $\mu\text{g}/\text{m}^3$ which was well below its then current occupational indoor air RBC (1.9 $\mu\text{g}/\text{m}^3$) (Stantec 2009)

1.5.3 OFF-SITE ASSESSMENT

In February 2010, Stantec collected 8 indoor air, 2 outdoor air, 1 crawlspace, and 4 sub-slab soil gas samples from off-Site properties along E. 40th Avenue and Donald Street which abut the Site to the north and east, respectively (Stantec 2011). Laboratory analysis identified the presence of TCE in two of three sub-slab soil gas samples collected at the Edgewood Villa Condominiums (4023 and 4083 Donald Street) at concentrations ranging from 7.6 to 9.3 $\mu\text{g}/\text{m}^3$. PCE was detected in only one sub-slab sample (20 $\mu\text{g}/\text{m}^3$) collected from 4023 Donald Street. None of these concentrations exceeded the then current DEQ RBCs established for soil gas (RBC_{SV}) when evaluating vapor intrusion at urban residential use properties (**Figures 5 and 6** and **Tables 11 and 12**).

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Laboratory analysis of indoor air samples collected at the condominium and at the Edgewood Family Daycare (3990 Donald Street) detected TCE ($2.3 \mu\text{g}/\text{m}^3$) in only one sample collected at the northernmost condominium unit at 4023 Donald Street. PCE was detected in 7 of 8 samples at concentrations ranging from 0.31 to $4.9 \mu\text{g}/\text{m}^3$. TCE ($0.42 \mu\text{g}/\text{m}^3$) and PCE ($4.1 \mu\text{g}/\text{m}^3$) were detected in the outdoor air sample collected near the condominium buildings. Neither TCE nor PCE were detected in the outdoor air sample collected near the Edgewood Family Daycare (now Edgewood Wee Care). Both TCE ($0.23 \mu\text{g}/\text{m}^3$) and PCE ($0.51 \mu\text{g}/\text{m}^3$) were detected in the sample of crawlspace air collected at the daycare center.

Based on the results obtained at the daycare center on October 11, 2010, DEQ issued a letter entitled *Siegmund's/Edgewood Shopping Center, 370 E. 40th Street, Eugene, Oregon, Remedial Measures at Edgewood Family Daycare* requesting installation of a vapor barrier in the daycare crawlspace and collection of dry season sub-slab and indoor air samples at the Edgewood Villa Condominiums. A vapor barrier was placed over the crawlspace dirt floor by Alpha Environmental Services of Portland, OR under contract with Mr. Robert Breeden (Stantec 2011).

1.5.4 REMEDIAL ACTIONS

1.5.4.1 Groundwater Treatment

BB&A installed ozone/ultraviolet and air-sparging remedial systems near MW-5 which operated from February to March 1994. Although temporary reductions in dissolved phase PCE concentrations were noted in MW-5, contaminant rebound to levels above baseline (pre-remediation) concentrations subsequently occurred. In 2004, BB&A injected approximately one gallon of dilute (e.g., 10 percent) hydrogen peroxide to MW-5 on a weekly basis for six weeks.

PCE concentrations reportedly decreased from $35,700 \mu\text{g}/\text{L}$ to $7,540 \mu\text{g}/\text{L}$ in MW-5. At some point prior to 2004, BB&A installed a 4-inch diameter well immediately south of MW-5, apparently to be used for groundwater treatment (construction details unknown). The top of the casing was enclosed in a green box which remained on-site until it was removed during the Interim Removal Action (IRA). Although the top of the casing was covered with a steel lid, no casing cap was installed and as such surface water flowing down the bank could flow into the casing.

Stantec installed seven boreholes (Wells I-1 through I-4 and E-1 through E-3) for remedial injection and extraction pilot test purposes in July 2011. Additionally, a shallow injection trench was installed near the southern Site boundary behind the former dry cleaners.

Original injection volume proposed was for 1,100 (4 totes) gallons of 40% sodium permanganate (NaMnO_4), with a target dilute concentration of 4% NaMnO_4 to be injected – resulting in a total proposed injection volume of 9,600 gallons of 4% NaMnO_4 . However, due to observed subsurface saturation and minor chemical surfacing issues the dilute NaMnO_4 concentration was increased to approximately 5% and total concentrated NaMnO_4 volume was decreased to 825 gallons (3 totes). These alterations resulted in a total injected volume of 5,955 gallons during August and October 2011.

No significant reduction in COIs was noted in post injection groundwater monitoring events.

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1.5.4.2 Interim Removal Action

An IRA was performed at the Site in May 2020 in general accordance with Stantec's April 29, 2019 Interim Removal Action Workplan (workplan), approved by the Oregon DEQ on May 4, 2020 (**Figure 3**). IRA activities completed at the Site in August 2020 consisted of:

- Procurement of required water discharge erosion control and building permits obtained from the City of Eugene.
- Construction of a temporary on-Site groundwater treatment system using filtration and a 2,000-pound activated carbon vessel.
- Abandonment of groundwater monitoring wells MW-5 and DW-1 within the IRA excavation footprint in accordance with Oregon Water Resources Department requirements.
- Excavation and off-Site disposal of approximately 800 cubic yards of soil suspected to be an ongoing source of the VOC groundwater plume beneath the Site.
- Dewatering of approximately 7,000-gallons from the excavation, on-Site water treatment and permitted disposal to the City-owned sanitary sewer system.
- Collection of soil samples from the final excavation limits.
- Backfilling the excavation and surface restoration; and
- Installation of a replacement ground water monitoring well MW-5R.

2 Environmental Setting

2.1 Climate Information

Annual Precipitation:	46.1-inches		
Average Temperature:	Low 42 °F	High 63°F	Average 52.5°F
Prevailing Wind Speed:	3.99 mph		

2.2 Topography

The Site is situated at an elevation of approximately 544 feet above mean sea level (amsl). Topography at the Site slopes to the north-northeast.

2.3 Surface Water Hydrology

There are no surface water bodies on or within ½-mile of the Site.

2.4 Regional and Site Geology and Soils

Regional geology is identified as urban land Hazelair-Dixonville complex. Urban land consists of areas that are covered by concrete, asphalt, buildings, or other impervious surfaces that obscure or alter the soils so that identification and interpretations are not feasible. The Hazelair-Dixonville complex consists of moderately deep and moderately well drained soils on rolling foothills and toe slopes. These soils formed in colluvium and residuum derived from basaltic rock. Typically, the surface layer is very dark brown silty clay approximately 14 inches in thickness underlain by dark brown silty clay and cobbly clay approximately 12 inches thick.

Soil boring logs prepared during Site assessment indicate silty sand to a depth of 5-feet underlain by weathered rock and dense clay to a depth of 15-feet bgs. Soils encountered during placement of a deep well (DW-1) in the source area behind the former dry cleaner consisted of silt with gravel in the upper 15 feet of soil boring DW-1, underlain by gray sandstone bedrock of the Eugene Formation at depths from approximately 15 feet bgs to the terminus of the boring at approximately 29 feet bgs. Based on the geologic material encountered in the 15-foot bgs interval of the boring and blow count field data, it appears that there is a gradual transition between silt soil and sandstone bedrock which occurs between approximately 12 feet bgs and 17.5 feet bgs near DW-1.

2.5 Hydrogeology

Depth-to-water data collected during the most recent groundwater monitoring event in September 2022 ranges from 1.46 feet below top of well casing (MW-6) to 8.21 feet below the top of well casing (MW-4). Groundwater flows in a north-northeasterly direction at an approximate gradient of 0.027 feet per foot (ft/ft), as indicated on the groundwater elevation map (**Figure 2**).

3 Conceptual Site Model

The Conceptual Site Model (CSM) has been developed in accordance with the DEQ 2003 *Risk-Based Decision-Making Guidance (RBDM)* and is based on historic land use, Site-specific environmental data, and an understanding of the contaminant fate and transport processes that control the migration of halogenated volatile organic compound (HVOC) contaminants. The following sections discuss the factors affecting the CSM, including land use, contaminants and sources present at the Site, the nature and extent of contamination, receptors, and exposure pathways.

Per Section 2.2 of DEQ's 2003 *RBDM Guidance*, a CSM "is a summary that:

- Describes all known or suspected **sources** of contamination
- Identifies who/what is likely to be affected by the contaminants (**receptors**); and
- Considers how and where contaminants are likely to move (**pathways**)."

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3.1 Source and Nature of Contamination

Historical Site use and environmental investigations have determined the suspected source area for Site COIs to be located directly behind the former dry-cleaning business in the alleyway along the southern boundary of the Site. Groundwater monitoring wells MW-5 and DW-1 were located in this suspected source area prior to the IRA (**Figure 2**). Since approximately 2007, the highest concentrations of PCE in groundwater (up to 150,000 µg/L) were detected in well MW-5.

Previous investigations have identified chlorinated volatile organic compounds as COIs including PCE, TCE, cis-1,2-Dichloroethene (cis-1,2-DCE) and vinyl chloride (VC) at least once in soil, soil, gas, and/or groundwater.

3.2 Extent of Contamination

3.2.1 SOIL

PCE, TCE, and cis-1,2-DCE were identified in soil to a maximum depth of 18-feet bgs prior to the IRA extending from near the south side of the former dry cleaner to near the former groundwater monitoring well MW-5 (**Figure 3**). None of the reported concentrations of these COIs were identified above DEQ RBCs (**Table 1**).

3.2.2 GROUNDWATER

Groundwater monitoring has been conducted since 2007.

Historically, the highest concentrations of PCE, TCE and cis-1,2-DCE have been reported in samples collected from the suspected source area, identified as the location of groundwater monitoring well MW-5 (see **Table 2** and **Figure 2**).

Historically PCE was detected in all groundwater samples collected from shallow monitoring wells at the Site at concentrations ranging from 100,000 µg/L (MW-5) to 56.1 µg/L (MW-7).

TCE was detected in all groundwater samples collected from shallow monitoring wells at concentrations ranging from 143 µg/L (MW-5) to 3.08 µg/L (MW-7).

Cis-1,2-DCE was detected in groundwater samples collected from shallow monitoring wells MW-4 (3.61 µg/L), MW-5 (7.63 µg/L) and MW-6 (4.65 µg/L). All other samples collected from the shallow monitoring well network were reported below laboratory reporting limits for cis-1,2-DCE.

3.2.3 OTHER MEDIA

Results for assessment of indoor air and soil vapor are presented in Section 2.5.

3.3 Exposure Pathway Summary

An exposure pathway is the route that a chemical takes from the source to an exposed individual. An exposure pathway generally consists of the following four elements:

- A source and mechanism of chemical release to the environment
- An environmental transport medium (e.g., soil, water, or soil vapor)
- An exposure point, or point of potential human contact, with the contaminated medium
- An exposure route (e.g., ingestion) at the point of human contact

If any of the above elements are missing, the pathway is considered incomplete, and exposure does not occur. The following exposure pathways have been evaluated:

3.4 Groundwater Pathways of Exposure

Potentially complete groundwater exposure pathways for current and potential future receptors are:

- Volatilization of COIs to outdoor air (residential, urban residential, occupational).
- Vapor intrusion into buildings (residential urban residential, occupational); and
- Dermal contact/inhalation in an excavation (construction/excavation worker).

3.5 Direct Contact Pathways of Exposure

One chemical of potential concern (COPC), TCE, at soil boring B-12 was identified in the source area; however, this location was removed during the IRA. No other COPCs have been identified in soil and as such there are no potentially complete soil exposure pathways for current and potential future receptors.

3.6 Air Pathways of Exposure

Potentially complete air exposure pathways for current and potential future receptors are:

- Volatilization to outdoor air (residential, urban residential, occupational); and
- Vapor intrusion into buildings (residential, urban residential, occupational).

3.7 Receptors

As defined by DEQ in the 2003 RBDM guidance, potential receptors are those individuals that may be exposed to Site contaminants under the current and reasonably likely future land use scenarios. Currently, the Site is used for commercial purposes and residential properties are located off-Site down-gradient to the north and northeast. Residential condominium properties are located east of the Site,

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across Donald Street (cross-gradient). According to City zoning information, residential dwellings are allowed on land zoned CCD; therefore, a reasonable (although unanticipated) future use of the Site may include a residential receptor. As such, current and reasonably likely future receptors are:

- **On-Site Residents:** Since land use around the Site includes both single family (including duplexes) and multi-family residences (condominiums) future residential receptors include both residential and urban residential receptors. The onsite residential receptor is assumed to be a long-term receptor occupying ground floor residences (either single family or multi-family). This receptor is assumed to live in the dwelling 24 hours per day, 350 days per year for 26 years.
- **Occupational worker:** This occupational indoor worker is assumed to be a long-term receptor employed by businesses operating in ground floor commercial spaces, who spends most of the workday indoors, where they may be exposed to volatiles from subsurface sources while working inside onsite buildings.
- **Construction/excavation worker:** This construction/utility worker (trench worker) is assumed to be exposed to contaminated soil and groundwater entering an excavation during the workday for the duration of an onsite construction project. The activities for this receptor typically involve substantial albeit short term exposures during excavation projects.

There are no ecological receptors or habitats within the locality of facility (LOF).

The CSM for the Site is illustrated in **Figure 4**.

3.8 Contaminant Transport

Chlorinated VOCs entering the subsurface will partition among four possible compartments: soil-air, soil-water, soil-matrix and non-aqueous phase liquid (when the soil pores are saturated with solvent). Contaminant moving from these phases (but mainly the dissolved fraction) will subsequently contaminate groundwater.

At the Site, dry cleaning chemicals were released to soil behind the former dry cleaner and, as a result of gravity, the chemicals partitioned to soil vapor and groundwater. No dense non-aqueous phase liquid (DNAPL) has been observed and transport in the dissolved phase has occurred due to Site topography and the groundwater gradient.

3.9 Contaminant Degradation/Persistence

A combination of the physical setting and biological and non-biological subsurface processes affect contaminant movement. Chlorinated aliphatic hydrocarbons with 3 or 4 chlorine atoms such as those present at the Site (i.e., PCE and TCE) are very persistent environmental contaminants primarily due to the stability of the carbon-chlorine bond. This stability results in minimal biodegradation by aerobic microorganisms. Oxidative destruction can occur under aerobic (oxygen is the electron acceptor) or anaerobic (nitrate, iron, sulfate and methane serve as electron acceptors) conditions and the less

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chlorinated compounds (i.e., cis-1,2-DCE and vinyl chloride) are subject to oxidation (microbes have not been found that oxidize PCE). Under anaerobic conditions degradation is more favorable and occurs by anoxic dehalogenases (reductive dechlorination).

Abiotic degradation involves chemical reactions in soil and water that do not require the mediation of microbes and is usually a slow process. The primary naturally occurring abiotic processes are hydrolysis and elimination (a.k.a. dehydrohalogenation).

Since 2007, there have been no notable increases in degradation intermediates, such as cis-1,2-DCE that can accumulate because the existing microorganisms, if any, cannot produce the appropriate enzymes to continue the dechlorination process. Dissolved oxygen (DO) measured during groundwater monitoring indicates that groundwater remains aerobic assuming aerobic conditions are present when DO is $>1\text{mg/L}^1$.

3.10 Preliminary Hot Spot Determination

Hot spots were evaluated in accordance with DEQ guidance (DEQ 1998). None of the COIs were reported in soil at or above November 2015 DEQ Hot Spot Concentrations for any receptor.

Concentrations of COIs in groundwater monitoring wells across the Site exceed residential RBCs for ingestion and inhalation from tapwater. However, as described in Section 5.1.2, there are currently no beneficial uses of groundwater within the LOF nor is future extraction of groundwater as a potable water source likely due to the depth and slow recharge noted in groundwater monitoring reports. Based on this information, possible effects of Site contamination on beneficial uses of water using criteria presented in Oregon Administrative Rules (OAR) 340-122-080(3)(f) have not been identified.

3.10.1 LOCALITY OF FACILITY

In the Oregon Cleanup Rules (under OAR 340-122-115[35]), the locality of facility (LOF) is defined as “any point where a human or an ecological receptor contacts or is reasonably likely to come in contact with facility-related hazardous substances”. Based on environmental sampling data collected at the Site to date, the LOF for the Site consists of the 4.5-acre Edgewood Shopping Center Site as well as off-Site to the northeast, as demonstrated by detection of HVOC compounds in the groundwater sample collected from soil boring SB-2 during the 2018 additional Site characterization.

¹ Natural Attenuation General Data Guide UG-2035 ENV. Naval Facilities Engineering Command February 1999

4 Land and Water Use Determination

4.1.1 ZONING AND LAND USE

The Site currently is zoned as C2 – Community Commercial District (CCD). According to the City of Eugene Planning and Development Department's Land Use City Code CCD zoning allows a variety of commercial land use in support of a population smaller than that of the metropolitan area but larger than that of a neighborhood. CCD zoning allows for residential housing including single-family detached dwellings and duplex (two-family) residential dwellings. Residential dwellings larger than a two-family duplex are permissible under special development standards.

The Site currently is in use as a commercial property with multiple tenants. No redevelopment plan is currently in place for the Site.

Property use in the LOF is predominantly single-family residences. Multi-family duplexes and a condominium complex are adjacent to the Site across E. 40th Avenue and Donald Street respectively.

4.1.2 BENEFICIAL WATER USE

There are no current beneficial uses of water (groundwater or surface water) within the LOF; and unlikely will be in the future. The LOF is defined as the Site and area extending to the northeast. The City of Eugene Water and Electric Board (EWEB) obtains municipal drinking water from the McKenzie River, located approximately 11 miles northeast of the Site. All commercial units at the Site are served by municipal water from EWEB; no private water supply wells are located on-Site.

A beneficial water use determination was conducted by Stantec on February 28, 2018 in accordance with DEQ's *Guidance for Conducting Beneficial Water Use Determinations at Environmental Cleanup Sites* (DEQ 1998). The Oregon Water Resources Department (WRD) well log database was searched for Township 18 South, Range 3 West, Sections 7, 8, 17, 18, 19 and 20 and Township 18 South, Range 4 West, Sections 12, 13 and 24. The nearest wells to the Site are identified as irrigation wells at the Eugene Memorial Gardens. These two wells were reportedly installed in 1954 to depths of 100 and 390 feet bgs. Eugene Memorial Gardens is not identified as a current business in the Eugene area; however, a cemetery identified as Rest Haven Cemetery is located along Willamette Street approximately 1,200 feet to the west and in an apparent cross-gradient hydrogeologic position relative to the measured Site groundwater flow.

No domestic water supply wells were listed within a 2-mile radius of the Site. The nearest domestic well reported by WRD is located at 31537 Glenfiddish Way, approximately 2.5 miles to the south-southwest of the Site. This well was installed in 1996 to a depth of 143 feet bgs and first water was encountered during drilling at a reported depth of 110 feet bgs.

5 Risk Evaluation

5.1 Exposure Point Concentrations (EPCs)

The Exposure Point Concentration (EPC) is the concentration of a COPC that could be contacted by a receptor over the exposure period. The EPC is intended to represent the potential for contact with media at any given location by a receptor moving randomly across the physical boundaries of an exposure area.

An exposure point concentration is the concentration of a specific chemical in a medium (e.g., soil) at the point where there is potential contact with a receptor. An estimate of the average concentration is used in evaluating potential risk because toxicity criteria are based on lifetime average exposure and the average concentration is most representative of the concentration of a chemical that would be contacted at a site over time (EPA 1992).

5.1.1 RME EPCS

For COIs in soil, due to the low number of detections across the Site, the maximum detected concentration of each COI was used as the EPC (**Table 3**).

For COIs in groundwater, because of the uncertainty in estimating a true average concentration of a chemical at a site, the 90% UCL of the mean for groundwater monitoring collected since 2007 was calculated using the standard Environmental Protection Agency (EPA) method to derive a 95% UCL but calculated at the 90 percent level. Although typically a 95% UCL is used to represent reasonable maximum exposure (RME), the 90% upper confidence limit on the mean was used in accordance with DEQ guidance, (DEQ 2010) using the EPA statistical software ProUCL version 5.2. EPCs for groundwater are presented in **Table 5**.

5.1.2 CTE EPCs

Consistent with OAR 340-122-0084(1)(g), the arithmetic mean was used as the CTE EPC. ProUCL was used to calculate summary statistics including the arithmetic mean for both detected and not-detected values. The CTE EPC results for groundwater are provided in **Table 7** for urban residential receptors and **Table 8** for construction/ excavation workers.

5.2 EPCs for Groundwater

The exposure point concentration was derived for each groundwater monitoring well using groundwater monitoring data collected from 2007 since according to the DEQ guidance (DEQ 2010) when evaluating potential vapor intrusion from groundwater, the EPC should be calculated using data representative of conditions at existing or future buildings (e.g., data from each impacted well). At the Site, the only areas with sufficient room to construct new buildings are at or near monitoring wells MW-1 through MW-3. An EPC for MW-4 was calculated since it is close to the existing building and immediately downgradient from former source area well MW-5 and would act as a surrogate for evaluating vapor intrusion at that location

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should the property be redeveloped. MW-5 was in the alley behind the shopping center but has been replaced by MW-5R (placed in the excavation area). Although there is insufficient room to construct a new structure in that location it has been included to evaluate potential exposure by construction-trenchworkers both *prior* to (MW-5) and after the interim removal action (MW-5R). The EPCs for PCE, and TCE in MW-5R are based both on the maximum detected concentrations and the 90% UCL (see **Table 5**).

5.3 EPCs for Indoor Air

Table 9 presents the indoor results obtained from sampling tenant spaces at the Edgewood Shopping Center. As shown in **Table 10**, the EPCs for indoor air samples represent the concentration of each COPC.

5.4 COPC Screen

The 95% UCL for each chemical of interest noted on **Table 3** and **Table 5** were divided by its RBC_{wi} for an urban residential receptor to calculate the C/RBC ratio. Since the RBCs for carcinogens were established based on an incremental excess lifetime cancer risk (IELCR) of one-in-one million (1×10^{-6} or $1E-06$). A C/RBC ratio less than one would indicate an acceptable risk as defined in OAR 340-122—0115(2)(a), 3(a), and 4(a) and the COI would not be considered a COPC requiring further quantitative evaluation. Although no COPCs in groundwater were identified in **Table 5** for urban residential receptors, conservatively, PCE and TCE were carried forward for screening level risk evaluation for the groundwater vapor intrusion into buildings exposure pathway (see Discussion Section for rationale).

PCE was identified as a COPC for the Groundwater in an Excavation exposure pathway (RBC_{we}) for construction and trenchworker receptors prior to implementing the interim removal action.

5.5 Risk Characterization

A screening level human health risk assessment was performed as part of the Additional Site Characterization report using procedures in accordance with the Oregon Department of Environmental Quality (DEQ) 2003 (Revised October 2, 2017) *Risk-Based Decision-Making Guidance (RBDM)* and the 2010 *Human Health Risk Assessment Guidance*. Potential cancer risks and non-cancer hazards were evaluated under the reasonable maximum exposure (RME) for the selected site-COPCs tetrachloroethene (PCE), trichloroethene (TCE) and cis 1,2-dichloroethene (cis 1,2-DCE).

5.5.1 NON-CANCER HAZARD ESTIMATES

Hazard quotients (HQs) are used to assess the potential for adverse health effects resulting from exposure to chemicals with non-cancer effects. The HQ represents the ratio between the estimated exposure level and the acceptable exposure level for a given COPC. For purposes of the HHRA, HQs were calculated by comparing the EPCs to the DEQ RBCs developed for chemicals classified as non-carcinogens. DEQ RBCs incorporate COPC-specific average daily doses and RfDs and represent acceptable exposure levels. For the HHRA, HQs were calculated using the following equation:

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$$HQ = \frac{EPC}{RBC}$$

HQs for individual chemicals were summed to yield hazard indices (HIs) that provide conservative estimates of total hazard. HQs were presented separately for each receptor population that is carried through the risk evaluation process. Each receptor scenario was evaluated separately. The receptor-specific HQs were summed across chemical and exposure pathways.

5.5.2 POTENTIAL CANCER RISK

Potential cancer risks (CR) are expressed as the probability of an individual developing cancer over a lifetime because of exposure to the potential carcinogen. The calculated risk represents an estimated upper-bound incremental probability of excess individual lifetime cancer risk. For purposes of the HHRA, cancer risks will be calculated by comparing the estimated exposure concentration to the exposure level associated with an estimated incremental cancer risk of 1×10^{-6} . DEQ RBCs incorporate COPC specific lifetime average daily doses and CSFs and are based on a cancer risk of 1×10^{-6} .

For the HHRA, cancer risks were calculated using the following equation:

$$Risk = \frac{EPC}{RBC} \times 0.000001$$

Oregon Administrative Rule (OAR) 340-122-0115(2)(a)(3)(a), and (4)(a) define acceptable risk to be an excess lifetime cancer risk (ELCR) of 1×10^{-6} (1E-06) for individual carcinogens and 1×10^{-5} (1E-05) for cumulative risk from multiple carcinogens. The acceptable non-cancer hazards resulting from exposure to single or multiple chemicals is 1. For the Edgewood Shopping Center site, two carcinogens (PCE and TCE) have been identified as COPCs. Accordingly, the threshold for unacceptable risk is 1E-05. A summary of estimated potential cancer risks is presented in the following table. Detailed estimates of potential risk and non-cancer hazards are provided in **Tables 5, 6, and 8**.

5.5.3 RISK CHARACTERIZATION SUMMARY

The Edgewood Shopping Center site has been divided into two exposure areas: source area soil and groundwater, and non-source area soil and groundwater based on COPC concentrations and distributions, and the estimates of potential risk are presented accordingly in the following.

RME Source and Non-Source Area Soil

No COPCs have been identified in soil (see **Table 3**).

RME Source Area Groundwater

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Potential estimated risks resulting from the groundwater volatilization to outdoor air exposure pathway by urban residential receptors was **1E-06** before the IRA and is **1E-08** after the IRA (**Table 6**).

For a future construction/excavation worker, potential cancer risk resulting from groundwater entering an excavation was **3E-05** before the IRA and is **8E-07** after implementing the IRA (**Table 8**).

