TECHNICAL MEMORANDUM

Remedial Progress Review and Evaluation of Groundwater Cleanup Levels at the Boeing Renton Plant

Prepared for:

The Boeing Company

EHS Remediation

Prepared by:

CALIBRE Systems, Inc.

16935 SE 39th St.

Bellevue, Washington 98008

May 2021, DRAFT

Project No. T0014538

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AO	Agreed Order
AWQC	Ambient Water Quality Criteria
cis-1,2-DCE	cis-1,2-dichloroethene
CLARC	Cleanup Level and Risk Calculation
CAP	Cleanup Action Plan
COC	contaminant of concern
CPOC	conditional points of compliance
CVOC	chlorinated volatile organic compound
DCE	Dichloroethene
Ecology	Department of Ecology
EPA	Environmental Protection Agency
ERD	Enhanced reductive dechlorination
FS	Feasibility Study
HI	Hazard Index
IC	institutional control
Kd	soil-water partitioning relationship
k	degradation rate constant
MTCA	Model Toxics Control Act
µg/L	Micrograms per liter
PCE	Tetrachloroethene
TCE	Trichloroethene
VC	Vinyl chloride
VOC	volatile organic compound

1.0 INTRODUCTION

Remedial actions at the Boeing Renton Facility have been implemented under the Washington State Department of Ecology (Ecology) Agreed Order (AO) No. 8191. The AO was issued to Boeing on January 2, 2013 to implement the site-wide Cleanup Action Plan (CAP) for twelve separate solid waste management units (SWMUs) and areas of concern (AOCs) identified at the Renton Facility.

Following Model Toxics Control Act (MTCA) procedures and pursuant to WAC 173-340-420, a periodic review is appropriate to consider post-cleanup site conditions and monitoring data to assure that human health and the environment are being protected with the cleanup actions implemented. Remedy performance criteria to be reviewed include (WAC 173-430-420 (4));

1) The effectiveness of ongoing or completed cleanup actions;
2) New scientific information for individual hazardous substances or mixtures present at the site;
3) New applicable state and federal laws for hazardous substances present at the site;
4) Current and projected site and resource uses;
5) The availability and practicability of more permanent remedies; and
6) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

WAC 173-340-420 also indicates that a review on a five-year frequency may be appropriate. The first four review criteria listed above (items 1, 2, 3 and 4) are relevant to the current status of the cleanup actions at the Renton Facility (the Site). The two additional performance review criteria [5) Alternate remedies, and 6) analytical methods] are easily addressed. The remedies implemented under the CAP are intended to be permanent remedies (and the existing performance data demonstrate effectiveness) and existing analytical methods provide sufficient precision to demonstrate compliance (the method detections are lower than the established criteria).

1.1 Review of Remedial Progress at Renton

The Site-wide remedies were implemented with approval of the Engineering Design Report (EDR) in 2014 and the first draft of this review (CALIBRE 2019) was initiated in late 2019, to provide supporting information for the first 5-year review. The initial draft of this project evaluation was submitted to Ecology in late December 2019 (CALIBRE 2019). Ecology provided comments on the approach to setting Site cleanup levels via e-mail received on February 13, 2020 (Ecology 2020). This report has been prepared to address each of the comments received from Ecology.

This review of remedial progress and current Site conditions, along with the evaluation of the compliance monitoring program, has been an integral part of the Renton cleanup action for several years. The most recent submittal was *Recommendations for Modifications to Compliance Monitoring Plan (CMP) Addendum # 3* (CALIBRE 2020) approved by Ecology in late July 2020. This existing remedial progress review (CALIBRE 2020) is included in this report as Attachment C and presents a summary of

remedial actions and performance data collected. This approach for managing the cleanup action is noted in the CAP which states that site conditions will be reevaluated, including review of cleanup standards appropriate for future land uses. This process has been highly effective; most of the AOCs/SWMUs have met, or are approaching, the MTCA criteria for protection of a potable water resource.

This report presents a summary of current Site conditions and describes the review of the cleanup levels (CULs) for groundwater applicable to the Site. The prior CULs were calculated for the Site starting in the Feasibility Study Work Plan (FSWP, Geomatrix 2004) and Feasibility Study (FS, AMEC 2008) and later detailed in the draft Cleanup Action Plan (CAP) (AMEC 2013) for each AOC at the Site. Starting in the 2004 FSWP, CULs were developed using the criteria applicable at that time and considered all of the initial compounds detected in source areas. Evaluation of cleanup levels, a key step in a 5-year review, is necessary to update criteria based on current standards, evaluating only those constituents which are now present in groundwater, and to provide standardized cleanup levels for each chemical that would apply to all areas of the Site. This progress review and evaluation of Site cleanup levels started with multiple meetings with Ecology in 2019. The planning meetings were used to clarify:

1. Site-wide remedial actions have been implemented and current groundwater monitoring data indicate reduced COC concentrations, plus the current data demonstrate that many of the chemicals on the initial COC list for each AOC are no longer present in groundwater.
2. EPA has established revised toxicity criteria for TCE, PCE, and arsenic, to account for recent scientific studies, and new State and Federal standards have been set for arsenic.
3. Ecology and EPA published new/revised standards which are now the promulgated criteria set for protection of surface water considering fish consumption and ingestion of potable water.
4. Ecology has completed State-wide data review and published data regarding naturally occurring arsenic in groundwater and CULs are to consider natural background levels.

1.2 Initial Development of Cleanup Levels

The initial development of Site cleanup levels started with the FS planning in the FSWP (Geomatrix 2004). Cleanup levels were previously calculated using the following steps:

1) Initially, the MTCA Method B criteria published by Ecology in Cleanup Level and Risk Calculation (CLARC) were selected.

2) If the COCs present within an AOC/area were expected to discharge to surface water, criteria for protection of surface water were developed. The surface water protection criteria (applicable at the point of discharge to surface water) were based on protection of human exposure to COCs through drinking the surface water and consumption of fish from the surface water and also considered the potential for ecological impacts in the surface water. Based on the surface water

criteria developed, the FS determined that they were either technically infeasible to achieve and/or the criteria could not be achieved within a reasonable restoration time frame. Based on these conditions, the FS proposed, and CAP established, the use of conditional points of compliance (CPOCs) following the MTCA procedures in WAC 173-340-720.

3) For organic COCs amenable to degradation processes, such as benzene, tetrachloroethene (PCE), trichloroethene (TCE), cis 1,2 dichloroethene (DCE), and vinyl chloride (VC), the risk-based calculation, from 2) above, was adjusted using a modeled attenuation factor in groundwater between the CPOCs and the nearest surface water. This approach was detailed in the FSWP and FS for the Site (Geomatrix 2004 and 2008). For the modeling analysis, literature values of the degradation half-life for the Site COCs were used; for example, a half-life for VC was assumed to be 7.8 years, based on the selected literature studies cited. This initial attenuation modeling was completed as part of the FSWP in 2004.

4) At each CPOC location, the lowest of the values from the steps above were applied, and cumulative Site risk from all chemicals listed as COCs at each AOC/SWMU area was calculated and the initial cleanup levels were adjusted downward as necessary so that the cumulative hazard index (HI) was < 1 and cumulative cancer risk was < 10^{-5} (as per the MTCA requirements in WAC 173-340-705(5) and 173-340-708(5)). To complete this evaluation, the analysis assumed that all the COCs listed for each AOC were present and then apportioned a fraction of the "allowable" risk between all of the initial COCs which were considered to be present.

5) If the calculated values were lower than the practical quantitation limit (PQL), the CULs were adjusted upward to the PQL (as per the MTCA requirements in WAC 173-340-707). This adjustment included arsenic and lead, for which the CULs were set to the PQL of 1 microgram per liter (µg/L).

6) Cleanup levels were established for CPOC locations. Cleanup levels were not specified for areas up gradient of CPOC locations.

1.3 Relevant Changes in MTCA since the Cleanup Action Plan was Prepared

The Department of Ecology (Ecology) has made several clarifications and changes to MTCA since the 2004 start of the FSWP and the draft CAP (AMEC 2012) which are relevant to calculating CULs for groundwater at the Site. Additionally, Site-wide remedial actions have been implemented that have changed conditions at the Site in several relevant ways. The important factors that have changed are:

A. Remedial actions have been implemented throughout the Site and current groundwater monitoring data demonstrate significantly reduced COC concentrations. In addition, the current Site monitoring data also demonstrate that the prior list of COCs has been reduced in many AOCs.

This is important because many of the chemicals on the initial COC list for each AOC are no longer present in groundwater.

B. The US Environmental Protection Agency (EPA) has re-evaluated toxicity criteria for TCE, PCE, and arsenic, to account for recent scientific studies, and new State and Federal standards have been set for arsenic.

C. Ecology and EPA published new/revised standards which are now the promulgated criteria for protection of surface water considering fish consumption and ingestion of potable water.

D. The scientific knowledge regarding degradation rates for VC under a variety of conditions has grown, specifically for reducing conditions such as are present at Renton (a buried marsh/lake bed with naturally reducing conditions) where definitive data have been collected demonstrating degradation and attenuation of VC.

E. Ecology has completed extensive data analysis and published reports (Ecology 2018) documenting the range of arsenic to be expected as a naturally occurring compound in groundwater, and pursuant to MTCA, CULs need to adjusted to consider natural background levels.

Interim actions to remove source-area contaminants at the Site started during the RI/FS phase in 2004 and Site-wide remedial actions defined in the CAP started at the Site in 2014, with the submittal of the EDR report (AMEC 2014). In the intervening years, the interim actions and remedial actions have resulted in significant reductions in contaminant concentrations present in soil and groundwater. In this same time period, changes in applicable State and Federal Standards and MTCA cleanup criteria have occurred since the original CULs started in the 2004 FSWP and later documented in the draft CAP. The remainder of this report presents the methodology for developing revised CULs for the Site based on current regulations, promulgated standards and recent Ecology guidance documents.

2.0 REVISED CLEANUP LEVELS BASED ON CURRENT STANDARDS AND POLICY

This section presents recommended updated CULs based on:

- Changes in groundwater quality that have eliminated several of the prior COCs from consideration;
- Changes to the promulgated criteria for the remaining COCs;
- Considering natural degradation processes (for VC, cis 1,2 DCE, TCE, PCE and benzene) that are consistent with geochemical conditions at the Site; and
- Current Ecology Guidance/Policy for setting CULs and monitoring compliance in groundwater.

First, the CULs need to be based on the COCs truly present in groundwater at each site/area. The COCs that are currently present in groundwater include PCE, TCE, VC, cis 1,2 DCE, benzene, total petroleum hydrocarbons (TPH), arsenic, copper, and lead. Only a portion of these COCS are present at the various SWMUs/AOCs. Table 1 presents the initial list of Site COCs in groundwater from the CAP, Table 2 presents the current COCs that are actually present in groundwater within each area based on recent (2020) monitoring results. Key differences include: SWMU 172/174 with an estimated 14 different COCs in groundwater (in the CAP) versus the 6 currently present; AOC-001/002 with an estimated 13 COCs in groundwater (in the CAP) versus the 4 currently present; and AOC-90 with an estimated 17 COCs in groundwater (in the CAP) versus the 7 at the source and only 1 in the CPOC wells.

Consideration of the actual COCs currently present, versus the estimated compounds from the RI and carried into the CAP, is critical for the MTCA cumulative risk calculations. It is also important to obviously consider the absolute magnitude of the concentrations listed in the CPOC wells in Table 2, most of the CVOCs present are at levels from 0.1 to 0.5 µg/L which are below or near MTCA criterion for protection of groundwater as a potable resource.

The locations of the different SWMUs and AOCs within the Renton Facility are shown in Figure 1.

Table 1 List of Initial COCs in Groundwater from the CAP (copied from Table 2 of the CAP)

AOC/ SWMU ID and COCs in CAP	Number of COCs Identified
SWMU-168	
Vinyl chloride	1
SWMU-172/174	
1,1-Dichloroethene	
Benzene	
Chloromethane	
cis -1,2-Dichloroethene	
Methylene chloride	
Tetrachloroethene	
Trichloroethene	
Vinyl chloride	
bis (2-Ethylhexyl) phthalate	
Arsenic	
Chromium, total, as Cr (III)	
Chromium, total, as Cr (VI)	
Copper	
Lead	14
Building 4-78/79 SWMU/AOC	
Vinyl chloride	
Trichloroethene	
cis -1,2-Dichloroethene	
Benzene	
TPH-Gasoline w/benzene	5
Former Fuel Farm SWMU/AOC	
TPH-Jet Fuel	
TPH-Diesel	2
AOC-001/002	
Benzene	
Trichloroethene	
cis -1,2-Dichloroethene	
trans -1,2-Dichloroethene	
1,1-Dichloroethene	
Chloroform	
Vinyl chloride	
Naphthalene	
AOC-003	
Tetrachloroethene	
Trichloroethene	
Vinyl Chloride	
cis -1,2- Dichloroethene	13

AOC/ SWMU ID and COCs in CAP	Number of COCs Identified
AOC-004	
Benzene	
Lead	
TPH-Gasoline w/benzene	3
AOC-034/035	
Vinyl chloride	
cis -1,2-Dichloroethene	2
AOC-060	
Vinyl chloride	
Trichloroethene	
cis- 1,2-Dichloroethene	3
AOC-090	
1,1-Dichloroethene	
1,1,2-Trichloroethane	
1,1,2,2-Tetrachloroethane	
Acetone	
Benzene	
Toluene	
Carbon tetrachloride	
Chloroform	
cis -1,2-Dichloroethene	
trans -1,2-Dichloroethene	
Methylene chloride	
Vinyl chloride	
Tetrachloroethene	
Trichloroethene	
TPH-Gasoline w/benzene	
TPH-Diesel	
TPH-Motor Oil	17
AOC-092	
Benzene	
TPH-Gasoline w/benzene	2
AOC-093	
TPH-Gasoline w/o benzene	1

Other Areas not in CAP	
Apron A	2
4-70	3
Lot 20/Former 10-71	4

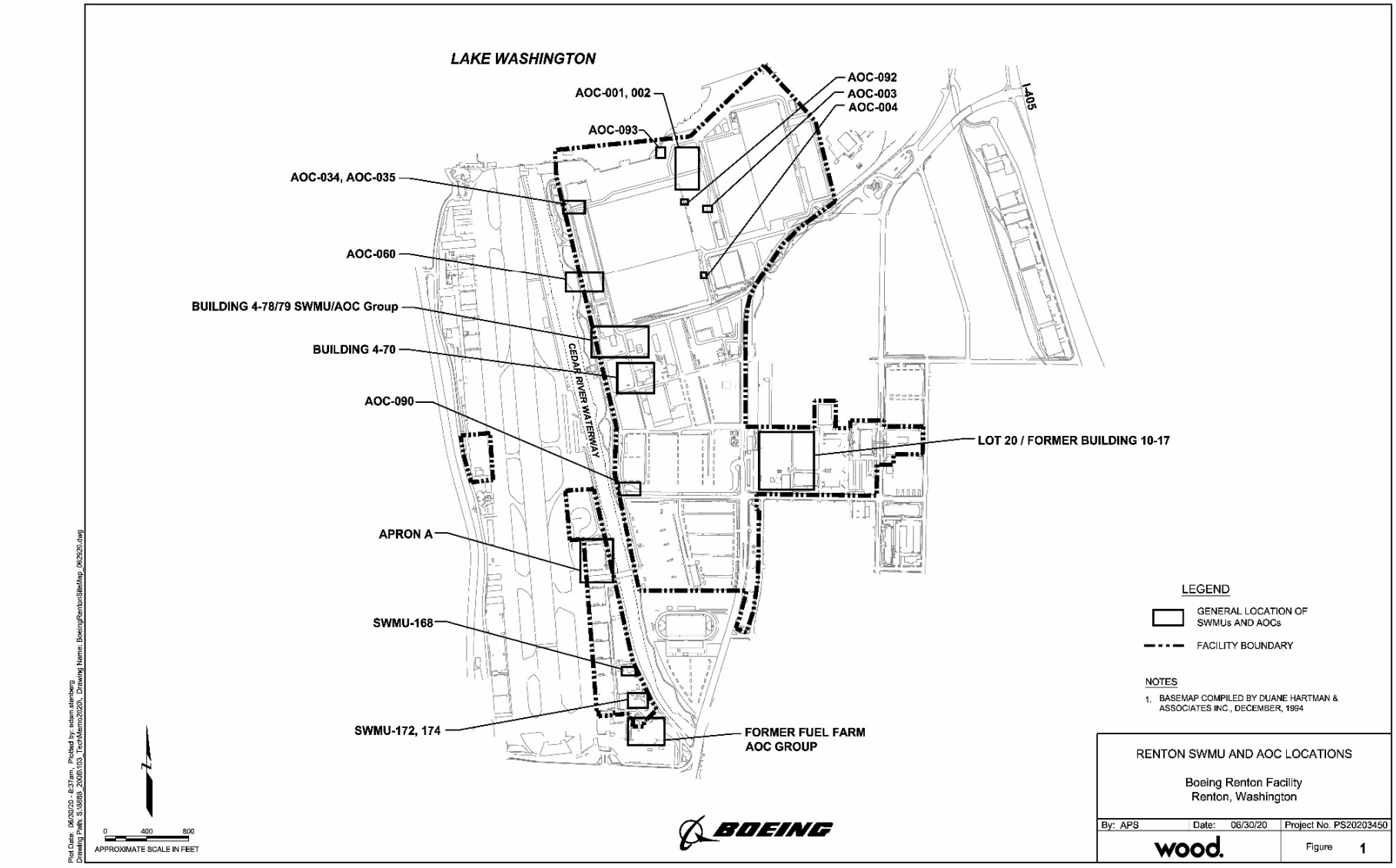
Table 2 COCs Currently Present in Groundwater by SWMU/AOC

SWMU/AOCs	COCs Present in Groundwater - Source Area	COCs Present in Groundwater – CPOC (and current maximum levels[1] detected)	Number of COCs remaining
SWMU-168	None	Vinyl Chloride (0.162 µg/L)	1
SWMU-172/174	Tetrachloroethene Trichloroethene Vinyl Chloride cis-1,2-Dichloroethene Arsenic Copper Lead	Trichloroethene (0.0227 µg/L) Vinyl Chloride (0.425 µg/L) cis-1,2-Dichloroethene (0.482 µg/L) Arsenic (10.1µg/L) Copper (10.8 µg/L) Lead (10.8 µg/L)	6
Building 4-78/79 SWMU/AOC Group	Vinyl Chloride cis-1,2-Dichloroethene Trichloroethene Benzene TPH-G	Vinyl Chloride (<0.2 µg/L) cis-1,2-Dichloroethene (1.17 µg/L) Trichloroethene (<0.20 µg/L) Benzene (0.24 µg/L) TPH-G (<100 µg/L)	5
Former Fuel Farm SWMU/AOC Group	None (both TPH-Jet Fuel & TPH-Diesel are non-detect)	TPH-Jet Fuel (5.7 mg/L) TPH-Diesel (7.67 mg/L)	2
AOC-001/002 (all wells closed with Apron R construction [2])	Trichloroethene Vinyl Chloride cis-1,2-Dichloroethene	Trichloroethene (<0.02 µg/L, Aug 2019) Vinyl Chloride (0.20 µg/L, Aug 2019) cis-1,2-Dichloroethene (0.24 µg/L, Aug 2019) Benzene (0.22 µg/L, Aug 2019)	3
AOC-003	Vinyl Chloride, cis-1,2-Dichloroethene	Vinyl Chloride (0.392 µg/L)	1
AOC-004	Lead	Lead (0.611 µg/L)	1
AOC-34/35 [3]	Vinyl Chloride, cis-1,2-Dichloroethene	Vinyl Chloride (0.392 µg/L)	0
AOC-060	Trichloroethene Vinyl Chloride cis-1,2-Dichloroethene	Trichloroethene (0.0291 µg/L) Vinyl Chloride (0.1 µg/L) cis-1,2-Dichloroethene 0.0925 µg/L)	3
AOC-090	Trichloroethene Vinyl Chloride cis-1,2-Dichloroethene Benzene TPH-G TPH-D TPH-O	Vinyl Chloride (0.377 µg/L shallow zone Vinyl Chloride (<0.02 µg/L intermediate , March 2020)	1
AOC-092 [3]	Benzene TPH-Gasoline w/benzene	———	0

AOC-093 (3)	TPH-Gasoline w/benzene	——	0
Apron A	N/A	Vinyl Chloride (<0.2 µg/L) cis-1,2-Dichloroethene (0.52 µg/L)	1
4-70 (3)	NA	Trichloroethene (0.37 µg/L, Mar 2020) Vinyl Chloride (0.21 µg/L, Mar 2020)	0
Lot 20/Former 10-71 (3)	NA	Vinyl Chloride (<0.2 µg/L, Nov 2019) Toluene (<0.2 µg/L, Nov 2019)	0

Notes:

1. Concentrations presented in CPOC column are maximum concentration (maximum from all wells sampled) from the most recent sampling in August 2020, unless otherwise noted.
2. The wells in AOC-001/002 area are part of Apron R construction, all wells were closed for redevelopment and will be replaced when the construction is complete, expected in late 2022.
3. The areas with zero (0) COCs remaining have met the remedial action goals and no additional remedial actions and or monitoring are ongoing.


LAKE WASHINGTON
AOC-001, 002
AOC-093
AOC-092
AOC-003
AOC-004
I-405
AOC-034, AOC-035
AOC-060
BUILDING 4-78/79 SWMU/AOC Group
BUILDING 4-70
CEDAR RIVER WATERWAY
AOC-090
LOT 20 / FORMER BUILDING 10-17
APRON A
SWMU-168
SWMU-172, 174
FORMER FUEL FARM AOC GROUP
LEGEND
GENERAL LOCATION OF SWMUs AND AOCs
FACILITY BOUNDARY
NOTES
1. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES INC., DECEMBER, 1994
0 400 800
APPROXIMATE SCALE IN FEET
BOEING
RENTON SWMU AND AOC LOCATIONS
Boeing Renton Facility
Renton, Washington
By: APS
Date: 06/30/20
Project No. PS20203450
wood.
Figure 1
Plot Date: 06/30/20 - 8:37am, Plotted by: adam.stenberg
Drawing Path: G:\Jobs_2020\100_Tech\Memo\2020\, Drawing Name: BoeingRentonSiteMap_062920.dwg

2.1 Updates to MCLs and Consideration of Background

Table 3 summarizes recommended updates to the chemical-specific CULs for groundwater based on use as a potable water supply. The criteria listed in Table 3 are based on promulgated State and Federal standards with adjustments as required to meet other risk-based considerations required under MTCA. The criteria listed in Table 3 are from current CLARC tables and the adjustments used to derive the CULs are based on MTCA defined procedures.

Table 3 Site-wide CULs for Groundwater Based on Use as Potable Water Supply

	Existing CULs in the CAP The CULs vary between AOCs/SWMUs & the range is cited (µg/L)	Applicable Federal Standard MCL (µg/L)	Method B Non-Cancer Hazard Index = 1 (µg/L)	Method B Cancer Risk (10^{-5}) (µg/L)	Does the ARAR exceed HI=1 or excess Cancer Risk exceed 10^{-5} ?	**Proposed Groundwater CUL based on Potable Supply (µg/L)**	Basis
Volatile Organic Compounds							
cis 1,2 DCE	*0.02 - 2.4*	70	16	N/A	Yes	**16**	Adjusted down from the MCL, Method B Non-Cancer effects with HI<1
PCE	*0.02 - 0.05*	5	48	210	No	**5**	MCL
TCE	*0.02 - 0.23*	5	4	5.4	Yes	**4**	Adjusted down from the MCL, Method B Non-Cancer effects with HI<1
VC	*0.05 - 2.9*	2	24	0.29	Yes	**0.29**	Adjusted down from the MCL, Method B Cancer effects with 10^{-5} risk
Benzene	*0.8 - 5.0*	5	32	8	No	**5**	MCL
TPH-gasoline with benzene	*800*	--	--	--		**800**	MTCA Method A
TPH-diesel	*500*	--	--	--		**500**	MTCA Method A
TPH-motor oil	*500*	--	--	--		**500**	MTCA Method A
Inorganics							
Arsenic	*1*	10	4.8	0.58	Yes/ NA*	**10**	MCL & based on background
Lead	*1*	15			NA	**15**	TT**
Copper	*3.5*	1,300			NA	**1,300**	TT**

*NA Arsenic: Ecology based this criteria on consideration of existing Safe Drinking Water Act, the MCL, and natural background (CLARC, Ecology 2018, and WAC 173-201A-240).

**TT Copper & Lead regulated as action levels where a treatment technique (TT) for potable supply is required for systems if the action levels shown are exceeded.

2.2 Consideration of Cumulative Risks

MTCA requires the consideration of total site risks when multiple COCs are present (WAC 713-340-720 (7)). These adjustments are required if, without these adjustments, the cumulative hazard index (HI) would exceed 1 or the total excess cancer risk would exceed 1 x 10^{-5}. The CULs presented in Table 3 have already considered the adjustments for individual chemicals from the applicable State and Federal standards (downward adjustments from the MCL as listed in the last column).

2.2.1 Cumulative Risks Considering Threshold Effects Criteria

The relevant site chemicals with threshold effects toxicity criteria (reference dose, RFDs) include cis 1,2 DCE, PCE, TCE, VC, benzene, and arsenic.

With the exception of 1 well at 4-78/79 SWMU/Area and arsenic at SWMU 172-174 as discussed below, all current water quality measurements at all wells (source areas wells, downgradient wells, and CPOC wells) for all AOCs/SWMUs are below these criteria (as included in Table 3 and the cumulative HI is below 1; i.e., the current conditions meet the cumulative risk criteria considering non-cancer effects). At 4-78/79 SWMU/Area Group, VC in well GW033S rebounded recently and continued treatment is ongoing.

At SWMU 172-174 arsenic is present in groundwater and the naturally occurring range exceeds a HI of 1; i.e., a background arsenic concentration of 10 µg/L (Ecology 2018) results in a calculated HI of 2.1. The HI exceedance is derived from the background arsenic present and, following the MTCA procedures and noted in CLARC, the CUL is to be based on background levels, not a concentration calculated from HI. This is appropriate considering the arsenic source is background related and was not related to releases from SWMU 172-174. The SWMU 172-174 area was initially identified in the RFI based on tanks used for waste water from steam cleaning operations for automotive and aircraft ground equipment.

2.2.2 Cumulative Risks Considering Carcinogenic Effects Criteria

The relevant site chemicals with carcinogenic effects toxicity criteria include PCE, TCE, VC, benzene, and arsenic which must be considered in an additive/cumulative manner. The organic chemicals (PCE, TCE, VC, and benzene) are anthropogenic and the inorganic chemical (arsenic) is a naturally occurring element that is commonly found in soil and groundwater in the Puget Sound Basin (Ecology 2018).

The range of arsenic values detected at the SWMU 172-174 Group is variable with average values in the range of 5-15 µg/L over the last 2+ years. This observed range of arsenic in groundwater is consistent with the naturally occurring background arsenic range in groundwater used for potable supply reported by Ecology[1] (Ecology 2018). A background arsenic concentration of 10 µg/L (Ecology 2018) results in a calculated background cancer risk of 1.7 x 10^{-4} from this single water ingestion pathway with the

[1] The 2018 Ecology background study is based on testing from over 2,500 potable supply wells in Puget Sound Basin. All samples are from water supply aquifers with no known anthropogenic impacts.

naturally occurring background arsenic levels. The natural background range exceeds the MTCA 10^{-5} cumulative risk requirement and MTCA requires that CULs be adjusted up to the background level (irrespective of the 10^{-5} cumulative risk requirement). Therefore, the cumulative risk evaluation evaluates only the organic chemicals where decisions related to "excess risk"[2] are relevant, meeting the cleanup levels and completion of active remedial actions. After the CULs for organic chemicals have been met, arsenic will be a remaining risk driver at background levels. This remaining background risk is effectively addressed with institutional controls (ICs) to prevent future use of groundwater as a potable resource. ICs are the only practical alternative for the background risk because it is infeasible to attain CULs below the background levels.

For the organic chemicals present, vinyl chloride has the lowest CUL of the COCs and it will drive all cumulative risk predictions. In the future, when remedial actions have achieved the CUL for vinyl chloride, the remaining COCs will either not be present, or alternatively the cumulative risk for all carcinogenic COCs remaining at each well will be calculated to demonstrate compliance with this MTCA 10^{-5} cumulative risk requirement. These well-by-well cumulative risk calculations have been completed which are included in Attachment B and also as an Excel file (enclosed with the submittal of this report). See further discussion of CVOCs degradation rates under the attenuation modeling in Section 3.

2.3 Consideration of Surface Water Criteria at CPOCs

MTCA recognizes that where a release has occurred at a site located adjacent to a surface water body, developing groundwater criteria can be complicated because it must also include evaluation and protection of surface water resources. The question becomes where to monitor groundwater or surface water to demonstrate compliance with cleanup levels developed to protect surface water. The earliest clarification of Ecology's intent is listed in the 1991 Summary for Amendments to MTCA Cleanup Regulation (Ecology 1991) indicating:

> *"Where [groundwater] cleanup levels are based on protecting nearby surface water, compliance with [the surface water quality criteria] will generally be based on surface water monitoring performed as close as possible to the groundwater/surface water interface,"*

This early clarification demonstrates the regulatory intent that surface water standards are to be applied at the groundwater/surface water interface, not throughout the upland areas of a groundwater plume where other standards (e.g., MCLs) are established for protection of human health.

MTCA and related Ecology Guidance (Ecology 2017) allow for use of CPOCs, which may be established in the upland or in a transitional zone where groundwater has mixed with surface water. The Renton CAP established CPOCs for the Renton facility that are near source areas in the upland portion of the Site

[2] In MTCA, when the term "cancer risk" is used or described, it is always used as "excess risk" recognizing that natural background is present; the specific definition provided in WAC 173-340-200 is *"additional cancer above the background cancer".*

(AMEC, 2012). MTCA requires the CPOCs to be located as near to the source area as practicable. This spatial position does not consider the documented attenuation between the CPOC location and the point of discharge to a waterway (which is specific the exposure point for which the surface water standard has been developed to protect). The recommended approach presented in Ecology Guidance (Ecology 2017) to address this issue is as follows:

> *"Where such monitoring wells [between the surface water and source of contamination] are used, the department should consider an estimate of natural attenuation between the monitoring well and the point or points where ground water flows into the surface water in evaluating whether compliance has been achieved."*

This same intent is noted in MTCA in WAC 173-340-720 (8, e, ii). Consistent with the 1991 Ecology description regarding groundwater compliance with surface water discharge standards, WAC 173-340-730 (6)(a) & (b) describes the point of compliance for cleanup standards for surface water as follows:

> (a)"*The point of compliance for the surface water cleanup levels shall be the point or points at which hazardous substances are released to surface waters of the state unless the department has authorized a mixing zone in accordance with chapter 173-201A WAC."*
> *(b)* "*Where hazardous substances are released to the surface water as a result of ground water flows, no mixing zone shall be allowed to demonstrate compliance with surface water cleanup levels*."

The relevant surface water criteria, updated to current promulgated standards, are shown in Table 4.

Table 4. Surface Water Criteria (as of January 4, 2021)

Volatile Organic Compounds	**Criteria (µg/L)**	**Basis**
cis 1,2 DCE	16	No AWQC, default to Method B for potable surface water
PCE	4.9	173-201A WAC
TCE	0.38	173-201A WAC
VC	0.02	173-201A WAC
Benzene	0.44	173-201A WAC
TPH-gasoline with benzene	N/A	
TPH-diesel	N/A	
TPH-motor oil	N/A	
Inorganics		
Arsenic[1]	10 [0.018]	173-201A WAC, natural background [Clean Water Act Section 304]
Lead	2.5	Clean Water Act Section 304
Copper[2]	11	Clean Water Act Section 304

Footnotes:

1 Arsenic: WAC 173-201A-240, Table 240 - Human Health Criteria for Consumption of Water and Organisms. This criterion for total arsenic is the maximum contaminant level (MCL) developed under the Safe Drinking Water Act. The MCL for total arsenic is applied to surface waters where consumption of organisms-only and where consumption of water + organisms reflect the designated uses. Ecology also considered naturally background levels.

2 Copper: based on aquatic freshwater chronic criteria and a hardness of 100 mg/L, the criteria for human ingestion is 100 times higher. For relative comparison, the storm water permit discharge benchmark for copper is 14 µg/L.

3.0 BIOSCREEN MODELING TO EVALUATE ATTENUATION

The BIOSCREEN model was used to estimate the attenuation between the CPOC and the point of surface water discharge. The modeling was implemented following the Ecology guidance regarding CPOCs and surface water criteria applied to groundwater (Ecology 2017).

3.1 Attenuation of Vinyl Chloride

BIOSCREEN was developed by the EPA to evaluate and predict chemical transport in groundwater where natural attenuation is an important consideration (EPA, 1996). BIOSCREEN uses source-area properties describing the chemical(s) in question (source area, source concentration, and degradation rates) and the hydrogeologic system (aquifer porosity, hydraulic conductivity, and hydraulic gradient) to predict chemical migration and attenuation. The general model input parameters are shown in Table 5.

Table 5. General BIOSCREEN Model Input Parameters

Parameter	Value	Source
Porosity	0.43	FS Appendix A, referencing MTCA three-phase partition model
Aquifer Thickness	5 to 15 feet	FS Appendix A, referencing Site boring logs
Hydraulic Gradient	Ranging from 0.001-0.008 ft/ft	FS Appendix A, referencing water table maps from the RI
Hydraulic Conductivity	Ranging from: 2.15×10^{-3} centimeters per second (cm/s) (sand) to 8.96×10^{-4} cm/s (silty sand)	FS Appendix A, referencing slug tests results from the RI

Based on the model documentation, BIOSCREEN was developed to answer the basic question regarding natural attenuation of organic chemicals: How far will the dissolved contaminant plume extend if no further source control measures are implemented? This is accomplished by using a solute transport model that includes first-order decay to represent biological degradation processes. The chemical concentration at distances, such as a CPOC or point of discharge, are calculated at the center of the plume over time allowing the user to evaluate plume migration and evolution.

Selection of a representative degradation rate (or equivalently a half-life) depends on the chemical in question and the subsurface conditions, specifically whether aerobic or anaerobic conditions are present. At the Renton site, the background conditions are naturally anaerobic which is empirically documented by the presence of dechlorination daughter products demonstrating that attenuation via reductive dechlorination is occurring. Based on these conditions, monitored natural attenuation (MNA)

and enhanced reductive dechlorination (ERD) were remedies recommended in the FS and selected in the CAP for multiple areas of the site. The existing performance monitoring provides definitive data demonstrating degradation and attenuation of VC. Trace to low levels of VC were initially detected in the CPOC wells before source control was implemented (demonstrating significant baseline degradation as the plumes migrate), and multiple monitoring wells have reached non-detect levels for VC (for example, AOC 034/035) where no ERD substrates were applied. These baseline conditions are the reason MNA was the remedy selected in the CAP for multiple areas of the Site. Boeing has chosen to additionally augment the MNA remedies in selected areas with ERD in order to accelerate Site cleanup.

The half-life applied in the modeling used in the FS was selected prior to any active ERD treatment of the different investigated areas. An EPA literature study summarizing degradation rate constants (k) for sites with anaerobic conditions states that under anaerobic conditions (i.e., those conditions that are representative of the Site), the mean degradation rate constants for VC are between 0.038 and 0.0076 (1/days)[3] (EPA, 2013). To ensure this analysis is conservative, slower rate constants of 0.0076 and 0.0025 (1/days)[4] are included in the BIOSCREEN modeling presented herein. The use of slower degradation rate constants is selected to ensure that the predicted results are conservative and protective. The BIOSCREEN model was run based on the Site conditions and the measured distances at each AOC/release area from the CPOCs to the nearest surface water, as was previously completed in the FS to support the CAP. The Site parameters for each AOC/area are shown in Table 6. More details and model predicted results for the BIOSCREEN modeling are included in Attachment A.

These values were used as inputs for BIOSCREEN and centerline concentrations (the central portion of the plume with the highest concentrations) and were calculated at the distance from the CPOC to the nearest waterway. An initial input concentration of 1 µg/L was assumed at each source area so that the calculated concentration discharging to the waterway is equivalent to an attenuation factor. The concentration of 1 µg/L is above the CUL for VC at 0.29 µg/L and in the range of VC measured in different CPOC areas for SWMU/AOC areas throughout most of the Site (see Table 2 with VC ranging from 0.1 to 0.43 µg /L). The input concentration (1.0 µg/L) is used to calculate general attenuation factors (not to predict current discharge concentrations) and the modeling also considers higher input/source-area concentrations. The BIOSCREEN model was run twice for each AOC; first with a rate constant of 0.0076 1/days and again with a rate constant of 0.0025 1/days.

The BIOSCREEN modeling evaluation of attenuation is intended to be a conservative estimate of the discharge concentration by using the following assumptions:

- The dispersion coefficients in the model are set at low values.

[3] These literature value rate constants correspond with degradation half-lives of 0.05 to 0.25 years.
[4] These rate constants used correspond with degradation half-lives of 0.25 to 0.75 years.