Non-Source Area Groundwater

Potential cancer risk to future urban residents resulting from the groundwater vapor intrusion into buildings exposure pathway was estimated on a well-by-well basis in non-source area wells and ranges from **1E-07** to **6E-07** (**Table 6**).

Estimates of potential cancer risk to future urban residents exposed via volatilization of COPCs from groundwater to outdoor air ranged from **8E-09** to **4E-08** (**Table 6**).

Construction and excavation workers could be exposed to COPCs in groundwater entering an excavation resulting in estimated cumulative potential cancer risks ranging from **8E-07** to **2E-07** (**Table 8**).

The results indicate that there is no potential for unacceptable vapor intrusion risk to future urban residents should buildings be constructed over or near the existing monitoring wells in the non-source area.

On-Site Indoor Air Risk

Table 10 presents the potential risk estimates on a tenant space-by tenant space basis based on 2008 and 2009 indoor air sampling. Cancer risks were estimated to range from **3E-07** (former dry cleaner and deli spaces) to **4E-08** (Breedon Office).

5.6 Uncertainty Assessment

In general, uncertainties in the HHRA process are essentially the accumulated uncertainties associated with the methodologies used in estimating the health risk results (EPA 1989). They are the product of many factors affecting each component of the HHRA process. These factors generally include, at a minimum, measurement errors, conservative exposure and modeling assumptions, and uncertainty and variability of the values used in the assessment.

The term "uncertainty" is often used in risk assessment to describe what are two conceptually different terms: uncertainty and variability. Uncertainty can be described as the lack of a precise knowledge resulting in a fundamental data gap. Variability describes the natural heterogeneity of a population. Uncertainty can sometimes be reduced or eliminated through further measurements or study. By contrast, variability is inherent in what is being observed. Although variability can be better understood, it cannot be reduced through further measurement or study, although it may be more precisely defined. However, the additional cost of further data collection may become disproportional to the reduction in uncertainty.

The risks and hazards presented are consistent with EPA's stated goal of RME representing the high end of the possible risk distribution, which is generally considered to be greater than the 90th percentile and

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less than the 98th percentile. However, these estimates are based on numerous and often conservative assumptions, and, in the absence of definitive information, are used to ensure that actual sites risks are not underestimated. The cumulative effect of these assumptions can result in an analysis with an overall conservativeness greater than the individual components. Accordingly, it is important to note that the risks presented within this document are based on numerous conservative assumptions to be protective of human health and to ensure that the risks presented here are more likely to be overestimated rather than underestimated.

Specific uncertainties associated with this HHRA include:

- ❑ The Oregon DEQ RBCs with which risks were evaluated have not been updated since May 2018 and as such they may not reflect changes in toxicity values that RBCs are based on since that time (i.e., cis-1,2-DCE).
- ❑ Use of soil to evaluate potential vapor intrusion into buildings (RBCss) contributes to uncertainty. The U.S. EPA (EPA 2015) and states with routinely updated VI guidance (e.g., California, Washington, and Michigan) no longer publish vapor intrusion screening levels for soil citing uncertainty regarding volatile loss during soil sampling, and short scale heterogeneity for soil concentrations.
- ❑ Groundwater data are not the preferred line-of-evidence for evaluating VI because of the uncertainties associated with the partitioning equations and uncertainty regarding transport through the capillary fringe.
- ❑ The effects of future placement of a building concrete slab over existing groundwater impacts in vacant portions of the Site cannot be currently evaluated but may include accumulation of chemicals of concern at higher than anticipated concentrations immediately below the slab.
- ❑ The assumption that individuals within a receptor population (or subpopulation) will receive the same intake doses. Variability in parameters such as absorption rate, inhalation rate, frequency and duration of exposure, body weight, and activity pattern will exist even in a narrowly defined age group or identified sensitive subpopulation (EPA, 1992).
- ❑ It is assumed that contaminant concentrations will not decline over time due to source depletion.

6 DISCUSSION

The EPA has established soil vapor screening levels (Vapor Intrusion Screening Levels or VISLs) that are based on dividing an indoor air concentration representing a risk less than 1E-06 and for non-carcinogens a hazard quotient less than one by a default attenuation factor for the transport of chemicals from the subsurface to indoor air of 0.03. Currently, DEQ uses an attenuation factor of 0.005. However, EPA's attenuation factor does not consider that chemicals may attenuate from the source to below the building slab regardless of depth: an assumption not supported by empirical data. Moreover, EPA appropriately acknowledges shortcomings in their attenuation factor database that served the basis for their 0.03

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attenuation factor citing a limited number of commercial/industrial buildings evaluated, lack of site-specific outdoor air data, a very limited number of paired indoor and sub-slab samples and inclusion of groundwater data from sites with widely differing hydrogeologic regimes. Of more importance, use of a single attenuation factor based predominantly on data from Colorado and New York can not adequately reflect unique conditions in the Pacific Northwest such as high soil moisture content and predominantly clay soils.

EPA notes that the use of their attenuation factor is designed to minimize the number of sites excluded where vapor intrusion may be occurring and that exceedance of VISLs merely indicates that further evaluation (i.e., indoor air sampling) is needed. Unfortunately, states like California and Michigan now consider VISLs based on an attenuation factor of 0.03 as de facto cleanup levels driving extensive and often unnecessary investigation and mitigation.

Possible uncertainty regarding use of 2018 DEQ vapor intrusion screening levels versus more conservative screening levels based on a default 0.03 screening level attenuation factor promoted by EPA was minimized at the Edgewood Shopping Center because all buildings with detectable concentrations of COIs in soil gas regardless of concentration were subjected to indoor and outdoor air sampling that conformed with the most current guidance even though that work was completed in 2009. The results were compared to air RBCs (RBCair) for each applicable receptor which, except for cis-1,2-DCE, are essentially the same as used by EPA in their most current November 2022 RSL table (note: EPA does not have screening levels for urban residential receptors). DEQ indicates the calculated RBC for cis-1,2-DCE exceeds the vapor pressure of the pure chemical and assumes that this chemical could not create an unacceptable risk whereas EPA has established a residential indoor air RSL of 42 $\mu\text{g}/\text{m}^3$ equating to a soil gas screening level of 1,400 $\mu\text{g}/\text{m}^3$ using their 0.03 attenuation factor.

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INDEPENDENT CLEANUP PATHWAY FINAL REPORT

Oregon DEQ 1998, Guidance for Conduction Beneficial Water Use Determinations at Environmental Cleanup Sites, July 1.

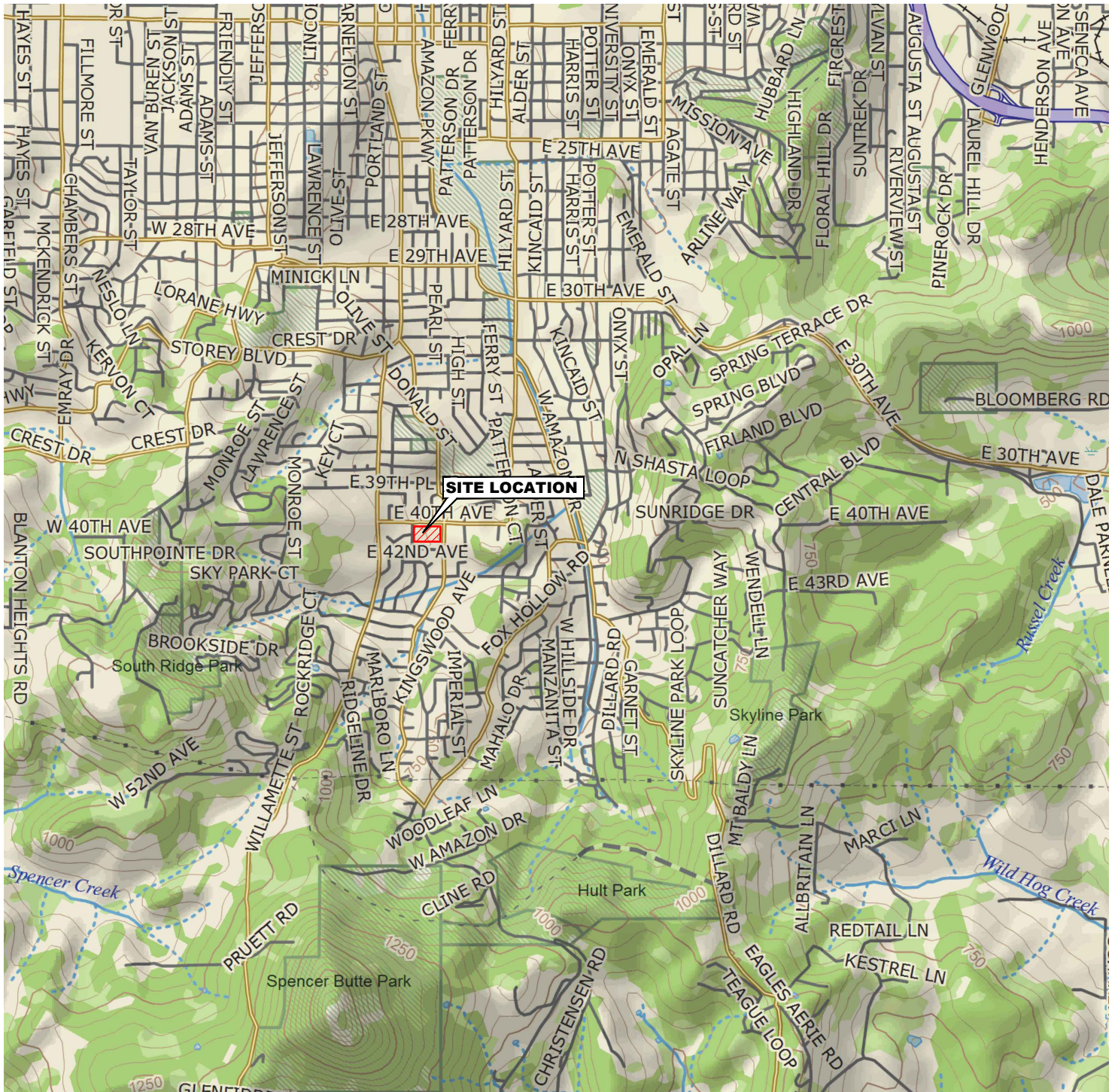
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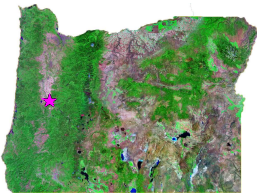
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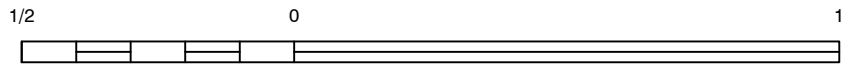
FIGURES



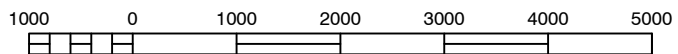
North



OREGON



SCALE (MILES)



SCALE (FEET)

REFERENCE: USGS 7.5 MINUTE QUADRANGLE, EUGENE EAST, OREGON



9400 SW BARNES ROAD, SUITE 200
PORTLAND, OREGON
PHONE (503) 297-1631/297-5429 (FAX)

FOR:
ROBERT BREEDEN
EDGEWOOD SHOPPING CENTER
350-390 E 40th AVENUE
EUGENE, OREGON

JOB NUMBER:
185750631

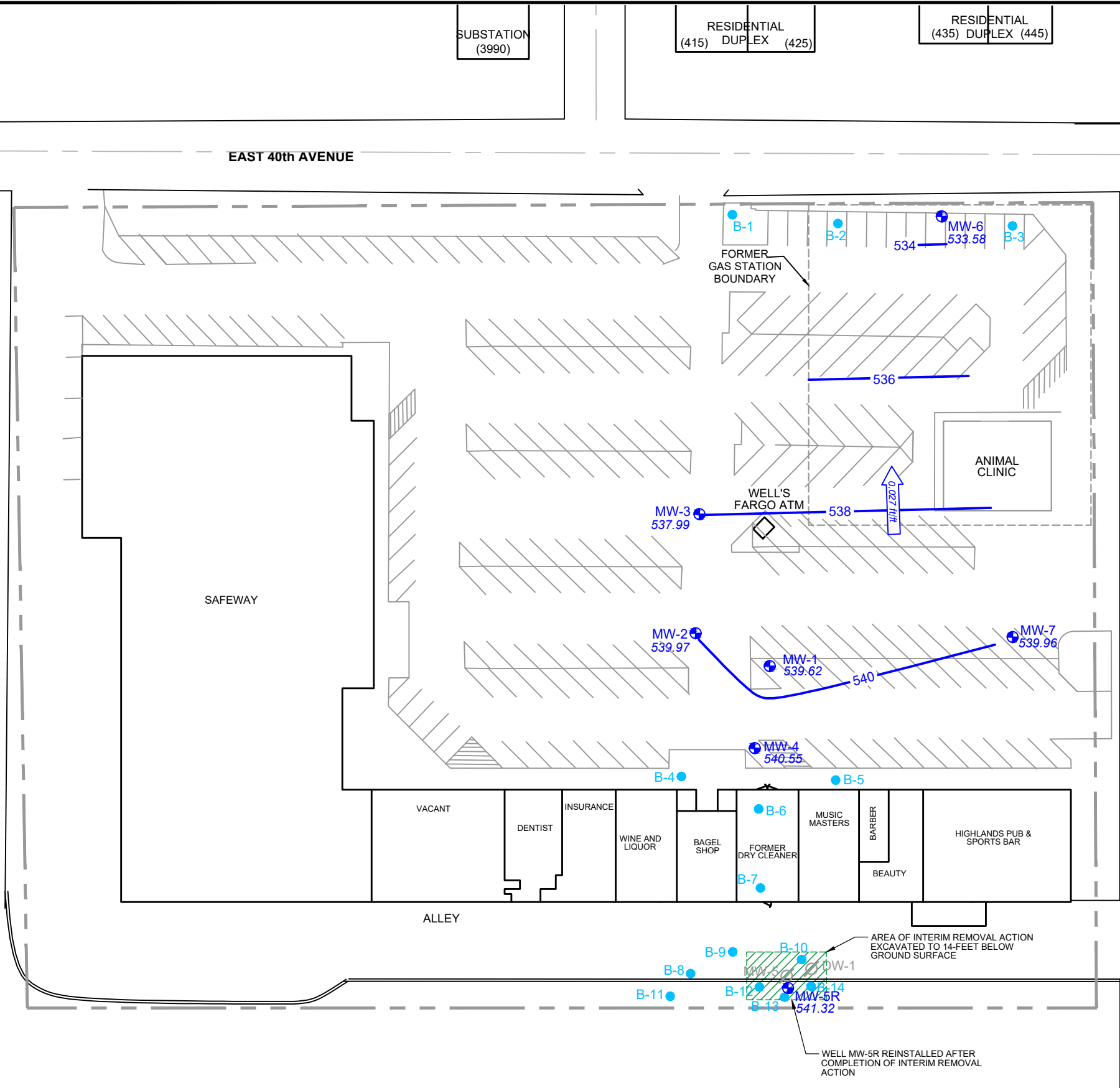
DRAWN BY:
MDR

CHECKED BY:
RM

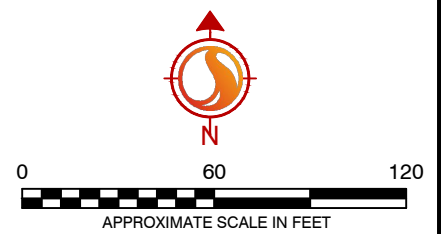
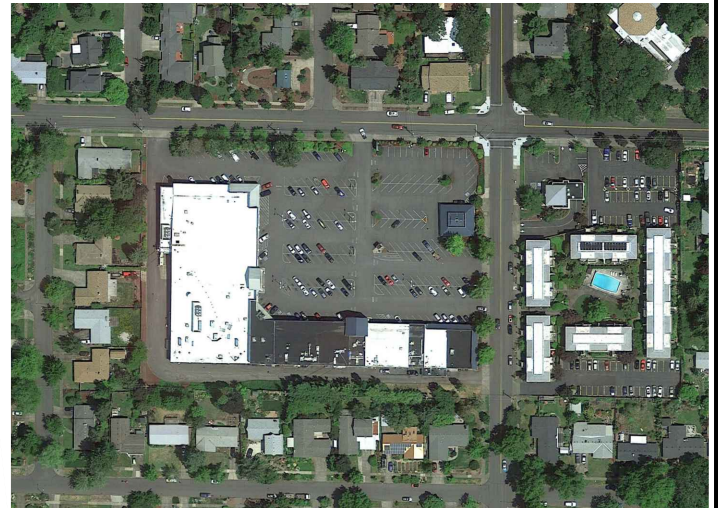
APPROVED BY:
PF

FIGURE:
1
DATE:
JAN 2019

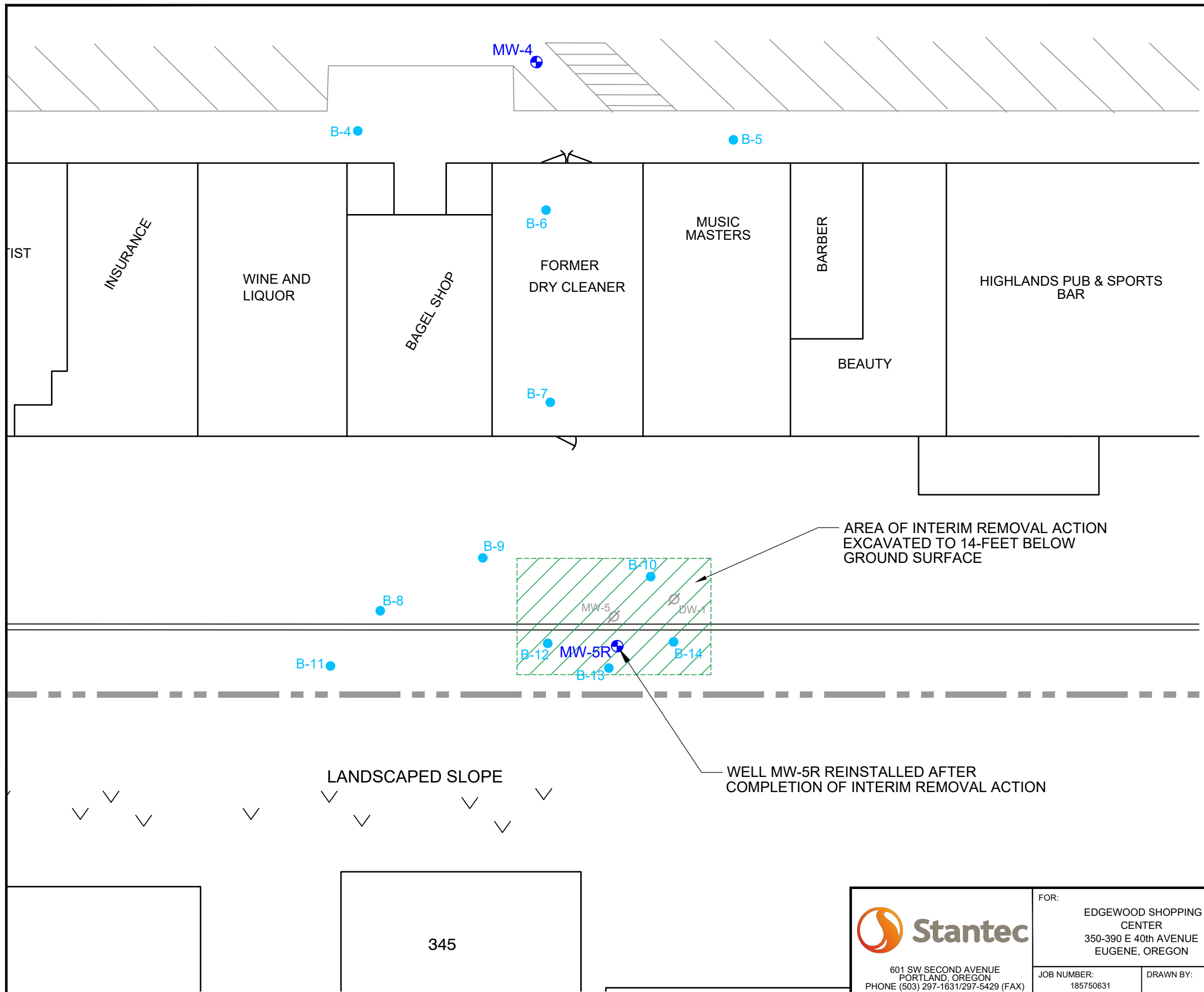
SITE LOCATION MAP



- LEGEND:**
- SITE BOUNDARY LINE
 - MW- [Symbol] MONITORING WELL LOCATION
 - MW-5 [Symbol] WELLS ABANDONED AUGUST 2020
 - B-1 [Symbol] PREVIOUS SOIL BORINGS (2007 and 2008)
 - B-1 [Symbol] PREVIOUS SOIL BORING (2018)
 - 539.85 [Symbol] GROUNDWATER ELEVATION
 - [Symbol] GROUNDWATER CONTOUR
 - 0.007 ft/ft [Symbol] GROUNDWATER FLOW DIRECTION AND HYDRAULIC GRADIENT (FT/FT)
 - NM [Symbol] NOT MEASURED



<p>601 SW SECOND AVENUE PORTLAND, OREGON PHONE (503) 297-1631/297-5429 (FAX)</p>	FOR:	<p>EDGEWOOD SHOPPING CENTER 350-390 E 40th AVENUE EUGENE, OREGON</p>		<p>SITE PLAN WITH SEPTEMBER 2022 GROUNDWATER ELEVATION CONTOURS</p>		FIGURE:
	JOB NUMBER:					DRAWN BY:
	185750631	MDR/JBL	BM	P. VAUGHAN	MAR 2022	2



LEGEND:

- SITE BOUNDARY LINE
- MW-4 ● MONITORING WELL LOCATION
- MW-5 ∅ WELLS ABANDONED AUGUST 2020
- B-1 ● PREVIOUS SOIL BORINGS (2007 and 2008)




AREA OF INTERIM REMOVAL ACTION
EXCAVATED TO 14-FOOT BELOW
GROUND SURFACE

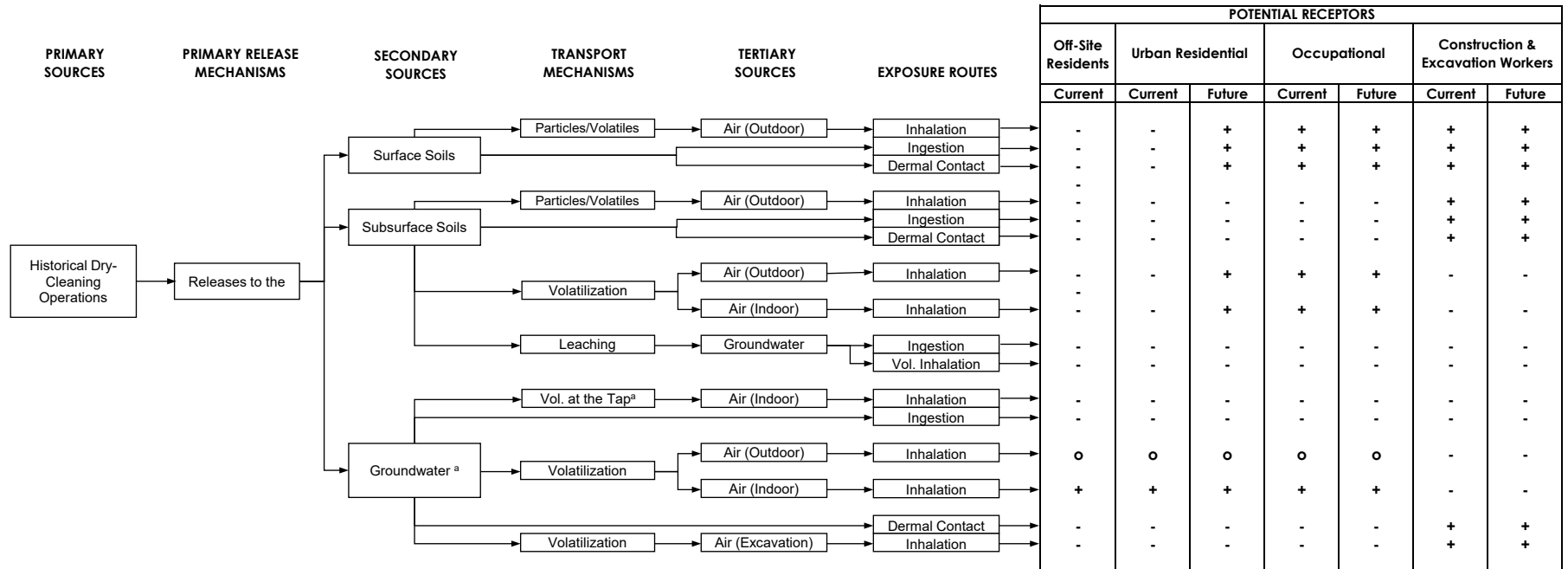
WELL MW-5R REINSTALLED AFTER
COMPLETION OF INTERIM REMOVAL ACTION



345

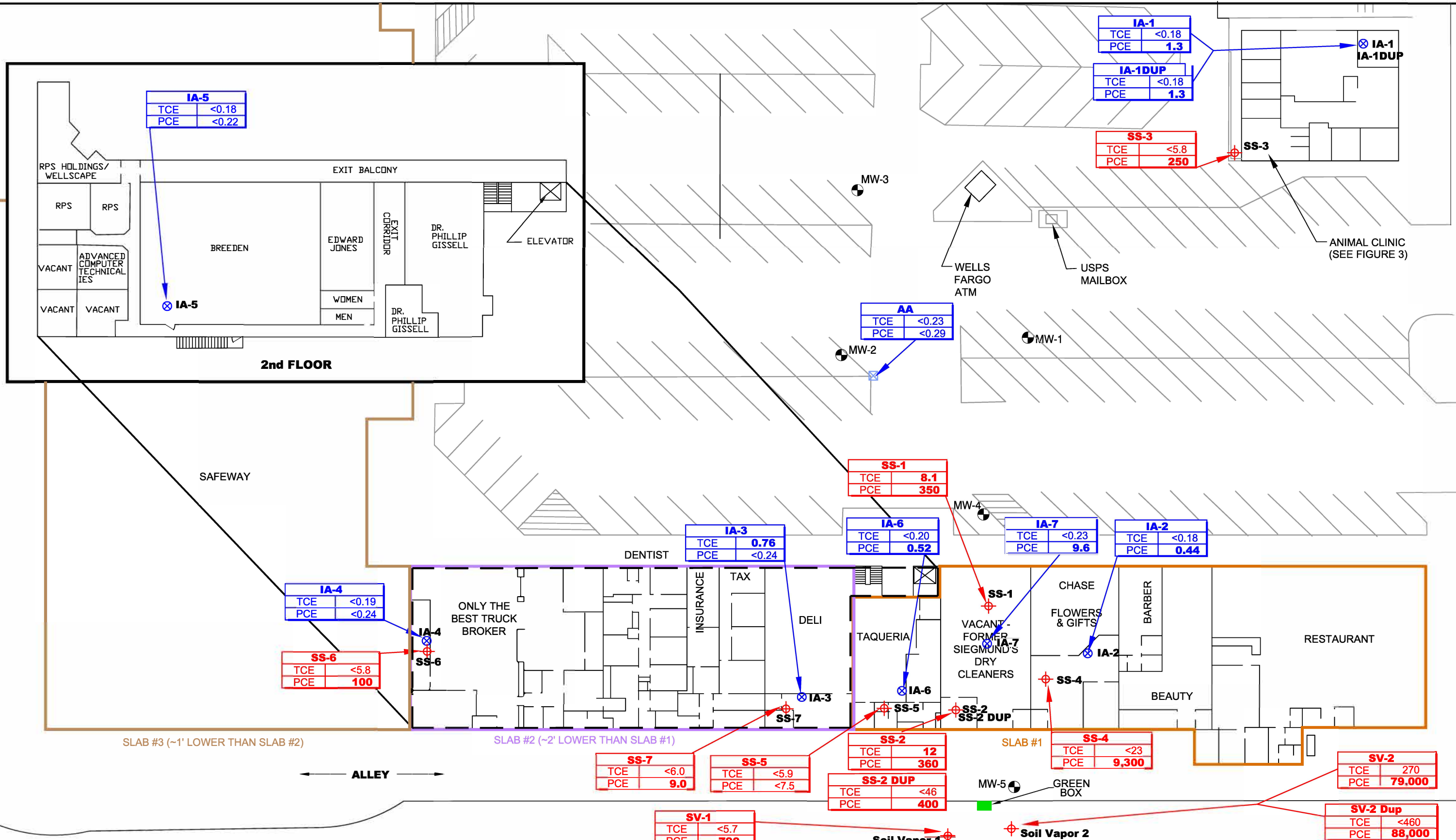
 601 SW SECOND AVENUE PORTLAND, OREGON PHONE (503) 297-1631/297-5429 (FAX)	FOR: EDGEWOOD SHOPPING CENTER 350-390 E 40th AVENUE EUGENE, OREGON	SITE PLAN WITH IRA DETAIL		FIGURE: 3
	JOB NUMBER: 185750631	DRAWN BY: MDR	CHECKED BY: RM	APPROVED BY: P. VAUGHAN