- The effects of chemical adsorption and resulting retardation of migration is set to zero.
- The remaining source mass is set with a large source inventory to ensure the model can simulate a continued flow of COCs from the source area towards the waterway. The actual amount of COCs in the source area can be estimated as the dissolved mass present in the volume of the source area. This last assumption is important and very conservative because it significantly over-predicts the total COC mass available for migration from the source area. The actual total COC mass is at least an order of magnitude smaller based on the site-specific groundwater measurements at each SWMU/AOC.

The predicted CVOC concentrations depend on 1) the decay constant, 2) travel time and 3) initial source-area concentration. The attenuation factor depends on 1) the decay constant, and 2) travel time; it is essentially independent of the initial source concentration. In addition to using multiple rate constants and site-specific distances, the modeling was completed with varying initial concentrations (5 times and 10 times higher) in order to evaluate results and demonstrate that attenuation factors observed at the various areas are independent of the initial concentrations; these simulations were added per the request of the Ecology Project Manager (Ecology, 2020). The simulations were initially run with a source concentration of 1 µg/L, they were also run at 5 µg/L and 10 µg/L, see Tables 7, 8, and 9. The results show that at these initial concentrations and a rate constant k=0.0076 1/days, each area has an attenuation factor of 99.9+% at the waterway. For the much slower rate constant k=0.0025 1/days, the attenuation factor ranges from 92.4% to 99.9+%. The modeling results of net attenuation between the CPOCs and surface water discharge are shown in Table 7 for an initial source concentration of 1 µg/L VC. These results demonstrate that the potable water criteria (from Table 3), applied at the CPOCs, are protective of discharge to surface water.

Table 6. Site Parameters for each SWMU/AOC Area

Area of Concern	**Distance from source to CPOC**	**CPOC Wells (from Appendix A of EDR, Figure C-1 to C-16)**	**Distance from CPOC to Surface water (from Appendix A of FS, Tables A-3 and A-4)**
SWMU-168	30 feet	GW229S, GW230I, GW231S	95 feet to Cedar River Waterway
SWMU-172/174	85 feet	GW233I, GS232S, GW234S, GW235I, GW236S	60 feet to Cedar River Waterway
Bldg. 4-78/4-79	215 feet	GW237S, GW238I, GW239I, GW240D, GW242I, GW241S	185 feet to Cedar River Waterway
Former Fuel Farm	285 feet	GW258S, GW183S, GW225I, GW184S, GW221S, GW211S, GW212S, GW224S	70 feet to Cedar River
AOC-001/002	150 feet	GW185S, GW197S, GW195S, GW196D, GW194S	60 feet to Lake Washington
AOC-003	150 feet	GW247S, GW248I	635 feet to Lake Washington
AOC-004		GW174S	1060 feet to Lake Washington
AOC-060	160 feet	GW149S, GW252S, GW253I, GW150S, GW254S	85 feet to Cedar River Waterway
AOC-090 (shallow northward)	260 feet	GW207S, GW180S, GW179I	150 feet to Cedar River Waterway
AOC-090 (shallow southward)	110 feet	GW178S, GW208S	125 feet to Cedar River Waterway
AOC-090 (intermediate)	35 feet	GW163I, GW165I, GW177I	120 feet to Cedar River Waterway
Apron A		GW264S	100 feet to Cedar River Waterway

Note: All dimensions are from Appendix A of the FS

Table 7. BIOSCREEN Modeling Attenuation Results for 1 µg/L Vinyl Chloride

SWMU/Area of interest	Initial Input of VC at Source	Concentration at Waterway		Net Attenuation from CPOC to Waterway	Net Attenuation from CPOC to Waterway
		k = 0.0076 1/days	k = 0.0025 1/days	k = 0.0076 1/days	k = 0.0025 1/days
	[µg/L]	[µg/L]	[µg/L]	As percent reduction	As percent reduction
SWMU-168	1	<0.001	<0.001	99.9+%	99.9+%
SWMU-172/174	1	<0.001	0.0766	99.9+%	92.37%
Bldg. 4-78/79 SWMU AOC Group	1	<0.001	<0.001	99.9+%	99.9+%
AOC-001/002	1	<0.001	<0.001	99.9+%	99.9+%
AOC-003	1	<0.001	<0.001	99.9+%	99.9+%
AOC-004	1	<0.001	<0.001	99.9+%	99.9+%
AOC-060	1	<0.001	<0.001	99.9+%	99.9+%
AOC-090 (shallow northward)	1	<0.001	<0.001	99.9+%	99.83%
AOC-090 (shallow southward)	1	<0.001	0.002	99.9+%	99.9+%
AOC-090 (intermediate)	1	<0.001	<0.001	99.9+%	99.9+%
Apron A	1	<0.001	<0.001	99.9+%	99.9+%

Table 8 BIOSCREEN Modeling Attenuation Results for 5 µg/L Vinyl Chloride

SWMU/Area of interest	Initial Input of VC at Source	Concentration at Waterway		Net Attenuation from CPOC to Waterway	Net Attenuation from CPOC to Waterway
		k = 0.0076 1/days	k = 0.0025 1/days	k = 0.0076 1/days	k = 0.0025 1/days
	[µg/L]	[µg/L]	[µg/L]	As percent reduction	As percent reduction
SWMU-168	5	<0.001	<0.001	99.9+%	99.9+%
SWMU-172/174	5	<0.0038	0.3823	99.9+%	92.37%
Bldg. 4-78/79 SWMU AOC Group	5	<0.001	<0.001	99.9+%	99.9+%
AOC-001/002	5	<0.001	<0.001	99.9+%	99.9+%
AOC-003	5	<0.001	<0.001	99.9+%	99.9+%
AOC-004	5	<0.001	<0.001	99.9+%	99.9+%
AOC-060	5	<0.001	<0.001	99.9+%	99.9+%
AOC-090 (shallow northward)	5	<0.001	<0.001	99.9+%	99.83%
AOC-090 (shallow southward)	5	<0.001	0.002	99.9+%	99.9+%
AOC-090 (intermediate)	5	<0.001	<0.001	99.9+%	99.9+%
Apron A	5	<0.001	<0.001	99.9+%	99.9+%

Table 9. BIOSCREEN Modeling Attenuation Results for 10 µg/L Vinyl Chloride

SWMU/Area of interest	Initial Input of VOC at Source	Concentration at Waterway		Net Attenuation from CPOC to Waterway k = 0.0076 1/days	Net Attenuation from CPOC to Waterway k = 0.0025 1/days
		k = 0.0076 1/days	k = 0.0025 1/days		
	[µg/L]	[µg/L]	[µg/L]	As percent reduction	As percent reduction
SWMU-168	10	<0.001	<0.001	99.9+%	99.9+%
SWMU-172/174	10	0.0076	0.7634	99.9+%	92.37%
Bldg. 4-78/79 SWMU AOC Group	10	<0.001	<0.001	99.9+%	99.9+%
AOC-001/002	10	<0.001	0.0025	99.9+%	99.9+%
AOC-003	10	<0.001	<0.001	99.9+%	99.9+%
AOC-004	10	<0.001	<0.001	99.9+%	99.9+%
AOC-060	10	<0.001	<0.001	99.9+%	99.9+%
AOC-090 (shallow northward)	10	<0.001	0.008	99.9+%	99.83%
AOC-090 (shallow southward)	10	<0.001	<0.001	99.9+%	99.9+%
AOC-090 (intermediate)	10	<0.001	<0.001	99.9+%	99.9+%
Apron A	10	<0.001	<0.001	99.9+%	99.9+%

3.2 Attenuation of Other CVOCs

In addition to vinyl chloride, degradation rate constants for other CVOCs were used to model attenuation of these chemicals. Table 10 presents the average degradation rate constants from the EPA review (EPA 2013) for PCE, TCE, cis-1,2-DCE and VC as applied to the SWMU 172/174 area. This specific area is used as an example as it is closest to the waterway, it will have the shortest travel time to the nearby surface water and therefore the minimum attenuation. Figure 2 presents the BIOSCREEN modeling results for the various CVOCs

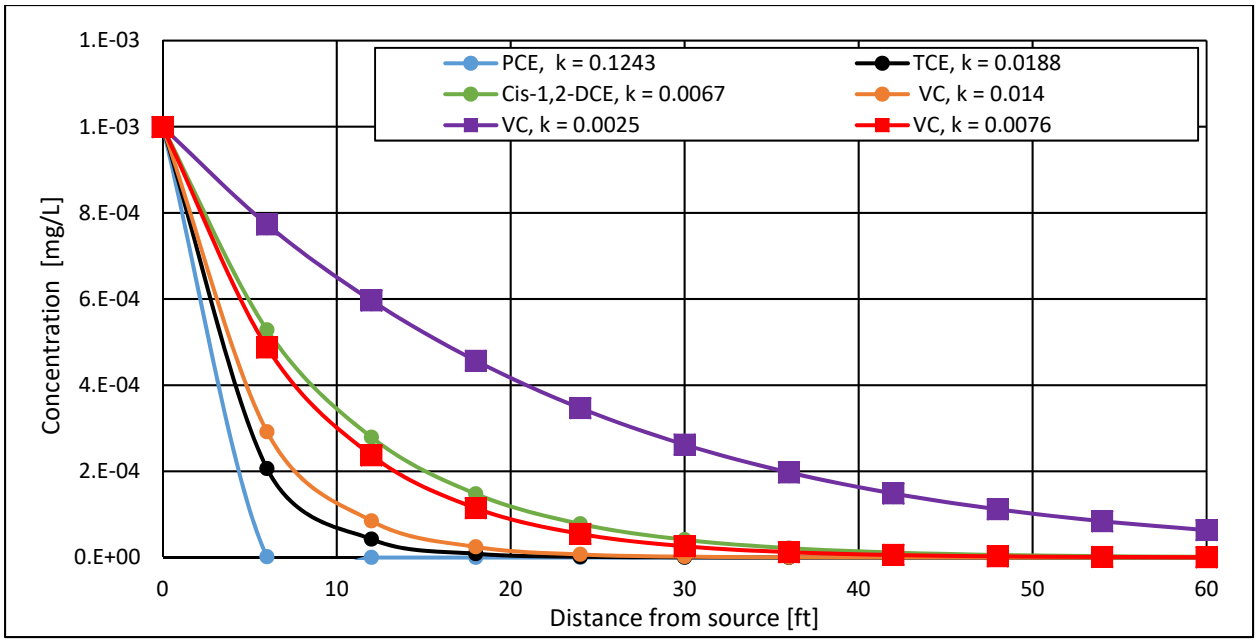
Table 10 BIOSCREEN Modeling Attenuation Results for Individual CVOCs

Chemical of concern	Concentration at waterway (with source area at 1 µg/L)	Net Attenuation from CPOC to Waterway
	[µg/L]	As percent reduction
PCE, k = 0.1243 (1/days)	<0.001	99.9+%
TCE, k = 0.0188 (1/days)	<0.001	99.9+%
cis-1,2-DCE, k = 0.0067 (1/days)	0.0017	99.83%
VC, k = 0.0141/days)	<0.001	99.9+%
Generic attenuation modeling used in this evaluation		
VC, k = 0.0025 (1/days)	0.0635	93.65%
VC, k = 0.0076 (1/days)	<0.001	99.9+%

Notes

The initial concentration at the source area are assumed as 1 µg/L at the time the CULs have been achieved & objective is to calculate net attenuation (not predicted discharge concentration).
PCE, k = 0.1243 (1/days), literature value from EPA 2013
TCE, k = 0.0188 (1/days), literature value from EPA 2013
cis-1,2-DCE, k = 0.0067 (1/days), literature value from EPA 2013
VC, k = 0.014 (1/days), literature value from EPA 2013

Figure 2 BIOSCREEN Modeling Attenuation Results for all CVOCs



Notes
PCE, k = 0.1243 1/days, literature value from EPA 2013
TCE, k = 0.0188 1/days, literature value from EPA 2013
Cis-1,2-DCE, k = 0.0067 1/days, literature value from EPA 2013
VC, k = 0.014 1/days, literature value from EPA 2013
The more conservation general attenuation rates used for VC, 0.0025 & 0.0076 1/days, included in the curves above demonstrate the conservative attenuation estimate.

3.3 Attenuation of Metals

A similar fate and transport modeling is used to estimate the attenuation of metals (arsenic, lead and copper) at SWMU-172/174. SWMU-172/174 and AOC-4 are the two SWMUs/AOCs where metals in groundwater were identified as COCs. The difference in the fate and transport modeling approach for metals is with the specific attenuation processes considered. For these inorganics (metals) no biodegradation processes are applicable and the only removal mechanisms considered are dispersion and adsorption. The adsorption is based on a soil-water partitioning relationship (Kd). The Kds used in the model are the specific values recommended in MTCA (Table 747-3 in WAC 173-340-747), see Table 14 for hydrogeologic and other modeling parameters used.

For this modeling, a representative mass of the COCs present in the "source area" must be estimated. This was initially estimated as the dissolved mass present in the volume of the source area by using the groundwater volume of the source area and the maximum COC concentration measured in the source area wells from the most recent (2020) sampling. The calculations for mobile mass of metals in the "source area" are shown in Tables 10, 11, and 12. The calculations demonstrate that the total mass of

the inorganic COCs present is insufficient to migrate within the soil matrix; all three of the COCs (arsenic, copper, and lead) are significantly adsorbed to soil based on the MTCA Kds in WAC 173-340-747, Table 747-3. The total mobile mass present in the "source area" groundwater is less than 0.04% of the total mass in the natural background soil for each COC and is therefore too small to measurably increase concentrations above natural background levels. The simple mass balance calculations are presented in Tables 11, 12, and 13 for arsenic, copper and lead, respectively.

Table 11 Mass of Arsenic from "Source Area" to Cedar River		
Mobile Arsenic in "Source Area"		
Width	30	ft
Depth	20	ft
Volume	18,000	ft3
Porosity	0.3	-
Arsenic concentration in water at source	16.4	µg/L
Arsenic mass lbs in water	5.53E-03	lbs
Background Arsenic present in soil in flow path to Cedar River		
Soil density	110	lbs/ft3
Background concentration (mean from Ecology publication)	3.71	mg/kg
Distance to River	60	ft
Soil mass	3,960,000	lbs
Background arsenic in soil	14.6916	lbs
Total mass of Arsenic in soil with "Source Area" added	14.697	lbs
Total Arsenic Concentration	3.711	mg/kg
Potential increase in soil from the source area to the point of discharge	0.04%	
Notes		
Natural Background Soil Metals Concentrations in Washington State Publication #94-115		
90th percentile	6.37	mg/kg
Mean	3.71	mg/kg
MEDIAN As	2.91	mg/kg

Table 12 Mass of Copper from "Source Area" to Cedar River

Mobile Copper in "Source Area"		
Width	30	ft
Depth	20	ft
Volume	18,000	ft3
Porosity	0.3	-
Max. Copper concentration measured in water	33.4	µg/L
Mass of Copper in water	1.13E-02	lbs
Background Copper in soil in flow path to Cedar River		
Soil density	110	lbs/ft3
Background copper concentration in soil (mean from Ecology publication)	23	mg/kg
Distance to River	60	ft
Soil mass	3,960,000	lbs
Copper mass in soil (natural background)	91.08	lbs
Total mass of Copper in soil with "Source" added	91.0913	lbs
Copper Concentration in soil	23.003	mg/kg
Potential increase in soil from the "Source Area" to the point of discharge	0.012%	
Notes		
Natural Background Soil Metals Concentrations in Washington State Publication #94-115		
90th percentile	36	mg/kg
Mean	23.15	mg/kg
MEDIAN Cu	17.8	mg/kg

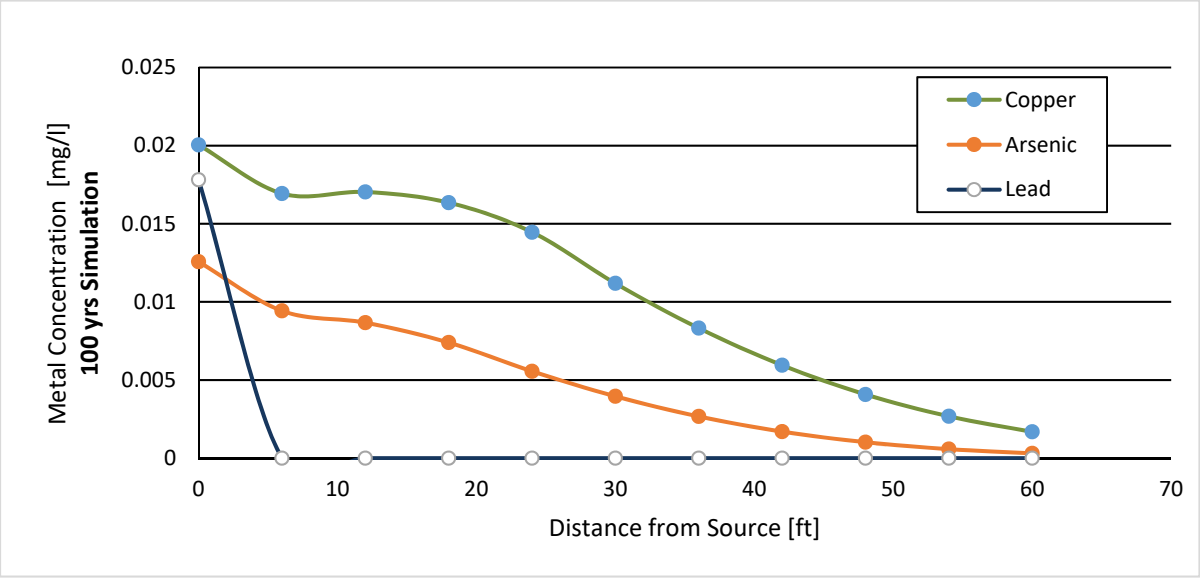
Table 13 Mass of Lead from "Source Area" to Cedar River		
Mobile Lead in "Source" Area		
Width	30	ft
Depth	20	ft
Volume	18,000	ft3
Porosity	0.3	-
Max. Lead concentration measured in water	26.6	µg/L
Lead in water	8.96E-03	lbs
Background Lead in flow path to Cedar River		
Soil density	110	lbs/ft3
Background lead in soil (mean from Ecology publication)	11.9	mg/kg
Distance to River	60	ft
Soil mass	3,960,000	lbs
Lead mass in soil (background)	47.124	lbs
Total mass of Lead	47.133	lbs
Lead Concentration	11.9023	mg/kg
Potential increase in soil from the "Source Area" to the point of discharge	0.019%	
Notes		
Natural Background Soil Metals Concentrations in Washington State Publication #94-115		
90th percentile	24	mg/kg
Mean	11.9	mg/kg
MEDIAN Pb	8.2	mg/kg

Since the mass of the inorganic COCs present in groundwater is insufficient to migrate with the MTCA Kds and the natural background present in soils, the model was run with a much higher assumed inventory for each COC at the source (assumed as 2.2 lbs, or 1 kg, present for each compound), this is a very conservative assumption and it over-predicts the potential future discharge concentrations at the waterway. The modeling input parameters are presented in Table 14 and the mobility of the COCs over a 100-year time frame are presented in Figure 3. The modeling results demonstrate that the inorganic COCs will not migrate to the river at levels that have a measurable or adverse impact, even with an assumed inventory that is about two orders-of-magnitude higher (100 times higher) than the measured site conditions. These results demonstrate that the potable water criteria (from Table 3), applied at the CPOCs, are protective of discharge to surface water.

Table 14 Modeling input parameters for Inorganics at SWMU 172/174

COC	Geology	Hydraulic Conductivity	Concentration	COC Mass	Gradient	Porosity	Run time	Half-life (T½)	Retardation Factor (based on Kds from MTCA)	CPOC to Water	Source Width	Source Thickness	Disp long
	[USCS]	[cm/s]	[µg/L]	[kg]	[-]	[-]	[yrs]	[Yrs]	[ml/kg]	[ft]	[ft]	[ft]	ft
Copper	SP	2.15E-03	33.40	1.00	0.004	0.43	100	100000	93.1	60	30	20	1
Arsenic	SP	2.15E-03	16.4	1.00	0.004	0.43	100	100000	122.4	60	30	20	1
Lead	SP	2.15E-03	26.6	1.00	0.004	0.43	100	100000	41,861	60	30	20	1

Figure 3 Modeling Inorganics Transport at SWMU 172-174 Group with Retardation



4.0 CONCLUSIONS AND RECOMMENDATIONS

Table 15 combines the Site-wide groundwater CULs (i.e., MTCA CULs based on groundwater use as a potable supply) with the attenuation factors from the BIOSCREEN modeling. These results predict the concentration at the nearest surface water and are compared with the applicable surface water criteria (from Table 4). These results demonstrate that the MTCA CULs, based on protection for use as a potable water supply (from Table 3) applied at the CPOCs, are also protective of discharge to surface water.

This evaluation is based on current promulgated State and Federal standards for potable water supply combined with MTCA procedures for adjustments based on risk and background levels. Evaluating the net attenuation between the CPOCs and the discharge to surface water is based on the MTCA procedures defined in WAC 173-340-720 (8) (e) (ii) and recent Ecology Guidance (Ecology 2017).

Table 15. Comparison of Modeling Results with Surface Water Criteria at Point of Discharge to Waterway

Site COC	Groundwater CUL at CPOC Based on MTCA potable supply	Applicable Surface Water Criteria (at Discharge)	BIOSCREEN		Comparison
			Attenuation	Predicted concentration	
	[µg/L]	[µg/L]		[µg/L]	
cis 1,2 DCE	16	16	0.001	0.016	CUL at CPOC meets SW criteria at discharge
PCE	5	4.9	0.001	0.005	CUL at CPOC meets SW criteria at discharge
TCE	4	0.38	0.001	0.004	CUL at CPOC meets SW criteria at discharge
VC	0.29	0.02	0.001	0.00029	CUL at CPOC meets SW criteria at discharge
Benzene	5	0.44	0.001	0.005	CUL at CPOC meets SW criteria at discharge
Arsenic	10	0.018: as AWQC 10: adjusted to background	0.02	0.2	CUL at CPOC meets SW criteria at discharge
Lead	15	2.5	Exceeds 0.001	0	CUL at CPOC meets SW criteria at discharge
Copper	33[1]	11[2]	0.05	<1.7	CUL at CPOC meets SW criteria at discharge

1. Maximum copper value detected (33 [µg/L ug/L) over last 2 years at SWMU 172/174, typical values are in range of 0.5 to 5 µg/L.
2. The human health criteria for copper is 1,300 µg/L; the surface water criteria for copper in this table (11 µg/L) is based on ecological impacts from Clean Water Act Section 304.

5.0 REFERENCES

AMEC 2012. Draft Cleanup Action Plan, Boeing Renton Facility, Renton, Washington. September 2012.

AMEC Foster Wheeler Environment & Infrastructure, Inc. 2014. Draft Engineering Design Report Boeing Renton Cleanup Action Plan Implementation. Prepared for The Boeing Company. July 2014.

CALIBRE, 2019. Tech Memo. Cleanup Levels in Groundwater at the Boeing Renton Plant, Prepared for The Boeing Company. Submitted to Ecology December 17, 2019.

CALIBRE, 2020. Tech Memo. Evaluation of Recent Groundwater Sampling at the Boeing Renton Facility, Recommendations for Modifications to Compliance Monitoring Plan Addendum # 3, Prepared for The Boeing Company. June 30 2020.

Ecology, 1991, Responsiveness Summary for the Amendments to MTCA Cleanup Regulation Chapter 173-340 WAC, ("Responsiveness Summary") at page 202 (1991).

Ecology, 2017. Developing Conditional Points of Compliance at MTCA Sites Where Groundwater Discharges to Surface Water, Implementation Memorandum No. 16, Publication 16-09-053 (July 2017).

Ecology, 2018, Natural Background Groundwater Arsenic Concentrations in WA State, Review Draft, May 2018 Publication No. 14-09-044

Ecology 2020, email from Byung Maeng (Ecology) to Carl Bach (Boeing), dated February 13 2020, with Ecology comments on technical approach to developing cleanup levels for Renton Facility.

Geomatrix, 2004, Final Feasibility Study Work Plan, Boeing Renton Plant, Renton, Washington: Prepared for The Boeing Company, April.

Geomatrix, 2008, Draft Final Feasibility Study Report, Boeing Renton Facility, Renton Washington: Prepared for the Boeing Company, June.

U.S. Environmental Protection Agency, 1996. BIOSCREEN Natural Attenuation Decision Support System, Users Manual Version 1.3. EPA/600/R-96/087.

U.S. Environmental Protection Agency. 2013 Ground Water Issue Paper: Synthesis Report on State of Understanding of Chlorinated Solvent Transformation. EPA/600/R-13/237.

Attachment A

Additional Details and Model Predicted Results for the BIOSCREEN Modeling

Source concentration 1(ug/L) BIOSCREEN input parameters

Area of interest	Geology	Hydraulic Conductivity	Conc	VC Mass	Gradient	Porosity	Run time	Half life (T½)		CPOC to water	Source Width	Source Thickness	Disp long
	[USCS]	[cm/s]	[ug/L]	[kg]	[-]	[-]	[yrs]	VC to Ether [Yrs]		[ft]	[ft]	[ft]	ft
SWMU-168	(SM)	8.96E-04	1.00	1.00	0.004	0.43	15	0.25	0.75	95	15	5	1
SWMU-172/174	(SP)	2.15E-03	1.00	1.00	0.004	0.43	5	0.25	0.75	60	30	20	1
Bldg 4-78/79 SWMU AOC Group	(SM)	8.96E-04	1.00	1.00	0.001	0.43	200	0.25	0.75	185	100	20	1
AOC-001/002	(SM)	8.96E-04	1.00	1.00	0.003	0.43	40	0.25	0.75	60	30	5	1
AOC-003	(SM)	8.96E-04	1.00	1.00	0.003	0.43	150	0.25	0.75	635	30	5	1
AOC-004	(SM)	8.96E-04	1.00	1.00	0.002	0.43	370	0.25	0.75	1060	30	5	1
AOC-034/035	(SM)	8.96E-04	1.00	1.00	0.001	0.43	200	0.25	0.75	290	20	15	1
AOC-060	(SP)	2.15E-03	1.00	1.00	0.001	0.43	25	0.25	0.75	85	20	10	1
AOC-090 (shallow northward)	(SM)	8.96E-04	1.00	1.00	0.005	0.43	20	0.25	0.75	150	40	15	1
AOC-090 (shallow southward)	(SM)	8.96E-04	1.00	1.00	0.008	0.43	15	0.25	0.75	125	30	15	1
AOC-090 (intermediate)	(SP)	2.15E-03	1.00	1.00	0.002	0.43	20	0.25	0.75	120	30	15	1
AOC-092	(SM)	8.96E-04	1.00	1.00	0.001	0.43	415	0.25	0.75	592	30	10	1

Source concentration 1 (ug/L) BIOSCREEN VC modeling results

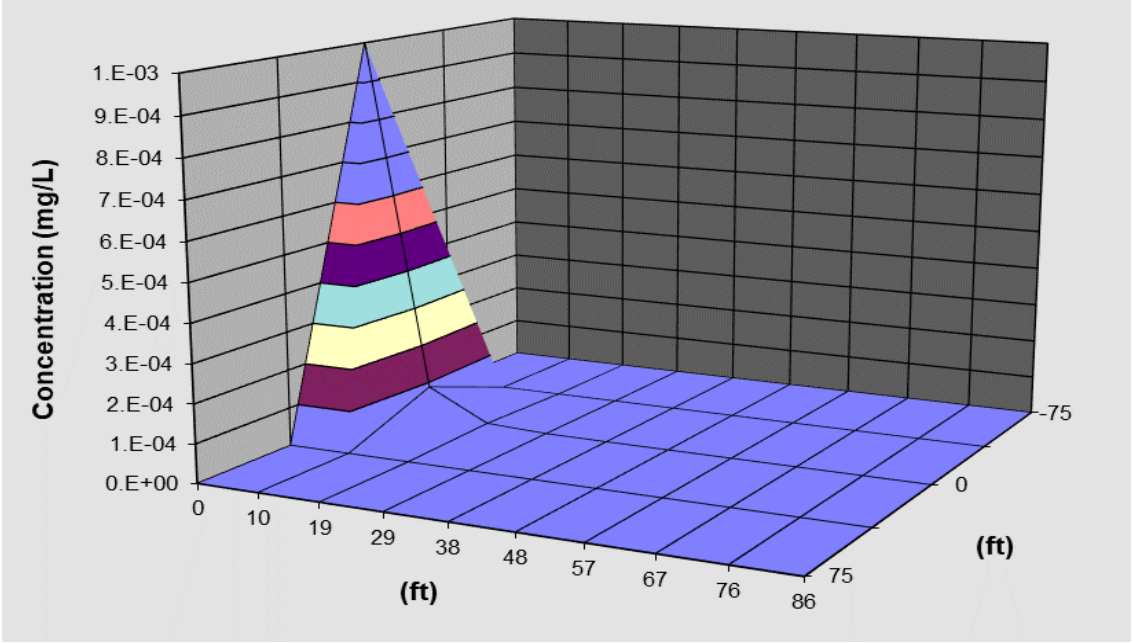
Area of interest	Input concentration	Concentration at waterway	
		T½ = 0.25 yrs k = 0.0076 1/days	T½ = 0.75 yrs k = 0.0025 1/days
	[ug/L]	[ug/L]	[ug/L]
SWMU-168	1	<0.001	<0.001
SWMU-172/174	1	<0.001	0.0766
Bldg 4-78/79 SWMU AOC Group	1	<0.001	<0.001
AOC-001/002	1	<0.001	<0.001
AOC-003	1	<0.001	<0.001
AOC-004	1	<0.001	<0.001
AOC-034/035	1	<0.001	<0.001
AOC-060	1	<0.001	<0.001
AOC-090 (shallow northward now)	1	<0.001	<0.001
AOC-090 (shallow southward now)	1	<0.001	0.002
AOC-090 (intermediate)	1	<0.001	<0.001
AOC-092	1	<0.001	<0.001

BIOSCREEN modeling of SWMU -168

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
15 year simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

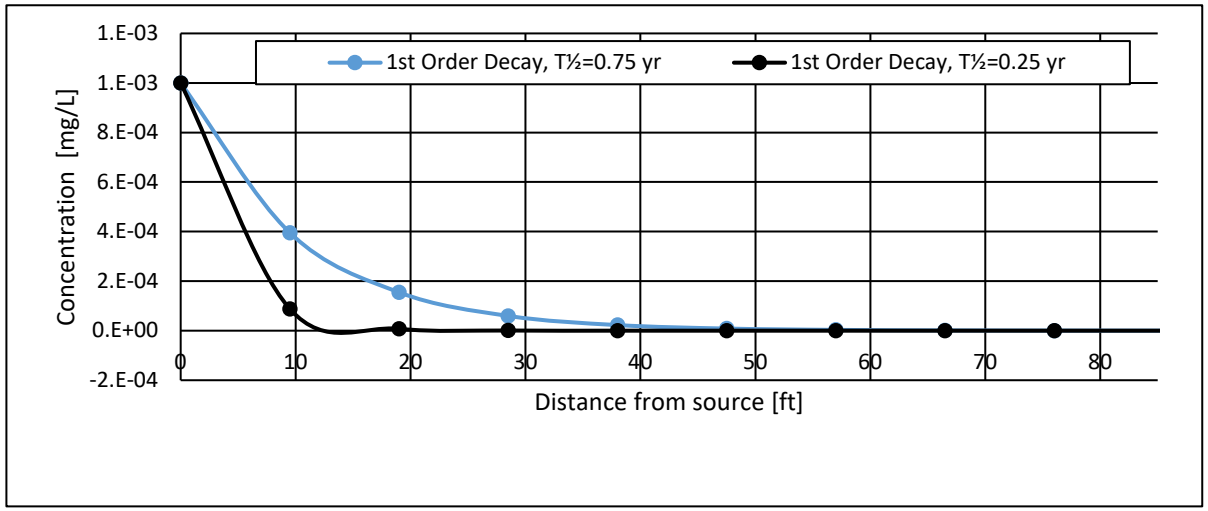
Distance (ft)	0	9.5	19	28.5	38	47.5	57	66.5	76	85.5	95	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-26	4.88E-26	6.07E-26	[mg/l]
0	1.00E-03	8.79E-05	7.65E-06	6.54E-07	5.52E-08	4.63E-09	3.87E-10	3.23E-11	2.70E-12	2.26E-13	1.89E-14	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-26	4.88E-26	6.07E-26	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of SWMU -168

CENTER LINE

Type of model	0	9.5	19	28.5	38	47.5	57	66.5	76	85.5	95	[Ft]
1st Order Decay, T½=0.75 yr	1.00E-03	3.95E-04	1.55E-04	5.96E-05	2.26E-05	8.54E-06	3.21E-06	1.21E-06	4.54E-07	1.71E-07	6.43E-08	[mg/l]
1st Order Decay, T½=0.25 yr	1.00E-03	8.79E-05	7.65E-06	6.54E-07	5.52E-08	4.63E-09	3.87E-10	3.23E-11	2.70E-12	2.26E-13	1.89E-14	[mg/l]



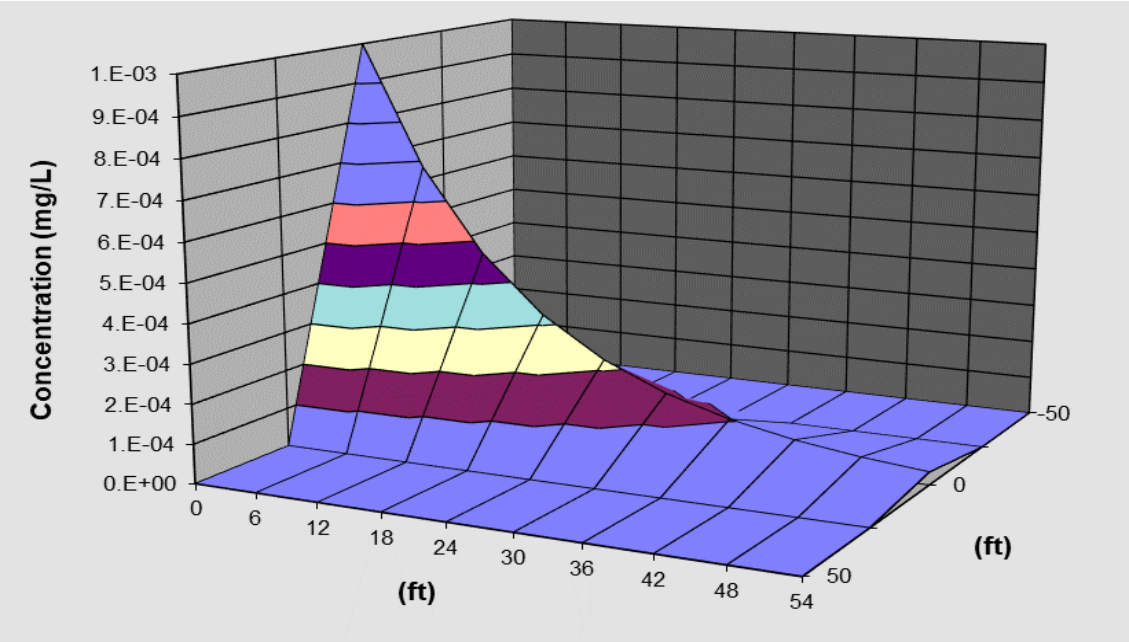
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.99%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of SWMU -172/174

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
5 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

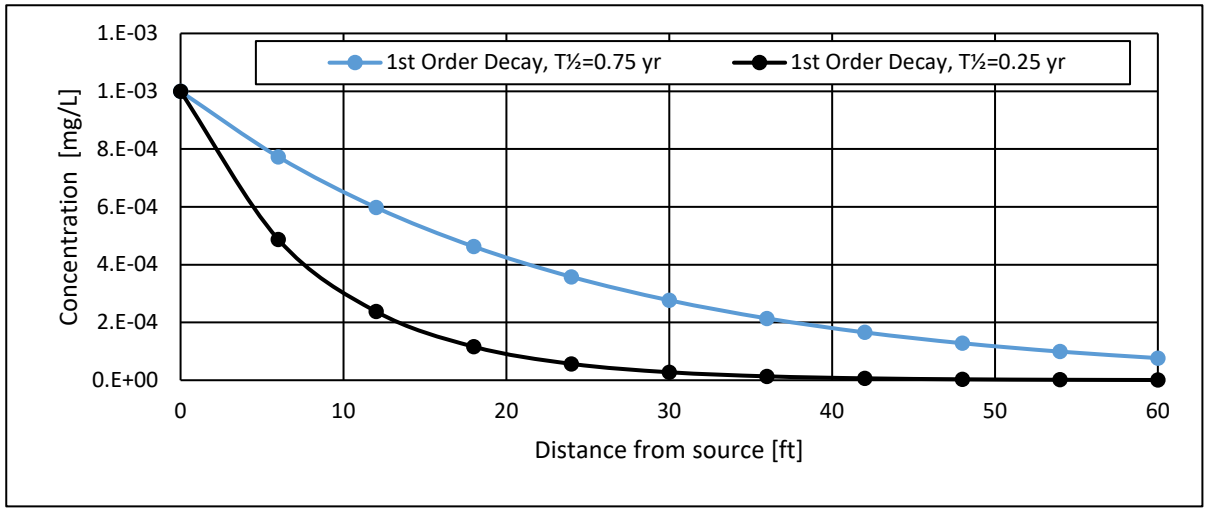
Distance (ft)	0	6	12	18	24	30	36	42	48	54	60	[Ft]
50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
25	0.00E+00	0.00E+00	2.54E-14	2.19E-11	5.52E-10	3.36E-09	1.00E-08	1.98E-08	3.03E-08	3.90E-08	4.44E-08	[mg/l]
0	9.99E-04	6.85E-04	4.69E-04	3.21E-04	2.20E-04	1.51E-04	1.03E-04	7.09E-05	4.86E-05	3.33E-05	2.28E-05	[mg/l]
-25	0.00E+00	0.00E+00	2.54E-14	2.19E-11	5.52E-10	3.36E-09	1.00E-08	1.98E-08	3.03E-08	3.90E-08	4.44E-08	[mg/l]
-50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of SWMU -172/174

CENTER LINE

Type of model	0	6	12	18	24	30	36	42	48	54	60	[Ft]
1st Order Decay, T½=0.75 yr	9.99E-04	7.73E-04	5.98E-04	4.62E-04	3.58E-04	2.77E-04	2.14E-04	1.65E-04	1.28E-04	9.90E-05	7.66E-05	[mg/l]
1st Order Decay, T½=0.25 yr	9.99E-04	4.87E-04	2.38E-04	1.16E-04	5.66E-05	2.76E-05	1.35E-05	6.57E-06	3.20E-06	1.56E-06	7.62E-07	[mg/l]



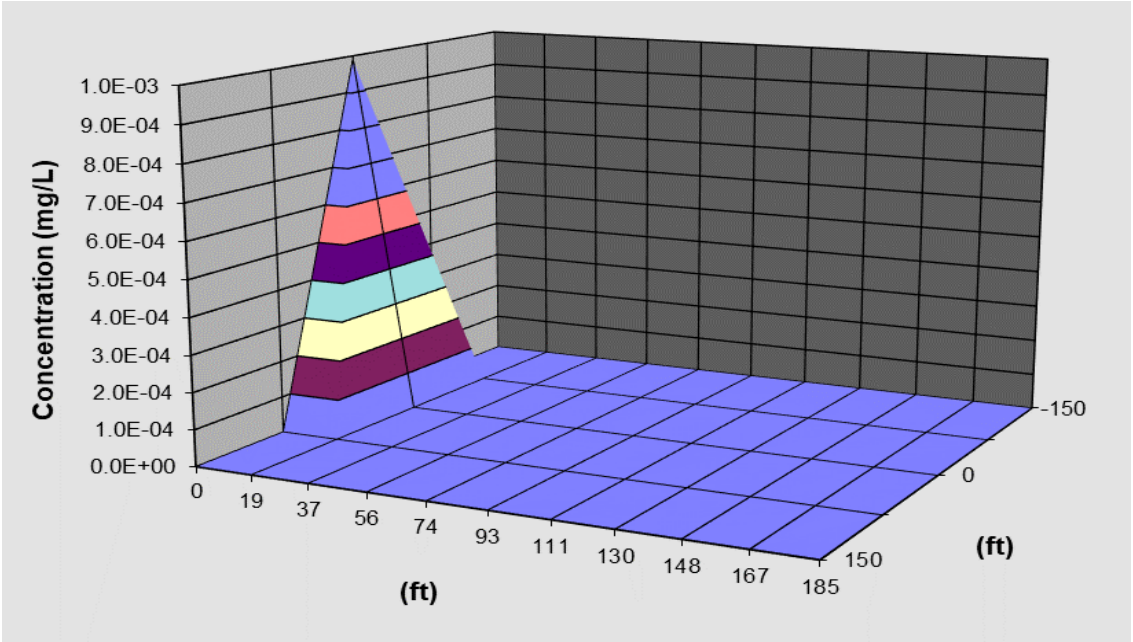
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	92.34%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	99.92%	reduction

BIOSCREEN modeling of Bldg 4-78/79 SWMU AOC Group

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
200 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

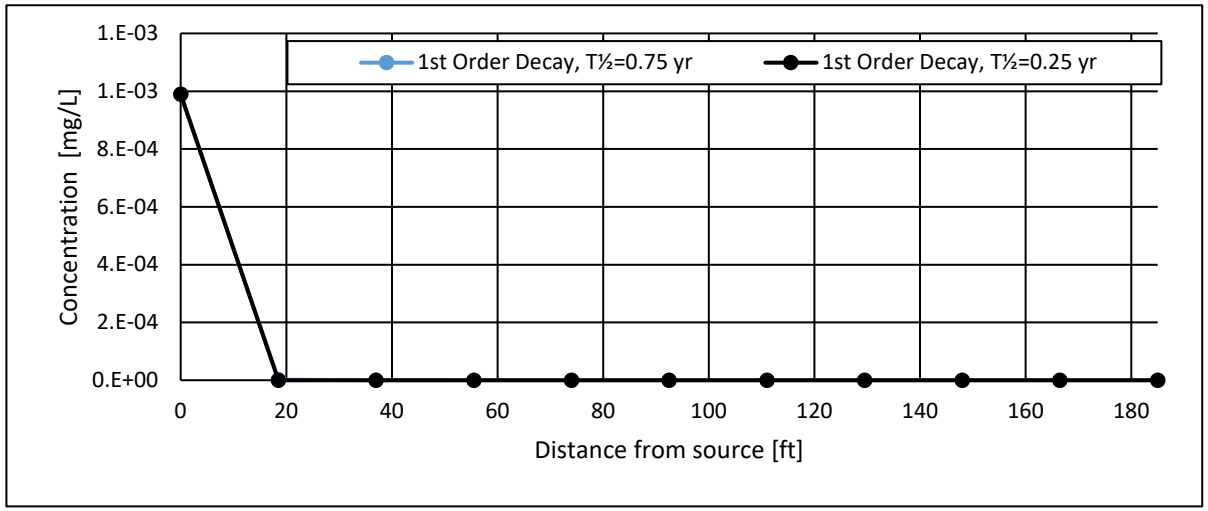
Distance (ft)	0	18.5	37	55.5	74	92.5	111	129.5	148	166.5	185	[Ft]
150	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
75	0.00E+00	0.00E+00	0.00E+00	4.67E-35	7.02E-38	6.13E-42	1.28E-46	1.18E-51	6.54E-57	2.56E-62	7.90E-68	[mg/l]
0	9.90E-04	1.14E-09	1.31E-15	1.50E-21	1.73E-27	1.99E-33	2.29E-39	2.63E-45	3.02E-51	3.48E-57	3.99E-63	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	4.67E-35	7.02E-38	6.13E-42	1.28E-46	1.18E-51	6.54E-57	2.56E-62	7.90E-68	[mg/l]
-150	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of Bldg 4-78/79 SWMU AOC Group

CENTER LINE

Type of model	0.0001	18.5	37	55.5	74	92.5	111	129.5	148	166.5	185	[Ft]
1st Order Decay, T½=0.75 yr	9.90E-04	2.48E-06	6.21E-09	1.56E-11	3.90E-14	9.77E-17	2.45E-19	6.14E-22	1.54E-24	3.85E-27	9.64E-30	[mg/l]
1st Order Decay, T½=0.25 yr	9.90E-04	1.14E-09	1.31E-15	1.50E-21	1.73E-27	1.99E-33	2.29E-39	2.63E-45	3.02E-51	3.48E-57	3.99E-63	[mg/l]



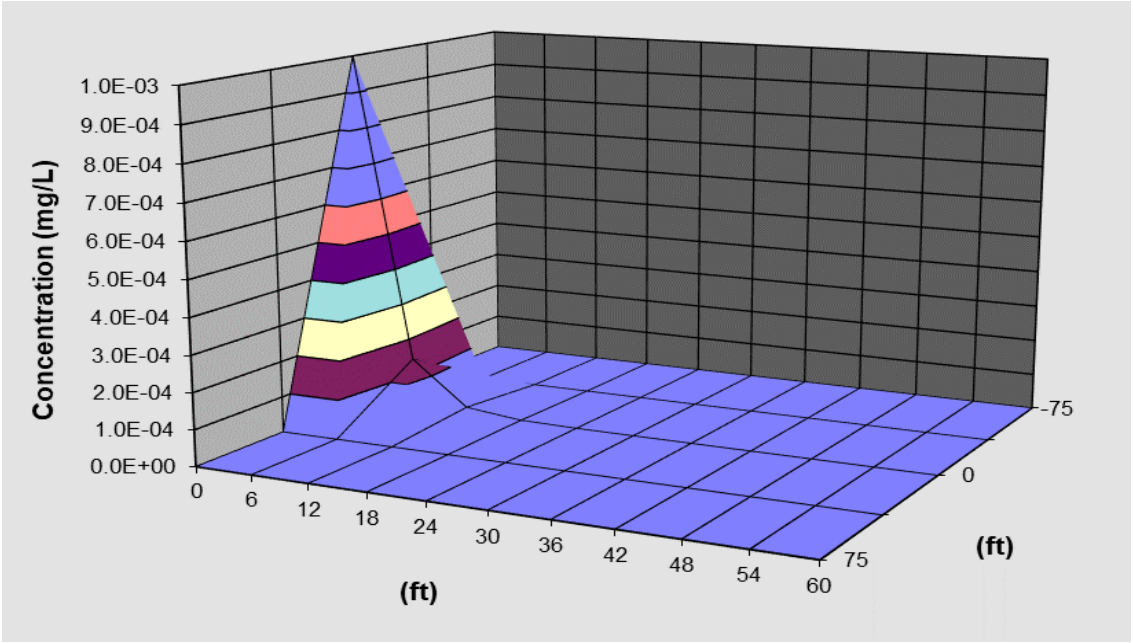
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-001/002

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
40 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

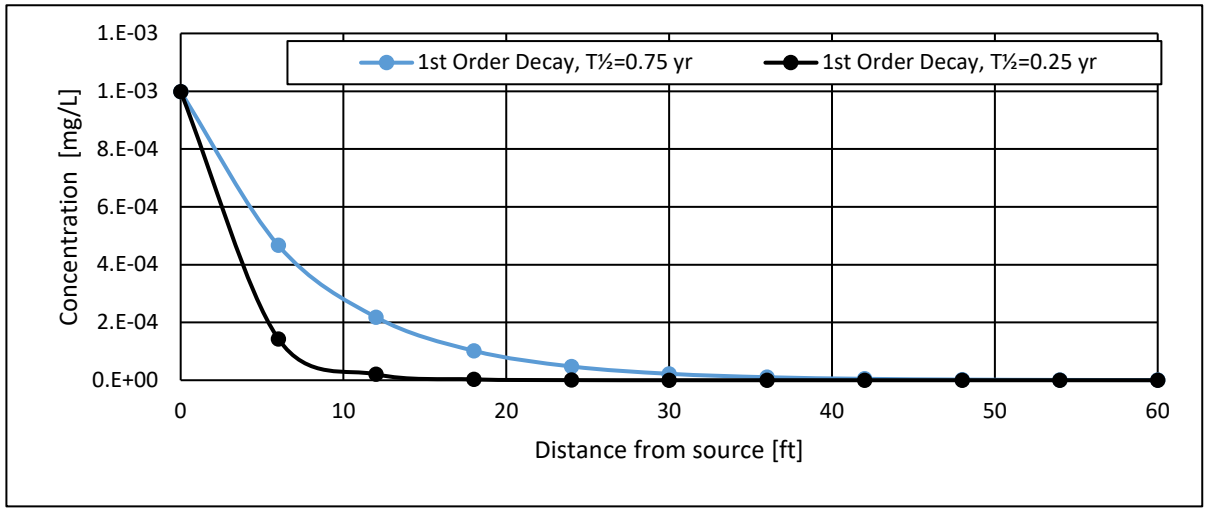
Distance (ft)	0.0001	6	12	18	24	30	36	42	48	54	60	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.17E-24	3.40E-23	9.64E-23	1.52E-22	[mg/l]
0	9.98E-04	1.43E-04	2.05E-05	2.94E-06	4.21E-07	6.04E-08	8.66E-09	1.24E-09	1.78E-10	2.55E-11	3.65E-12	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.17E-24	3.40E-23	9.64E-23	1.52E-22	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-001/002

CENTER LINE

Type of model	0	6	12	18	24	30	36	42	48	54	60	[Ft]
1st Order Decay, T½=0.75 yr	9.98E-04	4.66E-04	2.18E-04	1.02E-04	4.76E-05	2.23E-05	1.04E-05	4.86E-06	2.27E-06	1.06E-06	4.96E-07	[mg/l]
1st Order Decay, T½=0.25 yr	9.98E-04	1.43E-04	2.05E-05	2.94E-06	4.21E-07	6.04E-08	8.66E-09	1.24E-09	1.78E-10	2.55E-11	3.65E-12	[mg/l]



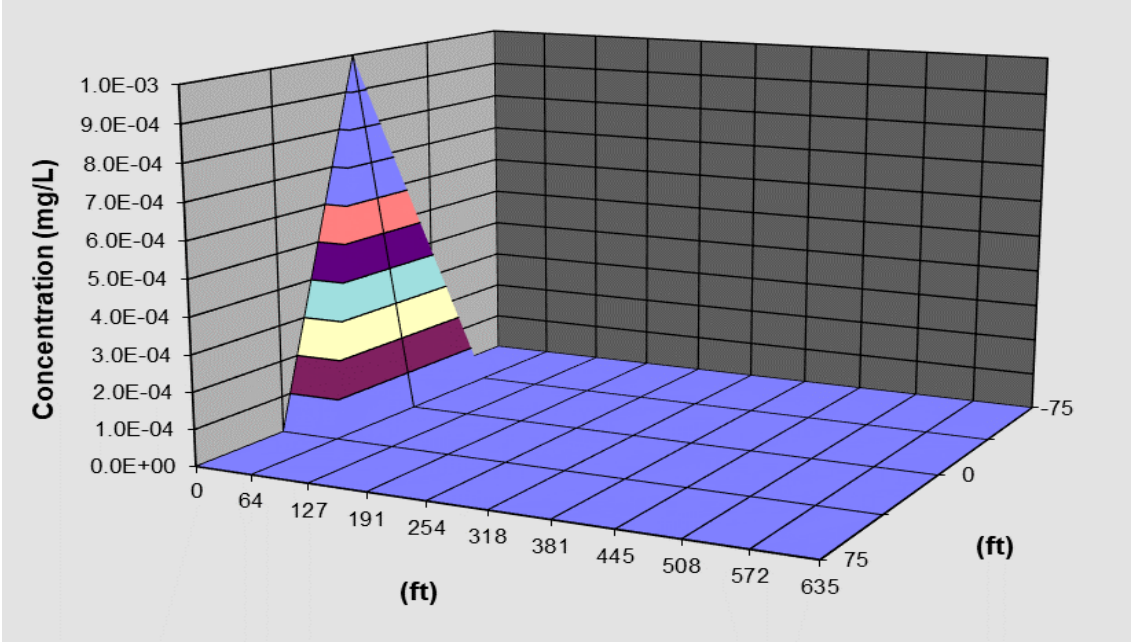
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.95%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-003

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
150 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

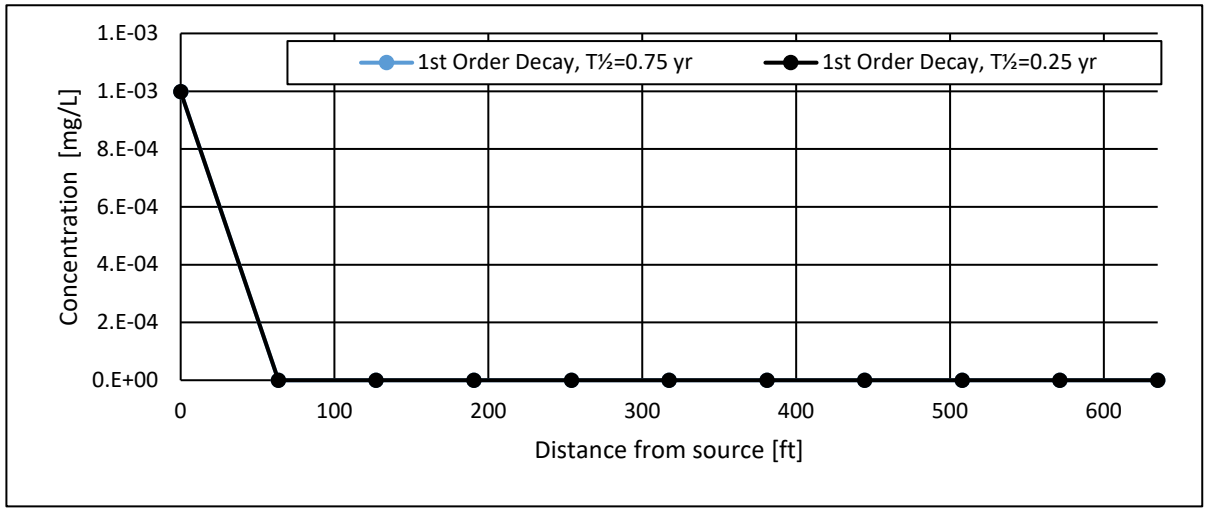
Distance (ft)	0.0001	63.5	127	190.5	254	317.5	381	444.5	508	571.5	635	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-62	3.63E-69	1.26E-76	1.86E-84	1.58E-92	8.97E-101	[mg/l]
37.5	0.00E+00	1.35E-22	3.78E-27	1.27E-34	7.94E-43	2.53E-51	5.77E-60	1.08E-68	1.81E-77	2.79E-86	4.06E-95	[mg/l]
0	9.98E-04	9.88E-13	9.39E-22	9.37E-31	9.61E-40	1.00E-48	1.06E-57	1.13E-66	1.22E-75	1.32E-84	1.45E-93	[mg/l]
-37.5	0.00E+00	1.35E-22	3.78E-27	1.27E-34	7.94E-43	2.53E-51	5.77E-60	1.08E-68	1.81E-77	2.79E-86	4.06E-95	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-62	3.63E-69	1.26E-76	1.86E-84	1.58E-92	8.97E-101	[mg/l]



BIOSCREEN modeling of AOC-003

CENTER LINE

Type of model	0	63.5	127	190.5	254	317.5	381	444.5	508	571.5	635	[Ft]
1st Order Decay, T½=0.75 yr	9.98E-04	2.67E-07	6.87E-11	1.85E-14	5.14E-18	1.45E-21	4.15E-25	1.20E-28	3.50E-32	1.03E-35	3.03E-39	[mg/l]
1st Order Decay, T½=0.25 yr	9.98E-04	9.88E-13	9.39E-22	9.37E-31	9.61E-40	1.00E-48	1.06E-57	1.13E-66	1.22E-75	1.32E-84	1.45E-93	[mg/l]



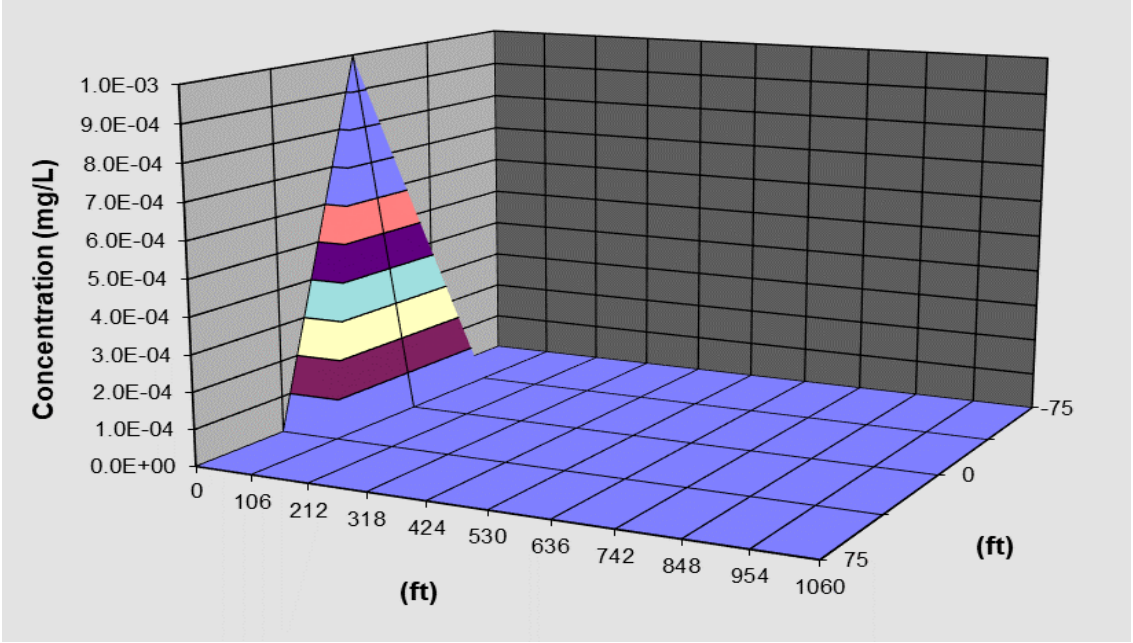
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-004

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
370 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

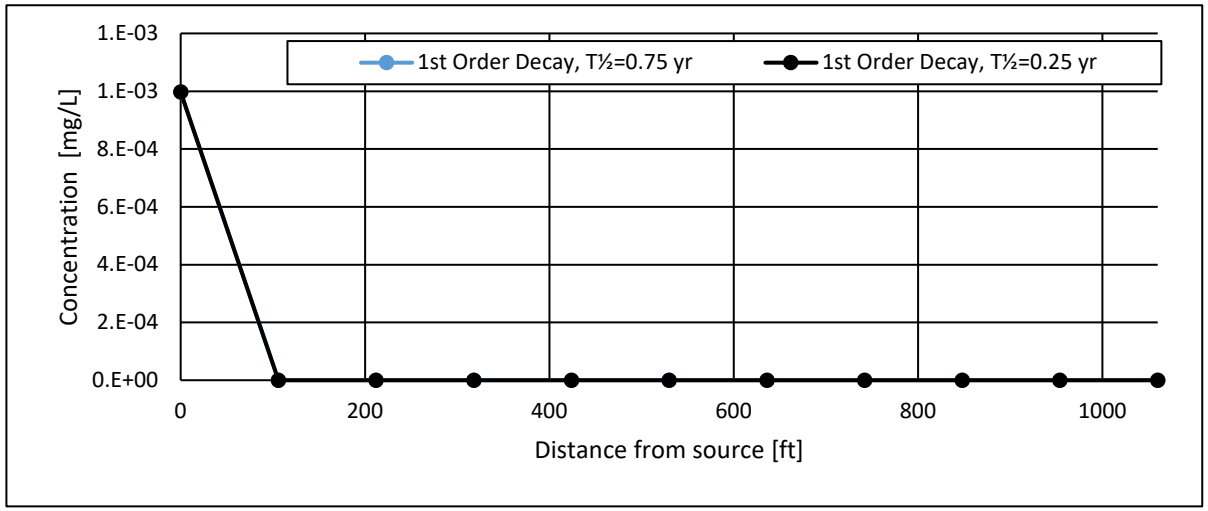
Distance (ft)	0.0001	106	212	318	424	530	636	742	848	954	1060	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	4.46E-79	1.76E-96	4.06E-115	2.27E-134	5.64E-154	8.45E-174	9.04E-194	7.63E-214	[mg/l]
37.5	0.00E+00	1.22E-30	1.66E-48	4.00E-68	3.53E-88	2.08E-108	1.01E-128	4.34E-149	1.74E-169	6.66E-190	2.47E-210	[mg/l]
0	9.97E-04	2.37E-24	5.91E-45	1.57E-65	4.35E-86	1.23E-106	3.57E-127	1.05E-147	3.11E-168	9.32E-189	2.82E-209	[mg/l]
-37.5	0.00E+00	1.22E-30	1.66E-48	4.00E-68	3.53E-88	2.08E-108	1.01E-128	4.34E-149	1.74E-169	6.66E-190	2.47E-210	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	4.46E-79	1.76E-96	4.06E-115	2.27E-134	5.64E-154	8.45E-174	9.04E-194	7.63E-214	[mg/l]



BIOSCREEN modeling of AOC-004

CENTER LINE

Type of model	0	106	212	318	424	530	636	742	848	954	1060	[Ft]
1st Order Decay, T½=0.75 yr	9.97E-04	3.21E-12	1.08E-20	3.91E-29	1.47E-37	5.63E-46	2.21E-54	8.77E-63	3.53E-71	1.43E-79	5.86E-88	[mg/l]
1st Order Decay, T½=0.25 yr	9.97E-04	2.37E-24	5.91E-45	1.57E-65	4.35E-86	1.23E-106	3.57E-127	1.05E-147	3.11E-168	9.32E-189	2.82E-209	[mg/l]



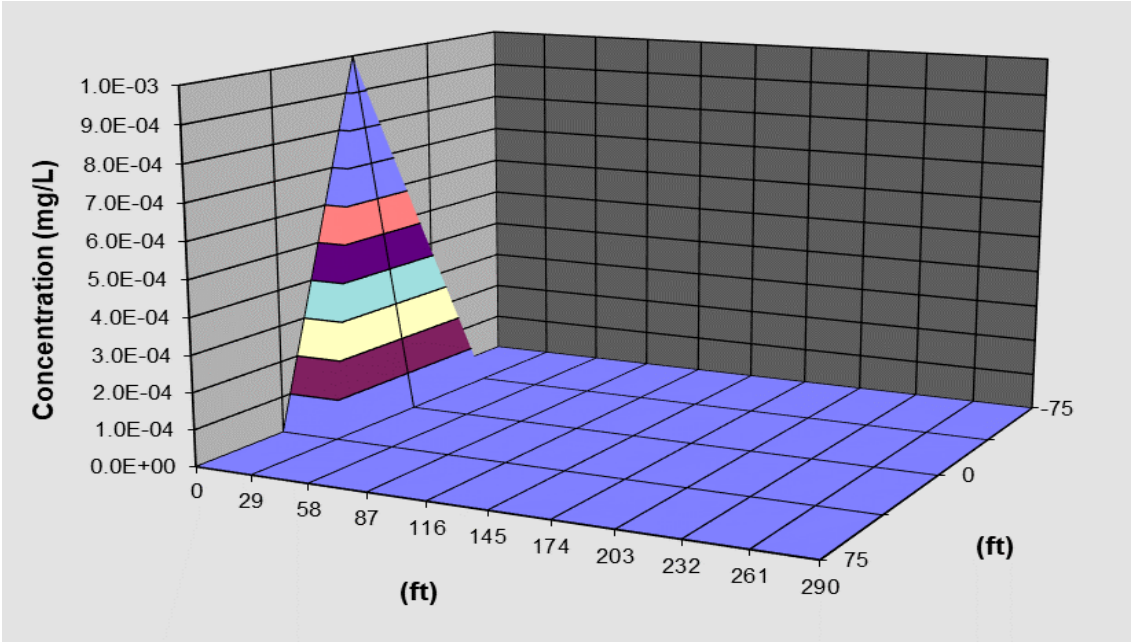
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-034/035

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
200 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

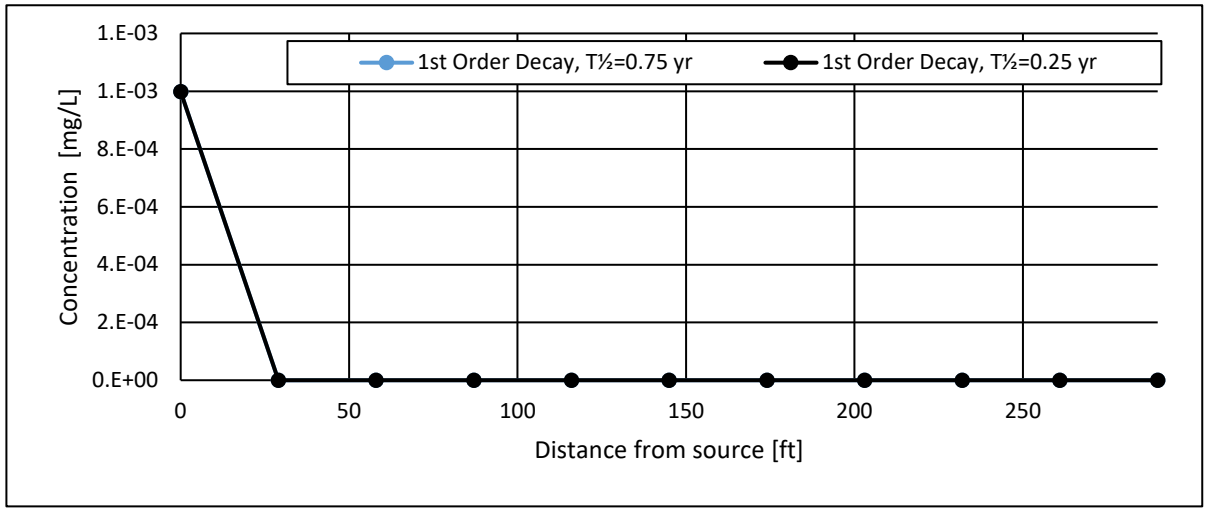
Distance (ft)	0.0001	29	58	87	116	145	174	203	232	261	290	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	2.52E-42	3.23E-49	4.56E-57	2.12E-65	5.21E-74	8.60E-83	1.08E-91	1.13E-100	[mg/l]
0	9.98E-04	4.88E-13	2.38E-22	1.15E-31	5.49E-41	2.60E-50	1.23E-59	5.79E-69	2.73E-78	1.28E-87	6.03E-97	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	2.52E-42	3.23E-49	4.56E-57	2.12E-65	5.21E-74	8.60E-83	1.08E-91	1.13E-100	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling ofAOC-034/035

CENTER LINE

Type of model	0	29	58	87	116	145	174	203	232	261	290	[Ft]
1st Order Decay, T½=0.75 yr	9.98E-04	8.35E-08	6.96E-12	5.74E-16	4.69E-20	3.81E-24	3.07E-28	2.48E-32	1.99E-36	1.60E-40	1.29E-44	[mg/l]
1st Order Decay, T½=0.25 yr	9.98E-04	4.88E-13	2.38E-22	1.15E-31	5.49E-41	2.60E-50	1.23E-59	5.79E-69	2.73E-78	1.28E-87	6.03E-97	[mg/l]



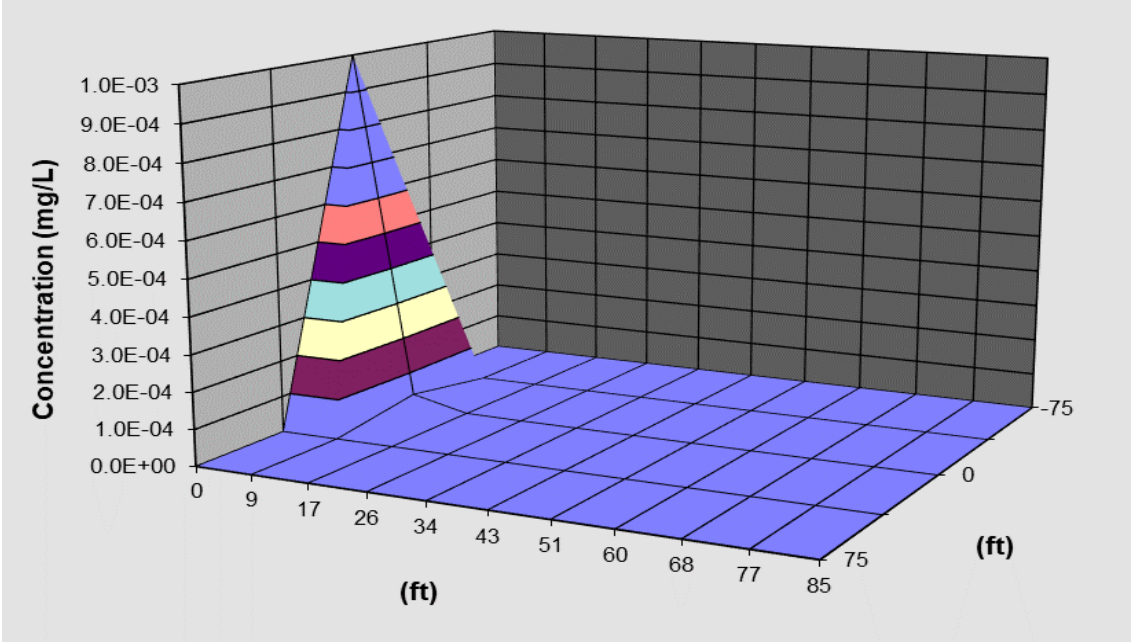
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-060

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
25 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

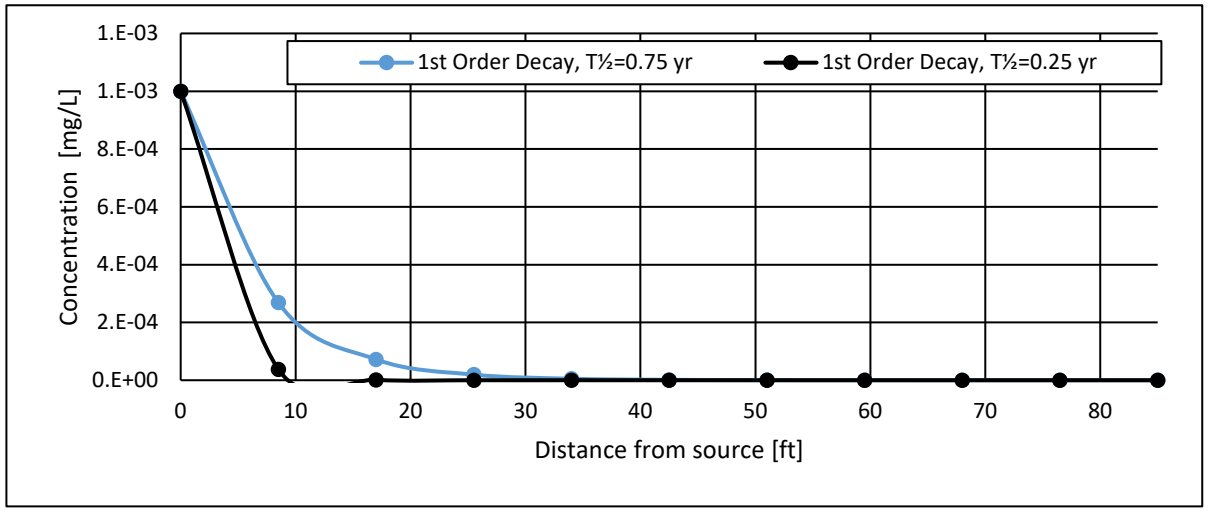
Distance (ft)	0.0001	8.5	17	25.5	34	42.5	51	59.5	68	76.5	85	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E-28	1.47E-28	6.83E-29	[mg/l]
0	1.00E-03	3.74E-05	1.40E-06	5.25E-08	1.96E-09	7.35E-11	2.74E-12	1.02E-13	3.81E-15	1.41E-16	5.25E-18	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E-28	1.47E-28	6.83E-29	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-060

CENTER LINE

Type of model	0	8.5	17	25.5	34	42.5	51	59.5	68	76.5	85	[Ft]
1st Order Decay, T½=0.75 yr	1.00E-03	2.68E-04	7.21E-05	1.94E-05	5.20E-06	1.39E-06	3.73E-07	9.99E-08	2.67E-08	7.10E-09	1.89E-09	[mg/l]
1st Order Decay, T½=0.25 yr	1.00E-03	3.74E-05	1.40E-06	5.25E-08	1.96E-09	7.35E-11	2.74E-12	1.02E-13	3.81E-15	1.41E-16	5.25E-18	[mg/l]



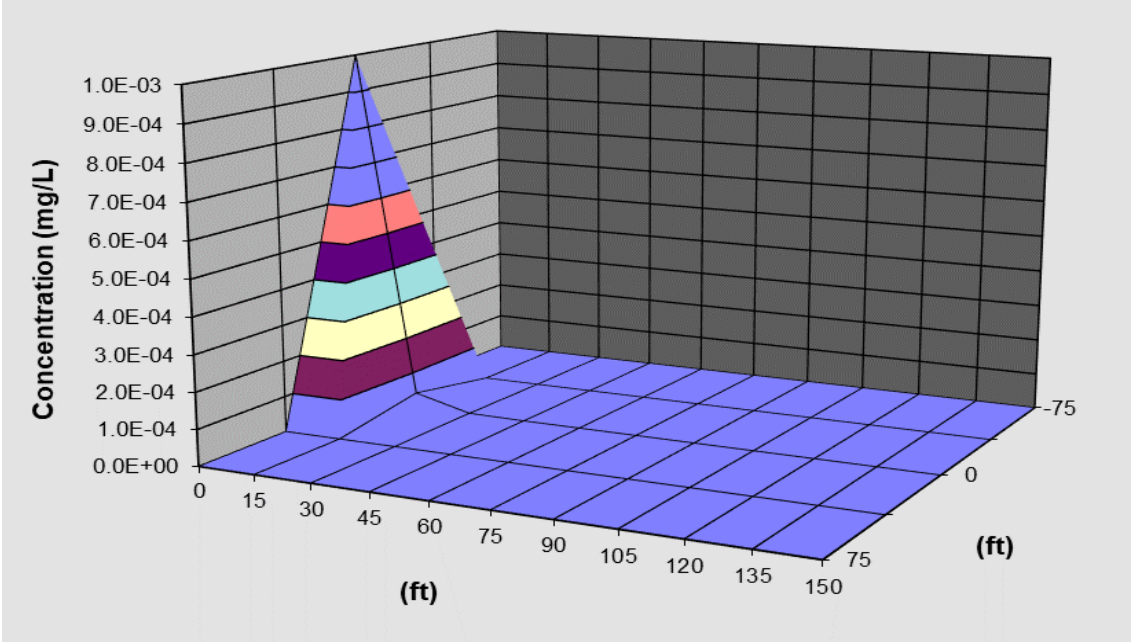
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-090 (shallow northward flow)