**Figure 4
Conceptual Site Model
Edgewood Shopping Center - Eugene, Oregon**



Notes:

- + Exposure pathway is complete or potentially complete. Pathway will be quantitatively evaluated
- Exposure pathway is incomplete. Pathway will not be evaluated
- ^a Assumes no beneficial use of groundwater
- o Exposure pathway is potentially complete but contributes little to risk



LEGEND:

- GROUNDWATER MONITORING WELL
- SUB-SLAB SAMPLE
- INDOOR AIR SAMPLE
- AMBIENT AIR SAMPLE
- OUTLINE OF 2nd FLOOR

ANALYTES

- TCE TRICHLOROETHENE
- PCE TETRACHLOROETHENE



Stantec
 7730 SW MOHAWK STREET
 TUALATIN, OREGON 97062
 PHONE: (503) 691-2030/692-7074 (FAX)

FOR:
 BREEDEN BROTHERS, INC.
 EDGEWOOD SHOPPING CENTER
 350-390 E 40th AVENUE
 EUGENE, OREGON

JOB NUMBER: 187902018
 DRAWN BY: DJH/ARA

**SUB-SLAB AND INDOOR AIR SAMPLE LOCATIONS
 EDGEWOOD SHOPPING CENTER**

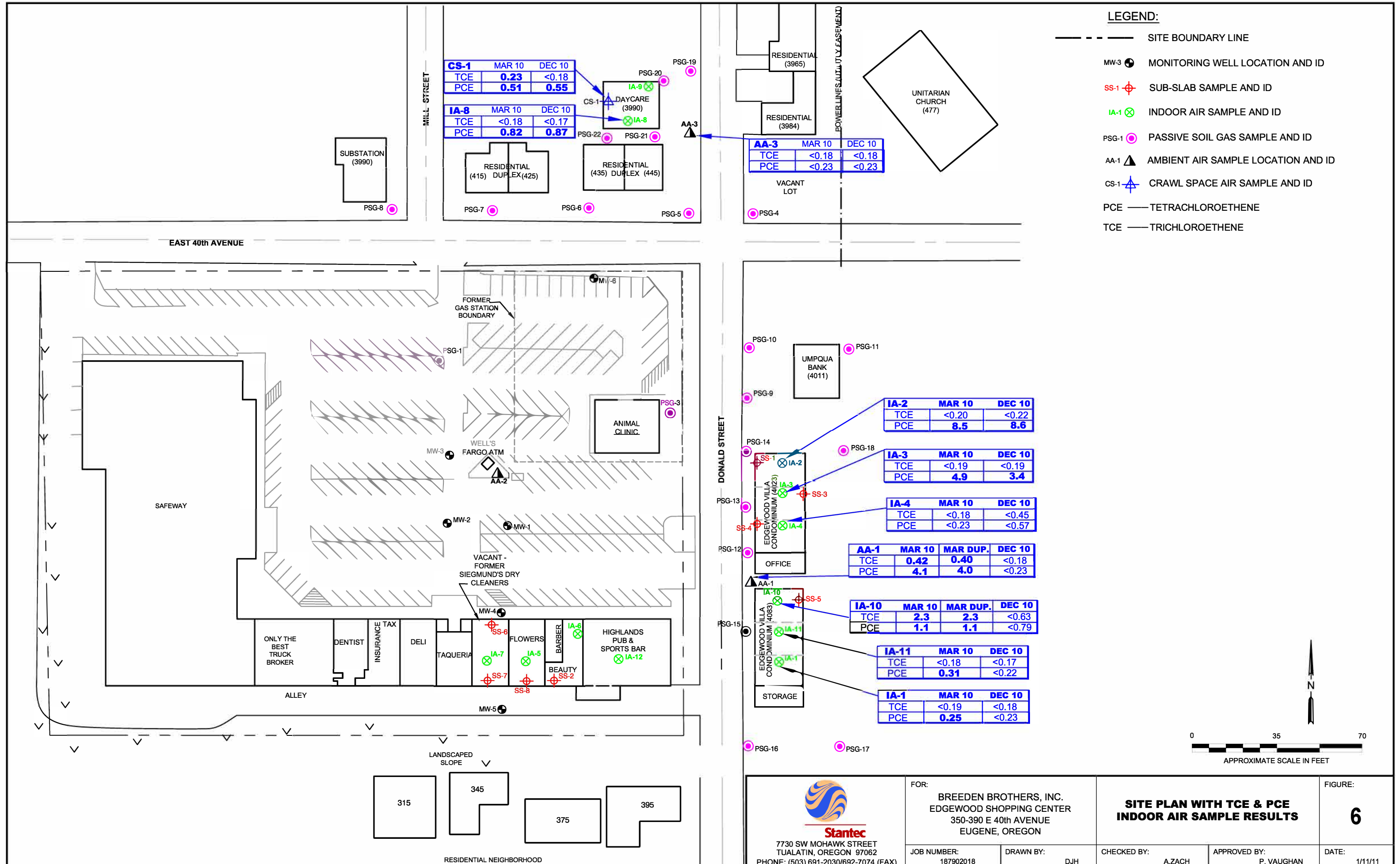
CHECKED BY: A.ZACH
 APPROVED BY: P. VAUGHAN

FIGURE:
5

DATE: 5/21/09

LEGEND:

- SITE BOUNDARY LINE
- MW-3 MONITORING WELL LOCATION AND ID
- SS-1 SUB-SLAB SAMPLE AND ID
- IA-1 INDOOR AIR SAMPLE AND ID
- PSG-1 PASSIVE SOIL GAS SAMPLE AND ID
- AA-1 AMBIENT AIR SAMPLE LOCATION AND ID
- CS-1 CRAWL SPACE AIR SAMPLE AND ID
- PCE — TETRACHLOROETHENE
- TCE — TRICHLOROETHENE



CS-1	MAR 10	DEC 10
TCE	0.23	<0.18
PCE	0.51	0.55

IA-8	MAR 10	DEC 10
TCE	<0.18	<0.17
PCE	0.82	0.87

AA-3	MAR 10	DEC 10
TCE	<0.18	<0.18
PCE	<0.23	<0.23

IA-2	MAR 10	DEC 10
TCE	<0.20	<0.22
PCE	8.5	8.6

IA-3	MAR 10	DEC 10
TCE	<0.19	<0.19
PCE	4.9	3.4

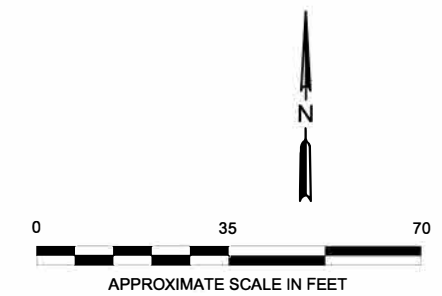
IA-4	MAR 10	DEC 10
TCE	<0.18	<0.45
PCE	<0.23	<0.57

AA-1	MAR 10	MAR DUP.	DEC 10
TCE	0.42	0.40	<0.18
PCE	4.1	4.0	<0.23

IA-10	MAR 10	MAR DUP.	DEC 10
TCE	2.3	2.3	<0.63
PCE	1.1	1.1	<0.79

IA-11	MAR 10	DEC 10
TCE	<0.18	<0.17
PCE	0.31	<0.22

IA-1	MAR 10	DEC 10
TCE	<0.19	<0.18
PCE	0.25	<0.23



<p>7730 SW MOHAWK STREET TUALATIN, OREGON 97062 PHONE: (503) 691-2030/692-7074 (FAX)</p>	FOR: BREEDEN BROTHERS, INC. EDGEWOOD SHOPPING CENTER 350-390 E 40th AVENUE EUGENE, OREGON		SITE PLAN WITH TCE & PCE INDOOR AIR SAMPLE RESULTS		FIGURE: 6
	JOB NUMBER: 187902018	DRAWN BY: DJH	CHECKED BY: A.ZACH	APPROVED BY: P. VAUGHAN	DATE: 1/11/11

TABLES

TABLE 1-SUMMARY OF SOIL ANALYTICAL RESULTS
Edgewood Shopping Center
350-390 E. 40th Avenue, Eugene, Oregon

Sample Identification	Sample Date	Sample Depth (feet below ground surface)	PID Field Screening Result	VOCs - 8260B (mg/kg)												
				PCE	TCE	cis-1,2-DCE	Vinyl Chloride	1,1,2,2-tetrachloroethane	1,1,1-trichloroethane	Carbon Tetrachloride	Chlorobenzene	1,2-Dichlorobenzene	1,4-Dichlorobenzene	1,1-Dichloroethene	Ethylbenzene	Isopropylbenzene
Historical (2007 to present) On-Site Soil Borings (results in mg/kg)																
B-1	10/16/2007	15	0	U (<0.0066)	U (<0.0066)	U (<0.0066)	U (<0.0066)	U (<0.0066)	U (<0.0066)	U (<0.0066)	U (<0.0066)	U (<0.0066)	U (<0.0066)	U (<0.0066)	U (<0.0066)	U (<0.0066)
B-2	10/16/2007	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
B-3	10/16/2007	10	0	U (<0.0064)	U (<0.0064)	U (<0.0064)	U (<0.0064)	U (<0.0064)	U (<0.0064)	U (<0.0064)	U (<0.0064)	U (<0.0064)	U (<0.0064)	U (<0.0064)	U (<0.0064)	U (<0.0064)
B-4	10/16/2007	5	87.1	U (<0.0050)	U (<0.0050)	U (<0.0050)	U (<0.0050)	U (<0.0050)	U (<0.0050)	U (<0.0050)	U (<0.0050)	U (<0.0050)	U (<0.0050)	U (<0.0050)	U (<0.0050)	U (<0.0050)
B-5	10/16/2007	10	86.1	0.0012	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)
B-6	10/16/2007	1	0	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)	U (<0.0010)
B-7	10/16/2007	0.5	0	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)
B-8	10/16/2007	5	381	0.0094	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)
B-9	10/16/2007	6	164	U (<0.0011)	U (<0.0011)	0.0051	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)
B-10	10/16/2007	6	801	U (<0.050)	U (<0.050)	U (<0.050)	U (<0.050)	U (<0.050)	U (<0.050)	U (<0.050)	U (<0.050)	U (<0.050)	U (<0.050)	U (<0.050)	U (<0.050)	U (<0.050)
B11	8/20/2008	10	--	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)	U (<0.0011)
B12	8/20/2008	10	--	U (<0.0067)	0.78	U (<0.0015)	U (<0.0015)	U (<0.0015)	U (<0.0015)	U (<0.0015)	U (<0.0015)	U (<0.0015)	U (<0.0015)	U (<0.0015)	U (<0.0015)	U (<0.0015)
B12	8/20/2008	15	--	0.024	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)
B13	8/20/2008	18	--	0.51	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)
B14	8/20/2008	10	--	0.26	0.008	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)	U (<0.0012)
MW-6	8/20/2008	10	--	U (<0.0013)	U (<0.0013)	0.022	U (<0.0013)	U (<0.0013)	U (<0.0013)	U (<0.0013)	U (<0.0013)	U (<0.0013)	U (<0.0013)	U (<0.0013)	0.002	0.0061
Off-Site Soil Boring (results in mg/kg)																
SB-2-7-8	1/29/2018	7' - 8'	0.2	<0.0375	<0.0375	<0.0375	<0.0375	<0.0751	<0.0375	<0.0751	<0.0375	<0.0375	<0.0375	<0.0375	<0.0751	<0.0375
Shallow Monitoring Well (results in mg/kg)																
MW-7-1-3	1/29/2018	1' - 3'	0.4	<0.0401	<0.0401	<0.0401	<0.0401	<0.0802	<0.0401	<0.0802	<0.0401	<0.0401	<0.0401	<0.0401	<0.0802	<0.0401
Duplicate X	1/29/2018	1' - 3'	0.4	<0.0420	<0.0420	<0.0420	<0.0420	<0.0839	<0.0420	<0.0839	<0.0420	<0.0420	<0.0420	<0.0420	<0.0839	<0.0420
Deep Monitoring Well (results in mg/kg)																
DW-1-5	9/26/2017	5'	55.0	1.37	<0.0408	<0.0408	<0.0408	<0.0816	<0.0408	<0.0816	<0.0408	<0.0408	<0.0408	<0.0408	--	--
DW-1-15	9/26/2017	15'	7.0	1.11	<0.0348	<0.0348	<0.0348	<0.0696	<0.0348	<0.0696	<0.0348	<0.0348	<0.0348	<0.0348	--	--
Generic RBC ₁₀ Occupational Volatilization to Outdoor Air				>Csat	96	>Max	89	NA	>Csat	62	>Csat	>Csat	36	>Csat	160	>Csat
Generic RBC ₁₀ Urban Residential Volatilization to Outdoor Air				>Csat	33	>Max	6.5	NA	>Csat	35	>Csat	>Csat	19	>Csat	85	>Csat
Generic RBC ₁₀ Occupational Vapor Intrusion into Buildings				36	2.3	>Max	2.2	NA	>Csat	1.6	>Max	>Csat	13	680	17	>Csat
Generic RBC ₁₀ Urban Residential Vapor Intrusion into Buildings				6.6	0.26	>Max	0.053	NA	>Csat	0.28	77	>Csat	2.3	54	3.0	>Csat
Generic RBC ₁₀ Urban Residential Soil Ingestion, Dermal Contact, Inhalation				540	17	310	0.8	NA	>Csat	21	>Csat	>Csat	62.0	>Csat	110	>Csat
Generic RBC ₁₀ Occupational Soil Ingestion, Dermal Contact, Inhalation				1,000	51	>Csat	4.4	NA	>Csat	34	>Csat	>Csat	64.00	>Csat	150	>Csat
Generic RBC ₁₀ Construction Worker Ingestion/Dermal Contact/Inhalation				1,800	470	710	34	NA	>Csat	320	>Csat	>Csat	>Csat	>Csat	>Csat	>Csat
Generic RBC ₁₀ Excavation Worker Ingestion/Dermal Contact/Inhalation				50,000	13,000	>Csat	>Csat	NA	>Max	>Csat	>Csat	>Csat	>Csat	>Csat	>Csat	>Csat

NOTES:
 PID = Photoionization Detector
 PCE = Tetrachloroethene
 TCE = Trichloroethene
 cis-1,2-DCE = cis-1,2-Dichloroethene
 -- = Not Analyzed, Not Applicable or Not Available
 mg/kg = Milligrams per kilogram

Shaded = soil boring location removed during 2020 Interim Removal Action

Oregon Department of Environmental Quality Risk-Based Concentrations (RBCs), November 1, 2015 revision

>Csat = This soil RBC exceeds the limit of three-phase equilibrium partitioning. Soil concentrations in excess of Csat indicate that free product might be present.

>Max = The constituent RBC for this pathway is calculated as greater than 1,000,000 mg/kg or 1,000,000 mg/L. Therefore, this substance is deemed not to pose risks in this scenario.

NA = No RBC is listed for this analyte

Table 2. Summary of Post Excavation Soil Analytical Results
 2020 Interim Removal Action-Confirmation Sampling
 Edgewood Shopping Center
 350-390 E 40th Avenue
 Eugene, Oregon

Sample Identification	Sample Date	Sample Depth (feet below ground surface)	PID Field Screening Result	VOCs - 82608 (mg/kg)											
				PCE	TCE	cis-1,2-DCE	Vinyl Chloride	1,1,2,2-Tetrachloroethane	1,1,1-Trichloroethane	Carbon Tetrachloride	Chlorobenzene	1,2-Dichlorobenzene	1,4-Dichlorobenzene	1,1-Dichloroethene	
N-SW-4-D	8/12/2020	4'	1.5	<0.0338	<0.0338	<0.0338	<0.0338	<0.0676	<0.0338	<0.0676	<0.0338	<0.0338	<0.0338	<0.0338	<0.0338
W-SW-4-B	8/13/2020	4'	1.2	<0.0375	<0.0375	<0.0375	<0.0375	<0.0751	<0.0375	<0.0751	<0.0375	<0.0375	<0.0375	<0.0375	<0.0375
W-2	8/14/2020	4'	2.5	<0.0349	<0.0349	<0.0349	<0.0349	<0.0698	<0.0349	<0.0698	<0.0349	<0.0349	<0.0349	<0.0349	<0.0349
DUP-1 (paired with W-2)	8/14/2020	4'	2.5	<0.0327	<0.0327	<0.0327	<0.0327	<0.0655	<0.0327	<0.0655	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327
E-SW-4-A	8/12/2020	4'	2.5	<0.0398	<0.0398	<0.0398	<0.0398	<0.0797	<0.0398	<0.0797	<0.0398	<0.0398	<0.0398	<0.0398	<0.0398
W-SW	8/14/2020	4'	3.5	<0.0377	<0.0377	<0.0377	<0.0377	<0.0753	<0.0377	<0.0753	<0.0377	<0.0377	<0.0377	<0.0377	<0.0377
DUP-2 (paired with W-SW)	8/14/2020	4'	3.5	<0.0360	<0.0360	<0.0360	<0.0360	<0.0720	<0.0360	<0.0720	<0.0360	<0.0360	<0.0360	<0.0360	<0.0360
W-3	8/14/2020	4'	3.0	0.0515	<0.0335	<0.0335	<0.0335	<0.0669	<0.0335	<0.0669	<0.0335	<0.0335	<0.0335	<0.0335	<0.0335
DUP-3 (paired with W-3)	8/14/2020	4'	3.0	0.0384	<0.0300	<0.0300	<0.0300	<0.0600	<0.0300	<0.0600	<0.0300	<0.0300	<0.0300	<0.0300	<0.0300
S-SW-4-A	8/6/2020	4'	10.5	0.133	<0.0389	<0.0389	<0.0389	<0.0778	<0.0389	<0.0778	<0.0389	<0.0389	<0.0389	<0.0389	<0.0389
N-SW-8-A	8/10/2020	8'	1.6	0.106	<0.0356	<0.0356	<0.0356	<0.0712	<0.0356	<0.0712	<0.0356	<0.0356	<0.0356	<0.0356	<0.0356
S-SW-8-C	8/12/2020	8'	15.5	0.382	<0.0368	<0.0368	<0.0368	<0.0736	<0.0368	<0.0736	<0.0368	<0.0368	<0.0368	<0.0368	<0.0368
S-SW-8-D	8/12/2020	8'	13.5	0.376	<0.0395	<0.0395	<0.0395	<0.0790	<0.0395	<0.0790	<0.0395	<0.0395	<0.0395	<0.0395	<0.0395
W-SW-8-A	8/10/2020	8'	3.5	0.485 H	<0.0331 H	<0.0331 H	<0.0331 H	<0.0661 H	<0.0331 H	<0.0661 H	<0.0331 H	<0.0331 H	<0.0331 H	<0.0331 H	<0.0331 H
W-SW-8-C	8/13/2020	8'	5.5	<0.0361	<0.0361	<0.0361	<0.0361	<0.0722	<0.0361	<0.0722	<0.0361	<0.0361	<0.0361	<0.0361	<0.0361
E-SW-8-C	8/12/2020	8'	14.0	<0.0352	<0.0352	<0.0352	<0.0352	<0.0703	<0.0352	<0.0703	<0.0352	<0.0352	<0.0352	<0.0352	<0.0352
N-SW-12-B	8/11/2020	12'	4.2	<0.0361	<0.0361	<0.0361	<0.0361	<0.0722	<0.0361	<0.0722	<0.0361	<0.0361	<0.0361	<0.0361	<0.0361
N-SW-12-C	8/12/2020	12'	2.5	<0.0363	<0.0363	<0.0363	<0.0363	<0.0726	<0.0363	<0.0726	<0.0363	<0.0363	<0.0363	<0.0363	<0.0363
N-SW-12-D	8/12/2020	12'	8.5	0.425	<0.0304	<0.0304	<0.0304	<0.0608	<0.0304	<0.0608	<0.0304	<0.0304	<0.0304	<0.0304	<0.0304
S-SW-12-A	8/13/2020	12'	2.0	<0.0353	<0.0353	<0.0353	<0.0353	<0.0706	<0.0353	<0.0706	<0.0353	<0.0353	<0.0353	<0.0353	<0.0353
S-SW-12-B	8/13/2020	12'	3.5	0.296	<0.0327	<0.0327	<0.0327	<0.0655	<0.0327	<0.0655	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327
S-SW-12-C	8/12/2020	12'	14.5	0.125	<0.0390	<0.0390	<0.0390	<0.0779	<0.0390	<0.0779	<0.0390	<0.0390	<0.0390	<0.0390	<0.0390
S-SW-12-D	8/12/2020	12'	15.5	0.0486	<0.0367	<0.0367	<0.0367	<0.0735	<0.0367	<0.0735	<0.0367	<0.0367	<0.0367	<0.0367	<0.0367
W-SW-12-A	8/11/2020	12'	13.1	2.57	<0.0334	<0.0334	<0.0334	<0.0669	<0.0334	<0.0669	<0.0334	<0.0334	<0.0334	<0.0334	<0.0334
W-SW-12-B	8/11/2020	12'	3.2	0.124 H	<0.0318 H	<0.0318 H	<0.0318 H	<0.0636 H	<0.0318 H	<0.0636 H	<0.0318 H	<0.0318 H	<0.0318 H	<0.0318 H	<0.0318 H
E-SW-12-A	8/12/2020	12'	7.5	0.314	<0.0328	<0.0328	<0.0328	<0.0657	<0.0328	<0.0657	<0.0328	<0.0328	<0.0328	<0.0328	<0.0328
E-SW-12-B	8/12/2020	12'	14.5	0.189	<0.0355	<0.0355	<0.0355	<0.0711	<0.0355	<0.0711	<0.0355	<0.0355	<0.0355	<0.0355	<0.0355
E-SW-12-C	8/12/2020	12'	8.5	<0.0354	<0.0354	<0.0354	<0.0354	<0.0707	<0.0354	<0.0707	<0.0354	<0.0354	<0.0354	<0.0354	<0.0354
BOT-NW-14	8/11/2020	14'	12.5	0.618	<0.0404	<0.0404	<0.0404	<0.0808	<0.0404	<0.0808	<0.0404	<0.0404	<0.0404	<0.0404	<0.0404
BOT-SW-14	8/11/2020	14'	4.5	0.114	<0.0324	<0.0324	<0.0324	<0.0648	<0.0324	<0.0648	<0.0324	<0.0324	<0.0324	<0.0324	<0.0324
BOT-NC-14	8/12/2020	14'	14	0.522	<0.0305	<0.0305	<0.0305	<0.0611	<0.0305	<0.0611	<0.0305	<0.0305	<0.0305	<0.0305	<0.0305
BOT-NE-14	8/12/2020	14'	14.6	0.949	<0.0350	<0.0350	<0.0350	<0.0700	<0.0350	<0.0700	<0.0350	<0.0350	<0.0350	<0.0350	<0.0350
BOT-SC-14	8/12/2020	14'	18.5	0.393	<0.0426	<0.0426	<0.0426	<0.0853	<0.0426	<0.0853	<0.0426	<0.0426	<0.0426	<0.0426	<0.0426
BOT-SE-14	8/12/2020	14'	16.5	0.202	<0.0393	<0.0393	<0.0393	<0.0785	<0.0393	<0.0785	<0.0393	<0.0393	<0.0393	<0.0393	<0.0393
Generic RBC _{ss} Occupational Volatilization to Outdoor Air				>Csat	96	>Max	89	NA	>Csat	62	>Csat	>Csat	36	>Csat	
Generic RBC _{ss} Urban Residential Volatilization to Outdoor Air				>Csat	33	>Max	6.5	NA	>Csat	35	>Csat	>Csat	19	>Csat	
Generic RBC _v Occupational Vapor Intrusion into Buildings				36	2.3	>Max	2.2	NA	>Csat	1.6	>Max	>Csat	13	680	
Generic RBC _v Urban Residential Vapor Intrusion into Buildings				6.6	0.26	>Max	0.053	NA	>Csat	0.28	77	>Csat	2.3	54	
Generic RBC _{ss} Urban Residential Soil Ingestion, Dermal Contact, Inhalation				540	17	310	0.8	NA	>Csat	21	>Csat	>Csat	62.0	>Csat	
Generic RBC _{ss} Occupational Soil Ingestion, Dermal Contact, Inhalation				1,000	51	>Csat	4.4	NA	>Csat	34	>Csat	>Csat	64.00	>Csat	
Generic RBC _w Construction Worker Ingestion/Dermal Contact/Inhalation				1,800	470	710	34	NA	>Csat	320	>Csat	>Csat	>Csat	>Csat	
Generic RBC _w Excavation Worker Ingestion/Dermal Contact/Inhalation				50,000	13,000	>Csat	>Csat	NA	>Max	>Csat	>Csat	>Csat	>Csat	>Csat	

NOTES:

PID = Photoionization Detector

PCE = Tetrachloroethene

TCE = Trichloroethene

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

-- = Not Analyzed, Not Applicable or Not Available

mg/kg = Milligrams per kilogram

Yellow Shaded = Detected value in excess of one or more RBCs

H = Sample analyzed outside of recommended hold time

Oregon Department of Environmental Quality Risk-Based Concentrations (RBCs), May 2018 revision

>Csat = This soil RBC exceeds the limit of three-phase equilibrium partitioning. Soil concentrations in excess of Csat indicate that free product might be present.