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
20 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

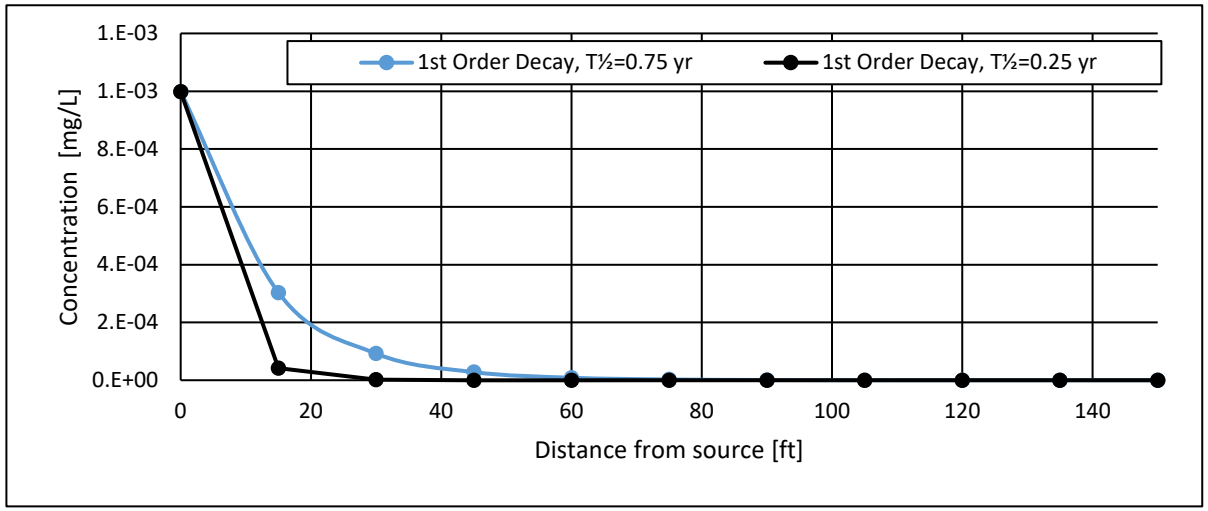
Distance (ft)	0.0001	15	30	45	60	75	90	105	120	135	150	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	7.77E-19	1.94E-16	6.48E-16	3.83E-16	9.46E-17	1.42E-17	1.55E-18	1.37E-19	1.05E-20	[mg/l]
0	9.98E-04	4.14E-05	1.72E-06	7.14E-08	2.96E-09	1.23E-10	5.10E-12	2.11E-13	8.76E-15	3.63E-16	1.50E-17	[mg/l]
-37.5	0.00E+00	0.00E+00	7.77E-19	1.94E-16	6.48E-16	3.83E-16	9.46E-17	1.42E-17	1.55E-18	1.37E-19	1.05E-20	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-090 (shallow northward flow)

CENTER LINE

Type of model	0	15	30	45	60	75	90	105	120	135	150	[Ft]
1st Order Decay, T½=0.75 yr	9.98E-04	3.03E-04	9.22E-05	2.80E-05	8.52E-06	2.59E-06	7.86E-07	2.39E-07	7.25E-08	2.20E-08	6.66E-09	[mg/l]
1st Order Decay, T½=0.25 yr	9.98E-04	4.14E-05	1.72E-06	7.14E-08	2.96E-09	1.23E-10	5.10E-12	2.11E-13	8.76E-15	3.63E-16	1.50E-17	[mg/l]



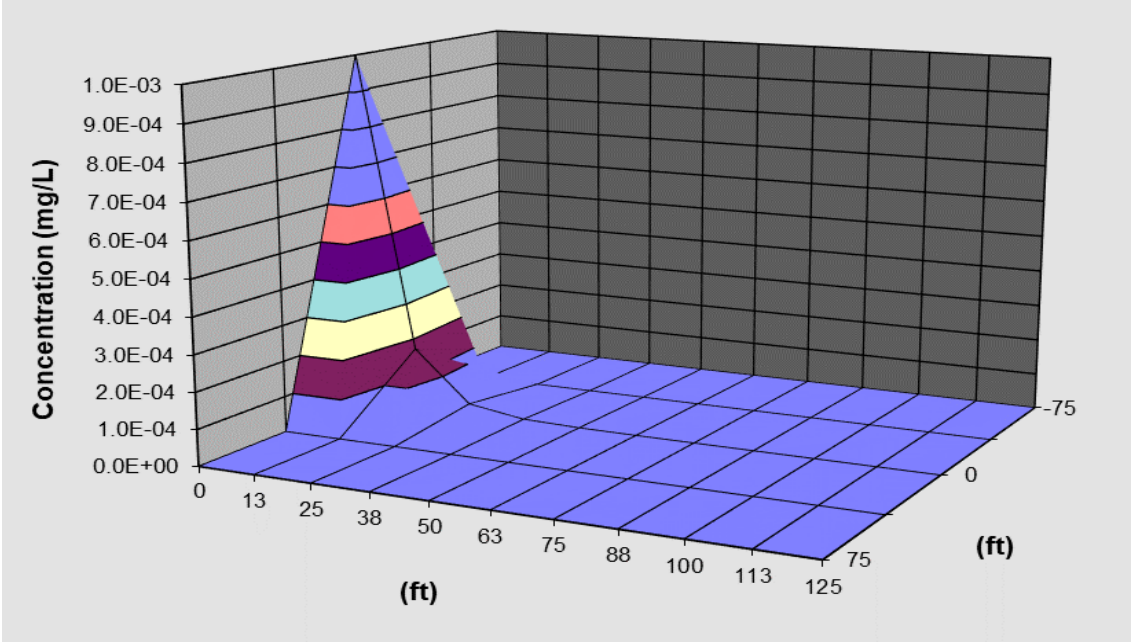
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-090 (shallow southward flow)

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
15 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

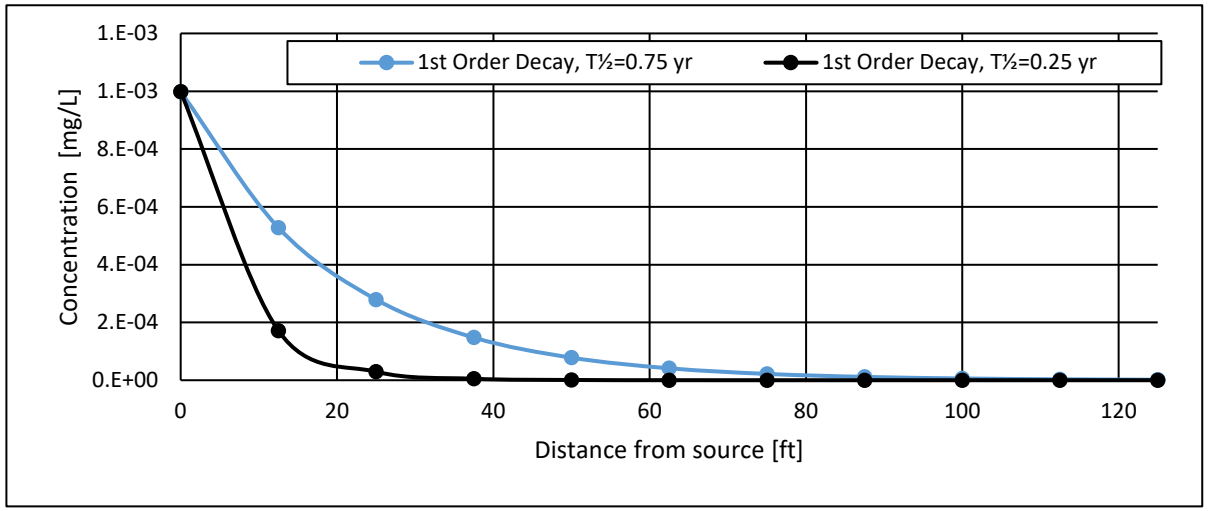
Distance (ft)	0.0001	12.5	25	37.5	50	62.5	75	87.5	100	112.5	125	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.87E-19	1.47E-17	8.07E-17	1.66E-16	1.85E-16	1.37E-16	7.62E-17	[mg/l]
0	9.99E-04	1.72E-04	2.95E-05	5.07E-06	8.72E-07	1.50E-07	2.58E-08	4.43E-09	7.60E-10	1.30E-10	2.24E-11	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.87E-19	1.47E-17	8.07E-17	1.66E-16	1.85E-16	1.37E-16	7.62E-17	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-090 (shallow southward flow)

CENTER LINE

Type of model	0	12.5	25	37.5	50	62.5	75	87.5	100	112.5	125	[Ft]
1st Order Decay, T½=0.75 yr	9.99E-04	5.28E-04	2.79E-04	1.48E-04	7.81E-05	4.13E-05	2.18E-05	1.15E-05	6.10E-06	3.22E-06	1.70E-06	[mg/l]
1st Order Decay, T½=0.25 yr	9.99E-04	1.72E-04	2.95E-05	5.07E-06	8.72E-07	1.50E-07	2.58E-08	4.43E-09	7.60E-10	1.30E-10	2.24E-11	[mg/l]



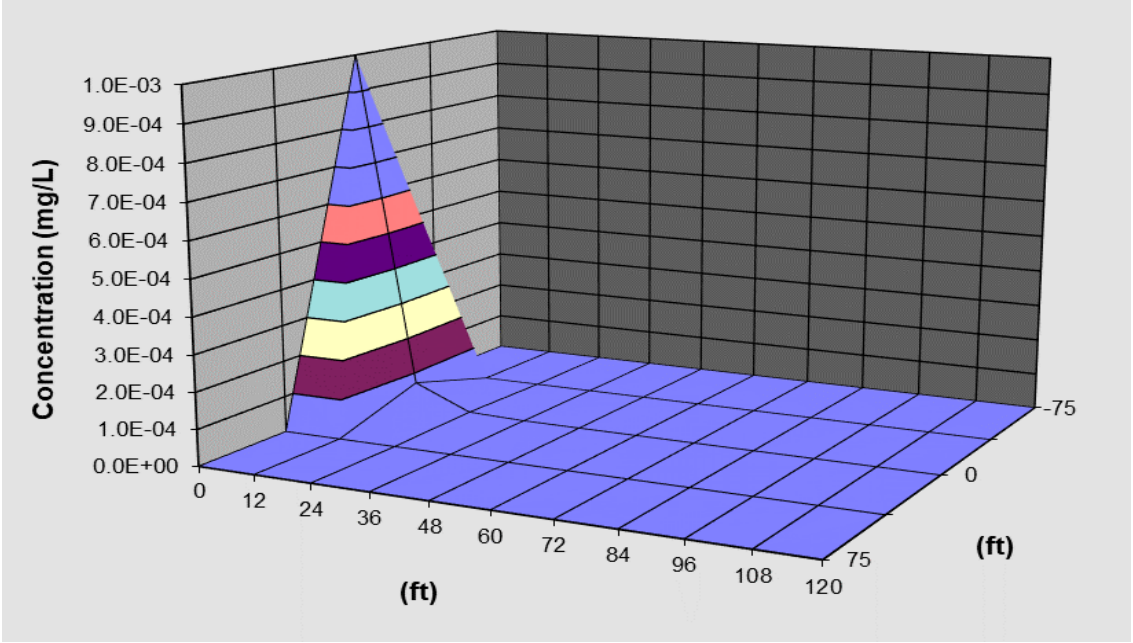
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.83%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-090 (intermediate)

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
20 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

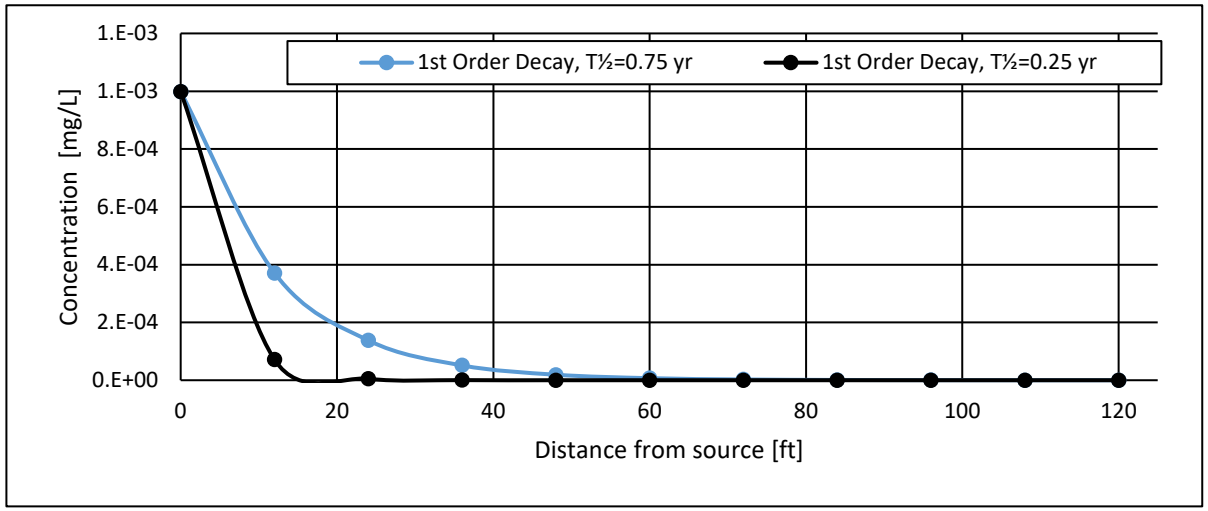
Distance (ft)	0.0001	12	24	36	48	60	72	84	96	108	120	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.03E-21	7.82E-20	2.06E-19	1.95E-19	9.79E-20	3.20E-20	7.77E-21	[mg/l]
0	9.99E-04	7.16E-05	5.13E-06	3.67E-07	2.63E-08	1.89E-09	1.35E-10	9.68E-12	6.93E-13	4.96E-14	3.55E-15	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.03E-21	7.82E-20	2.06E-19	1.95E-19	9.79E-20	3.20E-20	7.77E-21	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-090 (intermediate)

CENTER LINE

Type of model	0	12	24	36	48	60	72	84	96	108	120	[Ft]
1st Order Decay, T½=0.75 yr	9.99E-04	3.71E-04	1.38E-04	5.13E-05	1.90E-05	7.08E-06	2.63E-06	9.77E-07	3.63E-07	1.35E-07	4.99E-08	[mg/l]
1st Order Decay, T½=0.25 yr	9.99E-04	7.16E-05	5.13E-06	3.67E-07	2.63E-08	1.89E-09	1.35E-10	9.68E-12	6.93E-13	4.96E-14	3.55E-15	[mg/l]



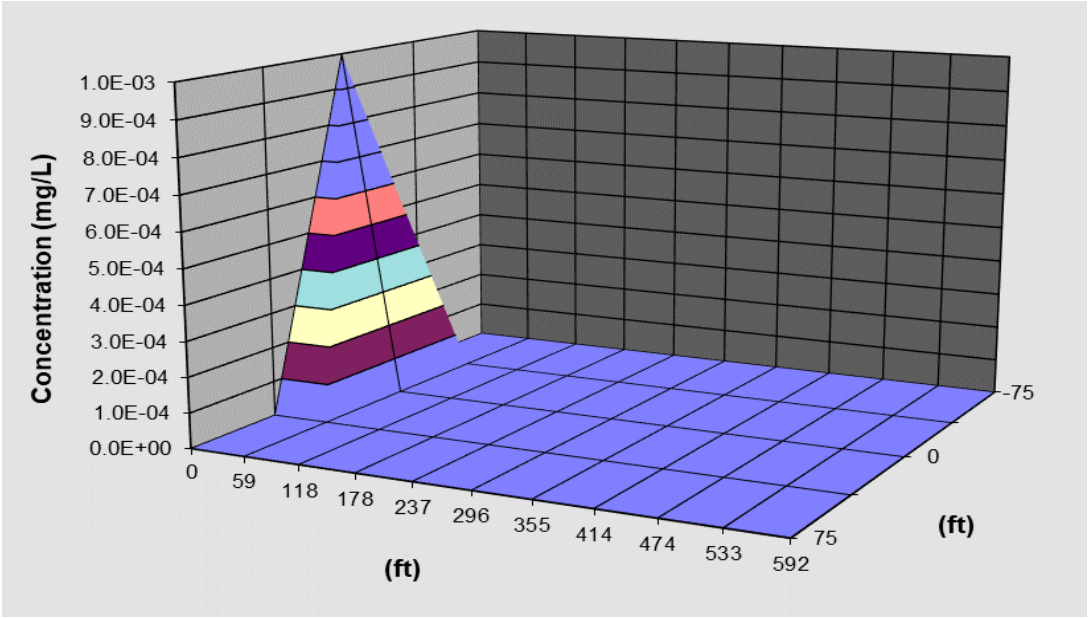
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-092

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
415 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

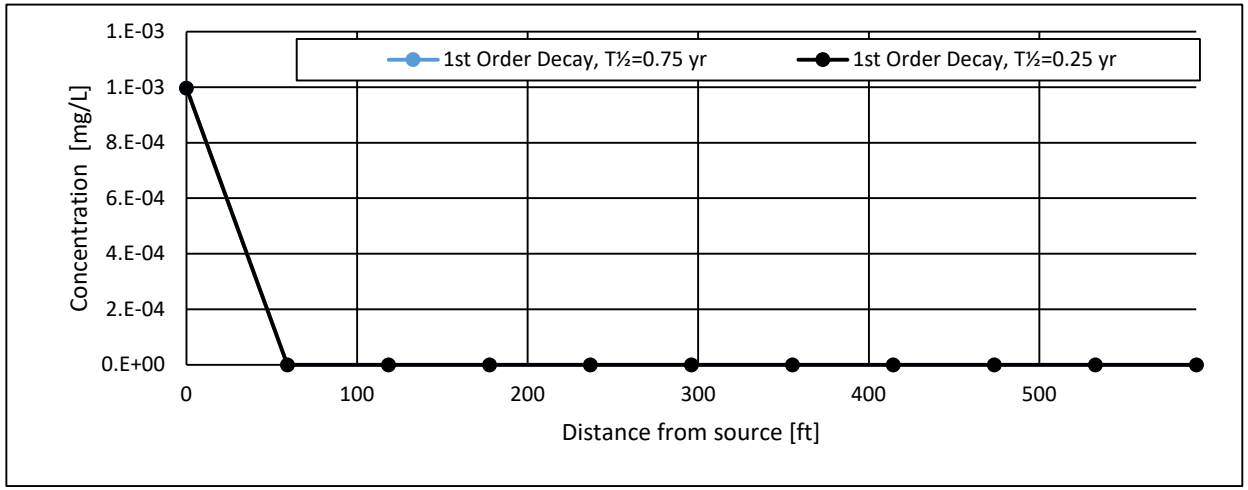
Distance (ft)	0	59.2	118.4	177.6	236.8	296	355.2	414.4	473.6	532.8	592	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.36E-113	3.79E-130	1.43E-147	2.17E-165	1.79E-183	9.65E-202	[mg/l]
37.5	0.00E+00	3.03E-33	1.75E-47	6.90E-65	4.32E-83	1.29E-101	2.65E-120	4.40E-139	6.39E-158	8.51E-177	1.06E-195	[mg/l]
0	9.97E-04	9.78E-23	9.27E-42	8.54E-61	7.78E-80	7.07E-99	6.44E-118	5.88E-137	5.39E-156	4.96E-175	4.58E-194	[mg/l]
-37.5	0.00E+00	3.03E-33	1.75E-47	6.90E-65	4.32E-83	1.29E-101	2.65E-120	4.40E-139	6.39E-158	8.51E-177	1.06E-195	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.36E-113	3.79E-130	1.43E-147	2.17E-165	1.79E-183	9.65E-202	[mg/l]



BIOSCREEN modeling of AOC-092

CENTER LINE

Type of model	0	59.2	118.4	177.6	236.8	296	355.2	414.4	473.6	532.8	592	[Ft]
1st Order Decay, T½=0.75 yr	9.97E-04	4.71E-12	2.15E-20	9.52E-29	4.18E-37	1.83E-45	8.02E-54	3.53E-62	1.56E-70	6.89E-79	3.06E-87	[mg/l]
1st Order Decay, T½=0.25 yr	9.97E-04	9.78E-23	9.27E-42	8.54E-61	7.78E-80	7.07E-99	6.44E-118	5.88E-137	5.39E-156	4.96E-175	4.58E-194	[mg/l]



	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

Model Simulations for VC at Multiple Source Area

Concentrations: VC at 5 µg/L and 10µg/L

5 x source concentration 5 (ug/L) BIOSCREEN input parameters

Area of interest	Geology	Hydraulic Conductivity	Conc	VC Mass	Gradient	Porosity	Run time	Half life (T½)		CPOC to water	Source Width	Source Thickness	Disp long
	[USCS]	[cm/s]	[ug/L]	[kg]	[-]	[-]	[yrs]	VC to Ether [Yrs]		[ft]	[ft]	[ft]	ft
SWMU-168	(SM)	8.96E-04	5.00	1.00	0.004	0.43	15	0.25	0.75	95	15	5	1
SWMU-172/174	(SP)	2.15E-03	5.00	1.00	0.004	0.43	5	0.25	0.75	60	30	20	1
Bldg 4-78/79 SWMU AOC Group	(SM)	8.96E-04	5.00	1.00	0.001	0.43	200	0.25	0.75	185	100	20	1
AOC-001/002	(SM)	8.96E-04	5.00	1.00	0.003	0.43	40	0.25	0.75	60	30	5	1
AOC-003	(SM)	8.96E-04	5.00	1.00	0.003	0.43	150	0.25	0.75	635	30	5	1
AOC-004	(SM)	8.96E-04	5.00	1.00	0.002	0.43	370	0.25	0.75	1060	30	5	1
AOC-034/035	(SM)	8.96E-04	5.00	1.00	0.001	0.43	200	0.25	0.75	290	20	15	1
AOC-060	(SP)	2.15E-03	5.00	1.00	0.001	0.43	25	0.25	0.75	85	20	10	1
AOC-090 (shallow northward)	(SM)	8.96E-04	5.00	1.00	0.005	0.43	20	0.25	0.75	150	40	15	1
AOC-090 (shallow southward)	(SM)	8.96E-04	5.00	1.00	0.008	0.43	15	0.25	0.75	125	30	15	1
AOC-090 (intermediate)	(SP)	2.15E-03	5.00	1.00	0.002	0.43	20	0.25	0.75	120	30	15	1
AOC-092	(SM)	8.96E-04	5.00	1.00	0.001	0.43	415	0.25	0.75	592	30	10	1

5 x source concentration 5 (ug/L) BIOSCREENVC modeling results

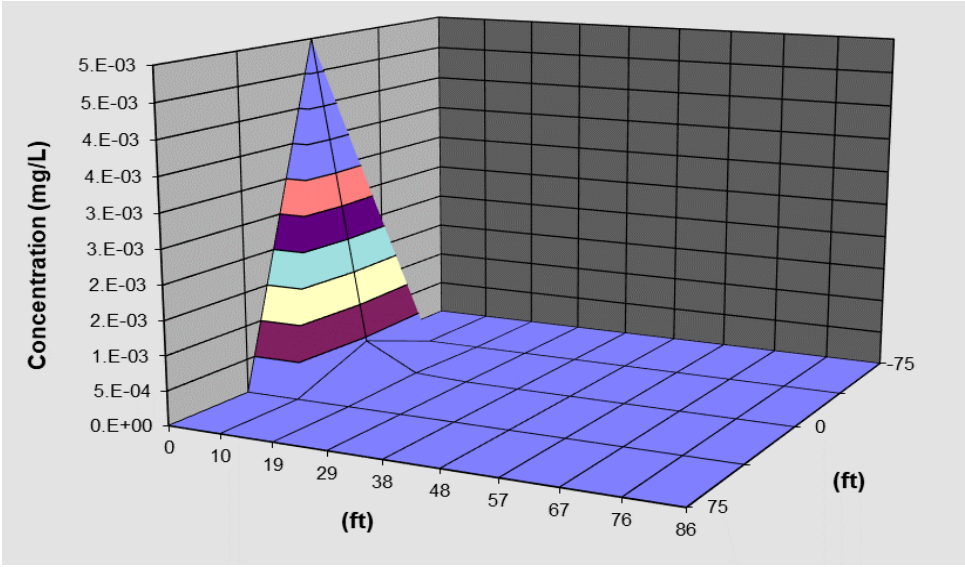
SWMU/Area of interest	Input concentration	Concentration at waterway	
		T½ = 0.25 yrs k = 0.0076 1/days	T½ = 0.75 yrs k = 0.0025 1/days
	[ug/L]	[ug/L]	[ug/L]
SWMU-168	5	<0.001	<0.001
SWMU-172/174	5	0.0038	0.3823
Bldg 4-78/79 SWMU AOC Group	5	<0.001	<0.001
AOC-001/002	5	<0.001	0.0025
AOC-003	5	<0.001	<0.001
AOC-004	5	<0.001	<0.001
AOC-034/035	5	<0.001	<0.001
AOC-060	5	<0.001	<0.001
AOC-090 (shallow northward now)	5	<0.001	<0.001
AOC-090 (shallow southward now)	5	<0.001	0.008
AOC-090 (intermediate)	5	<0.001	<0.001
AOC-092	5	<0.001	<0.001

BIOSCREEN modeling of SWMU -168

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
15 year simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

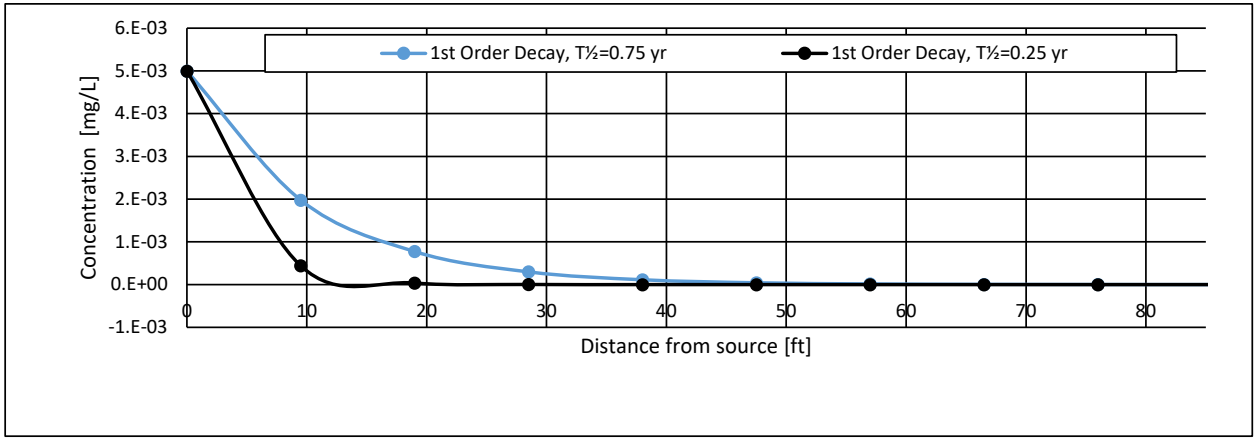
Distance (ft)	0	9.5	19	28.5	38	47.5	57	66.5	76	85.5	95	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-25	2.44E-25	3.04E-25	[mg/l]
0	5.00E-03	4.39E-04	3.82E-05	3.27E-06	2.76E-07	2.31E-08	1.94E-09	1.62E-10	1.35E-11	1.13E-12	9.44E-14	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-25	2.44E-25	3.04E-25	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of SWMU -168

CENTER LINE

Type of model	0	9.5	19	28.5	38	47.5	57	66.5	76	85.5	95	[Ft]
1st Order Decay, T½=0.75 yr	5.00E-03	1.98E-03	7.74E-04	2.98E-04	1.13E-04	4.27E-05	1.61E-05	6.04E-06	2.27E-06	8.53E-07	3.21E-07	[mg/l]
1st Order Decay, T½=0.25 yr	5.00E-03	4.39E-04	3.82E-05	3.27E-06	2.76E-07	2.31E-08	1.94E-09	1.62E-10	1.35E-11	1.13E-12	9.44E-14	[mg/l]



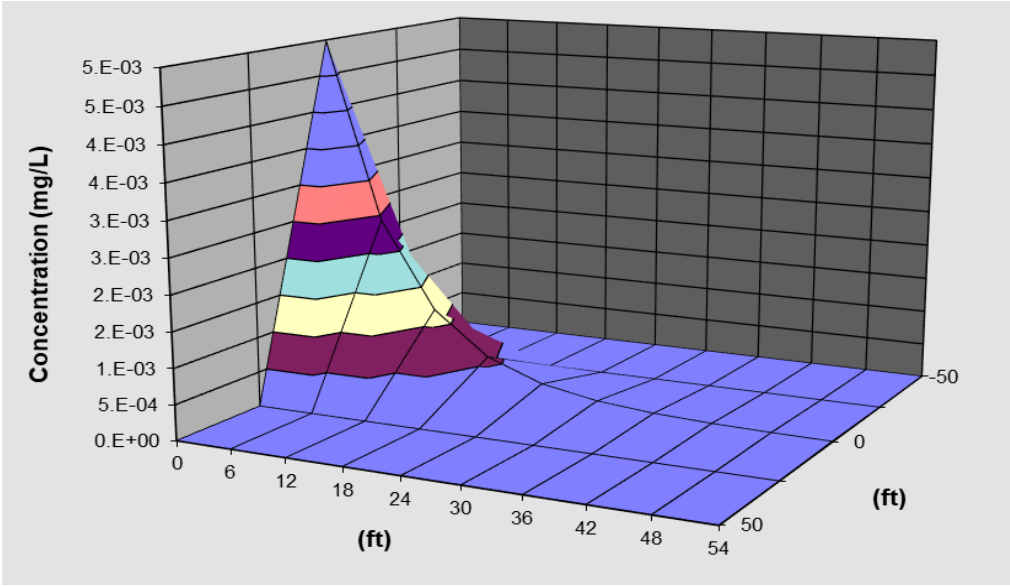
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.99%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of SWMU -172/174

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
5 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

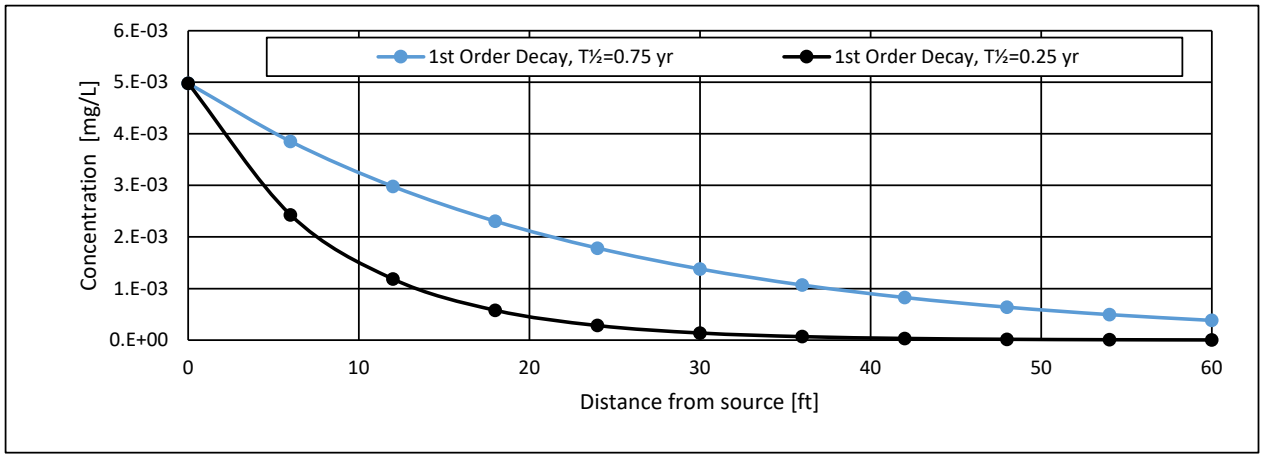
Distance (ft)	0	6	12	18	24	30	36	42	48	54	60	[Ft]
50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
25	0.00E+00	0.00E+00	6.42E-14	3.94E-11	7.07E-10	3.07E-09	6.52E-09	9.18E-09	9.99E-09	9.14E-09	7.41E-09	[mg/l]
0	4.98E-03	2.43E-03	1.19E-03	5.79E-04	2.82E-04	1.38E-04	6.72E-05	3.28E-05	1.60E-05	7.80E-06	3.81E-06	[mg/l]
-25	0.00E+00	0.00E+00	6.42E-14	3.94E-11	7.07E-10	3.07E-09	6.52E-09	9.18E-09	9.99E-09	9.14E-09	7.41E-09	[mg/l]
-50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of SWMU -172/174

CENTER LINE

Type of model	0	6	12	18	24	30	36	42	48	54	60	[Ft]
1st Order Decay, T½=0.75 yr	4.98E-03	3.85E-03	2.98E-03	2.31E-03	1.78E-03	1.38E-03	1.07E-03	8.26E-04	6.39E-04	4.94E-04	3.82E-04	[mg/l]
1st Order Decay, T½=0.25 yr	4.98E-03	2.43E-03	1.19E-03	5.79E-04	2.82E-04	1.38E-04	6.72E-05	3.28E-05	1.60E-05	7.80E-06	3.81E-06	[mg/l]



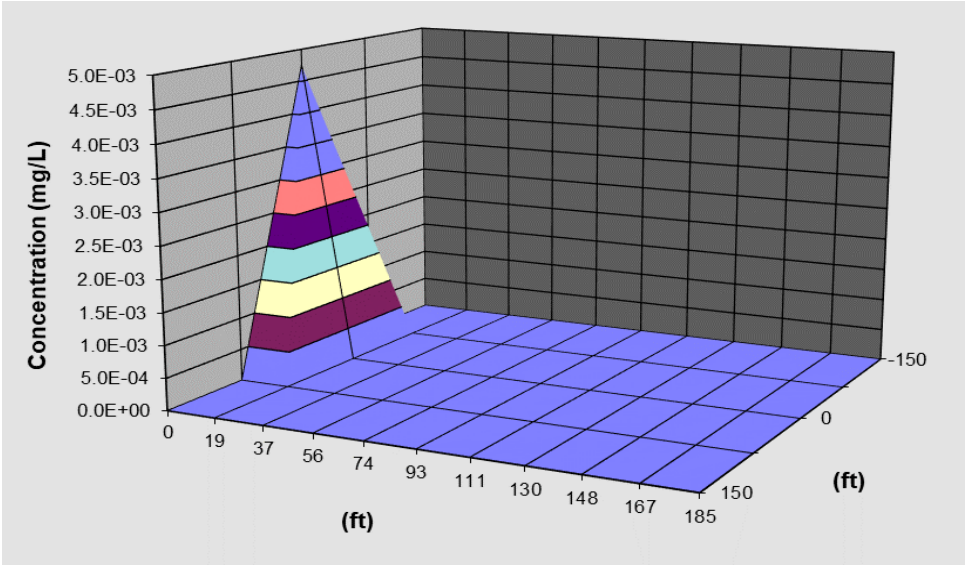
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	92.32%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	99.92%	reduction

BIOSCREEN modeling of Bldg 4-78/79 SWMU AOC Group

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
200 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

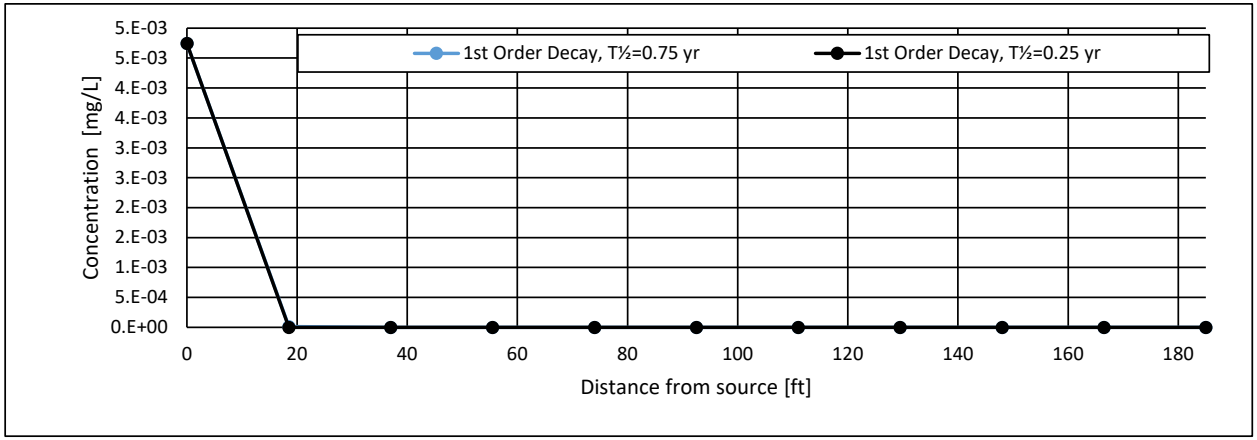
Distance (ft)	0	18.5	37	55.5	74	92.5	111	129.5	148	166.5	185	[Ft]
150	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
75	0.00E+00	0.00E+00	0.00E+00	2.25E-34	3.39E-37	2.96E-41	6.21E-46	5.75E-51	3.18E-56	1.25E-61	3.86E-67	[mg/l]
0	4.74E-03	5.47E-09	6.30E-15	7.25E-21	8.35E-27	9.62E-33	1.11E-38	1.28E-44	1.47E-50	1.69E-56	1.95E-62	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	2.25E-34	3.39E-37	2.96E-41	6.21E-46	5.75E-51	3.18E-56	1.25E-61	3.86E-67	[mg/l]
-150	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of Bldg 4-78/79 SWMU AOC Group

CENTER LINE

Type of model	0.0001	18.5	37	55.5	74	92.5	111	129.5	148	166.5	185	[Ft]
1st Order Decay, T½=0.75 yr	4.74E-03	1.19E-05	2.99E-08	7.50E-11	1.88E-13	4.73E-16	1.19E-18	2.98E-21	7.48E-24	1.88E-26	4.71E-29	[mg/l]
1st Order Decay, T½=0.25 yr	4.74E-03	5.47E-09	6.30E-15	7.25E-21	8.35E-27	9.62E-33	1.11E-38	1.28E-44	1.47E-50	1.69E-56	1.95E-62	[mg/l]



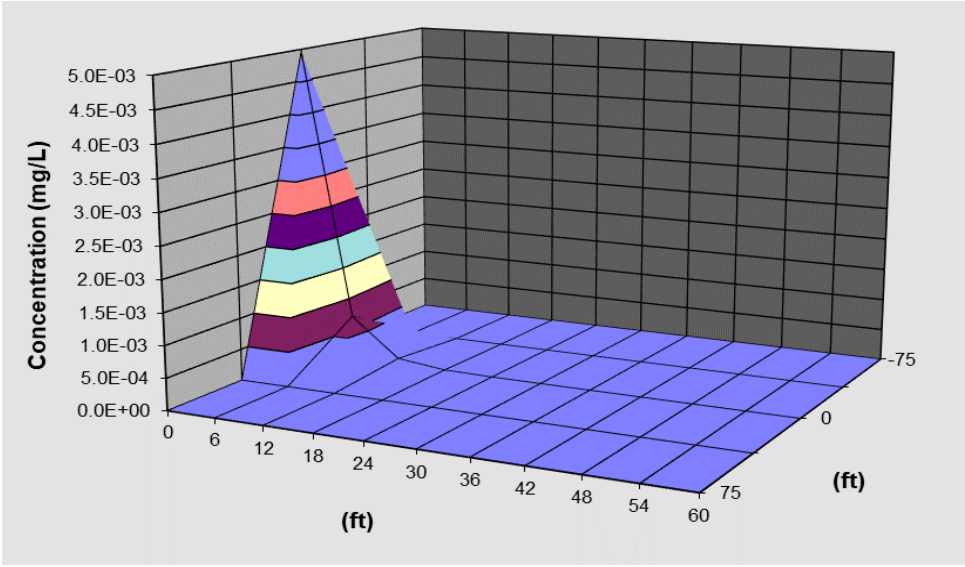
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-001/002

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
40 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

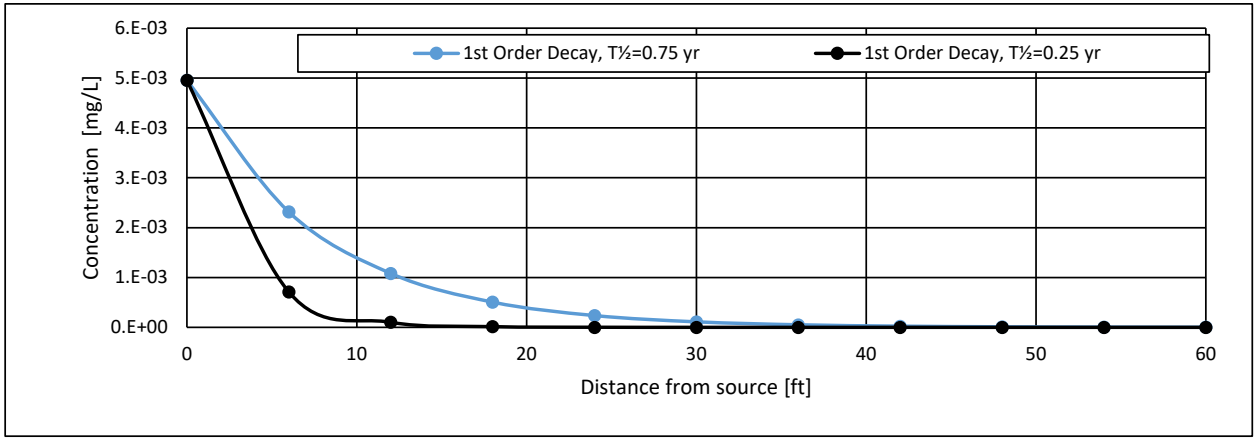
Distance (ft)	0.0001	6	12	18	24	30	36	42	48	54	60	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E-23	1.69E-22	4.79E-22	7.53E-22	[mg/l]
0	4.95E-03	7.10E-04	1.02E-04	1.46E-05	2.09E-06	3.00E-07	4.30E-08	6.17E-09	8.84E-10	1.27E-10	1.82E-11	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E-23	1.69E-22	4.79E-22	7.53E-22	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-001/002

CENTER LINE

Type of model	0	6	12	18	24	30	36	42	48	54	60	[Ft]
1st Order Decay, T½=0.75 yr	4.95E-03	2.32E-03	1.08E-03	5.06E-04	2.36E-04	1.11E-04	5.17E-05	2.41E-05	1.13E-05	5.28E-06	2.47E-06	[mg/l]
1st Order Decay, T½=0.25 yr	4.95E-03	7.10E-04	1.02E-04	1.46E-05	2.09E-06	3.00E-07	4.30E-08	6.17E-09	8.84E-10	1.27E-10	1.82E-11	[mg/l]



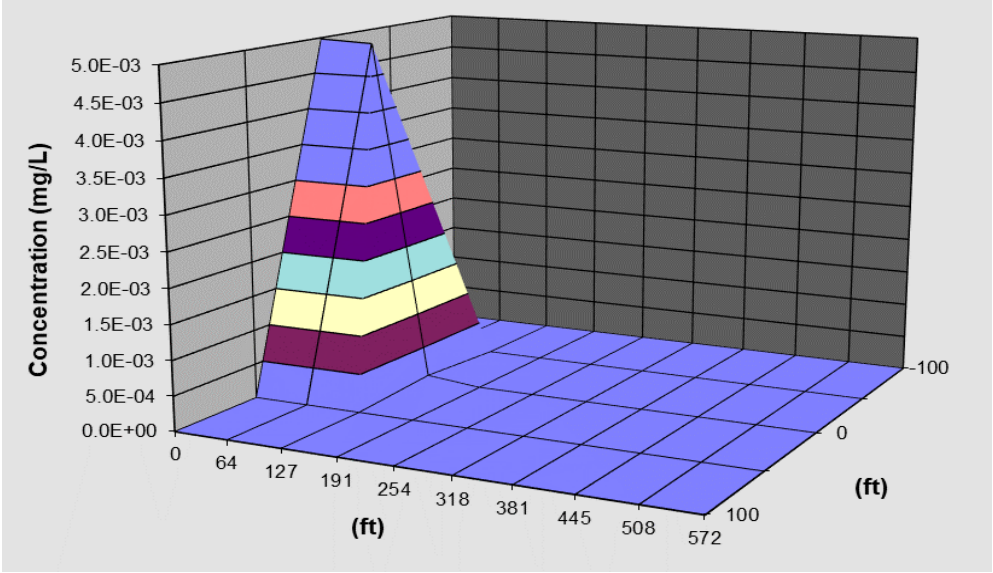
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.95%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-003

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
150 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

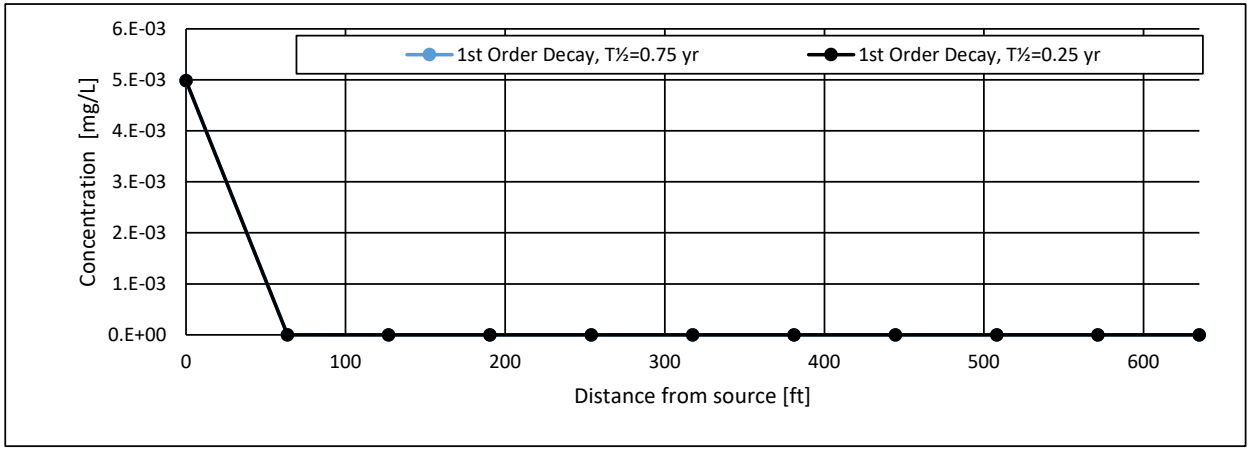
Distance (ft)	0.0001	63.5	127	190.5	254	317.5	381	444.5	508	571.5	635	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	1.49E-16	3.44E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
0	4.98E-03	4.95E-03	7.82E-05	4.75E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
-37.5	0.00E+00	0.00E+00	1.49E-16	3.44E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-003

CENTER LINE

Type of model	0	63.5	127	190.5	254	317.5	381	444.5	508	571.5	635	[Ft]
1st Order Decay, T½=0.75 yr	4.98E-03	1.59E-06	1.77E-10	6.06E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
1st Order Decay, T½=0.25 yr	4.98E-03	5.88E-12	6.86E-21	1.12E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



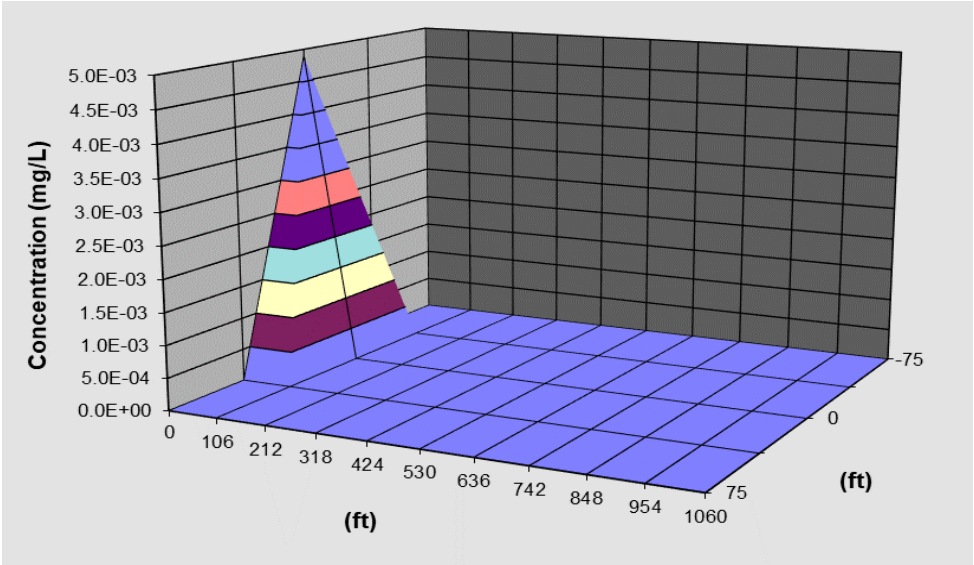
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-004

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
370 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

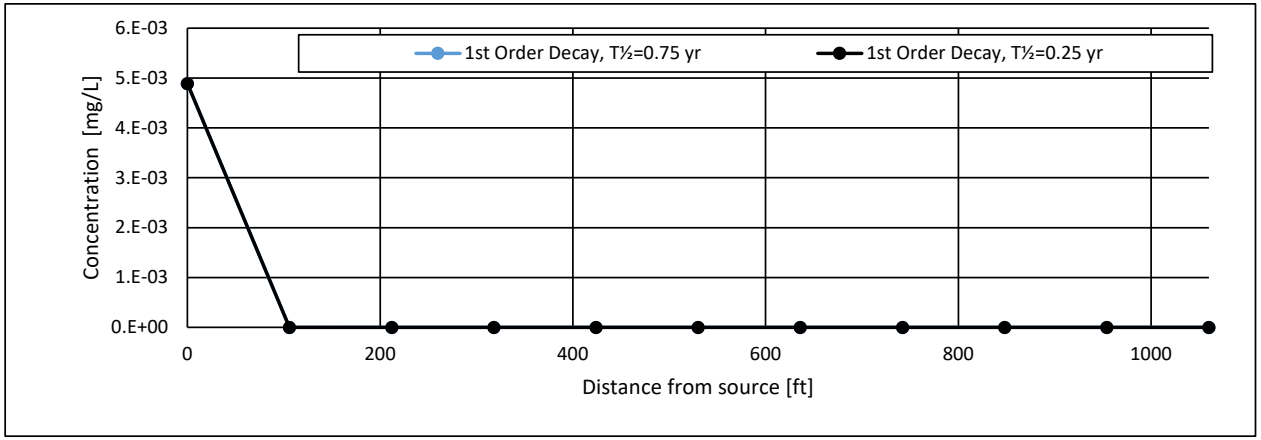
Distance (ft)	0.0001	106	212	318	424	530	636	742	848	954	1060	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	1.19E-61	1.77E-73	1.54E-86	3.27E-100	3.07E-114	1.74E-128	7.06E-143	2.25E-157	[mg/l]
37.5	0.00E+00	2.26E-24	1.16E-36	1.06E-50	3.55E-65	7.93E-80	1.45E-94	2.36E-109	3.59E-124	5.20E-139	7.28E-154	[mg/l]
0	4.89E-03	4.40E-18	4.15E-33	4.18E-48	4.38E-63	4.70E-78	5.14E-93	5.71E-108	6.41E-123	7.28E-138	8.32E-153	[mg/l]
-37.5	0.00E+00	2.26E-24	1.16E-36	1.06E-50	3.55E-65	7.93E-80	1.45E-94	2.36E-109	3.59E-124	5.20E-139	7.28E-154	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	1.19E-61	1.77E-73	1.54E-86	3.27E-100	3.07E-114	1.74E-128	7.06E-143	2.25E-157	[mg/l]



BIOSCREEN modeling of AOC-004

CENTER LINE

Type of model	0	106	212	318	424	530	636	742	848	954	1060	[Ft]
1st Order Decay, T½=0.75 yr	4.89E-03	5.15E-09	5.67E-15	6.69E-21	8.18E-27	1.03E-32	1.31E-38	1.71E-44	2.24E-50	2.97E-56	3.97E-62	[mg/l]
1st Order Decay, T½=0.25 yr	4.89E-03	4.40E-18	4.15E-33	4.18E-48	4.38E-63	4.70E-78	5.14E-93	5.71E-108	6.41E-123	7.28E-138	8.32E-153	[mg/l]



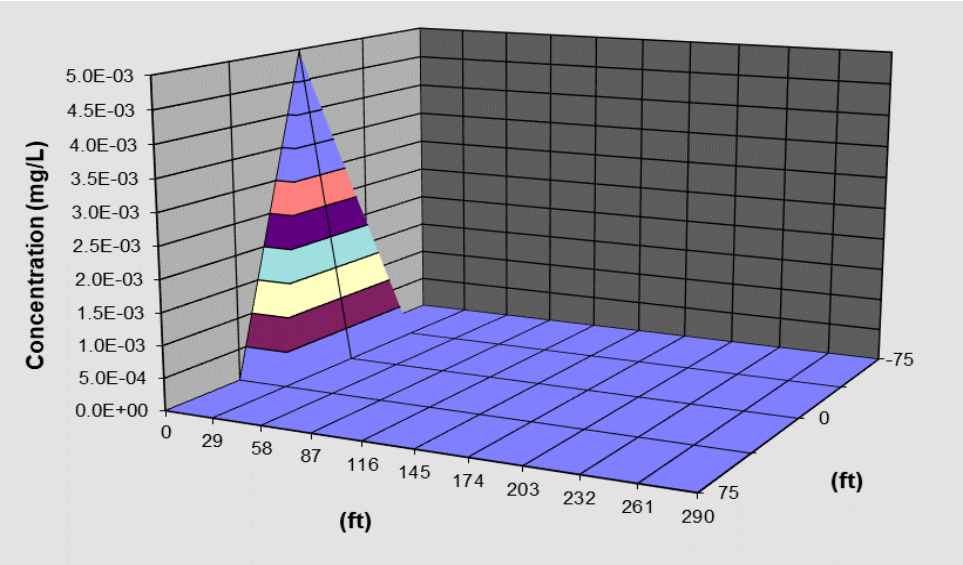
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-034/035

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
200 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

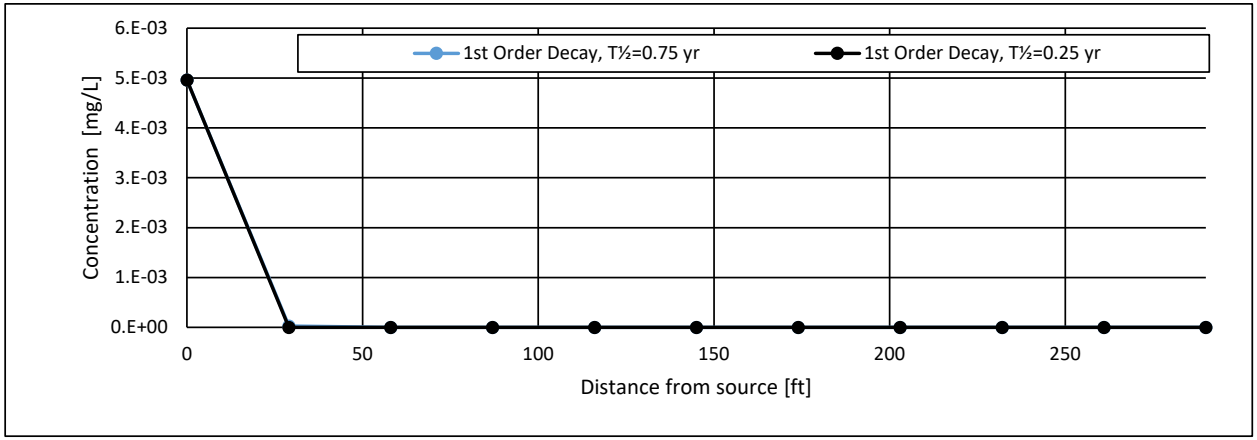
Distance (ft)	0.0001	29	58	87	116	145	174	203	232	261	290	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.72E-74	[mg/l]
37.5	0.00E+00	0.00E+00	5.21E-25	2.03E-27	2.01E-31	4.53E-36	4.89E-41	3.47E-46	1.89E-51	8.66E-57	3.50E-62	[mg/l]
0	4.96E-03	1.19E-08	2.64E-14	5.90E-20	1.34E-25	3.07E-31	7.08E-37	1.65E-42	3.85E-48	9.03E-54	2.13E-59	[mg/l]
-37.5	0.00E+00	0.00E+00	5.21E-25	2.03E-27	2.01E-31	4.53E-36	4.89E-41	3.47E-46	1.89E-51	8.66E-57	3.50E-62	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.72E-74	[mg/l]



BIOSCREEN modeling ofAOC-034/035

CENTER LINE

Type of model	0	29	58	87	116	145	174	203	232	261	290	[Ft]
1st Order Decay, T½=0.75 yr	4.96E-03	2.48E-05	1.15E-07	5.35E-10	2.53E-12	1.21E-14	5.82E-17	2.82E-19	1.37E-21	6.72E-24	3.30E-26	[mg/l]
1st Order Decay, T½=0.25 yr	4.96E-03	1.19E-08	2.64E-14	5.90E-20	1.34E-25	3.07E-31	7.08E-37	1.65E-42	3.85E-48	9.03E-54	2.13E-59	[mg/l]



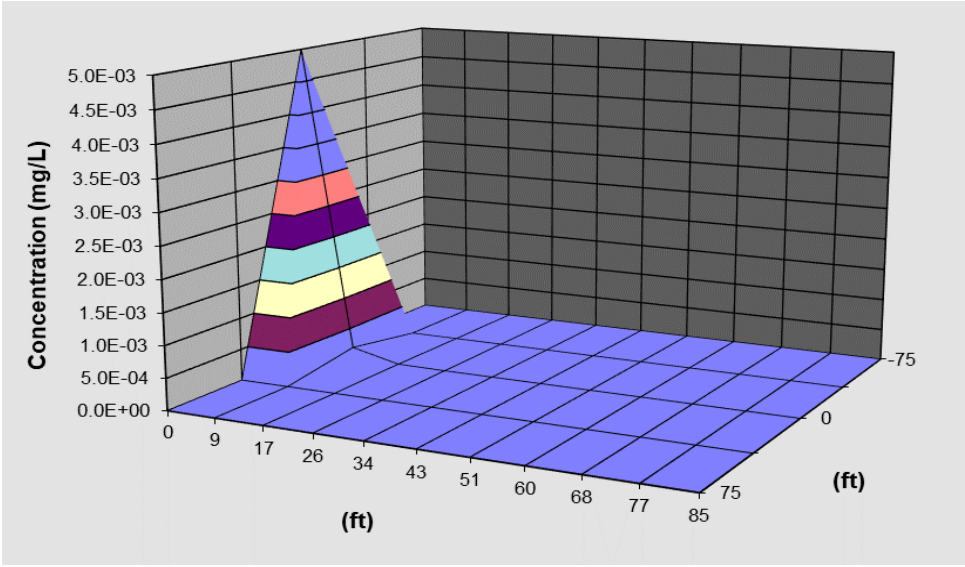
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-060

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
25 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

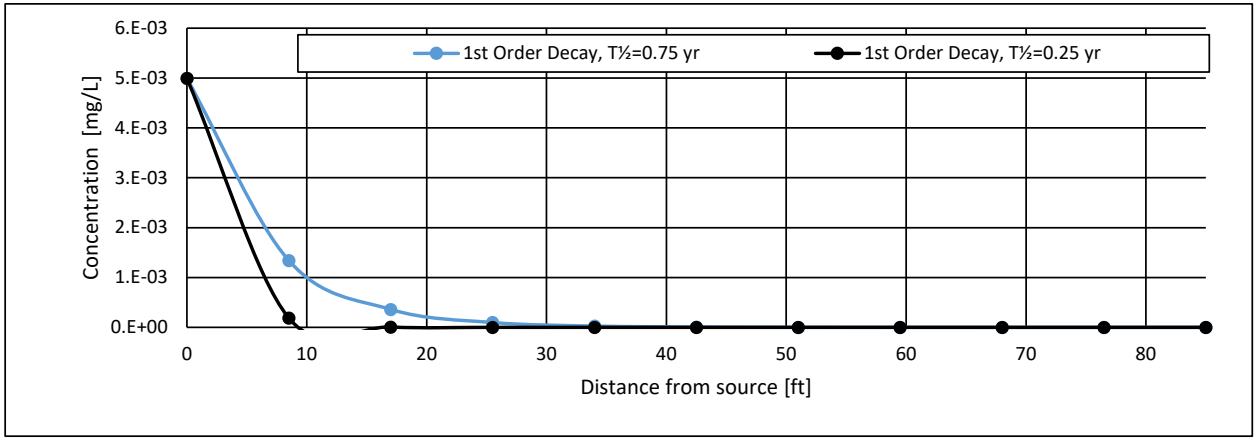
Distance (ft)	0.0001	8.5	17	25.5	34	42.5	51	59.5	68	76.5	85	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.48E-28	7.35E-28	3.41E-28	[mg/l]
0	4.99E-03	1.87E-04	7.00E-06	2.62E-07	9.81E-09	3.67E-10	1.37E-11	5.11E-13	1.90E-14	7.07E-16	2.62E-17	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.48E-28	7.35E-28	3.41E-28	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-060

CENTER LINE

Type of model	0	8.5	17	25.5	34	42.5	51	59.5	68	76.5	85	[Ft]
1st Order Decay, T½=0.75 yr	4.99E-03	1.34E-03	3.60E-04	9.67E-05	2.60E-05	6.96E-06	1.87E-06	4.99E-07	1.33E-07	3.55E-08	9.44E-09	[mg/l]
1st Order Decay, T½=0.25 yr	4.99E-03	1.87E-04	7.00E-06	2.62E-07	9.81E-09	3.67E-10	1.37E-11	5.11E-13	1.90E-14	7.07E-16	2.62E-17	[mg/l]



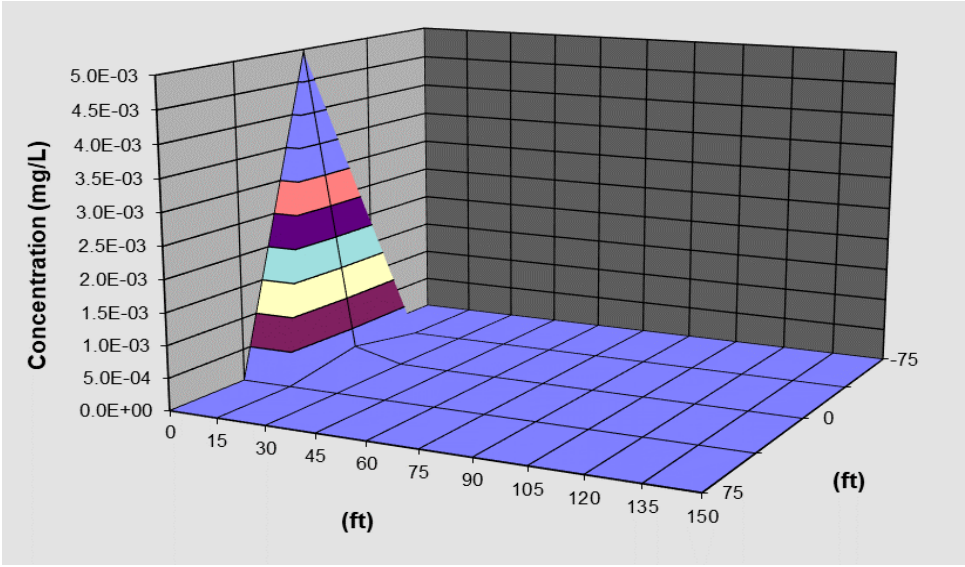
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-090 (shallow northward flow)

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
20 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

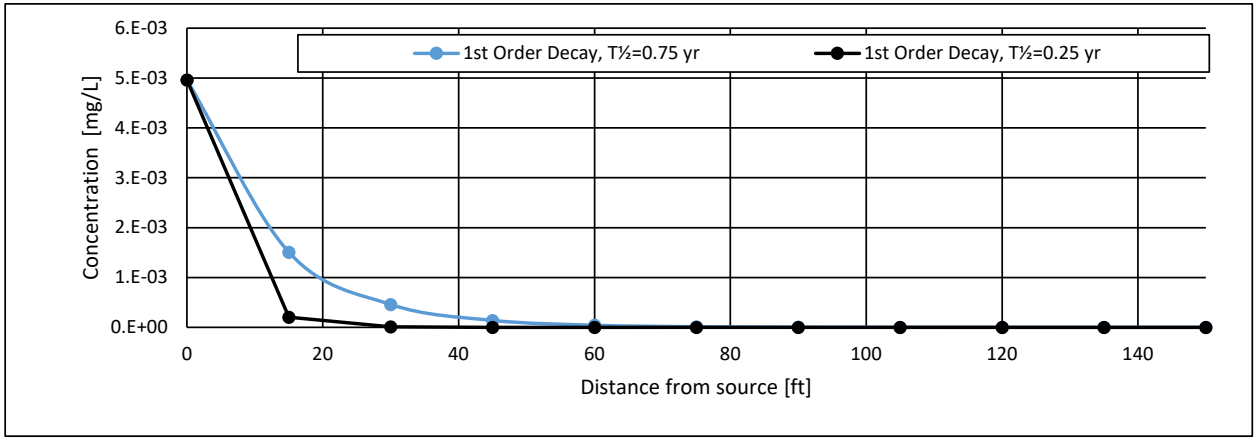
Distance (ft)	0.0001	15	30	45	60	75	90	105	120	135	150	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	3.87E-18	9.64E-16	3.22E-15	1.91E-15	4.71E-16	7.06E-17	7.73E-18	6.86E-19	5.24E-20	[mg/l]
0	4.96E-03	2.06E-04	8.55E-06	3.55E-07	1.47E-08	6.12E-10	2.54E-11	1.05E-12	4.37E-14	1.81E-15	7.50E-17	[mg/l]
-37.5	0.00E+00	0.00E+00	3.87E-18	9.64E-16	3.22E-15	1.91E-15	4.71E-16	7.06E-17	7.73E-18	6.86E-19	5.24E-20	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-090 (shallow northward flow)

CENTER LINE

Type of model	0	15	30	45	60	75	90	105	120	135	150	[Ft]
1st Order Decay, T½=0.75 yr	4.96E-03	1.51E-03	4.59E-04	1.39E-04	4.24E-05	1.29E-05	3.92E-06	1.19E-06	3.61E-07	1.10E-07	3.33E-08	[mg/l]
1st Order Decay, T½=0.25 yr	4.96E-03	2.06E-04	8.55E-06	3.55E-07	1.47E-08	6.12E-10	2.54E-11	1.05E-12	4.37E-14	1.81E-15	7.50E-17	[mg/l]



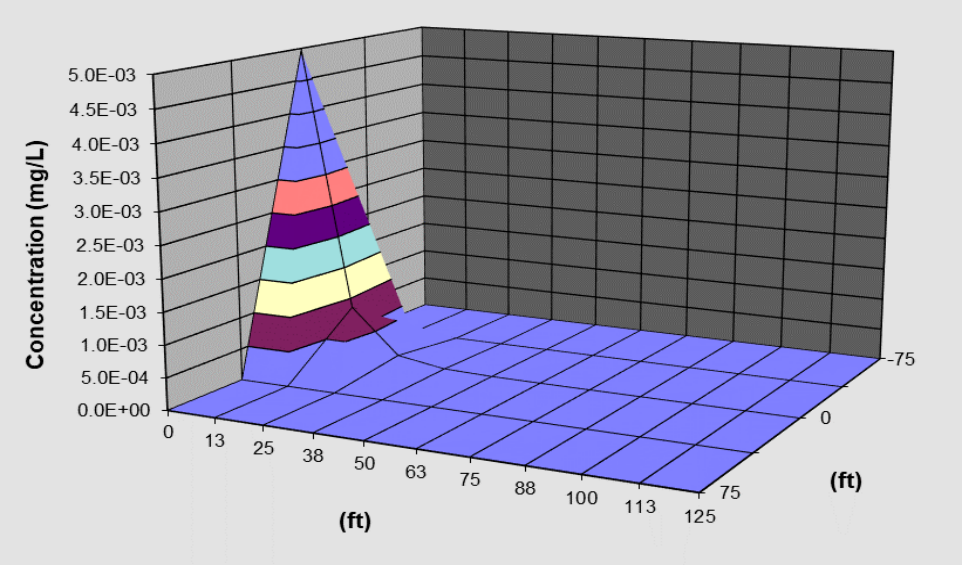
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-090 (shallow southward flow)

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
15 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

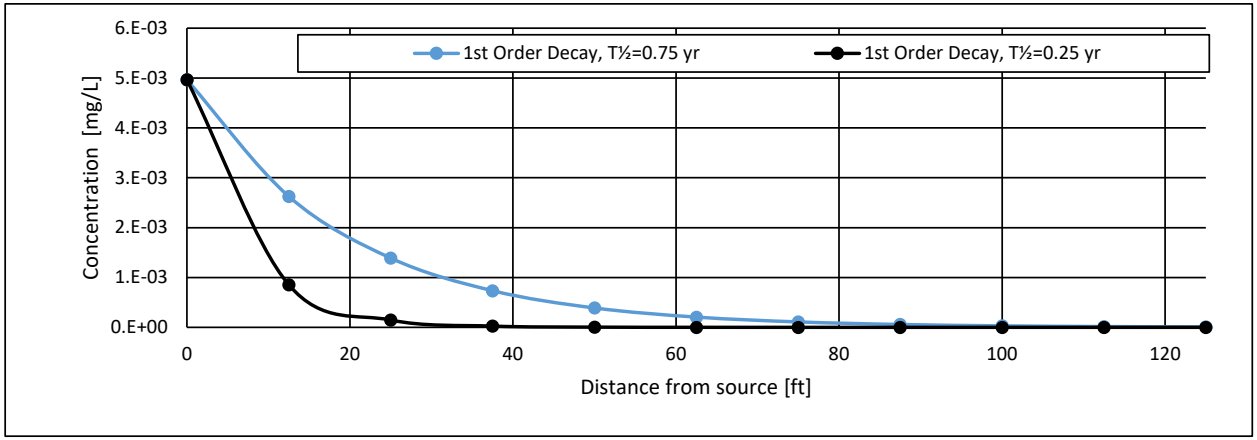
Distance (ft)	0.0001	12.5	25	37.5	50	62.5	75	87.5	100	112.5	125	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.43E-18	7.33E-17	4.02E-16	8.28E-16	9.24E-16	6.84E-16	3.80E-16	[mg/l]
0	4.96E-03	8.54E-04	1.47E-04	2.52E-05	4.34E-06	7.46E-07	1.28E-07	2.20E-08	3.79E-09	6.50E-10	1.12E-10	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.43E-18	7.33E-17	4.02E-16	8.28E-16	9.24E-16	6.84E-16	3.80E-16	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-090 (shallow southward flow)

CENTER LINE

Type of model	0	12.5	25	37.5	50	62.5	75	87.5	100	112.5	125	[Ft]
1st Order Decay, T½=0.75 yr	4.96E-03	2.63E-03	1.39E-03	7.35E-04	3.89E-04	2.06E-04	1.09E-04	5.75E-05	3.04E-05	1.60E-05	8.47E-06	[mg/l]
1st Order Decay, T½=0.25 yr	4.96E-03	8.54E-04	1.47E-04	2.52E-05	4.34E-06	7.46E-07	1.28E-07	2.20E-08	3.79E-09	6.50E-10	1.12E-10	[mg/l]



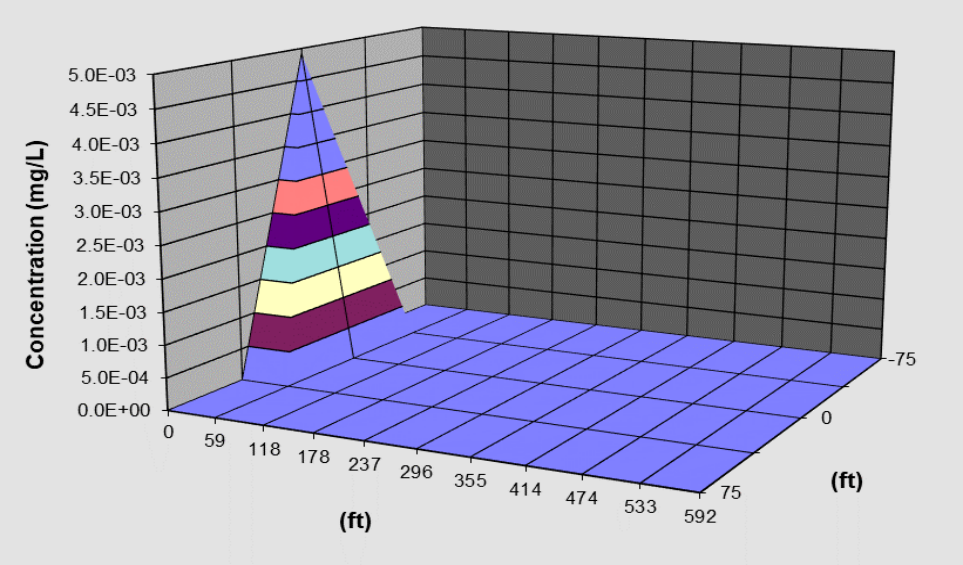
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.83%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-090 (intermediate)

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
20 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