>Max = The constituent RBC for this pathway is calculated as greater than 1,000,000 mg/kg or 1,000,000 mg/L. Therefore, this substance is deemed not to pose risks in this scenario.

NA = No RBC is listed for this analyte

**Table 3-Selection of Soil COPCs
Edgewood Shopping Center
Eugene, Oregon**

Non Source Area Soil

	Soil Ingestion, Dermal Contact, and Inhalation				Volatilization to Outdoor Air		Vapor Intrusion into Buildings		C/RBC¹		COPC?	
	Max Concentration	Urban Residential	Occupational	Construction	Excavation	Urban Residential	Occupational	Urban Residential	Occupational	ca		nc
	mg/kg	RBC _{SS}	RBC _{SS}	RBC _{SS}	RBC _{SS}	RBC _{SO}	RBC _{SO}	RBC _{si}	RBC _{si}			
PCE	0.0094	540	1,000	1,800	50,000	>C _{sat}	>C _{sat}	6.6	36	0.001	--	No
TCE	<0.0064	6.3	26	54	1,500	33	96	0.26	2.3	0.02	--	No
cis-1,2-DCE	0.0051	310	2,300	710	20,000	>MAX	>MAX	>Max	>Max	nc	1.0E-05	No
Vinyl Chloride	0.01	0.80	4.4	34	950	6.5	89	0.053	2.2	0.19	--	No
Total C/RBC										0.21		

Notes:

1. C/RBC evaluated using the highest detected concentration in soil against the lowest RBC regardless of exposure pathway

Source Area Soil

	Soil Ingestion, Dermal Contact, and Inhalation				Volatilization to Outdoor Air		Vapor Intrusion into Buildings		C/RBC¹		COPC?	
	Max Concentration	Urban Residential	Occupational	Construction	Excavation	Urban Residential	Occupational	Urban Residential	Occupational	ca		nc
	mg/kg	RBC _{SS}	RBC _{SS}	RBC _{SS}	RBC _{SS}	RBC _{SO}	RBC _{SO}	RBC _{si}	RBC _{si}			
PCE	1.37	540	1,000	1,800	50,000	>C _{sat}	>C _{sat}	6.6	36	0.21	--	No
TCE	0.78	6.3	26	54	1,500	33	96	0.26	2.3	3.00	--	Yes²
cis-1,2-DCE	<0.0064	310	2,300	710	20,000	>MAX	>MAX	>Max	>Max	nc	1.0E-05	No
Total C/RBC										0.4		

Notes:

1. C/RBC evaluated using the highest detected concentration in soil against the lowest RBC regardless of exposure pathway

2. TCE at this location removed during IRA.

**Table 4. Summary of Groundwater Analytical Results
Edgewood Shopping Center
350-390 E. 40th Avenue
Eugene, Oregon**

Well Number (TOC Elevation)	Sample Date	Depth to Water (feet)	Groundwater Elevation (feet above mean sea level)	VOCs - 8260B (µg/L)														
				PCE	TCE	cis-1,2-DCE	Vinyl Chloride	1,1,2,2-Tetrachloroethane	1,1,1-Trichloroethane	Carbon Tetrachloride	Chlorobenzene	1,2-Dichlorobenzene	1,4-Dichlorobenzene	1,1-Dichloroethene	Ethylbenzene	Isopropylbenzene	n-propylbenzene	
Monitoring Well Network																		
MW-1 (546.145)	10/16/2007	7.01	539.14	2,600	32	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	
	8/14/2008	5.58	540.57	2,800	32	6.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.0	<1.0	<1.0	<1.0
	11/17/2010	--	--	2,100	28	5.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	<1.0	<1.0	<1.0
	7/20/2011	4.41	541.74	2,660	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	--	--	--
	NaMnO4 Injection Event (Phase I = 8/25/11 to 8/30/11) (Phase II = 10/3/11 to 10/4/11)																	
	2/2/2012	5.05	541.10	3,130	33.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	--	--	--
	11/6/2012	--	--	Not sampled due to car parked over well														
	3/20/2013	4.41	541.74	3,700	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	--	--	--
	10/6/2016	6.10	540.05	3,200	32	3.4	<1.0	<1.0	<1.0	<3.0	<2.0	<2.0	<4.0	<2.0	--	--	--	
	1/31/2018	4.47	541.68	4,190	35	<4.00	<4.00	<5.00	<4.00	<10.0	<5.00	<5.00	<5.00	<4.00	<5.00	<10.0	<5.00	
	2/16/2018	4.43	541.72	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	10/21/2020	6.30	539.85	5,550	45.1	4.24	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	2.05	--	--	--	
	2/22/2021	3.49	542.66	5,900	44.2	<20	<20	<25	<20	<50	<25	<25	<25	<20	--	--	--	
	8/24/2021	6.77	539.38	5,680	46.7	<20	<20	<25	<20	<50	<25	<25	<25	<20	--	--	--	
	3/8/2022	4.50	541.65	4,330	44.0	<40	<40	<50	<40	<100	<50.0	<50	<50	<40	--	--	--	
9/19/2022	6.53	539.62	4,640	45.0	<40	<40	<50.0	<40.0	<100	<50.0	<50.0	<50.0	<40.0	--	--	--		
MW-2 (545.495)	10/16/2007	4.82	540.68	800	7.4	7.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	8/14/2008	5.09	540.41	740	6.5	5.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	3/17/2010	--	--	640	6.1	5.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	11/18/2010	--	--	640	5.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	7/20/2011	3.58	541.92	754	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	--	--	
	NaMnO4 Injection Event (Phase I = 8/25/11 to 8/30/11) (Phase II = 10/3/11 to 10/4/11)																	
	2/2/2012	4.10	541.40	947	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	--	--
	11/6/2012	4.89	540.61	920	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	--	--	--	
	3/20/2013	3.80	541.70	930	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	--	--	--	
	10/6/2016	5.10	540.40	1,500	7.6	3.2	<1.0	<1.0	<1.0	<3.0	<2.0	<2.0	<4.0	<2.0	--	--	--	
	1/31/2018	3.54	541.96	1,820	8.53	<4.00	<4.00	<5.00	<4.00	<10.0	<5.00	<5.00	<5.00	<4.00	<5.00	<10.0	<5.00	
	2/16/2018	3.60	541.90	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	10/21/2020	5.61	539.89	2,160	11.7	3.06	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	<0.400	--	--	--	
	2/22/2021	3.29	542.21	2,450	16.8	4.99	<0.800	<1.00	<0.800	<2.00	<1.00	<1.00	<1.00	<0.800	--	--	--	
	8/24/2021	--	--	Not sampled, well inaccessible														
3/8/2022	3.66	541.84	1,860	27.0	<20	<20	<25	<20	<50	<25	<25	<25	<20	--	--	--		
9/19/2022	5.53	539.97	1,890	21.5	<20	<20	<25	<20	<50	<25	<25	<25	<20	--	--	--		

**Table 4. Summary of Groundwater Analytical Results
Edgewood Shopping Center
350-390 E. 40th Avenue
Eugene, Oregon**

Well Number (TOC Elevation)	Sample Date	Depth to Water (feet)	Groundwater Elevation (feet above mean sea level)	VOCs - 8260B (µg/L)													
				PCE	TCE	cis-1,2-DCE	Vinyl Chloride	1,1,2,2-Tetrachloroethane	1,1,1-Trichloroethane	Carbon Tetrachloride	Chlorobenzene	1,2-Dichlorobenzene	1,4-Dichlorobenzene	1,1-Dichloroethane	Ethylbenzene	Isopropylbenzene	n-propylbenzene
MW-3 (542.588)	10/17/2007	4.18	538.41	840	7.5	7.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	8/14/2008	4.35	538.24	860	7.1	6.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	3/17/2010	--	--	660	6.6	5.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	11/16/2010	--	--	570	4.9	4.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	7/20/2011	3.16	539.43	675	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	--
NaMnO4 Injection Event (Phase I = 8/25/11 to 8/30/11) (Phase II = 10/3/11 to 10/4/11)																	
Dup 100616	2/2/2012	4.05	538.54	793	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	--	--
	11/6/2012	4.25	538.34	790	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	--	--	--
	3/20/2013	3.61	538.98	700	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	--	--	--
	10/6/2016	4.72	537.87	930	5.1	2.6	<1.0	<1.0	<3.0	<3.0	<2.0	<2.0	<4.0	<2.0	--	--	--
	10/6/2016	4.72	537.87	950	5.5	2.8	<1.0	<1.0	<3.0	<3.0	<2.0	<2.0	<4.0	<2.0	--	--	--
	1/31/2018	3.15	539.44	1,120	5.86	<4.00	<4.00	<5.00	<4.00	<10.0	<5.00	<5.00	<5.00	<4.00	<5.00	<10.0	<5.00
	2/16/2018	3.19	539.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/21/2020	4.84	537.75	1,090	6.50	1.48	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	<0.400	--	--	--
	2/22/2021	3.07	539.52	1,660	9.31	<4.00	<4.00	<5.00	<4.00	<10.0	<5.00	<5.00	<5.00	<4.00	--	--	--
	8/24/2021	4.86	537.73	838	<8.00	<8.00	<8.00	<10.0	<8.00	<20.0	<10.0	<10.0	<10.0	<8.00	--	--	--
	3/8/2022	3.60	538.99	1,280	12.8	<8.00	<8.00	<10.0	<8.00	<20.0	<10.0	<10.0	<10.0	<8.00	--	--	--
	9/19/2022	4.60	537.99	1,070	10	<8.00	<8.00	<10.0	<8.00	<20.0	<10.0	<10.0	<10.0	<8.00	--	--	--
MW-4 (548.757)	10/17/2007	6.95	541.81	2,300	15	27	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	8/14/2008	7.22	541.54	1,700	11	18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	3/17/2010	--	--	1,800	4.9	4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	11/18/2010	--	--	2,100	19	15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	7/20/2011	5.93	542.83	2,790	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	--	--	--
NaMnO4 Injection Event (Phase I = 8/25/11 to 8/30/11) (Phase II = 10/3/11 to 10/4/11)																	
Dup Y	2/2/2012	5.90	542.86	3,120	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	--	--	--
	11/6/2012	7.06	541.70	2,300	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	--	--	--
	3/20/2013	5.92	542.84	2,100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	--	--	--
	8/18/2016	8.10	540.66	<3,000	32	<1,000	<1.0	<1.0	<3.0	<3.0	<2.0	<2.0	<4.0	<2.0	--	--	--
	10/6/2016	8.78	539.98	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	1/30/2018	5.30	543.46	5,040	38.4	3.75	<0.400	<0.500	1.5	<1.00	<0.500	0.535	<0.500	1.96	<0.500	<1.00	<0.500
	1/30/2018	5.30	543.46	4,960	37.5	3.61	<0.400	<0.500	1.4	<1.00	<0.500	0.5	<0.500	1.99	<0.500	<1.00	<0.500
	2/16/2018	5.92	542.84	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/21/2020	8.42	540.34	4,920	40.7	4.54	<0.400	<0.500	1.07	<1.00	<0.500	<0.500	<0.500	1.24	--	--	--
	10/21/2020	--	--	5,020	40.5	4.49	<0.400	<0.500	0.941	<1.00	<0.500	<0.500	<0.500	1.26	--	--	--
DUP-01	2/22/2021	4.90	543.86	6,160	49.1	<20	<20	<25	<20	<50	<25	<25	<25	<20	--	--	--
	8/24/2021	8.55	540.21	5,620	51.5	<20	<20	<25	<20	<50	<25	<25	<25	<20	--	--	--
	3/8/2022	6.09	542.67	4,200	46	<40	<40	<40	<50	<40	<100	<50	<50	<40	--	--	--
	9/19/2022	8.21	540.55	3,620	<40	<40	<40	<50	<40	<100	<50	<50	<50	<40	--	--	--

**Table 4. Summary of Groundwater Analytical Results
Edgewood Shopping Center
350-390 E. 40th Avenue
Eugene, Oregon**

Well Number (TOC Elevation)	Sample Date	Depth to Water (feet)	Groundwater Elevation (feet above mean sea level)	VOCs - 8260B (µg/L)														
				PCE	TCE	cis-1,2-DCE	Vinyl Chloride	1,1,2,2-Tetrachloroethane	1,1,1-Trichloroethane	Carbon Tetrachloride	Chlorobenzene	1,2-Dichlorobenzene	1,4-Dichlorobenzene	1,1-Dichloroethene	Ethylbenzene	Isopropylbenzene	n-propylbenzene	
MW-5 (549.151)	10/17/2007	6.25	542.90	120,000	1,000	<25.0	<25.0	66	150	<25	<25	<25	<25	<25	<25	<25	<25	
	8/14/2008	6.69	542.46	100,000	1,100	42	<1.0	260	110	19	15	6.5	1.5	9.4	1.3	2.1	1.0	
	3/17/2010	--	--	130,000	650	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	
	11/18/2010	--	--	140,000	1,000	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	
	7/20/2011	5.03	544.12	118,000	<2,500	<2,500	<2,500	<2,500	<2,500	<2,500	<2,500	<2,500	<2,500	<2,500	--	--	--	
	NaMnO4 Injection Event (Phase I = 8/25/11 to 8/30/11) (Phase II = 10/3/11 to 10/4/11)																	
	2/2/2012	4.65	544.50	No sample collected due to unreacted NaMnO4 observed in well														
	11/6/2012	6.10	543.05	130,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	--	--	--
	3/20/2013	5.03	544.12	99,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	--	--	--
	8/18/2016	7.78	541.37	150,000	<3,000	<1,000	<1.0	<1.0	19	<3.0	2.7	12	<4.0	2.7	--	--	--	
	10/6/2016	7.94	541.21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	1/31/2018	4.41	544.74	100,000	143	7.63	<4.00	<5.00	10.9	<10.0	<5.00	9.47	<5.00	<4.00	<5.00	<10.0	<5.00	
	2/16/2018	5.11	544.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	5/20/2020	7.27	541.88	43,800	<200	<200	<200	<250	<200	<500	<250	<250	<250	<250	<200	<250	<500	<250
Well abandoned during August 2020 excavation																		
MW-5R (548.670)	10/21/2020	7.55	541.12	1,320	21.2	2.38	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	<0.400	--	--	--	
DUP 022221	2/22/2021	3.07	545.60	857	24.6	8.64	<4.00	<5.00	<4.00	<10.0	<5.00	<5.00	<5.00	<4.00	--	--	--	
	2/22/2021	--	--	813	22.6	8.58	<4.00	<5.00	<4.00	<10.0	<5.00	<5.00	<5.00	<4.00	--	--	--	
DUP 802421	8/24/2021	7.76	540.91	360	16.3	9.96	<4.00	<5.00	<4.00	<10.0	<5.00	<5.00	<5.00	<4.00	--	--	--	
	8/24/2021	--	--	389	16.9	10.1	<4.00	<5.00	<4.00	<10.0	<5.00	<5.00	<5.00	<4.00	--	--	--	
DUP 030822	3/8/2022	4.40	544.27	248	<2.00	<2.0	<2.00	<2.50	<2.00	<5.00	<2.50	<2.50	<2.50	<2.00	--	--	--	
	3/8/2022	--	--	276	<2.00	<2.00	<2.00	<0.500	<0.400	<5.00	<2.50	<2.50	<2.50	<2.00	--	--	--	
DUP 091922	9/19/2022	7.35	541.32	112	1.29	0.670	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	<0.400	--	--	--	
	9/19/2022	--	--	88.6	1.14	0.600	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	<0.400	--	--	--	

**Table 4. Summary of Groundwater Analytical Results
Edgewood Shopping Center
350-390 E. 40th Avenue
Eugene, Oregon**

Well Number (TOC Elevation)	Sample Date	Depth to Water (feet)	Groundwater Elevation (feet above mean sea level)	VOCs - 8260B (µg/L)														
				PCE	TCE	cis-1,2-DCE	Vinyl Chloride	1,1,2,2-Tetrachloroethane	1,1,1-Trichloroethane	Carbon Tetrachloride	Chlorobenzene	1,2-Dichlorobenzene	1,4-Dichlorobenzene	1,1-Dichloroethene	Ethylbenzene	Isopropylbenzene	n-propylbenzene	
MW-6 (535.039)	8/14/2008	1.96	533.08	590	22	6.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	3/17/2010	--	--	680	30	7.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	11/16/2010	--	--	620	26	8.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	7/20/2011	1.76	533.28	633	19.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	--	--	
	NaMnO4 Injection Event (Phase I = 8/25/11 to 8/30/11) (Phase II = 10/3/11 to 10/4/11)																	
	2/2/2012	1.74	533.30	765	31.8	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	--	--
	11/6/2012	0.99	534.05	640	24	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	--	--	--
	3/20/2013	1.54	533.50	590	25	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	--	--	--
	10/6/2016	1.77	533.27	530	17	4.0	<1.0	<1.0	<3.0	<3.0	<2.0	<2.0	<4.0	<2.0	--	--	--	
	1/30/2018	1.33	533.71	610	26.0	4.65	<4.00	<5.00	<4.00	<10.0	<5.00	<5.00	<5.00	<4.00	<5.00	<10.0	<5.00	
	2/16/2018	1.69	533.35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	10/21/2020	--	--	Not sampled, well inaccessible														
	2/22/2021	1.32	533.72	915	33.0	4.27	<4.00	<5.00	<4.00	<10	<5.00	<5.00	<5.00	<4.00	--	--	--	
	8/24/2021	1.74	533.30	841	23.9	<4.00	<4.00	<5.00	<4.00	<10	<5.00	<5.00	<5.00	<4.00	--	--	--	
3/8/2022	1.40	533.64	724	29.2	4.40	<4.00	<5.00	<4.00	<10	<5.00	<5.00	<5.00	<4.00	--	--	--		
9/19/2022	1.46	533.58	698	19.7	<4.00	<4.00	<5.00	<4.00	<10	<5.00	<5.00	<5.00	<4.00	--	--	--		
MW-7 (546.562)	1/31/2018	7.48	539.08	28.8	0.947	<0.400	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	<0.400	<0.500	<1.00	<0.500	
	2/16/2018	5.04	541.52	56.1	3.08	<0.400	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	<0.400	<0.500	<1.00	<0.500	
	10/21/2020	5.74	540.82	184	8.47	<0.400	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	<0.400	--	--	--	
	2/22/2021	4.18	542.36	174	4.44	<0.400	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	<0.400	--	--	--	
	8/24/2021	5.68	540.88	134	4.08	<0.800	<0.800	<1.00	<0.800	<2.00	<1.00	<1.00	<1.00	<0.800	--	--	--	
	3/8/2022	5.16	541.40	177	5.23	<0.400	<0.400	<0.500	<0.400	<1.00	<0.500	<0.500	<0.500	<0.400	--	--	--	
9/19/2022	6.60	539.96	117	3.28	<0.800	<0.800	<1.00	<0.800	<2.00	<1.00	<1.00	<1.00	<0.800	--	--	--		
DW-1 (549.012)	1/31/2018	4.20	544.81	3,890	20.1	13.4	<4.00	<5.00	5.5	<10.0	<5.00	<5.00	<5.00	<4.00	<5.00	<10.00	<5.00	
Well abandoned during August 2020 excavation																		
Soil Boring																		
SB-2	1/30/2018	11.35	--	40.5	9.64	2.64	<0.800	<1.00	<0.800	<2.00	<1.00	<1.00	<1.00	<0.800	<1.00	<2.00	<1.00	
Generic RBC _{wi} Occupational Vapor Intrusion				48,000	3,700	>S	880	NA	>S	1,200	>S	>S	7,100	360,000	8,200	>S	NA	
Generic RBC _{wi} Urban Residential Vapor Intrusion				8,700	430	>S	21	NA	>S	220	67,000	>S	1,300	29,000	1,500	>S	NA	
Generic RBC _{wo} Occupational Volatilization to Outdoor Air				>S	20,000	>S	5,900	NA	>S	7,700	>S	>S	21,000	2,400,000	43,000	>S	NA	
Generic RBC _{wo} Urban Residential Volatilization to Outdoor Air				150,000	6,900	>S	430	NA	>S	4,200	>S	>S	12,000	570,000	23,000	>S	NA	
Generic RBC _{we} Construction and Excavation Worker				5,600	3,000	18,000	960	NA	1,100,000	1,800	10,000	37,000	1,500	44,000	4,500	51,000	NA	

NOTES:

PCE = Tetrachloroethene

TCE = Trichloroethene

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

Analytes presented include any detected compounds reported at least one time during these sampling events for these wells.