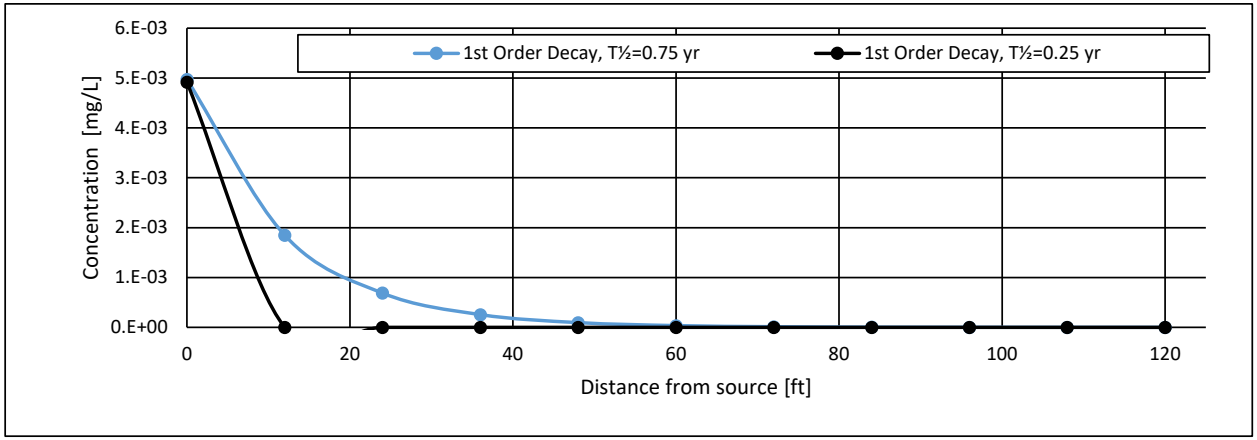
Distance (ft)	0.0001	12	24	36	48	60	72	84	96	108	120	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-112	1.88E-129	7.10E-147	1.08E-164	8.90E-183	4.81E-201	[mg/l]
37.5	0.00E+00	1.50E-32	8.65E-47	3.42E-64	2.14E-82	6.38E-101	1.31E-119	2.18E-138	3.18E-157	4.23E-176	5.30E-195	[mg/l]
0	4.92E-03	4.83E-22	4.58E-41	4.22E-60	3.85E-79	3.51E-98	3.20E-117	2.92E-136	2.68E-155	2.47E-174	2.28E-193	[mg/l]
-37.5	0.00E+00	1.50E-32	8.65E-47	3.42E-64	2.14E-82	6.38E-101	1.31E-119	2.18E-138	3.18E-157	4.23E-176	5.30E-195	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-112	1.88E-129	7.10E-147	1.08E-164	8.90E-183	4.81E-201	[mg/l]



BIOSCREEN modeling of AOC-090 (intermediate)

CENTER LINE

Type of model	0	12	24	36	48	60	72	84	96	108	120	[Ft]
1st Order Decay, T½=0.75 yr	4.97E-03	1.85E-03	6.87E-04	2.55E-04	9.49E-05	3.53E-05	1.31E-05	4.87E-06	1.81E-06	6.72E-07	2.49E-07	[mg/l]
1st Order Decay, T½=0.25 yr	4.92E-03	4.83E-22	4.58E-41	4.22E-60	3.85E-79	3.51E-98	3.20E-117	2.92E-136	2.68E-155	2.47E-174	2.28E-193	[mg/l]



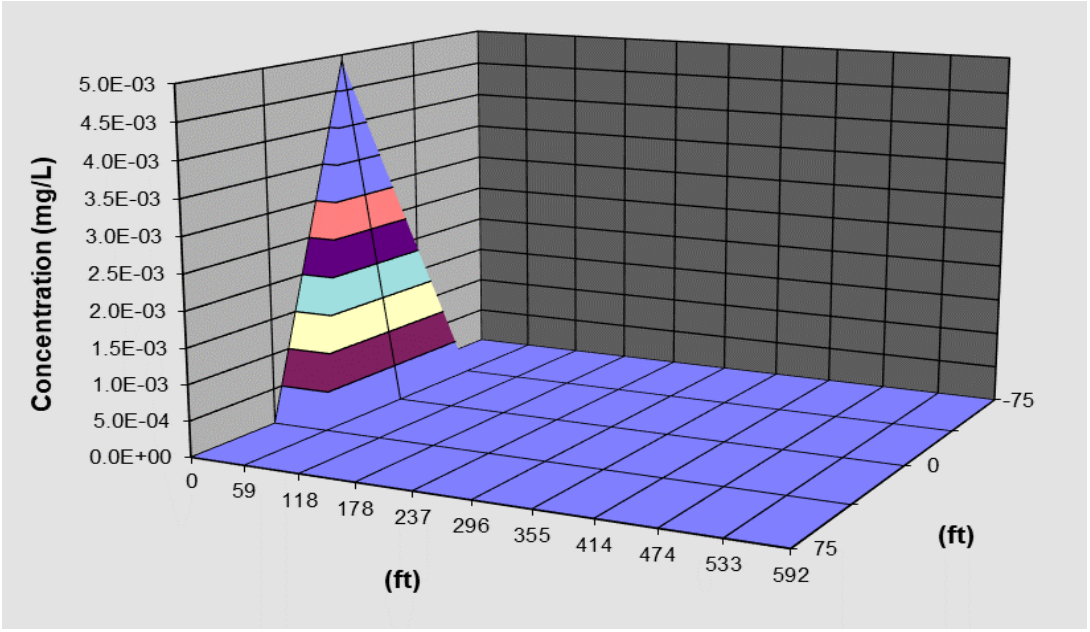
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.99%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-092

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
415 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

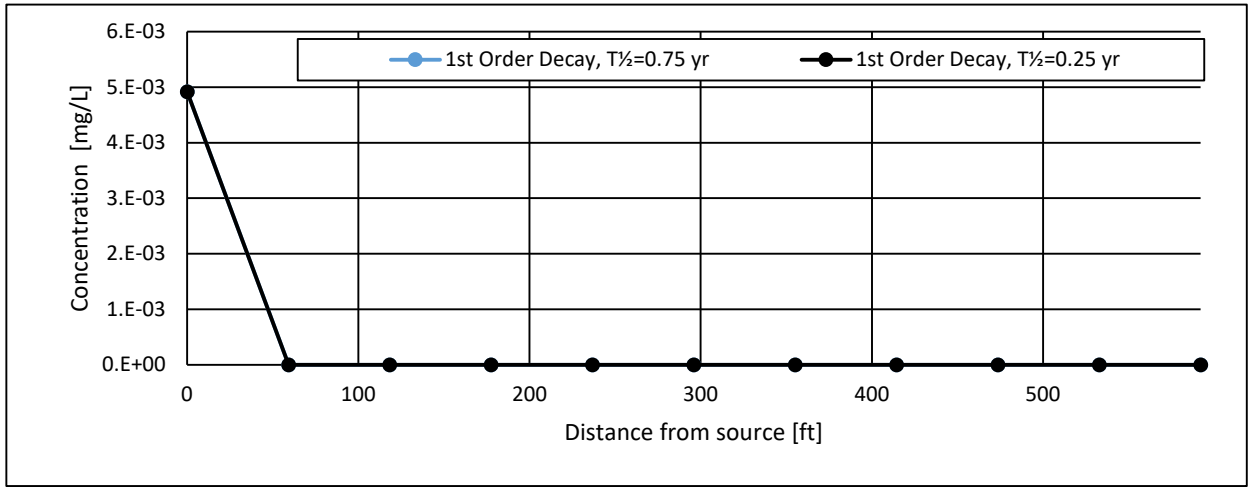
Distance (ft)	0	59.2	118.4	177.6	236.8	296	355.2	414.4	473.6	532.8	592	[Ft]
75	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-112	1.9E-129	7.1E-147	1.1E-164	8.9E-183	4.8E-201	[mg/l]
37.5	0.0E+00	1.5E-32	8.7E-47	3.4E-64	2.1E-82	6.4E-101	1.3E-119	2.2E-138	3.2E-157	4.2E-176	5.3E-195	[mg/l]
0	4.9E-03	4.8E-22	4.6E-41	4.2E-60	3.9E-79	3.5E-98	3.2E-117	2.9E-136	2.7E-155	2.5E-174	2.3E-193	[mg/l]
-37.5	0.0E+00	1.5E-32	8.7E-47	3.4E-64	2.1E-82	6.4E-101	1.3E-119	2.2E-138	3.2E-157	4.2E-176	5.3E-195	[mg/l]
-75	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-112	1.9E-129	7.1E-147	1.1E-164	8.9E-183	4.8E-201	[mg/l]



BIOSCREEN modeling of AOC-092

CENTER LINE

Type of model	0	59.2	118.4	177.6	236.8	296	355.2	414.4	473.6	532.8	592	[Ft]
1st Order Decay, T½=0.75 yr	4.9E-03	2.3E-11	1.1E-19	4.7E-28	2.1E-36	9.1E-45	4.0E-53	1.8E-61	7.7E-70	3.4E-78	1.5E-86	[mg/l]
1st Order Decay, T½=0.25 yr	4.9E-03	4.8E-22	4.6E-41	4.2E-60	3.9E-79	3.5E-98	3.2E-117	2.9E-136	2.7E-155	2.5E-174	2.3E-193	[mg/l]



	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

10 x source concentration 10 (ug/L) BIOSCREEN input parameters

Area of interest	Geology	Hydraulic Conductivity	Conc	VC Mass	Gradient	Porosity	Run time	Half life (T½)		CPOC to water	Source Width	Source Thickness	Disp long
	[USCS]	[cm/s]	[ug/L]	[kg]	[-]	[-]	[yrs]	VC to Ether [Yrs]		[ft]	[ft]	[ft]	ft
SWMU-168	(SM)	8.96E-04	10.00	1.00	0.004	0.43	15	0.25	0.75	95	15	5	1
SWMU-172/174	(SP)	2.15E-03	10.00	1.00	0.004	0.43	5	0.25	0.75	60	30	20	1
Bldg 4-78/79 SWMU AOC Group	(SM)	8.96E-04	10.00	1.00	0.001	0.43	200	0.25	0.75	185	100	20	1
AOC-001/002	(SM)	8.96E-04	10.00	1.00	0.003	0.43	40	0.25	0.75	60	30	5	1
AOC-003	(SM)	8.96E-04	10.00	1.00	0.003	0.43	150	0.25	0.75	635	30	5	1
AOC-004	(SM)	8.96E-04	10.00	1.00	0.002	0.43	370	0.25	0.75	1060	30	5	1
AOC-034/035	(SM)	8.96E-04	10.00	1.00	0.001	0.43	200	0.25	0.75	290	20	15	1
AOC-060	(SP)	2.15E-03	10.00	1.00	0.001	0.43	25	0.25	0.75	85	20	10	1
AOC-090 (shallow northward)	(SM)	8.96E-04	10.00	1.00	0.005	0.43	20	0.25	0.75	150	40	15	1
AOC-090 (shallow southward)	(SM)	8.96E-04	10.00	1.00	0.008	0.43	15	0.25	0.75	125	30	15	1
AOC-090 (intermediate)	(SP)	2.15E-03	10.00	1.00	0.002	0.43	20	0.25	0.75	120	30	15	1
AOC-092	(SM)	8.96E-04	10.00	1.00	0.001	0.43	415	0.25	0.75	592	30	10	1

10 x source concentration 10 (ug/L) BIOSCREENVC modeling results

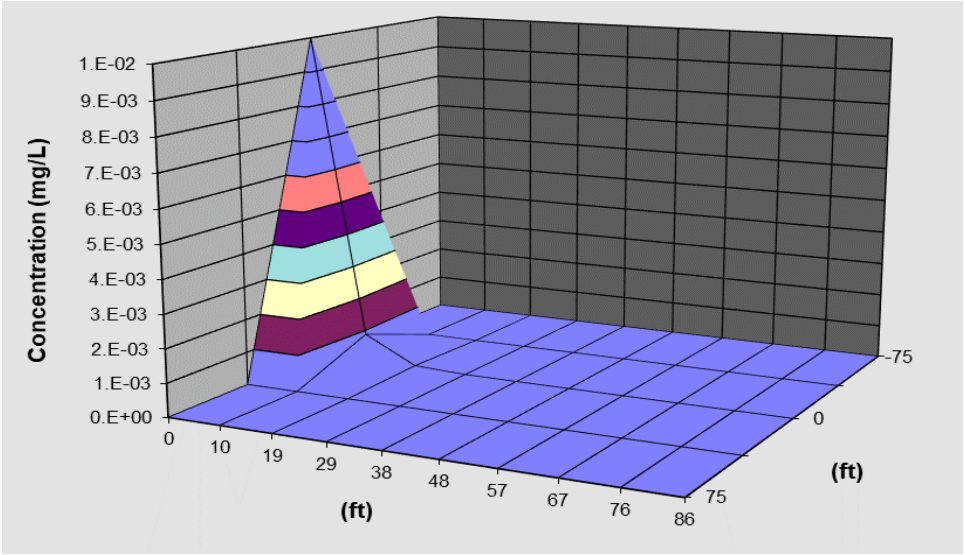
SWMU/Area of interest	Input concentration	Concentration at waterway	
		T½ = 0.25 yrs k = 0.0076 1/days	T½ = 0.75 yrs k = 0.0025 1/days
	[ug/L]	[ug/L]	[ug/L]
SWMU-168	10	<0.001	<0.001
SWMU-172/174	10	0.0076	0.7634
Bldg 4-78/79 SWMU AOC Group	10	<0.001	<0.001
AOC-001/002	10	<0.001	0.0049
AOC-003	10	<0.001	<0.001
AOC-004	10	<0.001	<0.001
AOC-034/035	10	<0.001	<0.001
AOC-060	10	<0.001	<0.001
AOC-090 (shallow northward now)	10	<0.001	<0.001
AOC-090 (shallow southward now)	10	<0.001	0.0169
AOC-090 (intermediate)	10	<0.001	<0.001
AOC-092	10	<0.001	<0.001

BIOSCREEN modeling of SWMU -168

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
15 year simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

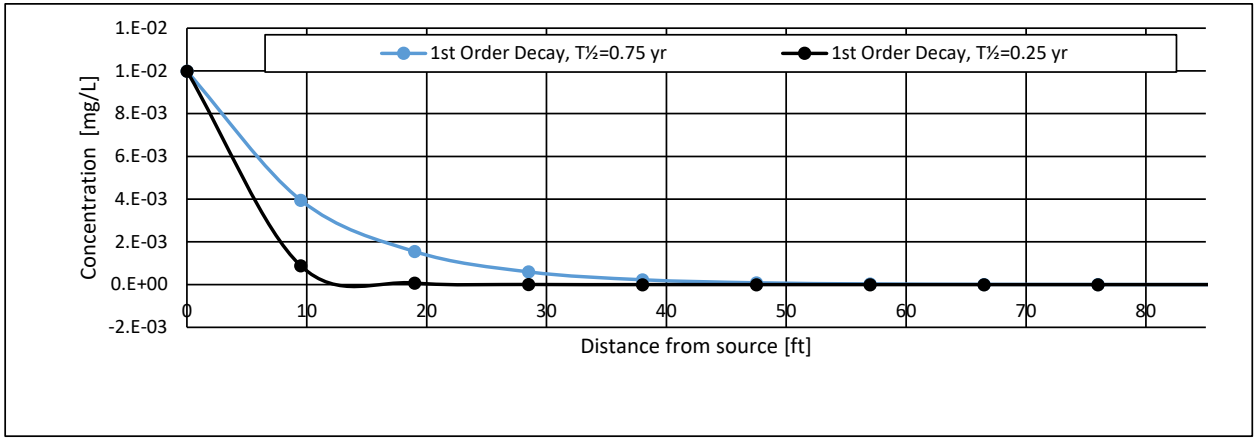
Distance (ft)	0	9.5	19	28.5	38	47.5	57	66.5	76	85.5	95	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-25	4.88E-25	6.07E-25	[mg/l]
0	9.99E-03	8.78E-04	7.64E-05	6.53E-06	5.52E-07	4.63E-08	3.87E-09	3.23E-10	2.70E-11	2.26E-12	1.89E-13	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E-25	4.88E-25	6.07E-25	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of SWMU -168

CENTER LINE

Type of model	0	9.5	19	28.5	38	47.5	57	66.5	76	85.5	95	[Ft]
1st Order Decay, T½=0.75 yr	9.99E-03	3.95E-03	1.55E-03	5.95E-04	2.26E-04	8.54E-05	3.21E-05	1.21E-05	4.54E-06	1.71E-06	6.42E-07	[mg/l]
1st Order Decay, T½=0.25 yr	9.99E-03	8.78E-04	7.64E-05	6.53E-06	5.52E-07	4.63E-08	3.87E-09	3.23E-10	2.70E-11	2.26E-12	1.89E-13	[mg/l]



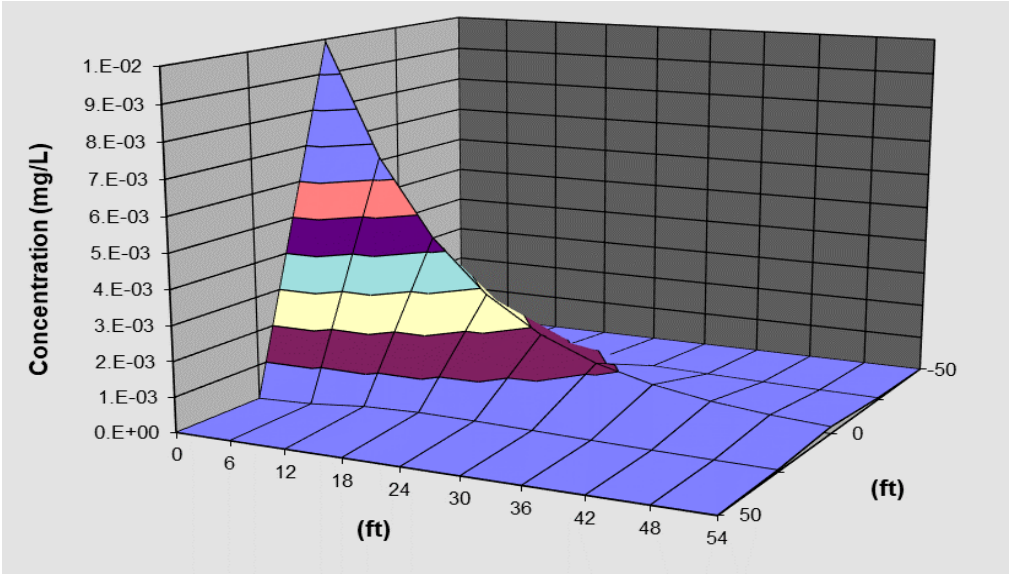
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.99%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of SWMU -172/174

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
5 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

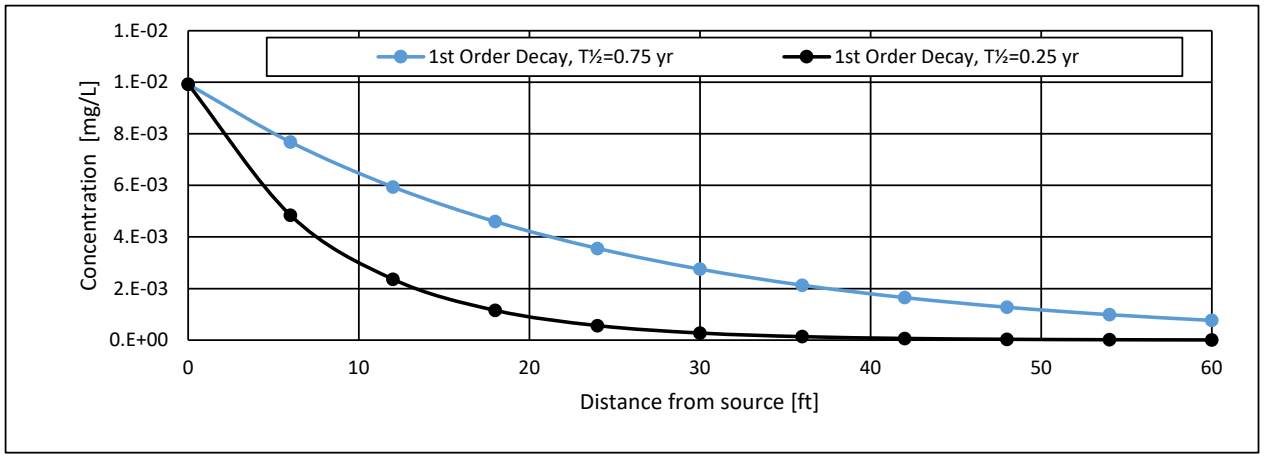
Distance (ft)	0	6	12	18	24	30	36	42	48	54	60	[Ft]
50	0.00E+00	0.00E+00	6.56E-12	1.87E-09	2.67E-08	1.15E-07	2.68E-07	4.41E-07	5.84E-07	6.67E-07	6.87E-07	[mg/l]
25	0.00E+00	5.46E-05	1.99E-04	2.45E-04	2.26E-04	1.85E-04	1.43E-04	1.06E-04	7.67E-05	5.46E-05	3.84E-05	[mg/l]
0	9.92E-03	6.62E-03	4.36E-03	2.83E-03	1.82E-03	1.17E-03	7.48E-04	4.80E-04	3.09E-04	1.99E-04	1.28E-04	[mg/l]
-25	0.00E+00	5.46E-05	1.99E-04	2.45E-04	2.26E-04	1.85E-04	1.43E-04	1.06E-04	7.67E-05	5.46E-05	3.84E-05	[mg/l]
-50	0.00E+00	0.00E+00	6.56E-12	1.87E-09	2.67E-08	1.15E-07	2.68E-07	4.41E-07	5.84E-07	6.67E-07	6.87E-07	[mg/l]



BIOSCREEN modeling of SWMU -172/174

CENTER LINE

Type of model	0	6	12	18	24	30	36	42	48	54	60	[Ft]
1st Order Decay, T½=0.75 yr	9.92E-03	7.68E-03	5.94E-03	4.60E-03	3.56E-03	2.75E-03	2.13E-03	1.65E-03	1.28E-03	9.87E-04	7.63E-04	[mg/l]
1st Order Decay, T½=0.25 yr	9.92E-03	4.84E-03	2.36E-03	1.15E-03	5.63E-04	2.75E-04	1.34E-04	6.54E-05	3.19E-05	1.56E-05	7.60E-06	[mg/l]



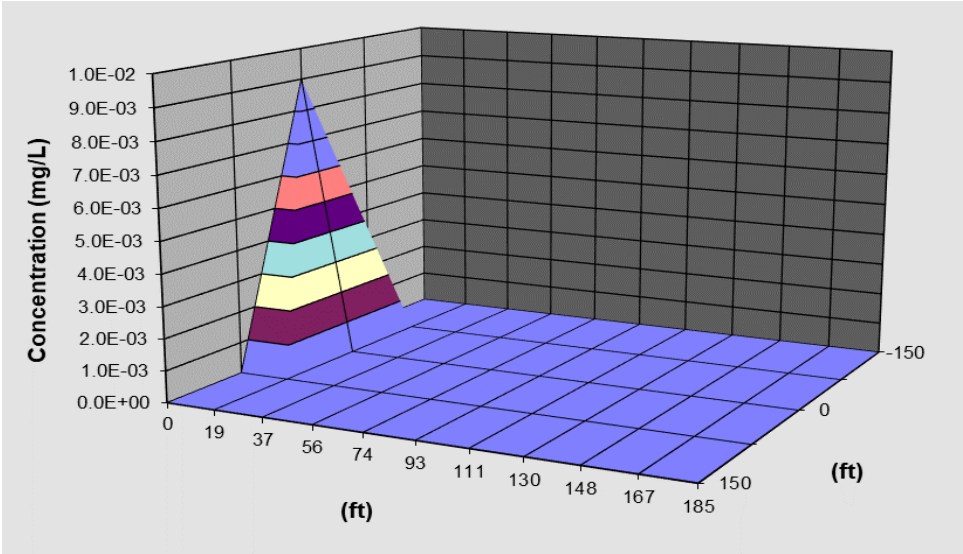
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	92.31%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	99.92%	reduction

BIOSCREEN modeling of Bldg 4-78/79 SWMU AOC Group

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
200 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

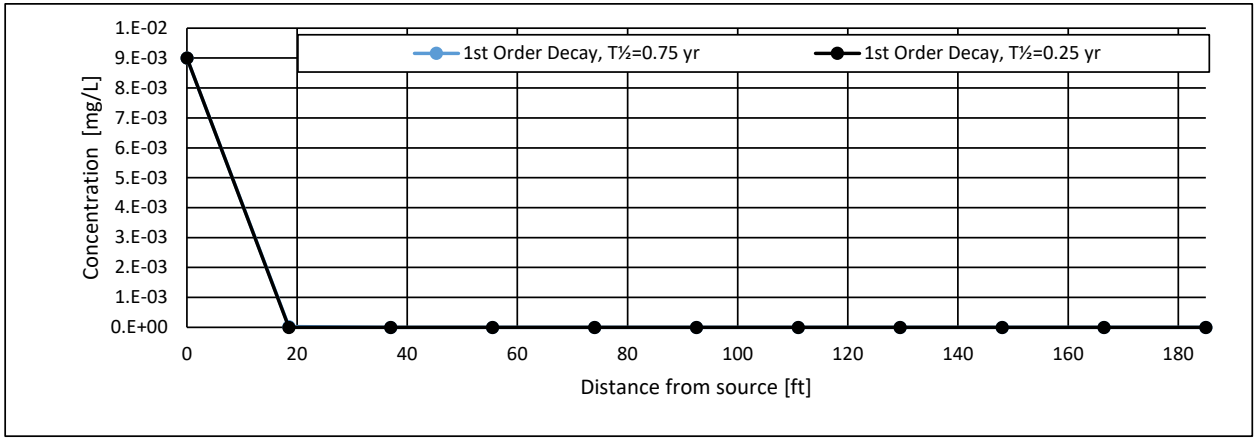
Distance (ft)	0	18.5	37	55.5	74	92.5	111	129.5	148	166.5	185	[Ft]
150	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
75	0.00E+00	0.00E+00	0.00E+00	4.30E-34	6.49E-37	5.69E-41	1.20E-45	1.11E-50	6.15E-56	2.42E-61	7.49E-67	[mg/l]
0	9.00E-03	1.04E-08	1.20E-14	1.39E-20	1.60E-26	1.85E-32	2.13E-38	2.46E-44	2.84E-50	3.28E-56	3.78E-62	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	4.30E-34	6.49E-37	5.69E-41	1.20E-45	1.11E-50	6.15E-56	2.42E-61	7.49E-67	[mg/l]
-150	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of Bldg 4-78/79 SWMU AOC Group

CENTER LINE

Type of model	0.0001	18.5	37	55.5	74	92.5	111	129.5	148	166.5	185	[Ft]
1st Order Decay, T½=0.75 yr	9.00E-03	2.27E-05	5.70E-08	1.43E-10	3.61E-13	9.07E-16	2.28E-18	5.74E-21	1.44E-23	3.63E-26	9.14E-29	[mg/l]
1st Order Decay, T½=0.25 yr	9.00E-03	1.04E-08	1.20E-14	1.39E-20	1.60E-26	1.85E-32	2.13E-38	2.46E-44	2.84E-50	3.28E-56	3.78E-62	[mg/l]



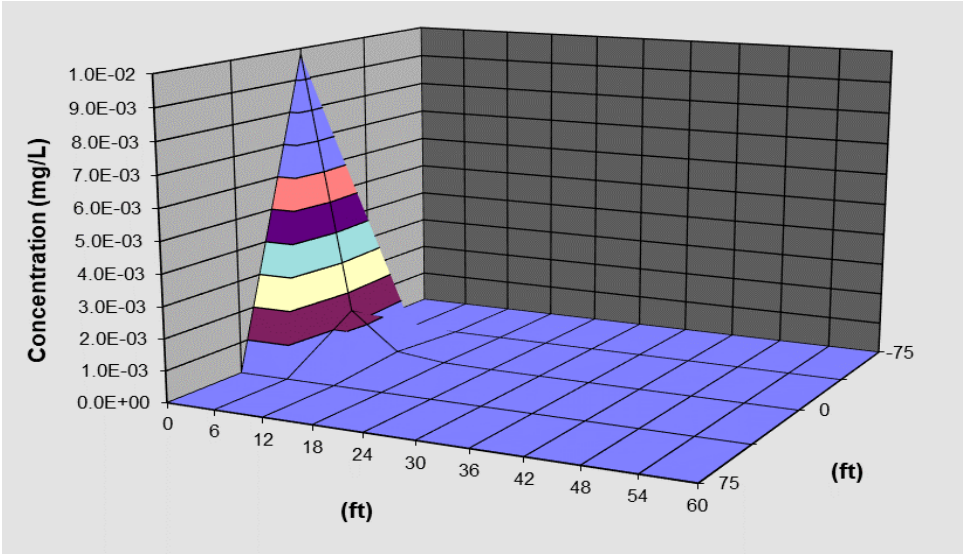
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-001/002

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
40 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

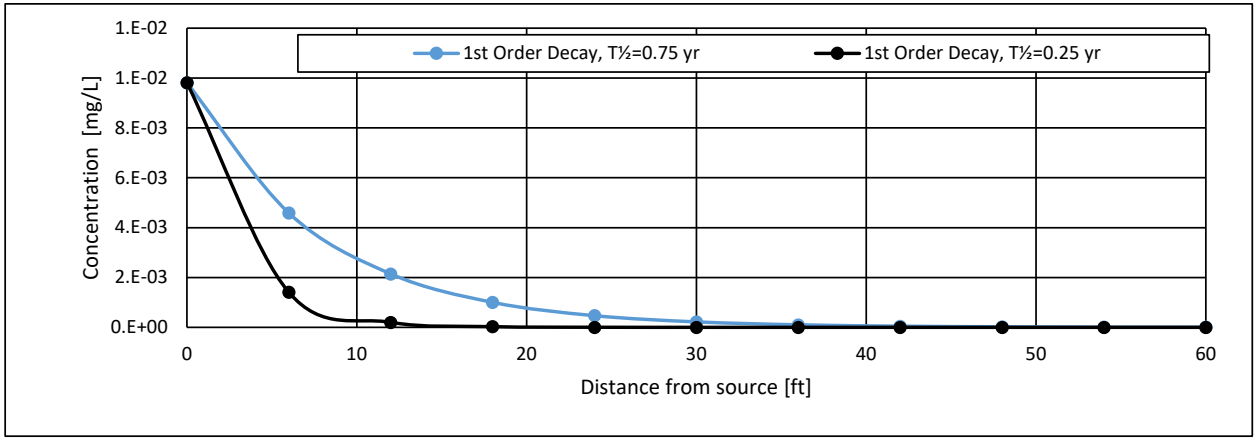
Distance (ft)	0.0001	6	12	18	24	30	36	42	48	54	60	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.09E-23	3.35E-22	9.52E-22	1.50E-21	[mg/l]
0	9.81E-03	1.41E-03	2.02E-04	2.89E-05	4.15E-06	5.95E-07	8.53E-08	1.22E-08	1.75E-09	2.52E-10	3.61E-11	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.09E-23	3.35E-22	9.52E-22	1.50E-21	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-001/002

CENTER LINE

Type of model	0	6	12	18	24	30	36	42	48	54	60	[Ft]
1st Order Decay, T½=0.75 yr	9.81E-03	4.59E-03	2.14E-03	1.00E-03	4.69E-04	2.19E-04	1.02E-04	4.79E-05	2.24E-05	1.05E-05	4.90E-06	[mg/l]
1st Order Decay, T½=0.25 yr	9.81E-03	1.41E-03	2.02E-04	2.89E-05	4.15E-06	5.95E-07	8.53E-08	1.22E-08	1.75E-09	2.52E-10	3.61E-11	[mg/l]



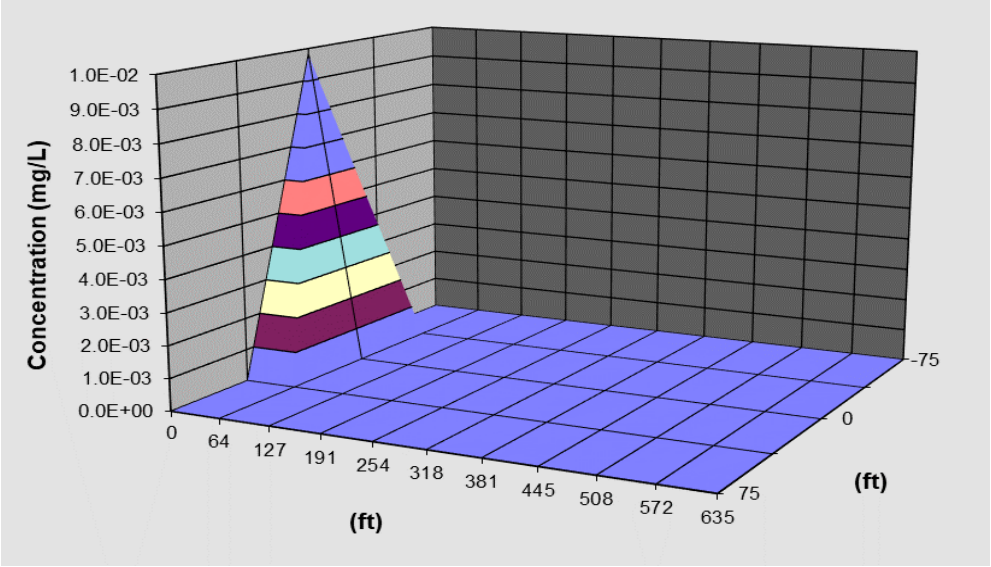
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.95%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-003

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
150 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

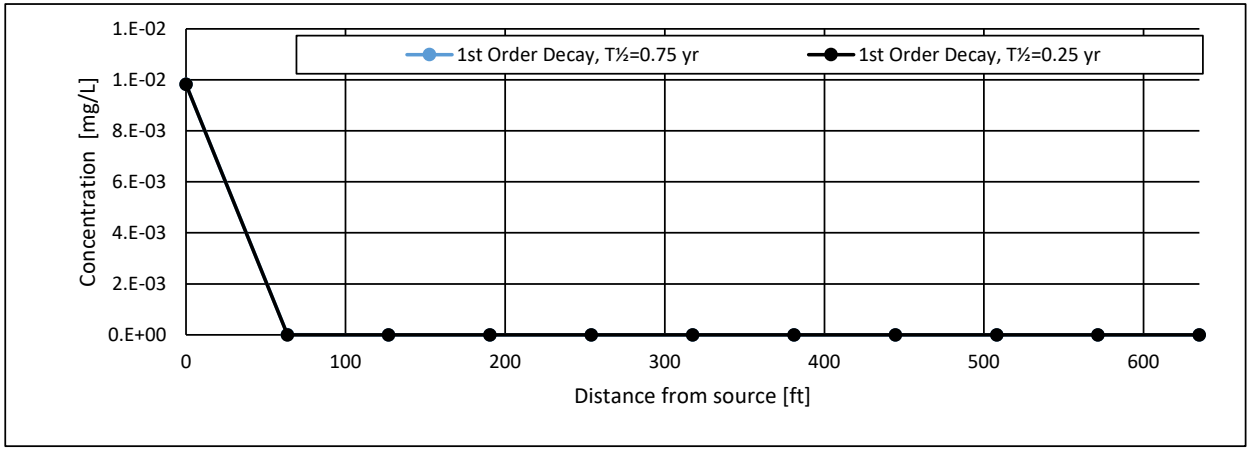
Distance (ft)	0.0001	63.5	127	190.5	254	317.5	381	444.5	508	571.5	635	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-61	3.60E-68	1.25E-75	1.85E-83	1.57E-91	8.92E-100	[mg/l]
37.5	0.00E+00	1.33E-21	3.73E-26	1.25E-33	7.85E-42	2.50E-50	5.71E-59	1.07E-67	1.79E-76	2.77E-85	4.04E-94	[mg/l]
0	9.82E-03	9.73E-12	9.26E-21	9.25E-30	9.49E-39	9.92E-48	1.05E-56	1.12E-65	1.21E-74	1.31E-83	1.44E-92	[mg/l]
-37.5	0.00E+00	1.33E-21	3.73E-26	1.25E-33	7.85E-42	2.50E-50	5.71E-59	1.07E-67	1.79E-76	2.77E-85	4.04E-94	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-61	3.60E-68	1.25E-75	1.85E-83	1.57E-91	8.92E-100	[mg/l]



BIOSCREEN modeling of AOC-003

CENTER LINE

Type of model	0	63.5	127	190.5	254	317.5	381	444.5	508	571.5	635	[Ft]
1st Order Decay, T½=0.75 yr	9.82E-03	2.63E-06	6.77E-10	1.83E-13	5.08E-17	1.44E-20	4.11E-24	1.19E-27	3.47E-31	1.02E-34	3.01E-38	[mg/l]
1st Order Decay, T½=0.25 yr	9.82E-03	9.73E-12	9.26E-21	9.25E-30	9.49E-39	9.92E-48	1.05E-56	1.12E-65	1.21E-74	1.31E-83	1.44E-92	[mg/l]



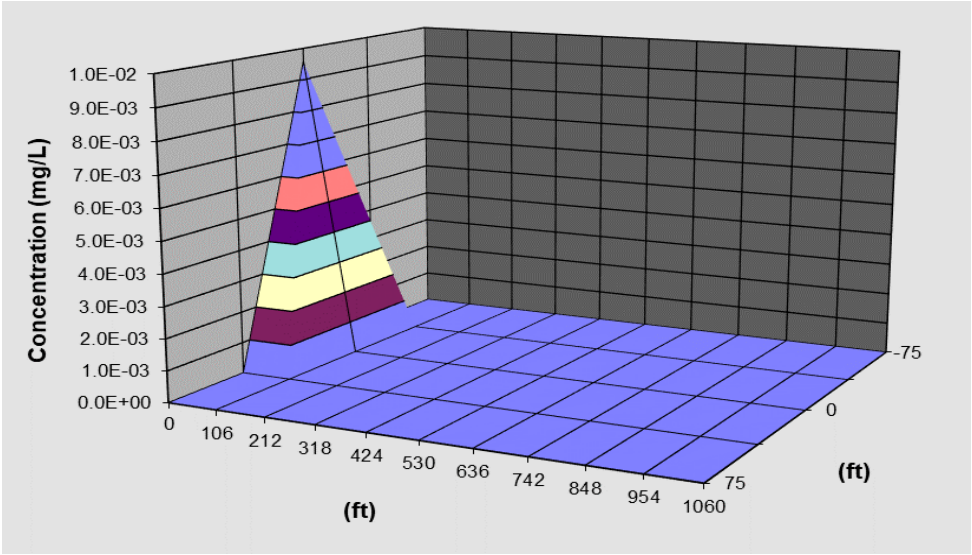
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-004

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
370 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

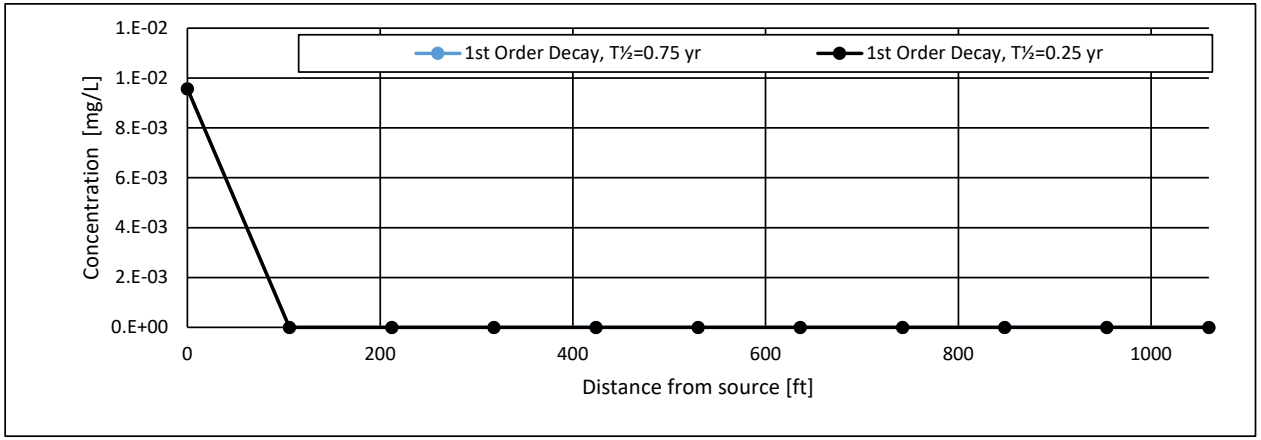
Distance (ft)	0.0001	106	212	318	424	530	636	742	848	954	1060	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	2.33E-61	3.47E-73	3.04E-86	6.43E-100	6.06E-114	3.44E-128	1.39E-142	4.45E-157	[mg/l]
37.5	0.00E+00	4.43E-24	2.28E-36	2.09E-50	6.98E-65	1.56E-79	2.85E-94	4.66E-109	7.08E-124	1.03E-138	1.44E-153	[mg/l]
0	9.57E-03	8.62E-18	8.14E-33	8.21E-48	8.60E-63	9.24E-78	1.01E-92	1.12E-107	1.26E-122	1.44E-137	1.64E-152	[mg/l]
-37.5	0.00E+00	4.43E-24	2.28E-36	2.09E-50	6.98E-65	1.56E-79	2.85E-94	4.66E-109	7.08E-124	1.03E-138	1.44E-153	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	2.33E-61	3.47E-73	3.04E-86	6.43E-100	6.06E-114	3.44E-128	1.39E-142	4.45E-157	[mg/l]



BIOSCREEN modeling of AOC-004

CENTER LINE

Type of model	0	106	212	318	424	530	636	742	848	954	1060	[Ft]
1st Order Decay, T½=0.75 yr	9.57E-03	1.01E-08	1.11E-14	1.31E-20	1.61E-26	2.02E-32	2.58E-38	3.36E-44	4.42E-50	5.87E-56	7.85E-62	[mg/l]
1st Order Decay, T½=0.25 yr	9.57E-03	8.62E-18	8.14E-33	8.21E-48	8.60E-63	9.24E-78	1.01E-92	1.12E-107	1.26E-122	1.44E-137	1.64E-152	[mg/l]



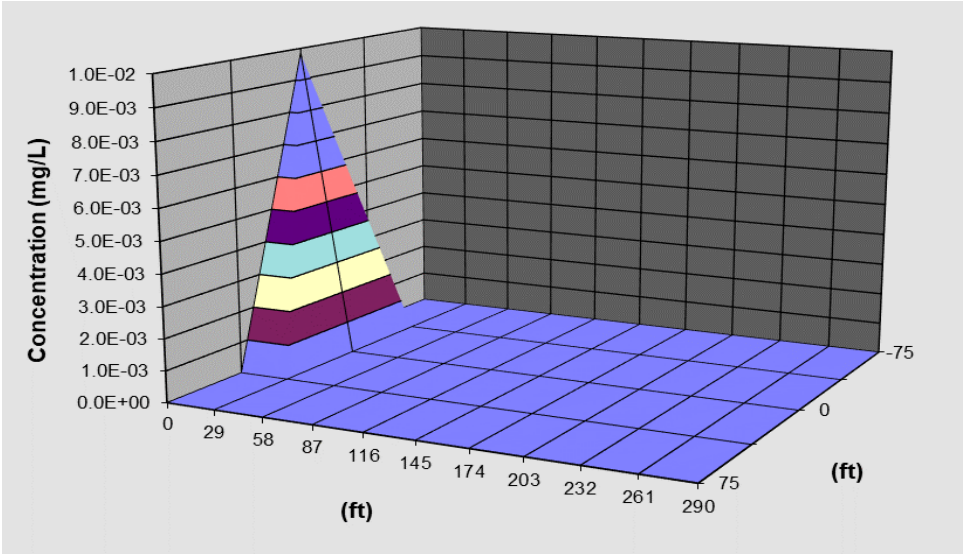
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-034/035

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
200 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

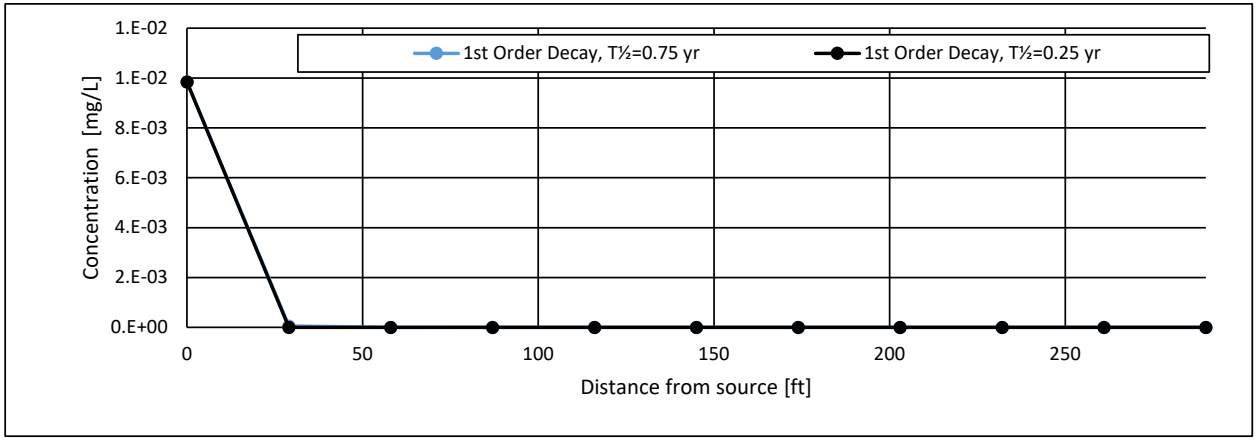
Distance (ft)	0.0001	29	58	87	116	145	174	203	232	261	290	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-74	[mg/l]
37.5	0.00E+00	0.00E+00	1.03E-24	4.04E-27	3.98E-31	9.00E-36	9.73E-41	6.90E-46	3.76E-51	1.72E-56	6.97E-62	[mg/l]
0	9.84E-03	2.36E-08	5.25E-14	1.17E-19	2.66E-25	6.09E-31	1.41E-36	3.27E-42	7.65E-48	1.80E-53	4.23E-59	[mg/l]
-37.5	0.00E+00	0.00E+00	1.03E-24	4.04E-27	3.98E-31	9.00E-36	9.73E-41	6.90E-46	3.76E-51	1.72E-56	6.97E-62	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-74	[mg/l]



BIOSCREEN modeling ofAOC-034/035

CENTER LINE

Type of model	0	29	58	87	116	145	174	203	232	261	290	[Ft]
1st Order Decay, T½=0.75 yr	9.84E-03	4.92E-05	2.28E-07	1.06E-09	5.02E-12	2.40E-14	1.16E-16	5.61E-19	2.73E-21	1.34E-23	6.56E-26	[mg/l]
1st Order Decay, T½=0.25 yr	9.84E-03	2.36E-08	5.25E-14	1.17E-19	2.66E-25	6.09E-31	1.41E-36	3.27E-42	7.65E-48	1.80E-53	4.23E-59	[mg/l]



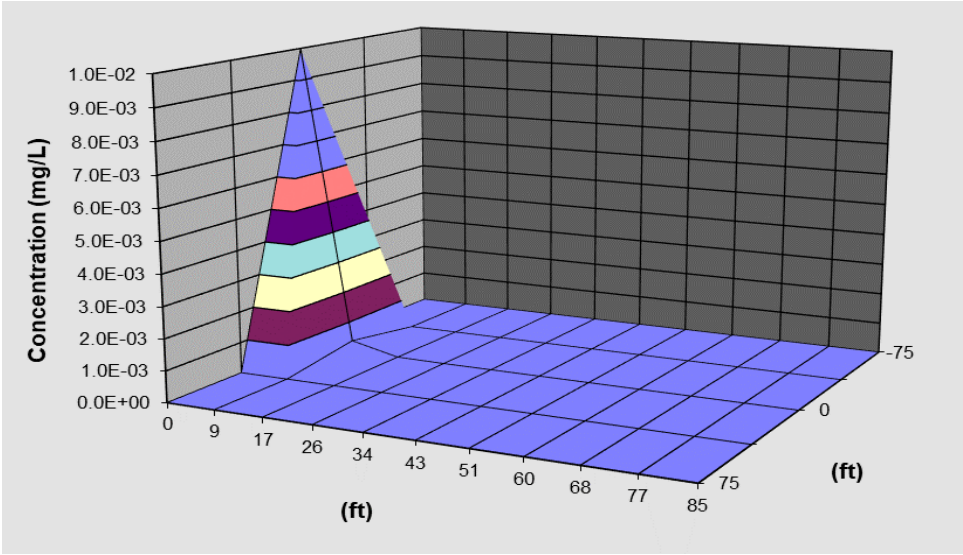
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-060

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
25 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

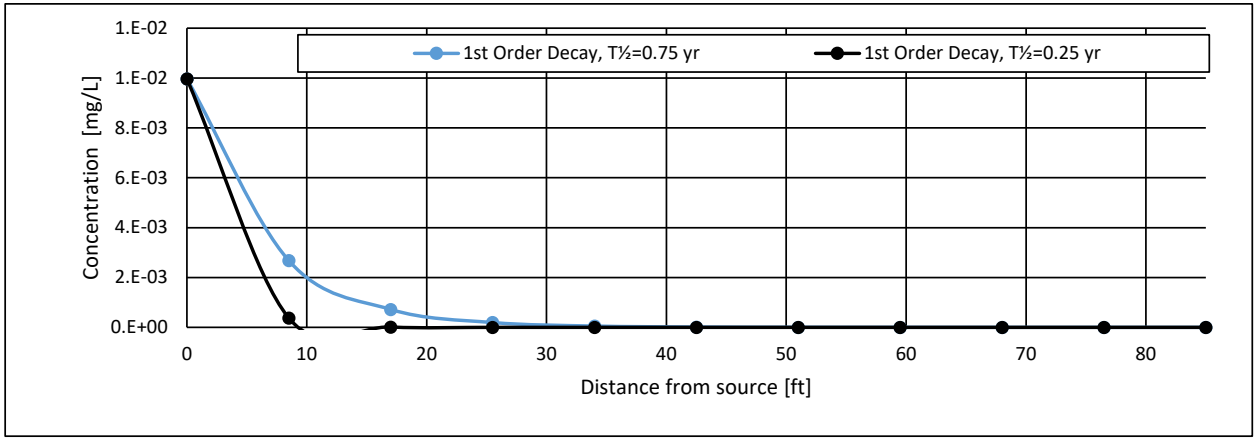
Distance (ft)	0.0001	8.5	17	25.5	34	42.5	51	59.5	68	76.5	85	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-27	1.47E-27	6.82E-28	[mg/l]
0	9.97E-03	3.73E-04	1.40E-05	5.23E-07	1.96E-08	7.33E-10	2.74E-11	1.02E-12	3.80E-14	1.41E-15	5.24E-17	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-27	1.47E-27	6.82E-28	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-060

CENTER LINE

Type of model	0	8.5	17	25.5	34	42.5	51	59.5	68	76.5	85	[Ft]
1st Order Decay, T½=0.75 yr	9.97E-03	2.68E-03	7.19E-04	1.93E-04	5.19E-05	1.39E-05	3.73E-06	9.97E-07	2.66E-07	7.10E-08	1.89E-08	[mg/l]
1st Order Decay, T½=0.25 yr	9.97E-03	3.73E-04	1.40E-05	5.23E-07	1.96E-08	7.33E-10	2.74E-11	1.02E-12	3.80E-14	1.41E-15	5.24E-17	[mg/l]



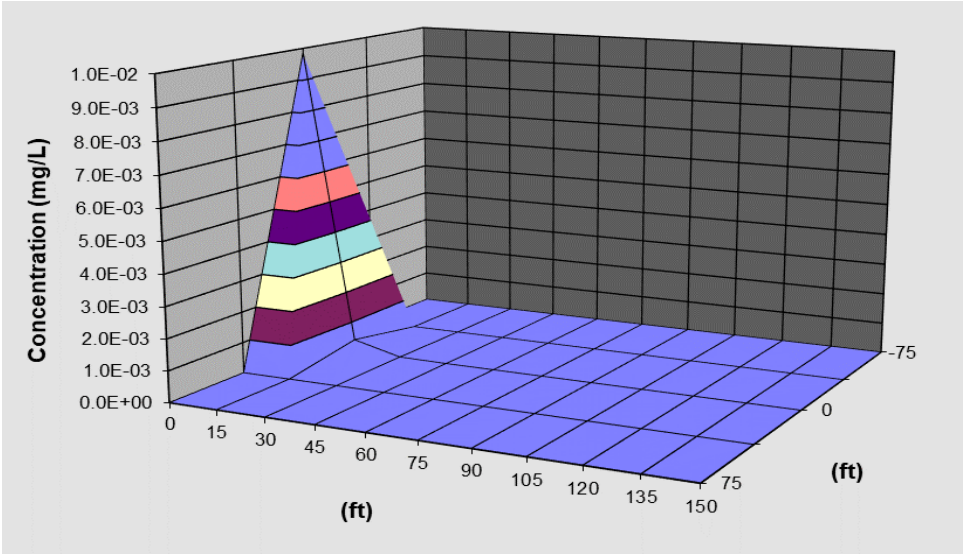
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-090 (shallow northward flow)

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
20 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

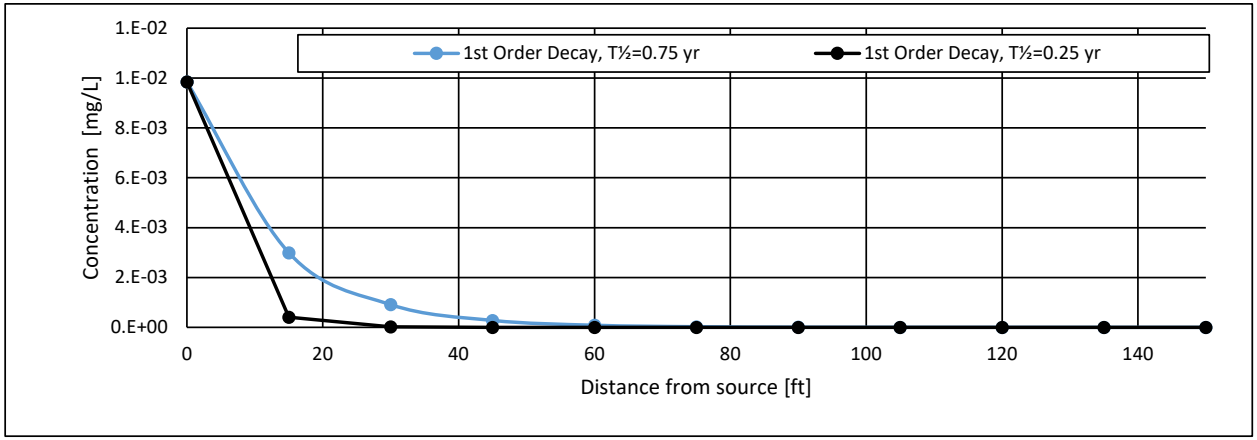
Distance (ft)	0.0001	15	30	45	60	75	90	105	120	135	150	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	7.68E-18	1.92E-15	6.41E-15	3.79E-15	9.38E-16	1.41E-16	1.54E-17	1.37E-18	1.05E-19	[mg/l]
0	9.84E-03	4.09E-04	1.70E-05	7.06E-07	2.93E-08	1.22E-09	5.06E-11	2.10E-12	8.71E-14	3.61E-15	1.50E-16	[mg/l]
-37.5	0.00E+00	0.00E+00	7.68E-18	1.92E-15	6.41E-15	3.79E-15	9.38E-16	1.41E-16	1.54E-17	1.37E-18	1.05E-19	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-090 (shallow northward flow)

CENTER LINE

Type of model	0	15	30	45	60	75	90	105	120	135	150	[Ft]
1st Order Decay, T½=0.75 yr	9.84E-03	2.99E-03	9.11E-04	2.77E-04	8.43E-05	2.56E-05	7.80E-06	2.37E-06	7.20E-07	2.19E-07	6.64E-08	[mg/l]
1st Order Decay, T½=0.25 yr	9.84E-03	4.09E-04	1.70E-05	7.06E-07	2.93E-08	1.22E-09	5.06E-11	2.10E-12	8.71E-14	3.61E-15	1.50E-16	[mg/l]



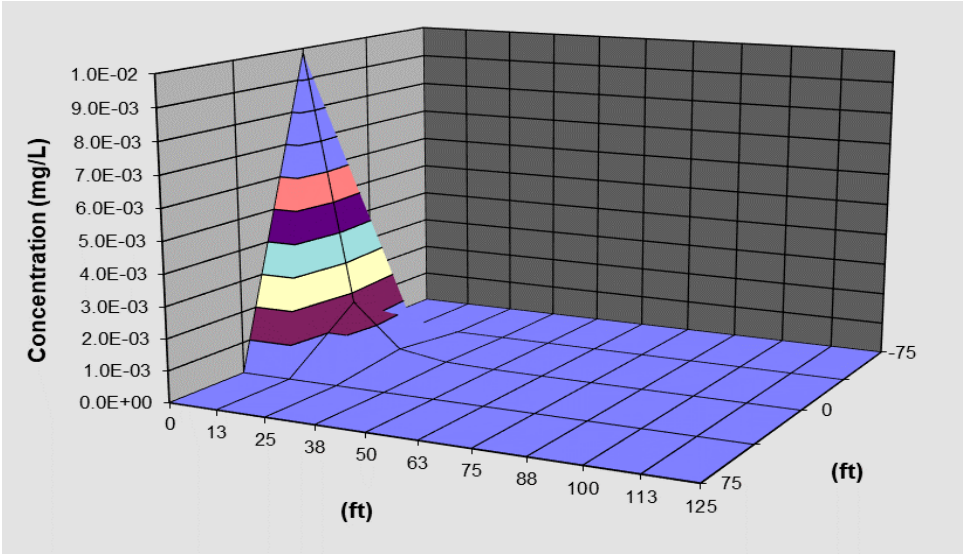
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-090 (shallow southward flow)

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
15 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

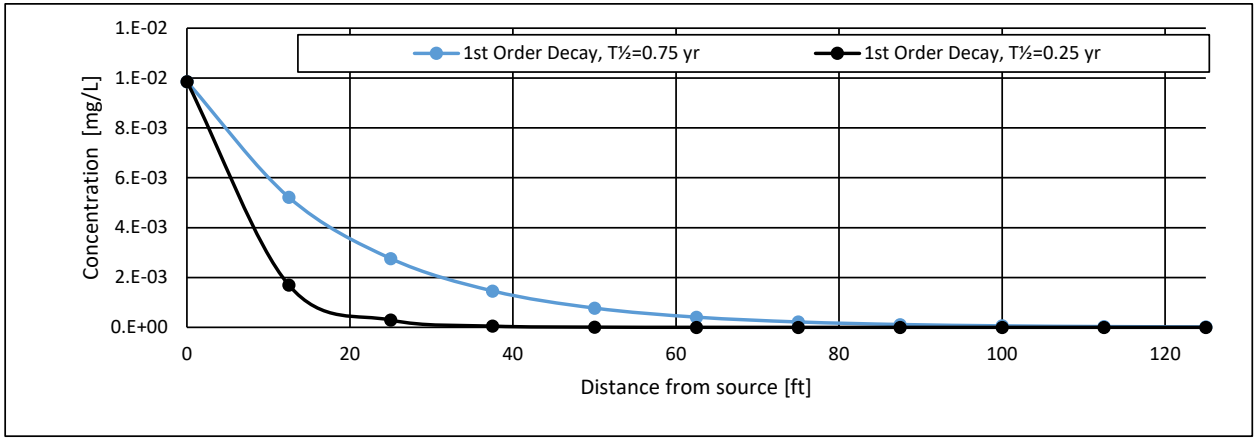
Distance (ft)	0.0001	12.5	25	37.5	50	62.5	75	87.5	100	112.5	125	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.82E-18	1.46E-16	8.00E-16	1.65E-15	1.84E-15	1.36E-15	7.57E-16	[mg/l]
0	9.86E-03	1.70E-03	2.92E-04	5.02E-05	8.63E-06	1.48E-06	2.55E-07	4.39E-08	7.54E-09	1.29E-09	2.22E-10	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.82E-18	1.46E-16	8.00E-16	1.65E-15	1.84E-15	1.36E-15	7.57E-16	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-090 (shallow southward flow)

CENTER LINE

Type of model	0	12.5	25	37.5	50	62.5	75	87.5	100	112.5	125	[Ft]
1st Order Decay, T½=0.75 yr	9.86E-03	5.22E-03	2.76E-03	1.46E-03	7.73E-04	4.09E-04	2.16E-04	1.14E-04	6.05E-05	3.20E-05	1.69E-05	[mg/l]
1st Order Decay, T½=0.25 yr	9.86E-03	1.70E-03	2.92E-04	5.02E-05	8.63E-06	1.48E-06	2.55E-07	4.39E-08	7.54E-09	1.29E-09	2.22E-10	[mg/l]



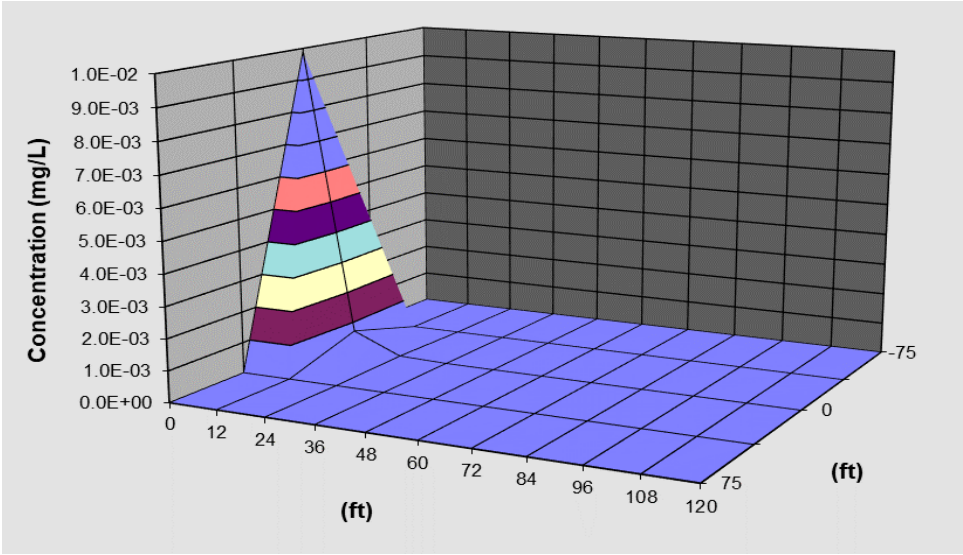
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.83%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-090 (intermediate)

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
20 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

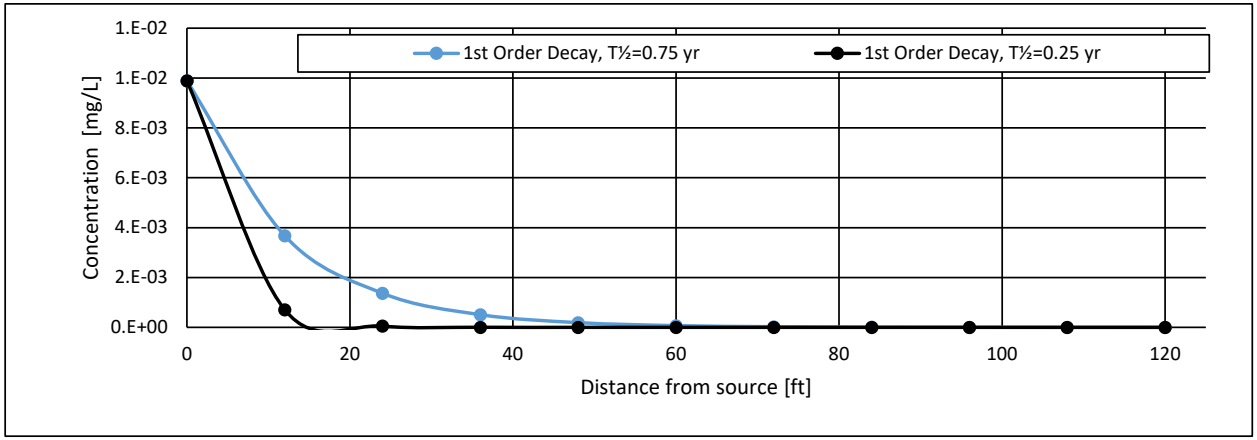
Distance (ft)	0.0001	12	24	36	48	60	72	84	96	108	120	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]
37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.99E-20	7.77E-19	2.04E-18	1.94E-18	9.74E-19	3.19E-19	7.74E-20	[mg/l]
0	9.89E-03	7.09E-04	5.08E-05	3.64E-06	2.61E-07	1.87E-08	1.34E-09	9.62E-11	6.89E-12	4.94E-13	3.53E-14	[mg/l]
-37.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.99E-20	7.77E-19	2.04E-18	1.94E-18	9.74E-19	3.19E-19	7.74E-20	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[mg/l]



BIOSCREEN modeling of AOC-090 (intermediate)

CENTER LINE

Type of model	0	12	24	36	48	60	72	84	96	108	120	[Ft]
1st Order Decay, T½=0.75 yr	9.89E-03	3.68E-03	1.37E-03	5.08E-04	1.89E-04	7.03E-05	2.61E-05	9.71E-06	3.61E-06	1.34E-06	4.97E-07	[mg/l]
1st Order Decay, T½=0.25 yr	9.89E-03	7.09E-04	5.08E-05	3.64E-06	2.61E-07	1.87E-08	1.34E-09	9.62E-11	6.89E-12	4.94E-13	3.53E-14	[mg/l]



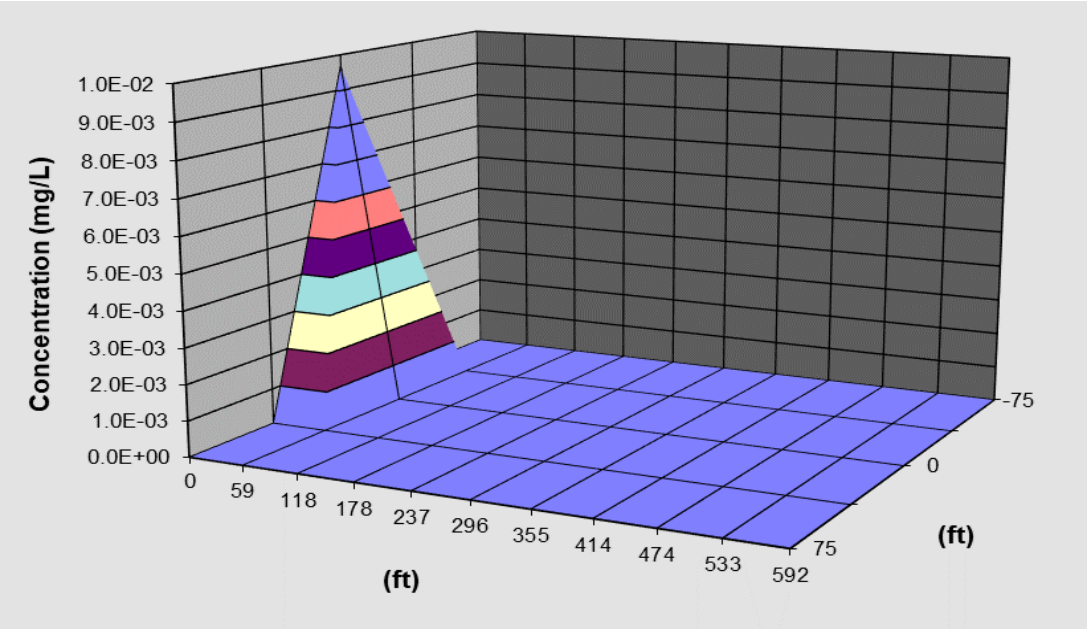
	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	99.99%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

BIOSCREEN modeling of AOC-092

1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)
415 years simulation time

DISSOLVED VINYL CHLORIDE CONCENTRATIONS IN PLUME ([mg/l]at Z=0)

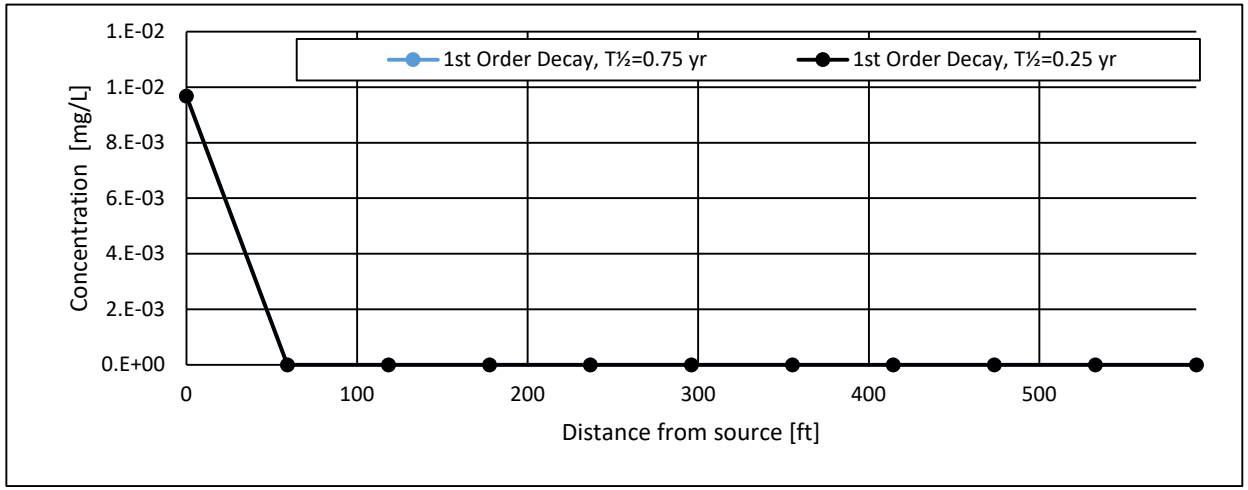
Distance (ft)	0	59.2	118.4	177.6	236.8	296	355.2	414.4	473.6	532.8	592	[Ft]
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-112	3.73E-129	1.41E-146	2.14E-164	1.77E-182	9.56E-201	[mg/l]
37.5	0.00E+00	2.95E-32	1.71E-46	6.74E-64	4.23E-82	1.26E-100	2.60E-119	4.33E-138	6.31E-157	8.41E-176	1.05E-194	[mg/l]
0	9.68E-03	9.52E-22	9.03E-41	8.34E-60	7.61E-79	6.94E-98	6.33E-117	5.79E-136	5.32E-155	4.90E-174	4.54E-193	[mg/l]
-37.5	0.00E+00	2.95E-32	1.71E-46	6.74E-64	4.23E-82	1.26E-100	2.60E-119	4.33E-138	6.31E-157	8.41E-176	1.05E-194	[mg/l]
-75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-112	3.73E-129	1.41E-146	2.14E-164	1.77E-182	9.56E-201	[mg/l]



BIOSCREEN modeling of AOC-092

CENTER LINE

Type of model	0	59.2	118.4	177.6	236.8	296	355.2	414.4	473.6	532.8	592	[Ft]
1st Order Decay, T½=0.75 yr	9.68E-03	4.58E-11	2.09E-19	9.30E-28	4.09E-36	1.79E-44	7.88E-53	3.47E-61	1.53E-69	6.81E-78	3.03E-86	[mg/l]
1st Order Decay, T½=0.25 yr	9.68E-03	9.52E-22	9.03E-41	8.34E-60	7.61E-79	6.94E-98	6.33E-117	5.79E-136	5.32E-155	4.90E-174	4.54E-193	[mg/l]



	net attenuation	
1st Order Decay,k = 0.0025 1/days (T½ =0.75 yrs)	100.00%	reduction
1st Order Decay,k = 0.0076 1/days (T½ =0.25 yrs)	100.00%	reduction

Model Simulations for Multiple CVOCs

PCE, TCE, cis1,2 DCE and VC

Table A-2-4: BIOSCREEN Modeling Attenuation Results for SWMU-172/174

Chemical of concern	Initial concentration	Concentration at waterway	Net Attenuation from CPOC to Waterway
	[ug/L]	[ug/L]	As percent reduction
PCE, k = 0.1243	1	<0.001	99.9+%
TCE, k = 0.0188	1	<0.001	99.9+%
Cis -1,2-DCE, k = 0.0067	1	0.0017	99.83%
VC, k = 0.014	1	<0.001	99.9+%
VC, k = 0.0025	1	0.0635	93.65%
VC, k = 0.0076	1	<0.001	99.9+%

Notes

PCE, k = 0.1243 1/days (T½ =0.015 yrs), Literature value from EPA 2013
TCE, k = 0.0188 1/days (T½ =0.1 yrs), Literature value from EPA 2013
Cis-1,2-DCE, k = 0.0067 1/days (T½ =0.28 yrs), Literature value from EPA 2013
VC, k = 0.014 1/days (T½ =0.14 yrs), Literature value from EPA 2013
VC, k = 0.0025 1/days (T½ =0.75 yrs), conservative value used in CUL Renton tech
VC, k = 0.0076 1/days (T½ =0.25 yrs), very conservative value used in CUL Renton

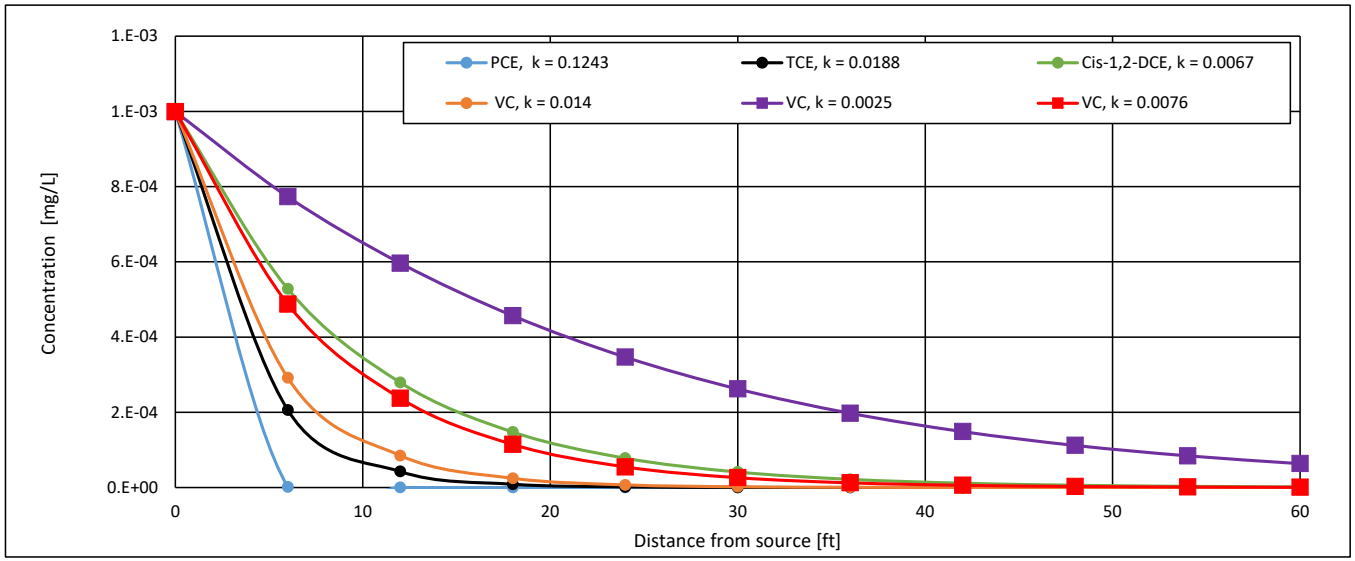
U.S. Environmental Protection Agency. 2013 Ground Water Issue Paper: Synthesis Report on State of Understanding of Chlorinated Solvent Transformation. EPA/600/R-13/237.