-- = Not Analyzed, Not Applicable, Not Available, or Not Surveyed

µg/L = Micrograms per Liter

(TOC Elevation) = Top of Casing Elevation in Feet

Yellow Shaded = Detected value in excess of one or more RBCs

Oregon Department of Environmental Quality Risk-Based Concentrations (RBCs), May 2018 revision

>S = This groundwater RBC exceeds the solubility limit. Groundwater concentrations in excess of S indicate that free product may be present

NA = No RBC is listed for this analyte

Table 5. Exposure Point Concentrations and Selection of COPCs for Groundwater
Edgewood Shopping Center
350-390 East 40th Avenue, Eugene, Oregon 97405
ECSI #4586

Groundwater Vapor Intrusion into Buildings																							
Chemical	RBC _{wi}	95%UCL	90%UCL	MW-1		C/RBC	95%UCL	90%UCL	MW-2		C/RBC	95%UCL	90%UCL	MW-3		C/RBC	95%UCL	90%UCL	MW-4		C/RBC	COPC?	
				Basis	Student's t-UCL				Basis	Student's t-UCL				Basis	Student's t-UCL				Basis	Student's t-UCL			
PCE	8,700	4,513	4,363	Student's t-UCL	0.5	1,588	1,517	Student's t-UCL	0.2	1,046	1,018	Student's t-UCL	0.12	4,197	4,051	Student's t-UCL	0.48	No					
TCE	430	53.81	50.32	adj Gamma UCL	0.1	13.75	13	Student's t-UCL	0.03	8,702	8,381	Student's t-UCL	0.02	50.9	48.29	adj Gamma UCL	0.12	No					
cis 1,2-DCE	>Sat	--	--	--	--	--	--	--	--	5,047	4,806	Student's t-UCL	--	--	--	--	--	No					
				Total C/RBC	0.6					Total C/RBC	0.23					Total C/RBC	0.14					Total C/RBC	0.6

Groundwater Volatilization to Outdoor Air																							
Chemical	RBC _{wo}	95%UCL	90%UCL	MW-1		C/RBC	95%UCL	90%UCL	MW-2		C/RBC	95%UCL	90%UCL	MW-3		C/RBC	95%UCL	90%UCL	MW-4		C/RBC	COPC?	
				Basis	Student's t-UCL				Basis	Student's t-UCL				Basis	Student's t-UCL				Basis	Student's t-UCL			
PCE	150,000	4,513	4,363	Student's t-UCL	0.03	1,588	1,517	Student's t-UCL	0.01	1,046	1,018	Student's t-UCL	0.01	4,197	4,051	Student's t-UCL	0.03	No					
TCE	6,900	53.81	50.32	adj Gamma UCL	0.01	13.75	13	Student's t-UCL	0.00	8,702	8,381	Student's t-UCL	0.00	50.9	48.29	adj Gamma UCL	0.01	No					
cis 1,2-DCE	>Sat	--	--	--	--	--	--	--	--	5,047	4,806	Student's t-UCL	--	--	--	--	--	No					
				Total C/RBC	0.04					Total C/RBC	0.01					Total C/RBC	0.01					Total C/RBC	0.04

Groundwater in Excavation																											
MW-5 Before Interim Removal Action										MW-5R (Post Interim Removal Action)																	
Chemical	RBC _{we}	95%UCL	90%UCL	Basis		C/RBC	RBC _{wi}	95%UCL	90%UCL	C/RBC	COPC?	Maximum	95%UCL	90%UCL	Basis		RBC _{wi}	C/RBC	COPC?	RBC _{we}	C/RBC	COPC?					
				Student's t-UCL	adj Gamma UCL										Student's t-UCL	adj Gamma UCL							Student's t-UCL	adj Gamma UCL			
PCE	5,600	132,448	129,384	Student's t-UCL	23.65	8,700	132,448	129,384	Student's t-UCL	15.22	Yes	1,320	752	688	Student's t-UCL	8,700	0.12	No	5,600	0.08	No						
TCE	3,000	1,489	1,385	adj Gamma UCL	0.50	430	1,489	1,385	adj Gamma UCL	3.46	No	24.6	18.25	16.64	Student's t-UCL	430	0.01	No	3,000	0.04	No						
cis 1,2-DCE	18,000	1,075	946.5	Student's t-UCL	0.06	>Sat	1,075	946.5	Student's t-UCL	--	No	10.1	7.482	6.807	Student's t-UCL	>Sat	0.00	No	18,000	--	No						
				Total C/RBC	24.21							Total C/RBC	18.69							Total C/RBC	0.13					Total C/RBC	0.12

Notes:
all concentrations expressed as micrograms per liter (µg/L)
-- = insufficient number of detections to calculate UCL
RBC_{wi} = Groundwater vapor intrusion into buildings-Urban Resident
RBC_{we} = Groundwater in an excavation -Construction and Excavation Worker
C/RBC = 95%UCL + RBC

**Table 6. RME Risks and Non-Cancer Hazards-On-Site Groundwater
Edgewood Shopping Center
350-390 East 40th Avenue, Eugene, Oregon 97405
ECSE #4586**

Groundwater Vapor Intrusion into Buildings-Urban Residential Receptors

Chemical	MW-1				MW-2				MW-3				MW-4			
	RBC _{wi}	90%UCL	Basis	CR	90%UCL	Basis	CR	90%UCL	Basis	CR	90%UCL	Basis	CR			
PCE	8,700	4,363	Student's t-UCL	5.0E-07	1,517	Student's t-UCL	1.7E-07	1,018	Student's t-UCL	1.2E-07	4,051	Student's t-UCL	4.7E-07			
TCE	430	50.32	adj Gamma UCL	1.2E-07	13	Student's t-UCL	3.0E-08	8,381	Student's t-UCL	1.9E-08	48.29	adj Gamma UCL	1.1E-07			
cis 1,2-DCE	>Sat	--	--	nc	--	--	--	4,806	Student's t-UCL	--	--	--	--			
TOTAL				6.E-07			2.E-07			1.E-07			6.E-07			

Groundwater Vapor Intrusion into Buildings-Future Occupational Receptors

Chemical	MW-1				MW-2				MW-3				MW-4			
	RBC _{wi}	90%UCL	Basis	CR	90%UCL	Basis	CR	90%UCL	Basis	CR	90%UCL	Basis	CR			
PCE	48,000	4,363	Student's t-UCL	9.1E-08	1,517	Student's t-UCL	3.2E-08	1,018	Student's t-UCL	2.1E-08	4,051	Student's t-UCL	8.4E-08			
TCE	3,700	50.32	adj Gamma UCL	1.4E-08	13	Student's t-UCL	3.5E-09	8,381	Student's t-UCL	2.3E-09	48.29	adj Gamma UCL	1.3E-08			
cis 1,2-DCE	>Sat	--	--	nc	--	--	--	4,806	Student's t-UCL	--	--	--	--			
TOTAL				1.E-07			4.E-08			2.E-08			1.E-07			

Groundwater Volatilization to Outdoor Air-Urban Residential Receptors

Chemical	MW-1				MW-2				MW-3				MW-4			
	RBC _{wo}	90%UCL	Basis	CR	90%UCL	Basis	CR	90%UCL	Basis	CR	90%UCL	Basis	CR			
PCE	150,000	4,363	Student's t-UCL	2.9E-08	1,517	Student's t-UCL	1.0E-08	1,018	Student's t-UCL	6.8E-09	4,051	Student's t-UCL	2.7E-08			
TCE	6,900	50.32	adj Gamma UCL	7.3E-09	13	Student's t-UCL	1.9E-09	8,381	Student's t-UCL	1.2E-09	48.29	adj Gamma UCL	7.0E-09			
cis 1,2-DCE	>Sat	--	--	nc	--	--	nc	4,806	Student's t-UCL	--	--	--	nc			
TOTAL				4.E-08			1.E-08			8.E-09			3.E-08			

MW-5 Groundwater Volatilization to Outdoor Air-Urban Residential Receptors

MW-5R Groundwater Volatilization to Outdoor Air-Urban Residential Receptors

Chemical	Before IRA				After IRA					
	RBC _{wo}	90%UCL	Basis	CR	HQ	Maximum	90%UCL	Basis	CR (Max)	CR (90%UCL)
PCE	150,000	129,384	Student's t-UCL	8.6E-07	--	1,320	688	Student's t-UCL	8.8E-09	4.6E-09
TCE	6,900	1,385	adj Gamma UCL	2.0E-07	--	24.6	16.64	Student's t-UCL	3.6E-09	2.4E-09
cis 1,2-DCE	>Sat	946.5	Student's t-UCL	nc	--	10.1	6.807	Student's t-UCL	nc	--
TOTAL				1.E-06					1.E-08	7.E-09

Notes:

all concentrations expressed as micrograms per liter (µg/L)

RBC_{wi} = Groundwater vapor intrusion into buildings-Urban Resident

RBC_{wo} = Groundwater in an excavation -Construction and Excavation Worker

nc = non-carcinogen

**Table 7. CTE Risks and Non-Cancer Hazards-On-Site Groundwater
Edgewood Shopping Center
350-390 East 40th Avenue, Eugene, Oregon 97405
ECSI #4586**

Groundwater Vapor Intrusion into Buildings-Urban Residential Receptors

Chemical	RBC _{wi}	MW-1		MW-2		MW-3		MW-4	
		Average	CR	Average	CR	Average	CR	Average	CR
PCE	8,700	3,883	4.5E-07	1,289	1.5E-07	927	1.1E-07	3,574	4.1E-07
TCE	430	37.85	8.8E-08	11.65	2.7E-08	7.379	1.7E-08	31.24	7.3E-08
cis 1,2-DCE	>Sat	--	nc	--	--	4.053	--	--	--
			5.E-07		2.E-07		1.E-07		5.E-07

Groundwater Volatilization to Outdoor Air-Urban Residential Receptors

Chemical	RBC _{wo}	MW-1		MW-2		MW-3		MW-4	
		Average	CR	Average	CR	Average	CR	Average	CR
PCE	150,000	3,883	2.6E-08	1,289	8.6E-09	927	6.2E-09	3,574	2.4E-08
TCE	6,900	37.85	5.5E-09	11.65	1.7E-09	7.379	1.1E-09	31.24	4.5E-09
cis 1,2-DCE	>Sat	--	nc	--	nc	4.806	--	--	nc
			3.E-08		1.E-08		7.E-09		3.E-08

Groundwater Volatilization to Outdoor Air-Urban Residential Receptors

Chemical	RBC _{wo}	MW-5 Before IRA			MW-5R After IRA		
		Average	CR	HQ	Average	CR	HQ
PCE	150,000	129,384	8.6E-07	--	496	3.3E-09	--
TCE	6,900	1,385	2.0E-07	--	12	1.7E-09	--
cis 1,2-DCE	>Sat	946.5	nc	--	5	--	--
			1.E-06			5.E-09	

Notes:

all concentrations expressed as micrograms per liter (µg/L)

RBC_{wi} =Groundwater vapor intrusion into buildings-Urban Resident

RBC_{we} = Groundwater in an excavation -Construction and Excavation Worker

nc = non-carcinogen

Table 8. Construction/Excavation Worker Risk-GW in Excavation

MW-5 and MW-5R-Source Area

RME Risks After IRA

CTE Risks After IRA

Chemical	RBC _{wo}	Max	Average	90%UCL	Basis	CR Max	CR 90% UCL	Average
PCE	5,600	1,320	496	4,363	Student's t-UCL	2.4E-07	7.8E-07	8.9E-08
TCE	3,000	25	12	50.32	adj Gamma UCL	8.2E-09	1.7E-08	4.0E-09
cis 1,2-DCE	18,000	10	5	6.807	Student's t-UCL	nc	nc	nc
						2.E-07	8.E-07	9.E-08

MW-5 RME Risks Before IRA

MW-5 CTE Risks Before IRA

Chemical	RBC _{wo}	Max	Average	90%UCL	Basis	CR Max	CR 90% UCL	Average
PCE	5,600	150,000	120,778	129,394	Student's t-UCL	2.7E-05	2.3E-05	2.2E-05
TCE	3,000	2,500	1,071	1,385	adj Gamma UCL	8.33333E-07	4.6E-07	3.6E-07
cis 1,2-DCE	18,000	42	25	**	Student's t-UCL	nc	nc	nc
						3.E-05	2.E-05	2.E-05

RME Construction/Excavation Worker Risk- Groundwater in Excavation-Non-Source Area Wells

MW-1

MW-2

MW-3

MW-4

Chemical	RBC _{wo}	90%UCL	Basis	CR	90%UCL	Basis	CR	90%UCL	Basis	CR	90%UCL	Basis	CR
PCE	5,600	4,363	Student's t-UCL	7.8E-07	1,517	Student's t-UCL	2.7E-07	1,018	Student's t-UCL	1.8E-07	4.051	Student's t-UCL	7.2E-07
TCE	3,000	50.32	adj Gamma UCL	1.7E-08	13	Student's t-UCL	4.3E-09	8.381	Student's t-UCL	2.8E-09	48.29	adj Gamma UCL	1.6E-08
cis 1,2-DCE	18,000	--	--	nc	--	--	--	4.806	Student's t-UCL	--	--	--	--
TOTAL				8.E-07					3.E-07	2.E-07			
													7.E-07

Notes:
 all concentrations expressed as micrograms per liter (µg/L)
 RME = reasonable maximum exposure
 CTE = central tendency exposure
 ** = Unable to calculate UCL due to elevated reporting limits.

Table 9. Indoor Air Dataset-Tenant Spaces- June 17, 2009
Edgewood Shopping Center
350-390 East 40th Avenue, Eugene, Oregon 97405
ECSI #4586

EPA Method TO-15	DEQ RBCs	Vet Clinic	Vet Clinic Dup	Flower Shop	Deli Shop	Produce Only	Breeden Off	Taqueria	Cleaners	Ambient Air
ANALYTE	($\mu\text{g}/\text{m}^3$)	IA-1	IA-1 DUP	IA-2	IA-3	IA-4	IA-5	IA-6	IA-7	AA
Vinyl Chloride	2.8	<0.043	<0.043	<0.044	<0.046	<0.045	<0.042	<0.049	<0.055	<0.055
1,1-dichloroethene	880	<0.067	<0.067	<0.068	<0.071	<0.069	<0.065	<0.076	<0.086	<0.086
1,1-dichloroethane	7.7	<0.14	<0.14	<0.14	<0.14	<1.4	<0.13	<0.15	<0.18	<0.18
<i>cis</i> -1,2-dichloroethene	>Pv	<0.13	<0.13	<0.14	0.40	<1.4	<0.13	<0.15	<0.17	<0.17
1,1,1-trichloroethane	22,000	<0.18	<0.18	<0.19	<0.20	<0.19	0.28	<0.21	<0.24	<0.24
Benzene	1.5	1	1	0.88	0.85	0.56	0.44	0.59	0.78	1.0
1,2-dichloroethane	0.47	0.48	0.49	0.57	<0.14	0.14	<0.13	<0.15	<0.18	0.18
Trichloroethene	2.90	<0.18	<0.18	<0.18	0.76	<0.19	<0.18	<0.20	<0.23	<0.23
Toluene	20,000	31	31	22	7.2	9.3	2.1	2.4	2.5	12
Tetrachloroethene	47	1.3	1.3	0.44	<0.24	<0.24	<0.22	0.52	9.6	<0.29
Ethylbenzene	4.9	2.7	2.8	1.4	0.44	0.71	0.17	0.23	0.33	0.84
m,p-xylene	440	4.2	4.4	3.0	1.1	1.5	0.48	0.59	0.71	1.5
o-xylene	440	1.5	1.5	1.2	0.38	0.50	0.15	0.21	0.31	0.52
1,1,1,2-tetrachloroethane	ne	<0.23	<0.23	<0.23	<0.24	<0.24	<0.22	<0.26	<0.30	<0.30
<i>trans</i> -1,2-dichloroethene	>Pv	<0.67	<0.67	<0.68	<0.71	<0.69	<0.65	<0.76	<0.86	<0.86
1,4-dichlorobenzene	1.1	<0.20	<0.20	0.20	0.28	<0.21	0.54	0.24	<0.26	<0.26
Carbon tetrachloride	2	0.6	0.59	0.51	0.57	0.53	0.54	0.54	0.52	0.50
Methylene chloride	1,200	2.6	2.6	1.6	<1.2	<1.2	1.4	<1.3	<1.5	<1.5
1,2-dibromoethane	0.020	<0.26	<0.26	<0.26	<0.28	<0.27	<0.25	<0.29	<0.33	<0.33

Notes

All results expressed as micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)
Oregon DEQ Risk Based Concentrations-Air in Occupational Use ($\mu\text{g}/\text{m}^3$), May 2018

Table 10. Indoor Air Cancer Risk Estimates-Tenant Spaces
 Edgewood Shopping Center
 350-390 East 40th Avenue, Eugene, Oregon 97405
 ECSI #4586

November 19, 2008

EPA Method TO-15	DEQ RBCs ¹	Breeden Office	CR	Cleaners	CR
ANALYTE					
Trichloroethene	2.90	0.084	2.9E-08	<0.18	6.2E-08
Tetrachloroethene	47	0.52	1.1E-08	2.6	5.5E-08
TOTAL			4.E-08		1.E-07

June 17, 2009

EPA Method TO-15	DEQ RBCs ¹	Vet Clinic		Flower Shop		Deli Shop		Produce Only		Breeden Off		Taqueria		Cleaners	
ANALYTE	(µg/m ³)	IA-1	CR	IA-2	CR	IA-3	CR	IA-4	CR	IA-5	CR	IA-6	CR	IA-7	CR
Trichloroethene	2.90	<0.18	6.2E-08	<0.18	6.2E-08	0.76	2.6E-07	<0.19	6.6E-08	<0.18	6.2E-08	<0.20	6.9E-08	<0.23	7.9E-08
Tetrachloroethene	47	1.3	2.8E-08	0.44	9.4E-09	<0.24	5.1E-09	<0.24	5.1E-09	<0.22	4.7E-09	0.52	1.1E-08	9.6	2.0E-07
TOTAL			9.E-08		7.E-08		3.E-07		7.E-08		7.E-08		8.E-08		3.E-07

Notes:

All results expressed as micrograms per cubic meter (µg/m³)

¹ = Oregon DEQ Risk Based Concentrations-Air in Occupational Use (µg/m³), May 2018

TABLE 11. INDOOR AIR SAMPLE RESULTS
EDGEWOOD SHOPPING CENTER-OFFSITE PROPERTIES
February and November 2010

COMPOUND	DEQ RBC Air Residential	Day Care CS-1 ¹		Office/4023D	AA-1		AA-1 Lab Dup	AA-2		IA-1		AA-3		IA-2		IA-3		IA-4		IA-8		IA-9		IA-10		IA-10 Lab Dup	IA-11	
		Feb-10	Nov-10	Feb-10	Feb-10	Nov-10	Feb-10	Feb-10	Feb-10	Nov-10	Feb-10	Nov-10	Feb-10	Nov-10	Feb-10	Nov-10	Feb-10	Nov-10	Feb-10	Nov-10	Feb-10	Nov-10	Feb-10	Nov-10	Feb-10	Nov-10	Feb-10	Nov-10
Vinyl Chloride	0.2	<0.046	0.15	<0.043	<0.043	<0.043	<0.043	<0.051	<0.046	<0.043	<0.044	<0.043	<0.047	<0.051	<0.045	<0.045	<0.043	<0.11	<0.043	<0.041	<0.046	0.067	<0.15	<0.080	<0.044	<0.041		
1,1-Dichloroethene	210	<0.071	<0.067	<0.067	<0.067	<0.067	<0.067	<0.080	<0.071	<0.067	<0.068	<0.067	<0.072	<0.080	<0.069	<0.069	<0.067	<0.17	<0.067	<0.064	<0.071	0.19	<0.23	0.17	<0.068	<0.064		
1,1-Dichloroethane	4.1	0.19	<0.14	<0.14	<0.14	<0.14	<0.14	<0.16	<0.14	<0.14	<0.14	<0.14	<0.15	<0.16	<0.14	<0.14	<0.14	<0.34	<0.14	<0.13	<0.14	<0.15	<0.47	<0.25	<0.14	<0.13		
cis-1,2-Dichloroethene	NE ²	<0.14	<0.13	<0.13	<0.13	<0.13	<0.13	<0.16	<0.14	<0.13	<0.14	<0.13	<0.14	<0.16	<0.14	<0.14	<0.13	<0.33	<0.13	<0.13	<0.14	<0.15	<0.46	<0.25	<0.14	<0.13		
1,1,1-Trichloroethane	5,200	<0.20	<0.18	<0.18	<0.18	<0.18	<0.18	<0.22	0.25	0.30	<0.19	<0.18	<0.20	<0.22	<0.19	<0.19	<0.18	<0.46	<0.18	<0.18	<0.20	0.52	<0.64	0.52	<0.19	<0.18		
Benzene	0.85	2.2	0.90	0.50	0.82	0.87	0.80	0.83	3.1	0.57	1.5	0.55	1.9	1.1	1.0	1.3	1.4	0.76	13	2.7	12	1.1	<0.93	1.1	0.70	0.46		
1,2-Dichloroethane	0.26	<0.14	<0.14	<0.14	0.17	<0.14	<0.14	<0.16	10	9.3	<0.14	<0.14	7.4	8.4	0.17	0.56	<0.14	<0.34	0.26	<0.13	0.27	1.0	<0.47	1.1	0.21	<0.13		
Trichloroethene	0.074	0.23	<0.18	<0.18	0.42	<0.18	0.40	<0.22	<0.19	<0.18	<0.18	<0.18	<0.20	<0.22	<0.19	<0.19	<0.18	<0.45	<0.18	<0.17	<0.19	2.3	<0.63	2.3	<0.18	<0.17		
Toluene	5,200	6.1	4.3	5.9	14	1.2	14	2.6	18	52	3.8	0.99	46	100	6.2	3.5	11	12	34	10	31	13	61	12	7.6	1.9		
Tetrachloroethene	1.1	0.51	0.55	0.33	4.1	<0.23	4.0	<0.27	0.25	<0.23	<0.23	<0.23	8.5	8.6	4.9	3.4	<0.23	<0.57	0.82	0.87	0.86	1.1	<0.79	1.1	0.31	<0.22		
Ethyl Benzene	2.7	0.80	0.49	0.28	1.1	0.20	1.0	0.45	3.5	2.5	0.57	0.16	1.4	2.5	0.81	0.40	0.54	<0.36	4.6	1.9	4.1	0.80	0.78	0.83	0.48	0.87		
m,p-Xylene	100	2.2	1.5	0.83	1.9	0.57	1.8	1.1	13	11	1.9	0.38	3.2	6.4	1.8	0.73	1.4	0.79	14	6.7	13	2.2	2.0	2.1	1.1	1.1		
o-Xylene	100	0.71	0.64 ^(J)	0.29 ^(J)	0.56	0.23 ^(J)	0.52	0.37	3.7	2.8 ^(J)	0.69	<0.14	1.3	1.9	0.68	0.40 ^(J)	0.50	<0.36	4.4	2.3	3.9	0.78	0.64 ^(J)	0.74	0.38	0.39 ^(J)		
1,1,2,2-Tetrachloroethane	NE	<0.24	<0.23	<0.23	<0.23	<0.23	<0.23	<0.28	<0.24	<0.23	<0.23	<0.23	<0.25	<0.28	<0.24	<0.24	<0.23	<0.58	<0.23	<0.22	<0.24	<0.26	<0.80	<0.43	<0.23	<0.22		
trans-1,2-Dichloroethene	63	<0.71	<0.67	<0.67	<0.67	<0.67	<0.67	<0.80	<0.71	<0.67	<0.68	<0.67	<0.72	<0.80	<0.69	<0.69	<0.67	<1.7	<0.67	<0.64	<0.71	<0.74	<2.3	<1.2	<0.68	<0.64		
1,4-Dichlorobenzene	0.6	<0.22	<0.20	<0.20	<0.20	<0.20	<0.20	<0.24	13	20	<0.20	<0.20	<0.22	<1.2	<0.21	<0.21	<0.20	<0.50	<0.20	<0.97	<0.22	<0.22	<0.70	<0.38	<0.20	<0.19		
Carbon Tetrachloride	0.44	0.59	0.75	0.54	0.65	0.50	0.60	0.57	1.4	1.5	0.56	0.60	1.2	0.53	0.89	0.57	0.68	0.54	0.59	0.23	0.61	0.61	1.0	0.62	0.63	0.50		
Methylene Chloride	14	<1.2	1.2	<1.2	<1.2	<1.2	<1.2	4.5	7.5	6.0	<1.2	<1.2	<1.3	<1.4	<1.2	<1.2	<1.2	<2.9	1.4	<1.1	<1.2	<1.3	<4.0	<2.2	<1.2	<1.1		
1,2-Dibromoethane (EDB)	0.011	<0.28	<0.26	<0.26	<0.26	<0.26	<0.26	<0.31	<0.28	<0.26	<0.26	<0.26	<0.28	<0.31	<0.27	<0.27	<0.26	<0.64	<0.26	<0.25	<0.28	<0.29	<0.90	<0.48	<0.26	<0.25		

All results expressed as micrograms per cubic meter (µg/m³)

1. Crawlspace (CS) air samples are considered to represent anticipated concentrations in indoor air.

2. Not Established

J. Data are considered to be estimates.

Values in red exceed RBC for air-Urban Residential Use

**TABLE 12. SUB-SLAB SOIL GAS RESULTS
EDGEWOOD VILLA CONDOMINIUMS
December and March 2010**

ANALYTE	RBCs-Soil Gas Urban Residential ($\mu\text{g}/\text{m}^3$) ¹	SS-1		SS-3		SS-4		SS-5		SS- Storage RM
		Feb-10	Nov-10	Feb-10	Nov-10	Feb-10	Nov-10	Feb-10	Nov-10	Nov-10
Vinyl Chloride	41	<2.9	<3.0	<2.9	<3.4	<2.8	<3.0	<3.0	<2.9	<3.0
1,1-Dichloroethene	42,000	<4.5	<4.6	<4.4	<5.3	<4.3	<4.6	<4.6	<4.4	<4.7
Methylene Chloride	2,800	<4.0	<4.0	<3.9	<4.6	<3.8	<4.0	<4.1	<3.9	12
trans-1,2-Dichloroethene	13,000	<4.5	<4.6	<4.4	<5.3	<4.3	<4.6	<4.6	<4.4	<4.7
1,1-Dichloroethane	830	<4.6	<4.7	<4.5	<5.4	<4.4	<4.7	<4.8	<4.5	<4.8
cis-1,2-Dichloroethene	NE	<4.5	<4.6	<4.4	<5.3	<4.3	<4.6	<4.6	<4.4	<4.7
1,1,1-Trichloroethane	1,000,000	<6.2	<6.4	<6.1	<7.2	<5.9	<6.4	<6.4	<6.1	<6.5
Carbon Tetrachloride	88	<7.2	<7.3	<7.0	<8.4	<6.8	<7.3	<7.4	<7.0	<7.4
Benzene	170	<3.6	<3.7	<3.6	<4.2	<3.5	<3.7	<3.8	<3.6	<3.8
1,2-Dichloroethane	51	<4.6	<4.7	<4.5	<5.4	<4.4	<4.7	<4.8	<4.5	<4.8
Trichloroethene	15	9.4	<6.3	<6.0	<7.1	8.3	<6.3	7.6	<6.0	<6.4
Toluene	1,000,000	<4.3	75	<4.2	17	<4.1	99	<4.4	28	58
Tetrachloroethene	220	20	13	<7.6	35	<7.4	<7.9	<8.0	<7.6	<8.0
1,2-Dibromoethane (EDB)	2.2	<8.8	<9.0	<8.6	<10	<8.4	<9.0	<9.0	<8.6	<9.1
Ethyl Benzene	530	<4.9	35	<4.9	9.5	<4.7	57	<5.1	19	40
m,p-Xylene	21,000	<5.0	87	<4.9	25	<4.7	150	<5.1	29	110
o-Xylene	21,000	<5.0	12	<4.9	<5.8	<4.7	22	<5.1	<4.9	16
1,1,2,2-Tetrachloroethane	NE	<7.8	<8.0	<7.7	<9.1	<7.5	<8.0	<8.1	<7.7	<8.1
1,4-Dichlorobenzene	120	<6.8	<7.0	<6.7	<8.0	<6.6	<7.0	<7.1	<6.7	<7.1
Chlorobenzene	10,000	<5.2	<5.4	<5.2	<6.1	<5.0	<5.4	<5.4	<5.2	<5.4
Methyl tert-butyl ether	5,100	<4.1	<4.2	<4.0	<4.8	<3.9	<4.2	<4.2	<4.0	<4.3
1,2,4-Trichlorobenzene	NE	<34	<34	<33	<39	<32	<34	<35	<33	<35
1,2-Dichlorobenzene	42,000	<6.8	<7.0	<6.7	<8.0	<6.6	<7.0	<7.1	<6.7	<7.1
Helium (%)	NE	2.9	<0.23	<0.11	<0.23	<0.11	<0.23	<0.12	<0.23	<0.23

All results expressed as micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)
1. Oregon DEQ Risk-Based Concentration-September 15, 2009

APPENDIX A

PROUCL OUTPUTS

A	B	C	D	E	F	G	H	I	J	K	L	
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation	ProUCL 5.2 4/6/2023 9:19:21 AM										
5	From File	WorkSheet.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	90%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	MW-2 PCE											
12												
13	General Statistics											
14	Total Number of Observations	14						Number of Distinct Observations	13			
15								Number of Missing Observations	0			
16	Minimum	640						Mean	1289			
17	Maximum	2450						Median	938.5			
18	SD	630.7						Std. Error of Mean	168.6			
19	Coefficient of Variation	0.489						Skewness	0.595			
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic	0.858						Shapiro Wilk GOF Test				
23	1% Shapiro Wilk Critical Value	0.825						Data appear Normal at 1% Significance Level				
24	Lilliefors Test Statistic	0.278						Lilliefors GOF Test				
25	1% Lilliefors Critical Value	0.263						Data Not Normal at 1% Significance Level				
26	Data appear Approximate Normal at 1% Significance Level											
27												
28	Assuming Normal Distribution											
29	90% Normal UCL					90% UCLs (Adjusted for Skewness)						
30	90% Student's-t UCL	1517						90% Adjusted-CLT UCL (Chen-1995)	1525			
31								90% Modified-t UCL (Johnson-1978)	1521			
32												
33	Gamma GOF Test											
34	A-D Test Statistic	0.823						Anderson-Darling Gamma GOF Test				
35	5% A-D Critical Value	0.739						Data Not Gamma Distributed at 5% Significance Level				
36	K-S Test Statistic	0.255						Kolmogorov-Smirnov Gamma GOF Test				
37	5% K-S Critical Value	0.229						Data Not Gamma Distributed at 5% Significance Level				
38	Data Not Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)	4.706						k star (bias corrected MLE)	3.745			
42	Theta hat (MLE)	274						Theta star (bias corrected MLE)	344.3			
43	nu hat (MLE)	131.8						nu star (bias corrected)	104.9			
44	MLE Mean (bias corrected)	1289						MLE Sd (bias corrected)	666.3			
45								Approximate Chi Square Value (0.1)	86.78			
46	Adjusted Level of Significance	0.0781						Adjusted Chi Square Value	85.05			
47												
48	Assuming Gamma Distribution											
49	90% Approximate Gamma UCL	1558						90% Adjusted Gamma UCL	1590			
50												

A	B	C	D	E	F	G	H	I	J	K	L
51	Lognormal GOF Test										
52	Shapiro Wilk Test Statistic			0.881		Shapiro Wilk Lognormal GOF Test					
53	10% Shapiro Wilk Critical Value			0.895		Data Not Lognormal at 10% Significance Level					
54	Lilliefors Test Statistic			0.23		Lilliefors Lognormal GOF Test					
55	10% Lilliefors Critical Value			0.208		Data Not Lognormal at 10% Significance Level					
56	Data Not Lognormal at 10% Significance Level										
57											
58	Lognormal Statistics										
59	Minimum of Logged Data			6.461		Mean of logged Data				7.052	
60	Maximum of Logged Data			7.804		SD of logged Data				0.485	
61											
62	Assuming Lognormal Distribution										
63	90% H-UCL			1596		90% Chebyshev (MVUE) UCL				1800	
64	95% Chebyshev (MVUE) UCL			2033		97.5% Chebyshev (MVUE) UCL				2356	
65	99% Chebyshev (MVUE) UCL			2990							
66											
67	Nonparametric Distribution Free UCL Statistics										
68	Data appear to follow a Discernible Distribution										
69											
70	Nonparametric Distribution Free UCLs										
71	90% CLT UCL			1505		90% BCA Bootstrap UCL				1514	
72	90% Standard Bootstrap UCL			1502		90% Bootstrap-t UCL				1536	
73	90% Hall's Bootstrap UCL			1502		90% Percentile Bootstrap UCL				1505	
74	90% Chebyshev(Mean, Sd) UCL			1795		95% Chebyshev(Mean, Sd) UCL				2024	
75	97.5% Chebyshev(Mean, Sd) UCL			2342		99% Chebyshev(Mean, Sd) UCL				2967	
76											
77	Suggested UCL to Use										
78	Recommendation Provided only for 95% Confidence Coefficient										
79											
80											
81	MW-2 TCE										
82											
83	General Statistics										
84	Total Number of Observations			14		Number of Distinct Observations				12	
85						Number of Missing Observations				0	
86	Minimum			5		Mean				11.65	
87	Maximum			27		Median				8.065	
88	SD			7.718		Std. Error of Mean				2.063	
89	Coefficient of Variation			0.662		Skewness				1.116	
90											
91	Normal GOF Test										
92	Shapiro Wilk Test Statistic			0.809		Shapiro Wilk GOF Test					
93	1% Shapiro Wilk Critical Value			0.825		Data Not Normal at 1% Significance Level					
94	Lilliefors Test Statistic			0.229		Lilliefors GOF Test					
95	1% Lilliefors Critical Value			0.263		Data appear Normal at 1% Significance Level					
96	Data appear Approximate Normal at 1% Significance Level										
97											

	A	B	C	D	E	F	G	H	I	J	K	L
98	Assuming Normal Distribution											
99	90% Normal UCL						90% UCLs (Adjusted for Skewness)					
100	90% Student's-t UCL				14.44		90% Adjusted-CLT UCL (Chen-1995)				14.73	
101							90% Modified-t UCL (Johnson-1978)				14.54	
102												
103	Gamma GOF Test											
104	A-D Test Statistic				0.752		Anderson-Darling Gamma GOF Test					
105	5% A-D Critical Value				0.743		Data Not Gamma Distributed at 5% Significance Level					
106	K-S Test Statistic				0.192		Kolmogorov-Smirnov Gamma GOF Test					
107	5% K-S Critical Value				0.231		Detected data appear Gamma Distributed at 5% Significance Level					
108	Detected data follow Appr. Gamma Distribution at 5% Significance Level											
109												
110	Gamma Statistics											
111	k hat (MLE)				2.924		k star (bias corrected MLE)				2.345	
112	Theta hat (MLE)				3.985		Theta star (bias corrected MLE)				4.969	
113	nu hat (MLE)				81.87		nu star (bias corrected)				65.66	
114	MLE Mean (bias corrected)				11.65		MLE Sd (bias corrected)				7.609	
115							Approximate Chi Square Value (0.1)				51.47	
116	Adjusted Level of Significance				0.0781		Adjusted Chi Square Value				50.15	
117												
118	Assuming Gamma Distribution											
119	90% Approximate Gamma UCL				14.86		90% Adjusted Gamma UCL				15.26	
120												
121	Lognormal GOF Test											
122	Shapiro Wilk Test Statistic				0.891		Shapiro Wilk Lognormal GOF Test					
123	10% Shapiro Wilk Critical Value				0.895		Data Not Lognormal at 10% Significance Level					
124	Lilliefors Test Statistic				0.158		Lilliefors Lognormal GOF Test					
125	10% Lilliefors Critical Value				0.208		Data appear Lognormal at 10% Significance Level					
126	Data appear Approximate Lognormal at 10% Significance Level											
127												
128	Lognormal Statistics											
129	Minimum of Logged Data				1.609		Mean of logged Data				2.275	
130	Maximum of Logged Data				3.296		SD of logged Data				0.605	
131												
132	Assuming Lognormal Distribution											
133	90% H-UCL				15.34		90% Chebyshev (MVUE) UCL				17.31	
134	95% Chebyshev (MVUE) UCL				19.93		97.5% Chebyshev (MVUE) UCL				23.58	
135	99% Chebyshev (MVUE) UCL				30.75							
136												
137	Nonparametric Distribution Free UCL Statistics											
138	Data appear to follow a Discernible Distribution											
139												
140	Nonparametric Distribution Free UCLs											
141	90% CLT UCL				14.3		90% BCA Bootstrap UCL				14.59	
142	90% Standard Bootstrap UCL				14.17		90% Bootstrap-t UCL				14.96	
143	90% Hall's Bootstrap UCL				14.25		90% Percentile Bootstrap UCL				14.21	
144	90% Chebyshev(Mean, Sd) UCL				17.84		95% Chebyshev(Mean, Sd) UCL				20.64	
145	97.5% Chebyshev(Mean, Sd) UCL				24.53		99% Chebyshev(Mean, Sd) UCL				32.18	
146												
147	Suggested UCL to Use											
148	Recommendation Provided only for 95% Confidence Coefficient											

A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets										
2											
3	User Selected Options										
4	Date/Time of Computation		ProUCL 5.2 4/6/2023 9:08:07 AM								
5	From File		WorkSheet.xls								
6	Full Precision		OFF								
7	Confidence Coefficient		95%								
8	Number of Bootstrap Operations		2000								
9											
10											
11	MW-2 PCE										
12											
13	General Statistics										
14	Total Number of Observations			14		Number of Distinct Observations			13		
15							Number of Missing Observations			0	
16	Minimum			640		Mean			1289		
17	Maximum			2450		Median			938.5		
18	SD			630.7		Std. Error of Mean			168.6		
19	Coefficient of Variation			0.489		Skewness			0.595		
20											
21	Normal GOF Test										
22	Shapiro Wilk Test Statistic			0.858		Shapiro Wilk GOF Test					
23	1% Shapiro Wilk Critical Value			0.825		Data appear Normal at 1% Significance Level					
24	Lilliefors Test Statistic			0.278		Lilliefors GOF Test					
25	1% Lilliefors Critical Value			0.263		Data Not Normal at 1% Significance Level					
26	Data appear Approximate Normal at 1% Significance Level										
27											
28	Assuming Normal Distribution										
29	95% Normal UCL					95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL			1588		95% Adjusted-CLT UCL (Chen-1995)			1595		
31							95% Modified-t UCL (Johnson-1978)			1592	
32											
33	Gamma GOF Test										
34	A-D Test Statistic			0.823		Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value			0.739		Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic			0.255		Kolmogorov-Smirnov Gamma GOF Test					
37	5% K-S Critical Value			0.229		Data Not Gamma Distributed at 5% Significance Level					
38	Data Not Gamma Distributed at 5% Significance Level										
39											
40	Gamma Statistics										
41	k hat (MLE)			4.706		k star (bias corrected MLE)			3.745		
42	Theta hat (MLE)			274		Theta star (bias corrected MLE)			344.3		
43	nu hat (MLE)			131.8		nu star (bias corrected)			104.9		
44	MLE Mean (bias corrected)			1289		MLE Sd (bias corrected)			666.3		
45							Approximate Chi Square Value (0.05)			82.23	
46	Adjusted Level of Significance			0.0312		Adjusted Chi Square Value			79.58		
47											

A	B	C	D	E	F	G	H	I	J	K	L
48	Assuming Gamma Distribution										
49	95% Approximate Gamma UCL				1644		95% Adjusted Gamma UCL				1699
50											
51	Lognormal GOF Test										
52	Shapiro Wilk Test Statistic				0.881		Shapiro Wilk Lognormal GOF Test				
53	10% Shapiro Wilk Critical Value				0.895		Data Not Lognormal at 10% Significance Level				
54	Lilliefors Test Statistic				0.23		Lilliefors Lognormal GOF Test				
55	10% Lilliefors Critical Value				0.208		Data Not Lognormal at 10% Significance Level				
56	Data Not Lognormal at 10% Significance Level										
57											
58	Lognormal Statistics										
59	Minimum of Logged Data				6.461		Mean of logged Data				7.052
60	Maximum of Logged Data				7.804		SD of logged Data				0.485
61											
62	Assuming Lognormal Distribution										
63	95% H-UCL				1701		90% Chebyshev (MVUE) UCL				1800
64	95% Chebyshev (MVUE) UCL				2033		97.5% Chebyshev (MVUE) UCL				2356
65	99% Chebyshev (MVUE) UCL				2990						
66											
67	Nonparametric Distribution Free UCL Statistics										
68	Data appear to follow a Discernible Distribution										
69											
70	Nonparametric Distribution Free UCLs										
71	95% CLT UCL				1567		95% BCA Bootstrap UCL				1574
72	95% Standard Bootstrap UCL				1563		95% Bootstrap-t UCL				1628
73	95% Hall's Bootstrap UCL				1548		95% Percentile Bootstrap UCL				1562
74	90% Chebyshev(Mean, Sd) UCL				1795		95% Chebyshev(Mean, Sd) UCL				2024
75	97.5% Chebyshev(Mean, Sd) UCL				2342		99% Chebyshev(Mean, Sd) UCL				2967
76											
77	Suggested UCL to Use										
78	95% Student's-t UCL				1588						
79											
80	When a data set follows an approximate distribution passing only one of the GOF tests,										
81	it is suggested to use a UCL based upon a distribution passing both GOF tests in ProUCL										
82											
83	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
84	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.										
85	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.										
86											
87											
88	MW-2 TCE										
89											
90	General Statistics										
91	Total Number of Observations				14		Number of Distinct Observations				12
92							Number of Missing Observations				0
93	Minimum				5		Mean				11.65
94	Maximum				27		Median				8.065
95	SD				7.718		Std. Error of Mean				2.063
96	Coefficient of Variation				0.662		Skewness				1.116
97											
98	Normal GOF Test										
99	Shapiro Wilk Test Statistic				0.809		Shapiro Wilk GOF Test				

A	B	C	D	E	F	G	H	I	J	K	L
100			1% Shapiro Wilk Critical Value		0.825		Data Not Normal at 1% Significance Level				
101			Lilliefors Test Statistic		0.229		Lilliefors GOF Test				
102			1% Lilliefors Critical Value		0.263		Data appear Normal at 1% Significance Level				
103			Data appear Approximate Normal at 1% Significance Level								
104											
105			Assuming Normal Distribution								
106			95% Normal UCL				95% UCLs (Adjusted for Skewness)				
107			95% Student's-t UCL		15.3		95% Adjusted-CLT UCL (Chen-1995)			15.7	
108							95% Modified-t UCL (Johnson-1978)			15.41	
109											
110			Gamma GOF Test								
111			A-D Test Statistic		0.752		Anderson-Darling Gamma GOF Test				
112			5% A-D Critical Value		0.743		Data Not Gamma Distributed at 5% Significance Level				
113			K-S Test Statistic		0.192		Kolmogorov-Smirnov Gamma GOF Test				
114			5% K-S Critical Value		0.231		Detected data appear Gamma Distributed at 5% Significance Level				
115			Detected data follow Appr. Gamma Distribution at 5% Significance Level								
116											
117			Gamma Statistics								
118			k hat (MLE)		2.924		k star (bias corrected MLE)			2.345	
119			Theta hat (MLE)		3.985		Theta star (bias corrected MLE)			4.969	
120			nu hat (MLE)		81.87		nu star (bias corrected)			65.66	
121			MLE Mean (bias corrected)		11.65		MLE Sd (bias corrected)			7.609	
122							Approximate Chi Square Value (0.05)			48.02	
123			Adjusted Level of Significance		0.0312		Adjusted Chi Square Value			46.02	
124											
125			Assuming Gamma Distribution								
126			95% Approximate Gamma UCL		15.93		95% Adjusted Gamma UCL			16.63	
127											
128			Lognormal GOF Test								
129			Shapiro Wilk Test Statistic		0.891		Shapiro Wilk Lognormal GOF Test				
130			10% Shapiro Wilk Critical Value		0.895		Data Not Lognormal at 10% Significance Level				
131			Lilliefors Test Statistic		0.158		Lilliefors Lognormal GOF Test				
132			10% Lilliefors Critical Value		0.208		Data appear Lognormal at 10% Significance Level				
133			Data appear Approximate Lognormal at 10% Significance Level								
134											
135			Lognormal Statistics								
136			Minimum of Logged Data		1.609		Mean of logged Data			2.275	
137			Maximum of Logged Data		3.296		SD of logged Data			0.605	
138											
139			Assuming Lognormal Distribution								
140			95% H-UCL		16.93		90% Chebyshev (MVUE) UCL			17.31	
141			95% Chebyshev (MVUE) UCL		19.93		97.5% Chebyshev (MVUE) UCL			23.58	
142			99% Chebyshev (MVUE) UCL		30.75						
143											
144			Nonparametric Distribution Free UCL Statistics								
145			Data appear to follow a Discernible Distribution								
146											

	A	B	C	D	E	F	G	H	I	J	K	L
147	Nonparametric Distribution Free UCLs											
148						95% CLT UCL	15.04				95% BCA Bootstrap UCL	15.51
149						95% Standard Bootstrap UCL	14.89				95% Bootstrap-t UCL	16.38
150						95% Hall's Bootstrap UCL	14.99				95% Percentile Bootstrap UCL	15.2
151						90% Chebyshev(Mean, Sd) UCL	17.84				95% Chebyshev(Mean, Sd) UCL	20.64
152						97.5% Chebyshev(Mean, Sd) UCL	24.53				99% Chebyshev(Mean, Sd) UCL	32.18
153												
154	Suggested UCL to Use											
155						95% Student's-t UCL	15.3					
156												
157	When a data set follows an approximate distribution passing only one of the GOF tests,											
158	it is suggested to use a UCL based upon a distribution passing both GOF tests in ProUCL											
159												
160	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
161	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.											
162	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
163												

A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets										
2											
3	User Selected Options										
4	Date/Time of Computation		ProUCL 5.2 4/6/2023 9:26:24 AM								
5	From File		WorkSheet_a.xls								
6	Full Precision		OFF								
7	Confidence Coefficient		90%								
8	Number of Bootstrap Operations		2000								
9											
10											
11	MW-3 PCE										
12											
13	General Statistics										
14	Total Number of Observations			16		Number of Distinct Observations			16		
15							Number of Missing Observations			0	
16	Minimum			570		Mean			926.6		
17	Maximum			1660		Median			850		
18	SD			272.9		Std. Error of Mean			68.23		
19	Coefficient of Variation			0.295		Skewness			1.329		
20											
21	Normal GOF Test										
22	Shapiro Wilk Test Statistic			0.904		Shapiro Wilk GOF Test					
23	1% Shapiro Wilk Critical Value			0.844		Data appear Normal at 1% Significance Level					
24	Lilliefors Test Statistic			0.159		Lilliefors GOF Test					
25	1% Lilliefors Critical Value			0.248		Data appear Normal at 1% Significance Level					
26	Data appear Normal at 1% Significance Level										
27											
28	Assuming Normal Distribution										
29	90% Normal UCL					90% UCLs (Adjusted for Skewness)					
30	90% Student's-t UCL			1018		90% Adjusted-CLT UCL (Chen-1995)			1030		
31							90% Modified-t UCL (Johnson-1978)			1022	
32											
33	Gamma GOF Test										
34	A-D Test Statistic			0.28		Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value			0.738		Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic			0.136		Kolmogorov-Smirnov Gamma GOF Test					
37	5% K-S Critical Value			0.215		Detected data appear Gamma Distributed at 5% Significance Level					
38	Detected data appear Gamma Distributed at 5% Significance Level										
39											
40	Gamma Statistics										
41	k hat (MLE)			13.94		k star (bias corrected MLE)			11.37		
42	Theta hat (MLE)			66.46		Theta star (bias corrected MLE)			81.5		
43	nu hat (MLE)			446.2		nu star (bias corrected)			363.8		
44	MLE Mean (bias corrected)			926.6		MLE Sd (bias corrected)			274.8		
45							Approximate Chi Square Value (0.1)			329.7	
46	Adjusted Level of Significance			0.0809		Adjusted Chi Square Value			326.8		
47											
48	Assuming Gamma Distribution										
49	90% Approximate Gamma UCL			1022		90% Adjusted Gamma UCL			1032		
50											

A	B	C	D	E	F	G	H	I	J	K	L
51	Lognormal GOF Test										
52	Shapiro Wilk Test Statistic			0.974		Shapiro Wilk Lognormal GOF Test					
53	10% Shapiro Wilk Critical Value			0.906		Data appear Lognormal at 10% Significance Level					
54	Lilliefors Test Statistic			0.118		Lilliefors Lognormal GOF Test					
55	10% Lilliefors Critical Value			0.196		Data appear Lognormal at 10% Significance Level					
56	Data appear Lognormal at 10% Significance Level										
57											
58	Lognormal Statistics										
59	Minimum of Logged Data			6.346		Mean of logged Data			6.795		
60	Maximum of Logged Data			7.415		SD of logged Data			0.272		
61											
62	Assuming Lognormal Distribution										
63	90% H-UCL			1023		90% Chebyshev (MVUE) UCL			1116		
64	95% Chebyshev (MVUE) UCL			1202		97.5% Chebyshev (MVUE) UCL			1322		
65	99% Chebyshev (MVUE) UCL			1558							
66											
67	Nonparametric Distribution Free UCL Statistics										
68	Data appear to follow a Discernible Distribution										
69											
70	Nonparametric Distribution Free UCLs										
71	90% CLT UCL			1014		90% BCA Bootstrap UCL			1024		
72	90% Standard Bootstrap UCL			1010		90% Bootstrap-t UCL			1039		
73	90% Hall's Bootstrap UCL			1058		90% Percentile Bootstrap UCL			1017		
74	90% Chebyshev(Mean, Sd) UCL			1131		95% Chebyshev(Mean, Sd) UCL			1224		
75	97.5% Chebyshev(Mean, Sd) UCL			1353		99% Chebyshev(Mean, Sd) UCL			1605		
76											
77	Suggested UCL to Use										
78	Recommendation Provided only for 95% Confidence Coefficient										
79											
80											
81	MW-3 TCE										
82											
83	General Statistics										
84	Total Number of Observations			16		Number of Distinct Observations			13		
85						Number of Missing Observations			0		
86	Minimum			4		Mean			7.198		
87	Maximum			12.8		Median			6.55		
88	SD			2.511		Std. Error of Mean			0.628		
89	Coefficient of Variation			0.349		Skewness			0.809		
90											
91	Normal GOF Test										
92	Shapiro Wilk Test Statistic			0.903		Shapiro Wilk GOF Test					
93	1% Shapiro Wilk Critical Value			0.844		Data appear Normal at 1% Significance Level					
94	Lilliefors Test Statistic			0.157		Lilliefors GOF Test					
95	1% Lilliefors Critical Value			0.248		Data appear Normal at 1% Significance Level					
96	Data appear Normal at 1% Significance Level										
97											
98	Assuming Normal Distribution										
99	90% Normal UCL					90% UCLs (Adjusted for Skewness)					
100	90% Student's-t UCL			8.04		90% Adjusted-CLT UCL (Chen-1995)			8.093		
101						90% Modified-t UCL (Johnson-1978)			8.061		
102											

A	B	C	D	E	F	G	H	I	J	K	L
103	Gamma GOF Test										
104	A-D Test Statistic		0.513		Anderson-Darling Gamma GOF Test						
105	5% A-D Critical Value		0.739		Detected data appear Gamma Distributed at 5% Significance Level						
106	K-S Test Statistic		0.137		Kolmogorov-Smirnov Gamma GOF Test						
107	5% K-S Critical Value		0.215		Detected data appear Gamma Distributed at 5% Significance Level						
108	Detected data appear Gamma Distributed at 5% Significance Level										
109											
110	Gamma Statistics										
111	k hat (MLE)		9.44		k star (bias corrected MLE)		7.711				
112	Theta hat (MLE)		0.763		Theta star (bias corrected MLE)		0.933				
113	nu hat (MLE)		302.1		nu star (bias corrected)		246.8				
114	MLE Mean (bias corrected)		7.198		MLE Sd (bias corrected)		2.592				
115					Approximate Chi Square Value (0.1)		218.8				
116	Adjusted Level of Significance		0.0809		Adjusted Chi Square Value		216.4				
117											
118	Assuming Gamma Distribution										
119	90% Approximate Gamma UCL		8.12		90% Adjusted Gamma UCL		8.21				
120											
121	Lognormal GOF Test										
122	Shapiro Wilk Test Statistic		0.944		Shapiro Wilk Lognormal GOF Test						
123	10% Shapiro Wilk Critical Value		0.906		Data appear Lognormal at 10% Significance Level						
124	Lilliefors Test Statistic		0.136		Lilliefors Lognormal GOF Test						
125	10% Lilliefors Critical Value		0.196		Data appear Lognormal at 10% Significance Level						
126	Data appear Lognormal at 10% Significance Level										
127											
128	Lognormal Statistics										
129	Minimum of Logged Data		1.386		Mean of logged Data		1.92				
130	Maximum of Logged Data		2.549		SD of logged Data		0.335				
131											
132	Assuming Lognormal Distribution										
133	90% H-UCL		8.162		90% Chebyshev (MVUE) UCL		9.024				
134	95% Chebyshev (MVUE) UCL		9.855		97.5% Chebyshev (MVUE) UCL		11.01				
135	99% Chebyshev (MVUE) UCL		13.27								
136											
137	Nonparametric Distribution Free UCL Statistics										
138	Data appear to follow a Discernible Distribution										
139											
140	Nonparametric Distribution Free UCLs										
141	90% CLT UCL		8.003		90% BCA Bootstrap UCL		8.061				
142	90% Standard Bootstrap UCL		7.971		90% Bootstrap-t UCL		8.132				
143	90% Hall's Bootstrap UCL		8.069		90% Percentile Bootstrap UCL		7.964				
144	90% Chebyshev(Mean, Sd) UCL		9.081		95% Chebyshev(Mean, Sd) UCL		9.935				
145	97.5% Chebyshev(Mean, Sd) UCL		11.12		99% Chebyshev(Mean, Sd) UCL		13.44				
146											
147	Suggested UCL to Use										
148	Recommendation Provided only for 95% Confidence Coefficient										
149											

A	B	C	D	E	F	G	H	I	J	K	L		
1	UCL Statistics for Uncensored Full Data Sets												
2													
3	User Selected Options												
4	Date/Time of Computation		ProUCL 5.2 4/6/2023 9:24:33 AM										
5	From File		WorkSheet_a.xls										
6	Full Precision		OFF										
7	Confidence Coefficient		95%										
8	Number of Bootstrap Operations		2000										
9													
10													
11	MW-3 PCE												
12													
13	General Statistics												
14	Total Number of Observations			16		Number of Distinct Observations			16				
15							Number of Missing Observations			0			
16	Minimum			570		Mean			926.6				
17	Maximum			1660		Median			850				
18	SD			272.9		Std. Error of Mean			68.23				
19	Coefficient of Variation			0.295		Skewness			1.329				
20													
21	Normal GOF Test												
22	Shapiro Wilk Test Statistic			0.904		Shapiro Wilk GOF Test							
23	1% Shapiro Wilk Critical Value			0.844		Data appear Normal at 1% Significance Level							
24	Lilliefors Test Statistic			0.159		Lilliefors GOF Test							
25	1% Lilliefors Critical Value			0.248		Data appear Normal at 1% Significance Level							
26	Data appear Normal at 1% Significance Level												
27													
28	Assuming Normal Distribution												
29	95% Normal UCL					95% UCLs (Adjusted for Skewness)							
30	95% Student's-t UCL			1046		95% Adjusted-CLT UCL (Chen-1995)			1063				
31						95% Modified-t UCL (Johnson-1978)			1050				
32													
33	Gamma GOF Test												
34	A-D Test Statistic			0.28		Anderson-Darling Gamma GOF Test							
35	5% A-D Critical Value			0.738		Detected data appear Gamma Distributed at 5% Significance Level							
36	K-S Test Statistic			0.136		Kolmogorov-Smirnov Gamma GOF Test							
37	5% K-S Critical Value			0.215		Detected data appear Gamma Distributed at 5% Significance Level							
38	Detected data appear Gamma Distributed at 5% Significance Level												
39													
40	Gamma Statistics												
41	k hat (MLE)			13.94		k star (bias corrected MLE)			11.37				
42	Theta hat (MLE)			66.46		Theta star (bias corrected MLE)			81.5				
43	nu hat (MLE)			446.2		nu star (bias corrected)			363.8				
44	MLE Mean (bias corrected)			926.6		MLE Sd (bias corrected)			274.8				
45						Approximate Chi Square Value (0.05)			320.6				
46	Adjusted Level of Significance			0.0335		Adjusted Chi Square Value			316				
47													
48	Assuming Gamma Distribution												
49	95% Approximate Gamma UCL			1051		95% Adjusted Gamma UCL			1067				
50													

A	B	C	D	E	F	G	H	I	J	K	L
51	Lognormal GOF Test										
52	Shapiro Wilk Test Statistic			0.974		Shapiro Wilk Lognormal GOF Test					
53	10% Shapiro Wilk Critical Value			0.906		Data appear Lognormal at 10% Significance Level					
54	Lilliefors Test Statistic			0.118		Lilliefors Lognormal GOF Test					
55	10% Lilliefors Critical Value			0.196		Data appear Lognormal at 10% Significance Level					
56	Data appear Lognormal at 10% Significance Level										
57											
58	Lognormal Statistics										
59	Minimum of Logged Data			6.346		Mean of logged Data			6.795		
60	Maximum of Logged Data			7.415		SD of logged Data			0.272		
61											
62	Assuming Lognormal Distribution										
63	95% H-UCL			1056		90% Chebyshev (MVUE) UCL			1116		
64	95% Chebyshev (MVUE) UCL			1202		97.5% Chebyshev (MVUE) UCL			1322		
65	99% Chebyshev (MVUE) UCL			1558							
66											
67	Nonparametric Distribution Free UCL Statistics										
68	Data appear to follow a Discernible Distribution										
69											
70	Nonparametric Distribution Free UCLs										
71	95% CLT UCL			1039		95% BCA Bootstrap UCL			1048		
72	95% Standard Bootstrap UCL			1034		95% Bootstrap-t UCL			1079		
73	95% Hall's Bootstrap UCL			1112		95% Percentile Bootstrap UCL			1037		
74	90% Chebyshev(Mean, Sd) UCL			1131		95% Chebyshev(Mean, Sd) UCL			1224		
75	97.5% Chebyshev(Mean, Sd) UCL			1353		99% Chebyshev(Mean, Sd) UCL			1605		
76											
77	Suggested UCL to Use										
78	95% Student's-t UCL			1046							
79											
80	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
81	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.										
82	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.										
83											
84											
85	MW-3 TCE										
86											
87	General Statistics										
88	Total Number of Observations			16		Number of Distinct Observations			13		
89						Number of Missing Observations			0		
90	Minimum			4		Mean			7.198		
91	Maximum			12.8		Median			6.55		
92	SD			2.511		Std. Error of Mean			0.628		
93	Coefficient of Variation			0.349		Skewness			0.809		
94											
95	Normal GOF Test										
96	Shapiro Wilk Test Statistic			0.903		Shapiro Wilk GOF Test					
97	1% Shapiro Wilk Critical Value			0.844		Data appear Normal at 1% Significance Level					
98	Lilliefors Test Statistic			0.157		Lilliefors GOF Test					
99	1% Lilliefors Critical Value			0.248		Data appear Normal at 1% Significance Level					
100	Data appear Normal at 1% Significance Level										
101											

A	B	C	D	E	F	G	H	I	J	K	L	
102	Assuming Normal Distribution											
103	95% Normal UCL				95% UCLs (Adjusted for Skewness)							
104	95% Student's-t UCL			8.299		95% Adjusted-CLT UCL (Chen-1995)				8.366		
105						95% Modified-t UCL (Johnson-1978)				8.32		
106												
107	Gamma GOF Test											
108	A-D Test Statistic			0.513		Anderson-Darling Gamma GOF Test						
109	5% A-D Critical Value			0.739		Detected data appear Gamma Distributed at 5% Significance Level						
110	K-S Test Statistic			0.137		Kolmogorov-Smirnov Gamma GOF Test						
111	5% K-S Critical Value			0.215		Detected data appear Gamma Distributed at 5% Significance Level						
112	Detected data appear Gamma Distributed at 5% Significance Level											
113												
114	Gamma Statistics											
115	k hat (MLE)			9.44		k star (bias corrected MLE)				7.711		
116	Theta hat (MLE)			0.763		Theta star (bias corrected MLE)				0.933		
117	nu hat (MLE)			302.1		nu star (bias corrected)				246.8		
118	MLE Mean (bias corrected)			7.198		MLE Sd (bias corrected)				2.592		
119						Approximate Chi Square Value (0.05)				211.4		
120	Adjusted Level of Significance			0.0335		Adjusted Chi Square Value				207.7		
121												
122	Assuming Gamma Distribution											
123	95% Approximate Gamma UCL			8.402		95% Adjusted Gamma UCL				8.553		
124												
125	Lognormal GOF Test											
126	Shapiro Wilk Test Statistic			0.944		Shapiro Wilk Lognormal GOF Test						
127	10% Shapiro Wilk Critical Value			0.906		Data appear Lognormal at 10% Significance Level						
128	Lilliefors Test Statistic			0.136		Lilliefors Lognormal GOF Test						
129	10% Lilliefors Critical Value			0.196		Data appear Lognormal at 10% Significance Level						
130	Data appear Lognormal at 10% Significance Level											
131												
132	Lognormal Statistics											
133	Minimum of Logged Data			1.386		Mean of logged Data				1.92		
134	Maximum of Logged Data			2.549		SD of logged Data				0.335		
135												
136	Assuming Lognormal Distribution											
137	95% H-UCL			8.505		90% Chebyshev (MVUE) UCL				9.024		
138	95% Chebyshev (MVUE) UCL			9.855		97.5% Chebyshev (MVUE) UCL				11.01		
139	99% Chebyshev (MVUE) UCL			13.27								
140												
141	Nonparametric Distribution Free UCL Statistics											
142	Data appear to follow a Discernible Distribution											
143												
144	Nonparametric Distribution Free UCLs											
145	95% CLT UCL			8.231		95% BCA Bootstrap UCL				8.354		
146	95% Standard Bootstrap UCL			8.191		95% Bootstrap-t UCL				8.504		
147	95% Hall's Bootstrap UCL			8.371		95% Percentile Bootstrap UCL				8.229		
148	90% Chebyshev(Mean, Sd) UCL			9.081		95% Chebyshev(Mean, Sd) UCL				9.935		
149	97.5% Chebyshev(Mean, Sd) UCL			11.12		99% Chebyshev(Mean, Sd) UCL				13.44		
150												

	A	B	C	D	E	F	G	H	I	J	K	L
151	Suggested UCL to Use											
152	95% Student's-t UCL					8.299						
153												
154	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
155	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.											
156	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
157												

A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets										
2											
3	User Selected Options										
4	Date/Time of Computation		ProUCL 5.2 4/6/2023 9:31:59 AM								
5	From File		WorkSheet_b.xls								
6	Full Precision		OFF								
7	Confidence Coefficient		90%								
8	Number of Bootstrap Operations		2000								
9											
10											
11	MW-4 PCE										
12											
13	General Statistics										
14	Total Number of Observations			17		Number of Distinct Observations			15		
15							Number of Missing Observations			0	
16	Minimum			1700		Mean			3574		
17	Maximum			6160		Median			3120		
18	SD			1471		Std. Error of Mean			356.9		
19	Coefficient of Variation			0.412		Skewness			0.31		
20											
21	Normal GOF Test										
22	Shapiro Wilk Test Statistic			0.91		Shapiro Wilk GOF Test					
23	1% Shapiro Wilk Critical Value			0.851		Data appear Normal at 1% Significance Level					
24	Lilliefors Test Statistic			0.173		Lilliefors GOF Test					
25	1% Lilliefors Critical Value			0.241		Data appear Normal at 1% Significance Level					
26	Data appear Normal at 1% Significance Level										
27											
28	Assuming Normal Distribution										
29	90% Normal UCL					90% UCLs (Adjusted for Skewness)					
30	90% Student's-t UCL			4051		90% Adjusted-CLT UCL (Chen-1995)			4050		
31						90% Modified-t UCL (Johnson-1978)			4055		
32											
33	Gamma GOF Test										
34	A-D Test Statistic			0.575		Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value			0.741		Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic			0.186		Kolmogorov-Smirnov Gamma GOF Test					
37	5% K-S Critical Value			0.21		Detected data appear Gamma Distributed at 5% Significance Level					
38	Detected data appear Gamma Distributed at 5% Significance Level										
39											
40	Gamma Statistics										
41	k hat (MLE)			6.113		k star (bias corrected MLE)			5.073		
42	Theta hat (MLE)			584.6		Theta star (bias corrected MLE)			704.4		
43	nu hat (MLE)			207.8		nu star (bias corrected)			172.5		
44	MLE Mean (bias corrected)			3574		MLE Sd (bias corrected)			1587		
45						Approximate Chi Square Value (0.1)			149.2		
46	Adjusted Level of Significance			0.0823		Adjusted Chi Square Value			147.3		
47											
48	Assuming Gamma Distribution										
49	90% Approximate Gamma UCL			4133		90% Adjusted Gamma UCL			4183		
50											

A	B	C	D	E	F	G	H	I	J	K	L
51	Lognormal GOF Test										
52	Shapiro Wilk Test Statistic				0.922	Shapiro Wilk Lognormal GOF Test					
53	10% Shapiro Wilk Critical Value				0.91	Data appear Lognormal at 10% Significance Level					
54	Lilliefors Test Statistic				0.18	Lilliefors Lognormal GOF Test					
55	10% Lilliefors Critical Value				0.19	Data appear Lognormal at 10% Significance Level					
56	Data appear Lognormal at 10% Significance Level										
57											
58	Lognormal Statistics										
59	Minimum of Logged Data				7.438	Mean of logged Data				8.097	
60	Maximum of Logged Data				8.726	SD of logged Data				0.428	
61											
62	Assuming Lognormal Distribution										
63	90% H-UCL				4216	90% Chebyshev (MVUE) UCL				4724	
64	95% Chebyshev (MVUE) UCL				5243	97.5% Chebyshev (MVUE) UCL				5962	
65	99% Chebyshev (MVUE) UCL				7375						
66											
67	Nonparametric Distribution Free UCL Statistics										
68	Data appear to follow a Discernible Distribution										
69											
70	Nonparametric Distribution Free UCLs										
71	90% CLT UCL				4031	90% BCA Bootstrap UCL				4034	
72	90% Standard Bootstrap UCL				4024	90% Bootstrap-t UCL				4073	
73	90% Hall's Bootstrap UCL				4034	90% Percentile Bootstrap UCL				4041	
74	90% Chebyshev(Mean, Sd) UCL				4644	95% Chebyshev(Mean, Sd) UCL				5129	
75	97.5% Chebyshev(Mean, Sd) UCL				5802	99% Chebyshev(Mean, Sd) UCL				7124	
76											
77	Suggested UCL to Use										
78	Recommendation Provided only for 95% Confidence Coefficient										
79											
80											
81	MW-4 TCE										
82											
83	General Statistics										
84	Total Number of Observations				17	Number of Distinct Observations				16	
85						Number of Missing Observations				0	
86	Minimum				4.9	Mean				31.24	
87	Maximum				51.5	Median				37.5	
88	SD				16.29	Std. Error of Mean				3.95	
89	Coefficient of Variation				0.521	Skewness				-0.231	
90											
91	Normal GOF Test										
92	Shapiro Wilk Test Statistic				0.89	Shapiro Wilk GOF Test					
93	1% Shapiro Wilk Critical Value				0.851	Data appear Normal at 1% Significance Level					
94	Lilliefors Test Statistic				0.179	Lilliefors GOF Test					
95	1% Lilliefors Critical Value				0.241	Data appear Normal at 1% Significance Level					
96	Data appear Normal at 1% Significance Level										
97											
98	Assuming Normal Distribution										
99	90% Normal UCL					90% UCLs (Adjusted for Skewness)					
100	90% Student's-t UCL				36.52	90% Adjusted-CLT UCL (Chen-1995)				36.15	
101						90% Modified-t UCL (Johnson-1978)				36.49	
102											

A	B	C	D	E	F	G	H	I	J	K	L
103	Gamma GOF Test										
104	A-D Test Statistic		0.852		Anderson-Darling Gamma GOF Test						
105	5% A-D Critical Value		0.746		Data Not Gamma Distributed at 5% Significance Level						
106	K-S Test Statistic		0.226		Kolmogorov-Smirnov Gamma GOF Test						
107	5% K-S Critical Value		0.211		Data Not Gamma Distributed at 5% Significance Level						
108	Data Not Gamma Distributed at 5% Significance Level										
109											
110	Gamma Statistics										
111	k hat (MLE)		2.854		k star (bias corrected MLE)		2.39				
112	Theta hat (MLE)		10.94		Theta star (bias corrected MLE)		13.07				
113	nu hat (MLE)		97.05		nu star (bias corrected)		81.26				
114	MLE Mean (bias corrected)		31.24		MLE Sd (bias corrected)		20.21				
115					Approximate Chi Square Value (0.1)		65.41				
116	Adjusted Level of Significance		0.0823		Adjusted Chi Square Value		64.22				
117											
118	Assuming Gamma Distribution										
119	90% Approximate Gamma UCL		38.81		90% Adjusted Gamma UCL		39.53				
120											
121	Lognormal GOF Test										
122	Shapiro Wilk Test Statistic		0.863		Shapiro Wilk Lognormal GOF Test						
123	10% Shapiro Wilk Critical Value		0.91		Data Not Lognormal at 10% Significance Level						
124	Lilliefors Test Statistic		0.23		Lilliefors Lognormal GOF Test						
125	10% Lilliefors Critical Value		0.19		Data Not Lognormal at 10% Significance Level						
126	Data Not Lognormal at 10% Significance Level										
127											
128	Lognormal Statistics										
129	Minimum of Logged Data		1.589		Mean of logged Data		3.256				
130	Maximum of Logged Data		3.942		SD of logged Data		0.698				
131											
132	Assuming Lognormal Distribution										
133	90% H-UCL		44.27		90% Chebyshev (MVUE) UCL		50.06				
134	95% Chebyshev (MVUE) UCL		57.99		97.5% Chebyshev (MVUE) UCL		69				
135	99% Chebyshev (MVUE) UCL		90.63								
136											
137	Nonparametric Distribution Free UCL Statistics										
138	Data appear to follow a Discernible Distribution										
139											
140	Nonparametric Distribution Free UCLs										
141	90% CLT UCL		36.3		90% BCA Bootstrap UCL		36.04				
142	90% Standard Bootstrap UCL		36.32		90% Bootstrap-t UCL		36.38				
143	90% Hall's Bootstrap UCL		35.97		90% Percentile Bootstrap UCL		36.47				
144	90% Chebyshev(Mean, Sd) UCL		43.09		95% Chebyshev(Mean, Sd) UCL		48.46				
145	97.5% Chebyshev(Mean, Sd) UCL		55.91		99% Chebyshev(Mean, Sd) UCL		70.55				
146											
147	Suggested UCL to Use										
148	Recommendation Provided only for 95% Confidence Coefficient										
149											
150	Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be										
151	reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.										
152											

A	B	C	D	E	F	G	H	I	J	K	L		
1	UCL Statistics for Uncensored Full Data Sets												
2													
3	User Selected Options												
4	Date/Time of Computation		ProUCL 5.2 4/6/2023 9:30:09 AM										
5	From File		WorkSheet_b.xls										
6	Full Precision		OFF										
7	Confidence Coefficient		95%										
8	Number of Bootstrap Operations		2000										
9													
10													
11	MW-4 PCE												
12													
13	General Statistics												
14	Total Number of Observations			17		Number of Distinct Observations			15				
15						Number of Missing Observations			0				
16	Minimum			1700		Mean			3574				
17	Maximum			6160		Median			3120				
18	SD			1471		Std. Error of Mean			356.9				
19	Coefficient of Variation			0.412		Skewness			0.31				
20													
21	Normal GOF Test												
22	Shapiro Wilk Test Statistic			0.91		Shapiro Wilk GOF Test							
23	1% Shapiro Wilk Critical Value			0.851		Data appear Normal at 1% Significance Level							
24	Lilliefors Test Statistic			0.173		Lilliefors GOF Test							
25	1% Lilliefors Critical Value			0.241		Data appear Normal at 1% Significance Level							
26	Data appear Normal at 1% Significance Level												
27													
28	Assuming Normal Distribution												
29	95% Normal UCL					95% UCLs (Adjusted for Skewness)							
30	95% Student's-t UCL			4197		95% Adjusted-CLT UCL (Chen-1995)			4189				
31						95% Modified-t UCL (Johnson-1978)			4201				
32													
33	Gamma GOF Test												
34	A-D Test Statistic			0.575		Anderson-Darling Gamma GOF Test							
35	5% A-D Critical Value			0.741		Detected data appear Gamma Distributed at 5% Significance Level							
36	K-S Test Statistic			0.186		Kolmogorov-Smirnov Gamma GOF Test							
37	5% K-S Critical Value			0.21		Detected data appear Gamma Distributed at 5% Significance Level							
38	Detected data appear Gamma Distributed at 5% Significance Level												
39													
40	Gamma Statistics												
41	k hat (MLE)			6.113		k star (bias corrected MLE)			5.073				
42	Theta hat (MLE)			584.6		Theta star (bias corrected MLE)			704.4				
43	nu hat (MLE)			207.8		nu star (bias corrected)			172.5				
44	MLE Mean (bias corrected)			3574		MLE Sd (bias corrected)			1587				
45						Approximate Chi Square Value (0.05)			143.1				
46	Adjusted Level of Significance			0.0346		Adjusted Chi Square Value			140.3				
47													
48	Assuming Gamma Distribution												
49	95% Approximate Gamma UCL			4307		95% Adjusted Gamma UCL			4393				
50													

A	B	C	D	E	F	G	H	I	J	K	L
51	Lognormal GOF Test										
52	Shapiro Wilk Test Statistic			0.922		Shapiro Wilk Lognormal GOF Test					
53	10% Shapiro Wilk Critical Value			0.91		Data appear Lognormal at 10% Significance Level					
54	Lilliefors Test Statistic			0.18		Lilliefors Lognormal GOF Test					
55	10% Lilliefors Critical Value			0.19		Data appear Lognormal at 10% Significance Level					
56	Data appear Lognormal at 10% Significance Level										
57											
58	Lognormal Statistics										
59	Minimum of Logged Data			7.438		Mean of logged Data			8.097		
60	Maximum of Logged Data			8.726		SD of logged Data			0.428		
61											
62	Assuming Lognormal Distribution										
63	95% H-UCL			4446		90% Chebyshev (MVUE) UCL			4724		
64	95% Chebyshev (MVUE) UCL			5243		97.5% Chebyshev (MVUE) UCL			5962		
65	99% Chebyshev (MVUE) UCL			7375							
66											
67	Nonparametric Distribution Free UCL Statistics										
68	Data appear to follow a Discernible Distribution										
69											
70	Nonparametric Distribution Free UCLs										
71	95% CLT UCL			4161		95% BCA Bootstrap UCL			4158		
72	95% Standard Bootstrap UCL			4151		95% Bootstrap-t UCL			4228		
73	95% Hall's Bootstrap UCL			4148		95% Percentile Bootstrap UCL			4165		
74	90% Chebyshev(Mean, Sd) UCL			4644		95% Chebyshev(Mean, Sd) UCL			5129		
75	97.5% Chebyshev(Mean, Sd) UCL			5802		99% Chebyshev(Mean, Sd) UCL			7124		
76											
77	Suggested UCL to Use										
78	95% Student's-t UCL			4197							
79											
80	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
81	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.										
82	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.										
83											
84											
85	MW-4 TCE										
86											
87	General Statistics										
88	Total Number of Observations			17		Number of Distinct Observations			16		
89						Number of Missing Observations			0		
90	Minimum			4.9		Mean			31.24		
91	Maximum			51.5		Median			37.5		
92	SD			16.29		Std. Error of Mean			3.95		
93	Coefficient of Variation			0.521		Skewness			-0.231		
94											
95	Normal GOF Test										
96	Shapiro Wilk Test Statistic			0.89		Shapiro Wilk GOF Test					
97	1% Shapiro Wilk Critical Value			0.851		Data appear Normal at 1% Significance Level					
98	Lilliefors Test Statistic			0.179		Lilliefors GOF Test					
99	1% Lilliefors Critical Value			0.241		Data appear Normal at 1% Significance Level					
100	Data appear Normal at 1% Significance Level										
101											

A	B	C	D	E	F	G	H	I	J	K	L
102	Assuming Normal Distribution										
103	95% Normal UCL					95% UCLs (Adjusted for Skewness)					
104	95% Student's-t UCL			38.14		95% Adjusted-CLT UCL (Chen-1995)				37.5	
105						95% Modified-t UCL (Johnson-1978)				38.1	
106											
107	Gamma GOF Test										
108	A-D Test Statistic			0.852		Anderson-Darling Gamma GOF Test					
109	5% A-D Critical Value			0.746		Data Not Gamma Distributed at 5% Significance Level					
110	K-S Test Statistic			0.226		Kolmogorov-Smirnov Gamma GOF Test					
111	5% K-S Critical Value			0.211		Data Not Gamma Distributed at 5% Significance Level					
112	Data Not Gamma Distributed at 5% Significance Level										
113											
114	Gamma Statistics										
115	k hat (MLE)			2.854		k star (bias corrected MLE)				2.39	
116	Theta hat (MLE)			10.94		Theta star (bias corrected MLE)				13.07	
117	nu hat (MLE)			97.05		nu star (bias corrected)				81.26	
118	MLE Mean (bias corrected)			31.24		MLE Sd (bias corrected)				20.21	
119						Approximate Chi Square Value (0.05)				61.48	
120	Adjusted Level of Significance			0.0346		Adjusted Chi Square Value				59.68	
121											
122	Assuming Gamma Distribution										
123	95% Approximate Gamma UCL			41.29		95% Adjusted Gamma UCL				42.53	
124											
125	Lognormal GOF Test										
126	Shapiro Wilk Test Statistic			0.863		Shapiro Wilk Lognormal GOF Test					
127	10% Shapiro Wilk Critical Value			0.91		Data Not Lognormal at 10% Significance Level					
128	Lilliefors Test Statistic			0.23		Lilliefors Lognormal GOF Test					
129	10% Lilliefors Critical Value			0.19		Data Not Lognormal at 10% Significance Level					
130	Data Not Lognormal at 10% Significance Level										
131											
132	Lognormal Statistics										
133	Minimum of Logged Data			1.589		Mean of logged Data				3.256	
134	Maximum of Logged Data			3.942		SD of logged Data				0.698	
135											
136	Assuming Lognormal Distribution										
137	95% H-UCL			49.07		90% Chebyshev (MVUE) UCL				50.06	
138	95% Chebyshev (MVUE) UCL			57.99		97.5% Chebyshev (MVUE) UCL				69	
139	99% Chebyshev (MVUE) UCL			90.63							
140											
141	Nonparametric Distribution Free UCL Statistics										
142	Data appear to follow a Discernible Distribution										
143											
144	Nonparametric Distribution Free UCLs										
145	95% CLT UCL			37.74		95% BCA Bootstrap UCL				37.46	
146	95% Standard Bootstrap UCL			37.76		95% Bootstrap-t UCL				38.07	
147	95% Hall's Bootstrap UCL			37.41		95% Percentile Bootstrap UCL				37.66	
148	90% Chebyshev(Mean, Sd) UCL			43.09		95% Chebyshev(Mean, Sd) UCL				48.46	
149	97.5% Chebyshev(Mean, Sd) UCL			55.91		99% Chebyshev(Mean, Sd) UCL				70.55	
150											

	A	B	C	D	E	F	G	H	I	J	K	L
151	Suggested UCL to Use											
152	95% Student's-t UCL					38.14						
153												
154	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
155	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.											
156	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
157												
158	Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be											
159	reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.											
160												

A	B	C	D	E	F	G	H	I	J	K	L	
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation	ProUCL 5.2 4/6/2023 1:02:38 PM										
5	From File	WorkSheet_c.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	90%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	MW-5R PCE											
12												
13	General Statistics											
14	Total Number of Observations	9						Number of Distinct Observations	9			
15								Number of Missing Observations	0			
16	Minimum	88.6						Mean	496			
17	Maximum	1320						Median	360			
18	SD	412.8						Std. Error of Mean	137.6			
19	Coefficient of Variation	0.832						Skewness	1.108			
20												
21	Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach,											
22	refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance,											
23	but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).											
24	The Chebyshev UCL often results in gross overestimates of the mean.											
25	Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.											
26												
27	Normal GOF Test											
28	Shapiro Wilk Test Statistic	0.87						Shapiro Wilk GOF Test				
29	1% Shapiro Wilk Critical Value	0.764						Data appear Normal at 1% Significance Level				
30	Lilliefors Test Statistic	0.269						Lilliefors GOF Test				
31	1% Lilliefors Critical Value	0.316						Data appear Normal at 1% Significance Level				
32	Data appear Normal at 1% Significance Level											
33	Note GOF tests may be unreliable for small sample sizes											
34												
35	Assuming Normal Distribution											
36	90% Normal UCL					90% UCLs (Adjusted for Skewness)						
37	90% Student's-t UCL	688.1						90% Adjusted-CLT UCL (Chen-1995)	708.6			
38								90% Modified-t UCL (Johnson-1978)	696.6			
39												
40	Gamma GOF Test											
41	A-D Test Statistic	0.277						Anderson-Darling Gamma GOF Test				
42	5% A-D Critical Value	0.733						Detected data appear Gamma Distributed at 5% Significance Level				
43	K-S Test Statistic	0.179						Kolmogorov-Smirnov Gamma GOF Test				
44	5% K-S Critical Value	0.284						Detected data appear Gamma Distributed at 5% Significance Level				
45	Detected data appear Gamma Distributed at 5% Significance Level											
46	Note GOF tests may be unreliable for small sample sizes											
47												

A	B	C	D	E	F	G	H	I	J	K	L
48	Gamma Statistics										
49				k hat (MLE)	1.631				k star (bias corrected MLE)		1.161
50				Theta hat (MLE)	304.2				Theta star (bias corrected MLE)		427.1
51				nu hat (MLE)	29.35				nu star (bias corrected)		20.9
52				MLE Mean (bias corrected)	496				MLE Sd (bias corrected)		460.3
53									Approximate Chi Square Value (0.1)		13.16
54				Adjusted Level of Significance	0.0666				Adjusted Chi Square Value		12.15
55											
56	Assuming Gamma Distribution										
57				90% Approximate Gamma UCL	787.7				90% Adjusted Gamma UCL		853.5
58											
59	Lognormal GOF Test										
60				Shapiro Wilk Test Statistic	0.954				Shapiro Wilk Lognormal GOF Test		
61				10% Shapiro Wilk Critical Value	0.859				Data appear Lognormal at 10% Significance Level		
62				Lilliefors Test Statistic	0.152				Lilliefors Lognormal GOF Test		
63				10% Lilliefors Critical Value	0.252				Data appear Lognormal at 10% Significance Level		
64	Data appear Lognormal at 10% Significance Level										
65	Note GOF tests may be unreliable for small sample sizes										
66											
67	Lognormal Statistics										
68				Minimum of Logged Data	4.484				Mean of logged Data		5.87
69				Maximum of Logged Data	7.185				SD of logged Data		0.911
70											
71	Assuming Lognormal Distribution										
72				90% H-UCL	1059				90% Chebyshev (MVUE) UCL		982.1
73				95% Chebyshev (MVUE) UCL	1198				97.5% Chebyshev (MVUE) UCL		1497
74				99% Chebyshev (MVUE) UCL	2085						
75											
76	Nonparametric Distribution Free UCL Statistics										
77	Data appear to follow a Discernible Distribution										
78											
79	Nonparametric Distribution Free UCLs										
80				90% CLT UCL	672.3				90% BCA Bootstrap UCL		704.2
81				90% Standard Bootstrap UCL	663.4				90% Bootstrap-t UCL		769.4
82				90% Hall's Bootstrap UCL	713.6				90% Percentile Bootstrap UCL		671.8
83				90% Chebyshev(Mean, Sd) UCL	908.7				95% Chebyshev(Mean, Sd) UCL		1096
84				97.5% Chebyshev(Mean, Sd) UCL	1355				99% Chebyshev(Mean, Sd) UCL		1865
85											
86	Suggested UCL to Use										
87	Recommendation Provided only for 95% Confidence Coefficient										
88											
89											
90	MW-5R TCE										
91											
92	General Statistics										
93				Total Number of Observations	9				Number of Distinct Observations		8
94									Number of Missing Observations		0
95				Minimum	1				Mean		11.78
96				Maximum	24.6				Median		16.3
97				SD	10.44				Std. Error of Mean		3.481
98				Coefficient of Variation	0.886				Skewness		-0.0608
99											

A	B	C	D	E	F	G	H	I	J	K	L	
100	Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach,											
101	refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance,											
102	but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).											
103	The Chebyshev UCL often results in gross overestimates of the mean.											
104	Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.											
105												
106	Normal GOF Test											
107	Shapiro Wilk Test Statistic	0.795	Shapiro Wilk GOF Test									
108	1% Shapiro Wilk Critical Value	0.764	Data appear Normal at 1% Significance Level									
109	Lilliefors Test Statistic	0.287	Lilliefors GOF Test									
110	1% Lilliefors Critical Value	0.316	Data appear Normal at 1% Significance Level									
111	Data appear Normal at 1% Significance Level											
112	Note GOF tests may be unreliable for small sample sizes											
113												
114	Assuming Normal Distribution											
115	90% Normal UCL					90% UCLs (Adjusted for Skewness)						
116	90% Student's-t UCL	16.64	90% Adjusted-CLT UCL (Chen-1995)					16.19				
117			90% Modified-t UCL (Johnson-1978)					16.63				
118												
119	Gamma GOF Test											
120	A-D Test Statistic	1.154	Anderson-Darling Gamma GOF Test									
121	5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level									
122	K-S Test Statistic	0.306	Kolmogorov-Smirnov Gamma GOF Test									
123	5% K-S Critical Value	0.289	Data Not Gamma Distributed at 5% Significance Level									
124	Data Not Gamma Distributed at 5% Significance Level											
125												
126	Gamma Statistics											
127	k hat (MLE)	0.785	k star (bias corrected MLE)					0.598				
128	Theta hat (MLE)	15	Theta star (bias corrected MLE)					19.72				
129	nu hat (MLE)	14.13	nu star (bias corrected)					10.76				
130	MLE Mean (bias corrected)	11.78	MLE Sd (bias corrected)					15.24				
131			Approximate Chi Square Value (0.1)					5.403				
132	Adjusted Level of Significance	0.0666	Adjusted Chi Square Value					4.789				
133												
134	Assuming Gamma Distribution											
135	90% Approximate Gamma UCL	23.45	90% Adjusted Gamma UCL					26.46				
136												
137	Lognormal GOF Test											
138	Shapiro Wilk Test Statistic	0.732	Shapiro Wilk Lognormal GOF Test									
139	10% Shapiro Wilk Critical Value	0.859	Data Not Lognormal at 10% Significance Level									
140	Lilliefors Test Statistic	0.315	Lilliefors Lognormal GOF Test									
141	10% Lilliefors Critical Value	0.252	Data Not Lognormal at 10% Significance Level									
142	Data Not Lognormal at 10% Significance Level											
143												
144	Lognormal Statistics											
145	Minimum of Logged Data	0	Mean of logged Data					1.709				
146	Maximum of Logged Data	3.203	SD of logged Data					1.537				
147												
148	Assuming Lognormal Distribution											
149	90% H-UCL	95.48	90% Chebyshev (MVUE) UCL					37.26				
150	95% Chebyshev (MVUE) UCL	47.6	97.5% Chebyshev (MVUE) UCL					61.96				
151	99% Chebyshev (MVUE) UCL	90.17										
152												

A	B	C	D	E	F	G	H	I	J	K	L
153	Nonparametric Distribution Free UCL Statistics										
154	Data appear to follow a Discernible Distribution										
155											
156	Nonparametric Distribution Free UCLs										
157	90% CLT UCL			16.24		90% BCA Bootstrap UCL			16.07		
158	90% Standard Bootstrap UCL			16.03		90% Bootstrap-t UCL			16.53		
159	90% Hall's Bootstrap UCL			15.63		90% Percentile Bootstrap UCL			16.06		
160	90% Chebyshev(Mean, Sd) UCL			22.22		95% Chebyshev(Mean, Sd) UCL			26.95		
161	97.5% Chebyshev(Mean, Sd) UCL			33.52		99% Chebyshev(Mean, Sd) UCL			46.42		
162											
163	Suggested UCL to Use										
164	Recommendation Provided only for 95% Confidence Coefficient										
165											
166	Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be										
167	reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.										
168											
169											
170	MW-5R cis 1,2-DCE										
171											
172	General Statistics										
173	Total Number of Observations			9		Number of Distinct Observations			8		
174						Number of Missing Observations			0		
175	Minimum			0.6		Mean			4.77		
176	Maximum			10.1		Median			2.38		
177	SD			4.376		Std. Error of Mean			1.459		
178	Coefficient of Variation			0.917		Skewness			0.273		
179											
180	Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach,										
181	refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance,										
182	but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).										
183	The Chebyshev UCL often results in gross overestimates of the mean.										
184	Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.										
185											
186	Normal GOF Test										
187	Shapiro Wilk Test Statistic			0.766		Shapiro Wilk GOF Test					
188	1% Shapiro Wilk Critical Value			0.764		Data appear Normal at 1% Significance Level					
189	Lilliefors Test Statistic			0.263		Lilliefors GOF Test					
190	1% Lilliefors Critical Value			0.316		Data appear Normal at 1% Significance Level					
191	Data appear Normal at 1% Significance Level										
192	Note GOF tests may be unreliable for small sample sizes										
193											
194	Assuming Normal Distribution										
195	90% Normal UCL					90% UCLs (Adjusted for Skewness)					
196	90% Student's-t UCL			6.807		90% Adjusted-CLT UCL (Chen-1995)			6.734		
197						90% Modified-t UCL (Johnson-1978)			6.829		
198											
199	Gamma GOF Test										
200	A-D Test Statistic			0.879		Anderson-Darling Gamma GOF Test					
201	5% A-D Critical Value			0.743		Data Not Gamma Distributed at 5% Significance Level					
202	K-S Test Statistic			0.279		Kolmogorov-Smirnov Gamma GOF Test					
203	5% K-S Critical Value			0.287		Detected data appear Gamma Distributed at 5% Significance Level					
204	Detected data follow Appr. Gamma Distribution at 5% Significance Level										
205	Note GOF tests may be unreliable for small sample sizes										
206											

	A	B	C	D	E	F	G	H	I	J	K	L
207	Gamma Statistics											
208					k hat (MLE)	1.001					k star (bias corrected MLE)	0.741
209					Theta hat (MLE)	4.765					Theta star (bias corrected MLE)	6.433
210					nu hat (MLE)	18.02					nu star (bias corrected)	13.35
211					MLE Mean (bias corrected)	4.77					MLE Sd (bias corrected)	5.539
212											Approximate Chi Square Value (0.1)	7.3
213					Adjusted Level of Significance	0.0666					Adjusted Chi Square Value	6.571
214	Assuming Gamma Distribution											
215					90% Approximate Gamma UCL	8.721					90% Adjusted Gamma UCL	9.689
217	Lognormal GOF Test											
218												
219					Shapiro Wilk Test Statistic	0.814					Shapiro Wilk Lognormal GOF Test	
220					10% Shapiro Wilk Critical Value	0.859					Data Not Lognormal at 10% Significance Level	
221					Lilliefors Test Statistic	0.27					Lilliefors Lognormal GOF Test	
222					10% Lilliefors Critical Value	0.252					Data Not Lognormal at 10% Significance Level	
223	Data Not Lognormal at 10% Significance Level											
224	Lognormal Statistics											
225												
226					Minimum of Logged Data	-0.511					Mean of logged Data	0.986
227					Maximum of Logged Data	2.313					SD of logged Data	1.241
228	Assuming Lognormal Distribution											
229												
230					90% H-UCL	18.1					90% Chebyshev (MVUE) UCL	11.68
231					95% Chebyshev (MVUE) UCL	14.66					97.5% Chebyshev (MVUE) UCL	18.8
232					99% Chebyshev (MVUE) UCL	26.92						
233	Nonparametric Distribution Free UCL Statistics											
234	Data appear to follow a Discernible Distribution											
235	Nonparametric Distribution Free UCLs											
236												
237												
238					90% CLT UCL	6.639					90% BCA Bootstrap UCL	6.687
239					90% Standard Bootstrap UCL	6.525					90% Bootstrap-t UCL	6.941
240					90% Hall's Bootstrap UCL	6.247					90% Percentile Bootstrap UCL	6.616
241					90% Chebyshev(Mean, Sd) UCL	9.146					95% Chebyshev(Mean, Sd) UCL	11.13
242					97.5% Chebyshev(Mean, Sd) UCL	13.88					99% Chebyshev(Mean, Sd) UCL	19.28
243	Suggested UCL to Use											
244	Suggested UCL to Use											
245	Recommendation Provided only for 95% Confidence Coefficient											
246												

A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets										
2											
3	User Selected Options										
4	Date/Time of Computation	ProUCL 5.2 4/6/2023 1:00:29 PM									
5	From File	WorkSheet_c.xls									
6	Full Precision	OFF									
7	Confidence Coefficient	95%									
8	Number of Bootstrap Operations	2000									
9											
10											
11	MW-5R PCE										
12											
13	General Statistics										
14	Total Number of Observations	9			Number of Distinct Observations			9			
15					Number of Missing Observations			0			
16		Minimum	88.6			Mean	496				
17		Maximum	1320			Median	360				
18		SD	412.8			Std. Error of Mean	137.6				
19		Coefficient of Variation	0.832			Skewness	1.108				
20											
21	Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach,										
22	refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance,										
23	but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).										
24	The Chebyshev UCL often results in gross overestimates of the mean.										
25	Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.										
26											
27	Normal GOF Test										
28	Shapiro Wilk Test Statistic	0.87			Shapiro Wilk GOF Test						
29	1% Shapiro Wilk Critical Value	0.764			Data appear Normal at 1% Significance Level						
30	Lilliefors Test Statistic	0.269			Lilliefors GOF Test						
31	1% Lilliefors Critical Value	0.316			Data appear Normal at 1% Significance Level						
32	Data appear Normal at 1% Significance Level										
33	Note GOF tests may be unreliable for small sample sizes										
34											
35	Assuming Normal Distribution										
36	95% Normal UCL				95% UCLs (Adjusted for Skewness)						
37		95% Student's-t UCL	751.8			95% Adjusted-CLT UCL (Chen-1995)	776.6				
38						95% Modified-t UCL (Johnson-1978)	760.3				
39											
40	Gamma GOF Test										
41	A-D Test Statistic	0.277			Anderson-Darling Gamma GOF Test						
42	5% A-D Critical Value	0.733			Detected data appear Gamma Distributed at 5% Significance Level						
43	K-S Test Statistic	0.179			Kolmogorov-Smirnov Gamma GOF Test						
44	5% K-S Critical Value	0.284			Detected data appear Gamma Distributed at 5% Significance Level						
45	Detected data appear Gamma Distributed at 5% Significance Level										
46	Note GOF tests may be unreliable for small sample sizes										
47											

A	B	C	D	E	F	G	H	I	J	K	L
48	Gamma Statistics										
49				k hat (MLE)	1.631				k star (bias corrected MLE)	1.161	
50				Theta hat (MLE)	304.2				Theta star (bias corrected MLE)	427.1	
51				nu hat (MLE)	29.35				nu star (bias corrected)	20.9	
52				MLE Mean (bias corrected)	496				MLE Sd (bias corrected)	460.3	
53									Approximate Chi Square Value (0.05)	11.52	
54				Adjusted Level of Significance	0.0231				Adjusted Chi Square Value	10.08	
55											
56	Assuming Gamma Distribution										
57				95% Approximate Gamma UCL	900				95% Adjusted Gamma UCL	1028	
58											
59	Lognormal GOF Test										
60				Shapiro Wilk Test Statistic	0.954				Shapiro Wilk Lognormal GOF Test		
61				10% Shapiro Wilk Critical Value	0.859				Data appear Lognormal at 10% Significance Level		
62				Lilliefors Test Statistic	0.152				Lilliefors Lognormal GOF Test		
63				10% Lilliefors Critical Value	0.252				Data appear Lognormal at 10% Significance Level		
64	Data appear Lognormal at 10% Significance Level										
65	Note GOF tests may be unreliable for small sample sizes										
66											
67	Lognormal Statistics										
68				Minimum of Logged Data	4.484				Mean of logged Data	5.87	
69				Maximum of Logged Data	7.185				SD of logged Data	0.911	
70											
71	Assuming Lognormal Distribution										
72				95% H-UCL	1431				90% Chebyshev (MVUE) UCL	982.1	
73				95% Chebyshev (MVUE) UCL	1198				97.5% Chebyshev (MVUE) UCL	1497	
74				99% Chebyshev (MVUE) UCL	2085						
75											
76	Nonparametric Distribution Free UCL Statistics										
77	Data appear to follow a Discernible Distribution										
78											
79	Nonparametric Distribution Free UCLs										
80				95% CLT UCL	722.3				95% BCA Bootstrap UCL	773.3	
81				95% Standard Bootstrap UCL	710.9				95% Bootstrap-t UCL	867.6	
82				95% Hall's Bootstrap UCL	759.1				95% Percentile Bootstrap UCL	718.7	
83				90% Chebyshev(Mean, Sd) UCL	908.7				95% Chebyshev(Mean, Sd) UCL	1096	
84				97.5% Chebyshev(Mean, Sd) UCL	1355				99% Chebyshev(Mean, Sd) UCL	1865	
85											
86	Suggested UCL to Use										
87				95% Student's-t UCL	751.8						
88											
89	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
90	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.										
91	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.										
92											
93											
94	MW-5R TCE										
95											

A	B	C	D	E	F	G	H	I	J	K	L
96	General Statistics										
97	Total Number of Observations			9		Number of Distinct Observations			8		
98						Number of Missing Observations			0		
99	Minimum			1		Mean			11.78		
100	Maximum			24.6		Median			16.3		
101	SD			10.44		Std. Error of Mean			3.481		
102	Coefficient of Variation			0.886		Skewness			-0.0608		
103											
104	Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach,										
105	refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance,										
106	but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).										
107	The Chebyshev UCL often results in gross overestimates of the mean.										
108	Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.										
109											
110	Normal GOF Test										
111	Shapiro Wilk Test Statistic			0.795		Shapiro Wilk GOF Test					
112	1% Shapiro Wilk Critical Value			0.764		Data appear Normal at 1% Significance Level					
113	Lilliefors Test Statistic			0.287		Lilliefors GOF Test					
114	1% Lilliefors Critical Value			0.316		Data appear Normal at 1% Significance Level					
115	Data appear Normal at 1% Significance Level										
116	Note GOF tests may be unreliable for small sample sizes										
117											
118	Assuming Normal Distribution										
119	95% Normal UCL					95% UCLs (Adjusted for Skewness)					
120	95% Student's-t UCL			18.25		95% Adjusted-CLT UCL (Chen-1995)			17.43		
121						95% Modified-t UCL (Johnson-1978)			18.24		
122											
123	Gamma GOF Test										
124	A-D Test Statistic			1.154		Anderson-Darling Gamma GOF Test					
125	5% A-D Critical Value			0.75		Data Not Gamma Distributed at 5% Significance Level					
126	K-S Test Statistic			0.306		Kolmogorov-Smirnov Gamma GOF Test					
127	5% K-S Critical Value			0.289		Data Not Gamma Distributed at 5% Significance Level					
128	Data Not Gamma Distributed at 5% Significance Level										
129											
130	Gamma Statistics										
131	k hat (MLE)			0.785		k star (bias corrected MLE)			0.598		
132	Theta hat (MLE)			15		Theta star (bias corrected MLE)			19.72		
133	nu hat (MLE)			14.13		nu star (bias corrected)			10.76		
134	MLE Mean (bias corrected)			11.78		MLE Sd (bias corrected)			15.24		
135						Approximate Chi Square Value (0.05)			4.419		
136	Adjusted Level of Significance			0.0231		Adjusted Chi Square Value			3.603		
137											
138	Assuming Gamma Distribution										
139	95% Approximate Gamma UCL			28.67		95% Adjusted Gamma UCL			35.17		
140											
141	Lognormal GOF Test										
142	Shapiro Wilk Test Statistic			0.732		Shapiro Wilk Lognormal GOF Test					
143	10% Shapiro Wilk Critical Value			0.859		Data Not Lognormal at 10% Significance Level					
144	Lilliefors Test Statistic			0.315		Lilliefors Lognormal GOF Test					
145	10% Lilliefors Critical Value			0.252		Data Not Lognormal at 10% Significance Level					
146	Data Not Lognormal at 10% Significance Level										
147											

A	B	C	D	E	F	G	H	I	J	K	L	
148	Lognormal Statistics											
149	Minimum of Logged Data				0	Mean of logged Data				1.709		
150	Maximum of Logged Data				3.203	SD of logged Data				1.537		
151	Assuming Lognormal Distribution											
152	95% H-UCL				211.3	90% Chebyshev (MVUE) UCL				37.26		
153	95% Chebyshev (MVUE) UCL				47.6	97.5% Chebyshev (MVUE) UCL				61.96		
154	99% Chebyshev (MVUE) UCL				90.17							
155	Nonparametric Distribution Free UCL Statistics											
156	Data appear to follow a Discernible Distribution											
157	Nonparametric Distribution Free UCLs											
158	95% CLT UCL				17.51	95% BCA Bootstrap UCL				17.24		
159	95% Standard Bootstrap UCL				17.24	95% Bootstrap-t UCL				18.27		
160	95% Hall's Bootstrap UCL				16.25	95% Percentile Bootstrap UCL				17.24		
161	90% Chebyshev(Mean, Sd) UCL				22.22	95% Chebyshev(Mean, Sd) UCL				26.95		
162	97.5% Chebyshev(Mean, Sd) UCL				33.52	99% Chebyshev(Mean, Sd) UCL				46.42		
163	Suggested UCL to Use											
164	95% Student's-t UCL				18.25							
165	<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness using results from simulation studies. However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>											
166	Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.											
167												
168												
169												
170												
171												
172												
173												
174												
175												
176												
177												
178	MW-5R cis 1,2-DCE											
179												
180	General Statistics											
181	Total Number of Observations				9	Number of Distinct Observations				8		
182						Number of Missing Observations				0		
183	Minimum				0.6	Mean				4.77		
184	Maximum				10.1	Median				2.38		
185	SD				4.376	Std. Error of Mean				1.459		
186	Coefficient of Variation				0.917	Skewness				0.273		
187												
188	<p>Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach, refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance, but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).</p>											
189	The Chebyshev UCL often results in gross overestimates of the mean.											
190	Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.											
191												
192												
193												
194	Normal GOF Test											
195	Shapiro Wilk Test Statistic				0.766	Shapiro Wilk GOF Test						
196	1% Shapiro Wilk Critical Value				0.764	Data appear Normal at 1% Significance Level						
197	Lilliefors Test Statistic				0.263	Lilliefors GOF Test						
198	1% Lilliefors Critical Value				0.316	Data appear Normal at 1% Significance Level						
199	Data appear Normal at 1% Significance Level											
200	Note GOF tests may be unreliable for small sample sizes											

A	B	C	D	E	F	G	H	I	J	K	L
201											
202	Assuming Normal Distribution										
203	95% Normal UCL					95% UCLs (Adjusted for Skewness)					
204	95% Student's-t UCL			7.482		95% Adjusted-CLT UCL (Chen-1995)				7.311	
205						95% Modified-t UCL (Johnson-1978)				7.504	
206											
207	Gamma GOF Test										
208	A-D Test Statistic			0.879		Anderson-Darling Gamma GOF Test					
209	5% A-D Critical Value			0.743		Data Not Gamma Distributed at 5% Significance Level					
210	K-S Test Statistic			0.279		Kolmogorov-Smirnov Gamma GOF Test					
211	5% K-S Critical Value			0.287		Detected data appear Gamma Distributed at 5% Significance Level					
212	Detected data follow Appr. Gamma Distribution at 5% Significance Level										
213	Note GOF tests may be unreliable for small sample sizes										
214											
215	Gamma Statistics										
216	k hat (MLE)			1.001		k star (bias corrected MLE)				0.741	
217	Theta hat (MLE)			4.765		Theta star (bias corrected MLE)				6.433	
218	nu hat (MLE)			18.02		nu star (bias corrected)				13.35	
219	MLE Mean (bias corrected)			4.77		MLE Sd (bias corrected)				5.539	
220						Approximate Chi Square Value (0.05)				6.127	
221	Adjusted Level of Significance			0.0231		Adjusted Chi Square Value				5.132	
222											
223	Assuming Gamma Distribution										
224	95% Approximate Gamma UCL			10.39		95% Adjusted Gamma UCL				12.4	
225											
226	Lognormal GOF Test										
227	Shapiro Wilk Test Statistic			0.814		Shapiro Wilk Lognormal GOF Test					
228	10% Shapiro Wilk Critical Value			0.859		Data Not Lognormal at 10% Significance Level					
229	Lilliefors Test Statistic			0.27		Lilliefors Lognormal GOF Test					
230	10% Lilliefors Critical Value			0.252		Data Not Lognormal at 10% Significance Level					
231	Data Not Lognormal at 10% Significance Level										
232											
233	Lognormal Statistics										
234	Minimum of Logged Data			-0.511		Mean of logged Data				0.986	
235	Maximum of Logged Data			2.313		SD of logged Data				1.241	
236											
237	Assuming Lognormal Distribution										
238	95% H-UCL			30.68		90% Chebyshev (MVUE) UCL				11.68	
239	95% Chebyshev (MVUE) UCL			14.66		97.5% Chebyshev (MVUE) UCL				18.8	
240	99% Chebyshev (MVUE) UCL			26.92							
241											
242	Nonparametric Distribution Free UCL Statistics										
243	Data appear to follow a Discernible Distribution										
244											
245	Nonparametric Distribution Free UCLs										
246	95% CLT UCL			7.169		95% BCA Bootstrap UCL				7.231	
247	95% Standard Bootstrap UCL			7.023		95% Bootstrap-t UCL				7.575	
248	95% Hall's Bootstrap UCL			6.416		95% Percentile Bootstrap UCL				6.968	
249	90% Chebyshev(Mean, Sd) UCL			9.146		95% Chebyshev(Mean, Sd) UCL				11.13	
250	97.5% Chebyshev(Mean, Sd) UCL			13.88		99% Chebyshev(Mean, Sd) UCL				19.28	
251											

	A	B	C	D	E	F	G	H	I	J	K	L
252	Suggested UCL to Use											
253	95% Student's-t UCL				7.482							
254												
255	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
256	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.											
257	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
258												