BIOSCREEN modeling of SWMU -172/174 for all CVOCs

1st order decay
CENTER LINE

5 years simulation time

Type of model	0	6	12	18	24	30	36	42	48	54	60	[Ft]
PCE, k = 0.1243	9.99E-04	1.70E-06	2.90E-09	4.95E-12	8.43E-15	1.44E-17	2.45E-20	4.18E-23	7.12E-26	1.21E-28	2.07E-31	[mg/l]
TCE, k = 0.0188	9.99E-04	2.06E-04	4.25E-05	8.77E-06	1.81E-06	3.73E-07	7.70E-08	1.59E-08	3.28E-09	6.76E-10	1.39E-10	[mg/l]
Cis-1,2-DCE, k = 0.0067	9.99E-04	5.28E-04	2.79E-04	1.48E-04	7.80E-05	4.12E-05	2.18E-05	1.15E-05	6.09E-06	3.22E-06	1.70E-06	[mg/l]
VC, k = 0.014	9.99E-04	2.92E-04	8.50E-05	2.46E-05	7.04E-06	2.01E-06	5.71E-07	1.62E-07	4.61E-08	1.31E-08	3.73E-09	[mg/l]
VC, k = 0.0025	9.99E-04	7.73E-04	5.96E-04	4.57E-04	3.47E-04	2.62E-04	1.97E-04	1.49E-04	1.12E-04	8.43E-05	6.35E-05	[mg/l]
VC, k = 0.0076	9.99E-04	4.87E-04	2.37E-04	1.15E-04	5.49E-05	2.61E-05	1.24E-05	5.90E-06	2.80E-06	1.33E-06	6.32E-07	[mg/l]



	net attenuation	
PCE, k = 0.1243 1/days (T½	100.0%	reduction
TCE, k = 0.0188 1/days (T½ =0.1	100.0%	reduction
Cis-1,2-DCE, k = 0.0067 1/days	99.83%	reduction
VC, k = 0.014 1/days (T½ =0.14	100.0%	reduction
VC, k = 0.0025 1/days (T½ =0.75	93.65%	reduction
VC, k = 0.0076 1/days (T½ =0.25	99.94%	reduction

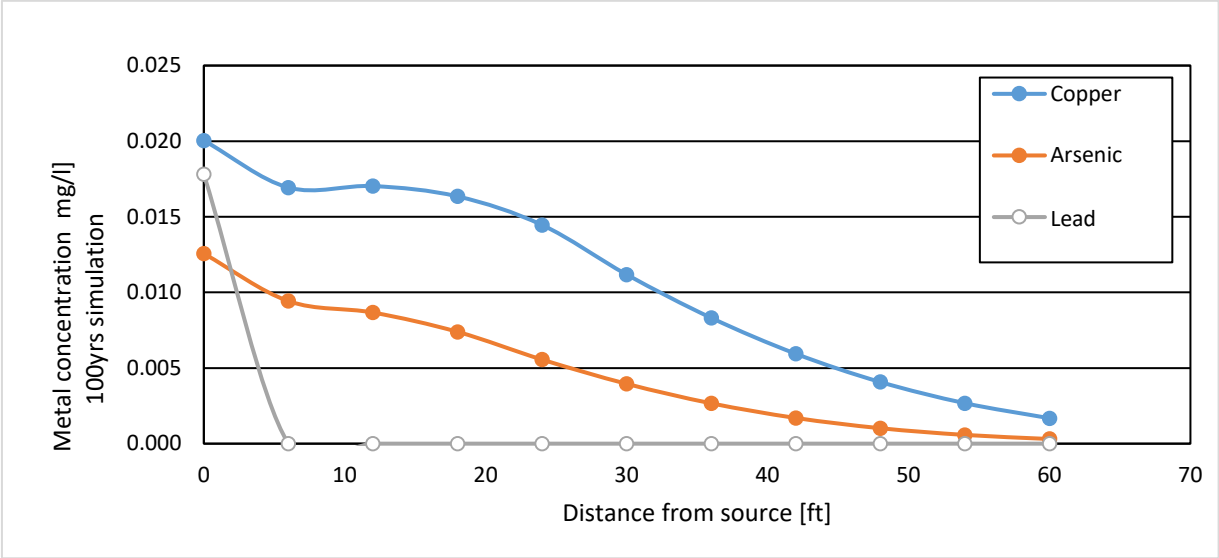
Model Simulations for Inorganics (Cu, As and Pb)
with no Degradation and Partition Coefficients (Kds) based
on Values Specified in MTCA (Table 747-3 in WAC 173-340-747)

Metal migration input parameters for BIOSCREEN

COC	Geology	Hydraulic Conductivity	Conc	Metal Mass	Gradient	Porosity	Run time	Half life (T½)	Retardation factor	CPOC to water	Source Width	Source Thickness	Disp long
	[USCS]	[cm/s]	[ug/L]	[kg]	[-]	[-]	[yrs]	[Yrs]	[-]	[ft]	[ft]	[ft]	ft
Copper	(SP)	2.15E-03	33.40	1.00	0.004	0.43	100	100000	93.1	60	30	20	1
Arsenic	(SP)	2.15E-03	16.4	1.00	0.004	0.43	100	100000	122.4	60	30	20	1
Lead	(SP)	2.15E-03	26.6	1.00	0.004	0.43	100	100000	41861	60	30	20	1

Modeled metal migration from source area

	Distance from Source (ft) at 100 yrs										
No Degradation	0	6	12	18	24	30	36	42	48	54	60
Copper (mg/L)	0.020	0.017	0.017	0.016	0.014	0.011	0.008	0.006	0.004	0.003	0.002
Arsenic (mg/L)	0.013	0.009	0.009	0.007	0.006	0.004	0.003	0.002	0.001	0.001	0.000
Lead (mg/L)	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Attachment B

Groundwater Sampling Results and MTCA
Cumulative Risk Calculations on Well-by-Well Basis

TABLE B-1: SWMU-168 CONCENTRATIONS OF CONSTITUENTS OF CONCERN
AUGUST 10, 2020
Boeing Renton Facility, Renton, Washington

Analyte	MCL[2]	MTCA CUL[2]	Well ID [1] CPOC Area GW230I
Volatile Organic Compounds (µg/L)			
Vinyl Chloride	2	0.29	0.162

EXCESS CR	5.6E-06
HI	0.01
Comparison of cumulative Excess Cancer Risk with MTCA 10^{-5} standard	under
Comparison of cumulative HI with MTCA < 1 standard	under

MTCA CUL above is based on protection of groundwater resource as potable water supply

Notes:
1. I = intermediate well.
2. MCL and MTCA CUL for potable water based on Table 2 in this report and CLARC

Abbreviations:
µg/L = micrograms per liter
CPOC = conditional point of compliance
SWMU = solid waste management unit
CR = Excess cancer risk
HI = Hazard Index
CLARC Cleanup Levels and Risk Calculations, Ecology 2020

TABLE B-2: SWMU-172 AND SWMU-174 GROUP CONCENTRATIONS OF CONSTITUENTS OF CONCERN
AUGUST 10, 2020
Boeing Renton Facility, Renton, Washington

Analyte	MCL[2]	MTCA CUL[2]	Well ID [3]									
			Source Area			Downgradient Plume Area			CPOC Area			
			GW152S	GW152S (field dup.)	GW153S	GW172S	GW173S	GW226S	GW232S	GW234S	GW235I	GW236S
Volatile Organic Compounds (µg/L)												
Tetrachloroethene	5	5	0.319	0.296	0.020 U	0.0603	0.020 U	0.0279	0.020 U	0.020 U	0.020 U	0.020 U
Trichloroethene	5	4	0.579	0.575	0.020 U	0.020 U	0.0239	0.020 U	0.020 U	0.020 U	0.0227	0.020 U
cis -1,2-Dichloroethene	70	16	1.66	1.74	0.0551	0.0561	0.0313	0.0218	0.482	0.0914	0.104	0.0881
Vinyl Chloride	2	0.29	0.284	0.299	0.135	0.0628	0.0455	0.0415	0.425	0.0279	0.020 U	0.020 U
Total Metals (µg/L)												
Arsenic	10	10.0	6.72	7.07	4.05	10.8	7.00	4.93	3.83	3.26	0.288	10.1
Copper	1300	1300	7.45 J	10.3 J	1.68	6.12	3.19	1.48	0.627	3.21	1.30	10.8
Lead	15	15.0	3.89	4.77	0.326	2.58	0.470	0.136	0.100 U	1.25	0.304	10.8
EXCESS CR			1.1E-05	1.1E-05	4.7E-06	1.6E-05	1.6E-06	1.4E-06	1.5E-05	9.6E-07	4.2E-08	1.7E-06
HI			0.27	0.27	0.01	0.17	0.01	0.00	0.05	0.01	0.01	0.03
Comparison of cumulative Excess Cancer Risk with MTCA 10^{-5} standard			over	over	under	over	under	under	over	under	under	under
Comparison of cumulative HI with MTCA < 1 standard			under	under	under	under	under	under	under	under	under	under

MTCA CULs above are based on protection of groundwater resource as potable water supply

Notes:
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = the value is estimated.
2. MCL and MTCA criteria for potable water based on Table 2 in this report and CLARC
3. S = shallow well; I = intermediate well.

Abbreviations:
µg/L = micrograms per liter
CPOC = conditional point of compliance
field dup. = field duplicate
SWMU = solid waste management unit
CR = Excess cancer risk
HI = Hazard Index
CLARC Cleanup Levels and Risk Calculations, Ecology 2020

TABLE B-3: BUILDING 4-78/79 SWMU/AOC GROUP CONCENTRATIONS OF CONSTITUENTS OF CONCERN
AUGUST 11, 2020
Boeing Renton Facility, Renton, Washington

Analyte	MCL[2]	MTCA CUL[2]	Well ID [3]							
			Source Area					CPOC Area		
			GW031S	GW031S (field dup.)	GW033S	GW034S	GW244S	GW143S	GW237S	GW240D
Volatile Organic Compounds (µg/L)										
Trichloroethene	5	4	0.20 UJ	0.20 UJ	0.25	0.20 U	0.20 U	0.23	0.20 U	0.20 U
cis -1,2-Dichloroethene	70	16	0.67 J	0.52 J	188	0.20 U	1.12	1.17	0.20 U	0.20 U
Vinyl Chloride	2	0.29	0.32 J	0.25 J	310	0.41	0.98	0.20 U	0.20 U	0.20 U
Benzene	5	8	1.72 J	2.05 J	12.5	0.20 U	0.43	0.20 U	0.24	0.20 U
Total Petroleum Hydrocarbons (µg/L)										
TPH-G (C7-C12)	NA	800	1,160	1,180	255	100 U	100 U	100 U	100 U	100 U
EXCESS CR			0.0E+00	0.0E+00	1.1E-02	1.4E-05	3.4E-05	4.3E-07	3.0E-07	0.0E+00
HI			0.00	0.00	25.12	0.02	0.12	0.13	0.01	0.00
Comparison of cumulative Excess Cancer Risk with MTCA 10^{-5} standard			under	under	over	over	over	under	under	under
Comparison of cumulative HI with MTCA < 1 standard			under	under	over	under	under	under	under	under
No risk comparison criterion exist for TPH, MTCA Method A values used			over	over	under	under	under	under	under	under

MTCA CULs above are based on protection of groundwater resource as potable water supply

Notes:
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = the value is estimated.
   UJ = The analyte was not detected at the estimated reporting limit indicated.
2. MCL and MTCA criteria for potable water based on Table 2 in this report and CLARC
3. S = shallow well; D = deep well.

Abbreviations:
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
field dup. = field duplicate
SWMU = solid waste management unit
TPH-G = total petroleum hydrocarbons in gasoline range
CR = Excess cancer risk
HI = Hazard Index
CLARC Cleanup Levels and Risk Calculations, Ecology 2020

TABLEB B-4: FORMER FUEL FARM CONCENTRATIONS OF CONSTITUENTS OF CONCERN
AUGUST 10, 2020
Boeing Renton Facility, Renton, Washington

Analyte	MCL[2]	MTCA CUL[2]	Well ID[3]			
			CPOC Area			
			GW211S	GW221S	GW224S	GW224S (field dup.)
Total Petroleum Hydrocarbons (ug/L)						
TPH-D (C12-C24)	NE	500	192	767	1080	948
TPH-O (C24-C38)	NE	500	200 U	200 U	200 U	200 U
Jet A (C10-C18)	NE	800	155	5700	1420	1300
No risk comparison criterion exist for TPH, MTCA Method A values used			under	over	over	over

MTCA CULs above are based on protection of groundwater resource as potable water supply

Notes
1. Data qualifiers are as follows:
U = The analyte was not detected at the reporting limit indicated.
3. S = shallow well.

Abbreviations
CPOC = conditional point of compliance
field dup. = field duplicate
ug/L = microgram per liter
NE= Not Established
TPH-D = total petroleum hydrocarbons as diesel
TPH-O = total petroleum hydrocarbons as motor oil
CR = Excess cancer risk
HI = Hazard Index
CLARC Cleanup Levels and Risk Calculations, Ecology 2020

TABLE B-5: AOC-003 CONCENTRATIONS OF CONSTITUENTS OF CONCERN
AUGUST 10, 2020
Boeing Renton Facility, Renton, Washington

Analyte	MCL[2]	MTCA CUL[2]	Well ID [1]			
			Source Area	Downgradient Plume Area	CPOC Area	
			GW249S	GW188S	GW247S	GW248I
Volatile Organic Compounds (µg/L)						
Vinyl Chloride	2	0.29	0.261	0.288	0.392	0.383
EXCESS CR			9.0E-06	9.9E-06	1.4E-05	1.3E-05
HI			0.01	0.01	0.02	0.02
Comparison of cumulative Excess Cancer Risk with MTCA 10^{-5} standard			under	under	over	over
Comparison of cumulative HI with MTCA < 1 standard			under	under	under	under

MTCA CUL above is based on protection of groundwater resource as potable water supply

Notes:
1. S = shallow well; I = intermediate well.
2. MCL and MTCA criteria for potable water based on Table 2 in this report and CLARC

Abbreviations:
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
CR = Excess cancer risk
HI = Hazard Index
CLARC Cleanup Levels and Risk Calculations, Ecology 2020

TABLE B-6: AOC-004 CONCENTRATIONS OF CONSTITUENTS OF CONCERN

AUGUST 12, 2020

Boeing Renton Facility, Renton, Washington

Analyte	MCL[2]	MTCA CUL[2]	Well ID [1] Source Area GW250S
Metals (ug/L)			
Lead	15	15	0.611

EXCESS CR	NA
HI	0.03
Comparison of cumulative Excess Cancer Risk with MTCA 10^{-5} standard	under
Comparison of cumulative HI with MTCA < 1 standard	under

MTCA CUL above is based on protection of groundwater resource as potable water supply

Notes:
1. S = shallow well.
2. MCL and MTCA criteria for potable water based on Table 2 in this report and CLARC

Abbreviations:
AOC = area of concern
µg/L = micrograms per liter
CR = Excess cancer risk
HI = Hazard Index
CLARC Cleanup Levels and Risk Calculations, Ecology 2020

TABLE B-7: AOC-060 CONCENTRATIONS OF CONSTITUENTS OF CONCERN
AUGUST 11, 2020
Boeing Renton Facility, Renton, Washington

Analyte	MCL[2]	MTCA CUL[2]	Well ID [3]						
			Source Area	Downgradient Plume Area				CPOC Area	
			GW009S	GW012S	GW014S	GW014S (field dup.)	GW147S	GW150S	GW253I
Volatile Organic Compounds (µg/L)									
Trichloroethene	5	4	0.0324	0.0518	0.020 U	0.020 U	3.37	0.0291	0.0211
cis -1,2-Dichloroethene	70	16	0.124	0.508	0.0932	0.0908	0.931	0.0935	0.0879
Vinyl Chloride	2	0.29	0.219	0.387	0.190	0.191	0.0643	0.0619	0.100

EXCESS CR	7.6E-06	1.3E-05	6.6E-06	6.6E-06	8.5E-06	2.2E-06	3.5E-06
HI	0.02	0.06	0.01	0.01	0.90	0.02	0.01
Comparison of cumulative Excess Cancer Risk with MTCA 10^{-5} standard	under	over	under	under	under	under	under
Comparison of cumulative HI with MTCA < 1 standard	under	under	under	under	under	under	under

MTCA CULs above are based on protection of groundwater resource as potable water supply

Notes:
1. Data qualifiers are as follows:
U = The analyte was not detected at the reporting limit indicated.
2. MCL and MTCA criteria for potable water based on Table 2 in this report and CLARC
3. S = shallow well; I = intermediate well.

Abbreviations:
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
field dup. = field duplicate
CR = Excess cancer risk
HI = Hazard Index
CLARC Cleanup Levels and Risk Calculations, Ecology 2020

TABLE B-8: AOC-090 CONCENTRATIONS OF CONSTITUENTS OF CONCERN
AUGUST 12, 2020
Boeing Renton Facility, Renton, Washington

Analyte	MCL[2]	MTCA Criteria[2]	Well ID [3]				
			Source Area	Downgradient Plume Area	Shallow Zone CPOC Area		
			GW189S 4	GW176S	GW178S	GW207S	GW208S
Volatile Organic Compounds (µg/L)							
Tetrachloroethene	5	5	0.020 U	NA	NA	NA	NA
Trichloroethene	5	4	0.324	NA	NA	NA	NA
cis-1,2-Dichloroethene	70	16	1.93	NA	NA	NA	NA
trans-1,2-Dichloroethene	100	100	0.20 U	NA	NA	NA	NA
Vinyl Chloride	2	0.29	0.369	0.232	0.141	0.377	0.343
1,1,2,2-Tetrachloroethane	5	1.7	0.020 U	NA	NA	NA	NA
1,1,2-Trichloroethane	5	0.77	0.20 U	NA	NA	NA	NA
1,1-Dichloroethene	7	400	0.0529	NA	NA	NA	NA
Acetone	NE	NE	5.00 U	NA	NA	NA	NA
Benzene	5	5	0.20 U	NA	NA	NA	NA
Carbon Tetrachloride	5	0.63	0.20 U	NA	NA	NA	NA
Chloroform	70	1.4	0.20 U	NA	NA	NA	NA
Methylene Chloride	NE	5.8	1.00 U	NA	NA	NA	NA
Toluene	1000	1000	1.05	NA	NA	NA	NA
Total Petroleum Hydrocarbons (µg/L)							
TPH-G (C7-C12)	NE	800	699	NA	NA	NA	NA
TPH-D (C12-C24)	NE	500	150	NA	NA	NA	NA
TPH-O (C24-C40)	NE	500	379	NA	NA	NA	NA
EXCESS CR			1.3E-05	8.0E-06	4.9E-06	1.3E-05	1.2E-05
HI			0.22	0.01	0.01	0.02	0.01
Comparison of cumulative Excess Cancer Risk with MTCA 10^{-5} standard			over	under	under	over	over
Comparison of cumulative HI with MTCA < 1 standard			under	under	under	under	under
No risk comparison criterion exist for TPH, MTCA Method A values used			under				

MTCA CULs above are based on protection of groundwater resource as potable water supply

Notes:
1. Data qualifiers are as follows:
U = The analyte was not detected at the reporting limit indicated.
2. MCL and MTCA criteria for potable water based on Table 2 in this report and CLARC
3. S = shallow well.
4. GW189S is the replacement well for GW168S.

Abbreviations:
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
NA = not analyzed
TPH-G = total petroleum hydrocarbons in the gasoline range
TPH-D = total petroleum hydrocarbons in diesel range
TPH-O = total petroleum hydrocarbons in the motor oil range
NE= Not Established
CR = Excess cancer risk
HI = Hazard Index
CLARC Cleanup Levels and Risk Calculations, Ecology 2020

TABLE B-9: APRON A CONCENTRATIONS
OF CONSTITUENTS OF CONCERN
AUGUST 10, 2020
Boeing Renton Facility, Renton, Washington

Analyte	MCL[2]	MTCA CUL[2]	Well ID[3] GW264S
Volatile Organic Compounds (µg/L)			
cis- 1,2-Dichloroethene	70	16	0.52
Vinyl Chloride	2	0.29	0.20 U

EXCESS CR	0.0E+00
HI	0.03
Comparison of cumulative Excess Cancer Risk with MTCA 10^{-5} standard	under
Comparison of cumulative HI with MTCA < 1 standard	under

MTCA CUL above is based on protection of groundwater resource as potable water supply

Notes
1. Data qualifiers are as follows:
U = The analyte was not detected at the reporting limit indicated.
2. MCL and MTCA criteria for potable water based on Table 2 in this report and CLARC
3. S = shallow well.

Abbreviations
µg/L = micrograms per liter
CR = Excess cancer risk
HI = Hazard Index
CLARC Cleanup Levels and Risk Calculations, Ecology 2020

Attachment C

Prior Submittal to Ecology

Evaluation of Recent Groundwater Sampling at the Boeing Renton Facility Recommendations for Modifications to Compliance Monitoring Plan (CMP) as Addendum # 3 to CMP, June 30, 2020

CALIBRE

Memorandum

To: Nick Garson, Boeing

cc: Kathleen Goodman, Wood

From: Tom McKeon, P.E. CALIBRE

Date: June 30, 2020

Subject: Evaluation of Recent Groundwater Sampling at the Boeing Renton Facility
Recommendations for Modifications to Compliance Monitoring Plan (CMP)
as Addendum # 3 to CMP

BACKGROUND

The Boeing Renton Facility remedial actions have been implemented under the Washington State Department of Ecology (Ecology) Agreed Order (AO) No. 8191. The AO was issued to Boeing on January 2, 2013 to implement the site wide Cleanup Action Plan (CAP) which provides for the following actions: soil excavation, soil vapor extraction, enhanced bioremediation, institutional controls, and monitored natural attenuation for twelve separate solid waste management units (SWMUs) and areas of concern (AOCs). These SWMUs and AOCs are described in detail on Table 1.

Table 1 also includes three additional areas (Lot 20/Building 10-71, Apron A and Building 4-70) that were identified after the CAP as part of construction related or property due diligence sampling at the Renton Facility. These three areas were identified based on the presence of low levels of VOCs in groundwater. Remedial actions have been implemented at each area and these three sites have been regularly monitored in conjunction with the Renton Facility corrective action.

The current site wide groundwater monitoring program follows the requirements the Engineering Design Report (EDR), approved by Ecology in 2014 and the Compliance Monitoring Plan (CMP), as amended; the second amendment to the CMP was submitted in December 2017 (and approved by Ecology) which deleted selected wells and analytes where the cleanup levels had been achieved (AMEC 2017e). The recommended modifications to the CMP (as Addendum # 3, pending Ecology review and approval) are included as Attachment 1.

INTRODUCTION

This technical memorandum (Tech Memo) presents an evaluation of all recent groundwater sampling at the Boeing Renton Facility and provides recommendations to modify the sampling program based on the site-specific cleanup levels (CULs) and recent performance monitoring data.

Removal actions and remedial measures started at the Facility when spills were first identified in the mid-1980's through 1990s. Added groundwater treatment was expanded in 2004/2005 to include biological treatment in selected plume areas (AOC-90 and AOC-001/002) as interim actions. All work

noted above was completed prior to the CAP in 2012. Implementation of all construction for the CAP was completed in 2015 and site wide groundwater monitoring activities under the CAP has been conducted since 2013.

Current groundwater monitoring data demonstrate significantly reduced Constituents of Concern (COC) concentrations as compared to concentrations present during the Remedial Investigation (RI) (1998 to 2001) and later development of the CAP in 2012. The current list of all wells sampled and all analytes is presented in the amended CMP (AMEC 2017e). The current data demonstrates that the prior list of COCs has been reduced in many SWMUs/AOCs (i.e., many of the chemicals on the initial COC list for some AOCs are no longer present in groundwater) and a number of wells have met the cleanup criteria for eight consecutive sampling events. The EDR outlined the groundwater monitoring program to be implemented for each SWMU and/or AOC addressed by the CAP. Section 5.2.2 of the EDR states that; "*If the concentration of COCs in all samples collected from all Conditional Point of Compliance (CPOC) monitoring wells at a given site are below the site-specific Clean up Levels (CULs) for a period of eight consecutive quarters, Boeing may consider the cleanup standard to have been attained and may submit a written request to Ecology to confirm attainment of the cleanup standard and to approve cessation of compliance monitoring at that site.*" This technical memorandum presents the sampling results for the most recent eight consecutive events and has been prepared to propose changes to the groundwater monitoring program in accordance with Section 3.5 (Modifications and Changes to Cleanup Actions) of the CAP, and Section 5.2.2 (Data Evaluation and Reporting) of the EDR.

This Tech Memo provides a review of all wells sampled in the site-wide monitoring program over the last eight sampling events (spanning two years for areas/wells sampled quarterly, and four years for areas/wells sampled twice a year). In accordance with the CAP and EDR, recommendations are made to drop specific wells that have been below CULs for the last eight monitoring events as these areas have met the established cleanup objectives. For remaining wells in some areas, the prior list of COCs is recommended to be reduced based on the existing data demonstrating that many of the initial COCs are no longer present in groundwater. In addition, the frequency of monitoring is evaluated and recommendations are made to adjust the frequency, as appropriate based on the existing time series of data already collected, to be consistent with the data needs for remedial optimization and performance monitoring.

This evaluation covers all of the monitoring wells sampled at the Renton Facility per the AO and CAP requirements. In order to provide a marking/designation for wells with recommended changes, the following highlighting is used; wells with recommended changes to drop from the sampling program are highlighted in yellow and wells with recommended changes to the analyte list (i.e., a reduction in the COCs) are highlighted in green. The data evaluation is broken down by each SWMU/AOC including a synopsis of site history with a summary and evaluation of the relevant data from each monitoring well. All of the recent monitoring results (last eight sampling events) are summarized in Tables 2-12. All of the analytical results presented in Tables 2-12 are from prior Groundwater Sampling Reports previously submitted to Ecology. The prior reports include the laboratory analytical reports and all backup data. The relevant quarterly progress reports (previously submitted to Ecology) include Wood 2020a, 2020b, Wood 2019a, 2019b, 2019c, 2019d, AMEC 2018, Wood 2018a, 2018b, 2018c, AMEC 2017a, 2017b, 2017c, 2017d, and AMEC 2016a, 2016b, 2016c.

The location of each SWMU/AOC/other Area within the Renton Facility is shown in Figure 1 and a short summary of all SWMUS/AOCs is presented in Table 1.

SWMU-168

SWMU-168 is located near the northeast corner of Building 5-50 on leased property at the Renton Municipal Airport and consists of the area around a former underground storage tank (UST) designated URE-31 (for underground tank Renton, number 31) (see Figure 2). This former UST (URE-31) was a 1,000-gallon concrete tank installed in 1979 and removed in September 1985. This UST was used for the storage of solvent waste generated in Building 5-50. There is no documented information regarding a release from this SWMU.

Soil and groundwater samples were collected during the RI at this SWMU in 1999 using push probes. Two COCs were identified; methylene chloride in soil and vinyl chloride (VC) in groundwater. Additional push probes were completed in April 2008 and June 2009 prior to developing the CAP. In the 2008 and 2009 soil sampling, the methylene chloride concentrations were less than the detection limit in the confirmation samples collected from a depth of approximately 2 to 4 feet below ground surface (bgs). In June 2009, an additional push probe (PP202) was completed in the vicinity of PP002 and PP166, and the concentration of methylene chloride in a soil sample collected from 5.5 to 6.5 feet bgs was also less than the detection limit. Results from the 2008 and 2009 investigations indicated the methylene chloride in soil had attenuated since the RI samples were collected (all subsequent samples were less than the method detection limit).

Thirteen groundwater samples from push probes were collected in the RI (1999) and pre-CAP (2008) sampling in the immediate area (near former URE-31 and approximately 30 feet downgradient). The total area covers approximately 4 car parking stalls and 12 of the 13 samples were non-detect for VC, with one detection at 2.1 µg/L VC (in 1999). In the subsequent 2008 characterization sampling all five samples were non-detect for VC at <0.2 µg/L.

The recent groundwater sampling results (eight sampling events) from SWMU-168 are shown in Table 2; three wells are sampled and VC is the sole COC. The location of wells at SWMU-168 is presented in Figure 2.

CPOC Area –

GW-229S – Below VC CUL of 0.11 µg/L for the last eight monitoring events. Three detections of VC from 0.021 to 0.027 µg/L.

GW-230I – Three low-level detections above CUL of 0.11 µg/L with detections ranging from 0.032 to 0.336 µg/L; the most recent sample is 0.087 µg/L VC.

GW-231S - Below VC CUL of 0.11 µg/L for the last eight monitoring events. Four detections (all below CUL) range from 0.026 to 0.0393 µg/L.

Summary of recommendations for SWMU-168:

- Drop:
  - GW-229S (CPOC well)
  - GW-231I (CPOC well)

SWMU-172/174

SWMU-172/174 (Figure 3) is located on the eastern side of the Renton Municipal Airport near the west side of the Cedar River Waterway. SWMU-172 and SWMU-174 are the locations of former wastewater USTs located adjacent to Buildings 5-09 and 5-08, respectively. Both USTs were used for the collection and temporary storage of steam-cleaning wastewater. SWMU-172 is associated with former UST URE-66, and SWMU-174 is associated with former UST URE-73. URE-66 was a 155-gallon concrete tank installed in 1963, and URE-73 was a 120-gallon concrete tank installed in 1957. URE-73 was deactivated in 1980; the deactivation date for URE-66 was not documented, indicating that it occurred prior to 1980. Both USTs were removed in 1987.

During the UST removal activities conducted in 1987 for both SWMUs, approximately 29 cubic yards of affected soil was removed from SWMU-172, and approximately 8 cubic yards of affected soil was removed from SWMU-174. The excavations were backfilled with clean, imported fill and repaved (Weston, 2001).

Soil and groundwater samples were collected during the RI in 1999 and 2000 from push probes and groundwater monitoring wells (Weston, 2001). Eight additional push probes were completed in April 2008 during the pre-CAP investigation, and additional groundwater samples were collected from existing groundwater monitoring wells (AMEC, 2008). The sampling included both soil and groundwater samples collected at the push probe locations.

The initial COCs identified for SWMU 172/174 were:

- Soil: Tetrachloroethene (PCE), trichloroethene (TCE), VC, cis-1,2-dichloroethene (cis-1,2DCE), 1,1-dichloroethene (1,1-DCE), benzene, methylene chloride, and metals (copper, thallium, and zinc);
- Groundwater: PCE, TCE, benzene, other solvents, and solvent-related biodegradation products; one semivolatile organic compound (SVOC), and metals (arsenic, chromium, copper, and lead).

The results of the Pre-CAP field investigation in April and May 2008 showed that concentrations of benzene and chlorinated solvents in soil were somewhat higher than those detected in prior RI samples collected in 1999 and 2000 (AMEC, 2008). Groundwater results obtained in the source areas during the pre-CAP indicated that similar groundwater constituents were detected during the investigation in 2008 as in the RI. Detected concentrations of PCE and TCE in groundwater were above the CULs at push probe locations PP175 and PP176.

The selected remedy in the CAP includes soil vapor extraction (SVE), enhanced bioremediation, monitored attenuation (MA), and institutional controls.

The recent sampling results (eight sampling events) from SMWU-172/174 are shown in Table 3; 11 wells are sampled and the COCs are chlorinated VOCs (CVOCs) and selected metals. The location of wells at SMWU-172/174 is presented in Figure 3.

Source Area

GW-152S – Multiple detections over CULs for COCs (CVOCs + metals).

GW-153S - Multiple detections over CULs for COCs (CVOCs + metals).

Downgradient Plume

GW-081S – Some trace-level detections of cis-1,2DCE and PCE (at 0.0357 and 0.0663 µg/L respectively for cis-1,2DCE and PCE) which are above the CULs (0.03 µg/L for cis-1,2DCE and 0.02 µg/L for PCE). Arsenic around 2 µg/L and above CUL (but noting that this is within the natural background level). TCE and VC are all non-detect and below CULs. Copper and lead are below CULs. This is not a CPOC well and no longer needed for evaluating MNA, data from the nearby CPOC wells suffice.

GW-172S - Multiple detections over CULs for COCs (CVOCs + metals).

GW-173S - Multiple detections over CULs for COCs (CVOCs + metals).

GW-226S - Some low level detections of cis-1,2DCE and PCE (under 0.1 µg/L) which are above CULs. Arsenic, copper, and lead with detections above CULs. TCE and VC are all below CULs.

CPOC Area

GW-232S - Multiple detections over CULs for some COCs. PCE and Lead below CULs.

GW-233I – One detection of TCE (at 0.023 µg/L) over CUL (0.02 µg/L) and trace-level detections ranging from 0.054 to 0.075 µg/L of cis-1,2DCE over CULs (0.03 µg/L). PCE and VC all non-detect and below CULs in the eight events, and metals below CULs.

GW-234S - Low level detections of TCE and cis-1,2DCE over CULs. PCE and VC below CULs. Metals above CULs.

GW-235I - Low level detections of TCE (ranging from 0.0253 to 0.0338 µg/L) over CUL and cis-1,2DCE (ranging from 0.0683 to 0.166 µg/L) over CULs. PCE and VC are all non-detect and below CULs in eight events, and metals below CULs.

GW-236S - Low level detections of TCE and cis-1,2DCE over CULs. PCE and VC below CUL. Metals over CULs.

The sampling frequency at SWMU 172/174 has been quarterly for many years, the data in Table 3 demonstrate very low levels and sufficient stability between sampling events. We recommend reducing the sampling frequency to twice a year (wet season in Spring and dry season in Fall). This frequency will provide sufficient data for all decisions related to remedial optimization and performance monitoring.

Summary of recommendations for SWMU 172/174:

- Drop:
  - GW-081S (downgradient well)
  - GW-233I (CPOC well)
- Reduce sampling frequency from quarterly to semi-annual for remaining monitoring wells.

Building 4-78/79 SWMU/AOC Group

The Building 4-78/79 SWMU/AOC Group is located in the west-central portion of the Facility near the east side of the Cedar River Waterway. This SWMU/AOC group includes a former dangerous waste storage area (SWMU-181), four former gasoline USTs (UREs-17, -23, -24 and -54), a former gasoline dispenser, and two former methyl ethyl ketone (MEK) USTs (UREs-18 and -25). The former USTs at the site were used to store gasoline and MEK. In addition, the fuel was piped to a fuel dispenser located on the east side of Building 4-79. The gasoline pump dispenser island and associated piping were also removed from this area. Buildings 4-61 and 4-73 were demolished in early 2004 and converted to parking facilities. Building 4-78 is currently used for temporary storage of hazardous wastes. Building 4-79 is used for painting of aircraft parts to support airplane manufacturing activities. A general description of the SWMU and AOCs is provided below.

- SWMU-181: Wastes previously stored at SWMU-181 included solvents, spent petroleum products, and sludges and became inactive in December 1989. The original container storage pad and canopy were removed in 1993 and replaced by Building 4-78, which is operated as a container storage unit (CSU). The CSU was initially operated as a permitted dangerous waste storage facility. A closure plan for the CSU was approved by Ecology on November 6, 1997, and implemented later in 1997. As documented in the final RI Report, historical data indicate that releases of VOCs, SVOCs, and TPH to groundwater occurred from this SWMU.
- AOC-13: Building 4-62 Former UST URE-17—This 1,000-gallon steel tank for gasoline was removed in September 1985; 50 gallons of gasoline was reported to have been removed from the tank excavation. Soil and groundwater samples collected in the vicinity of this former UST (sampled in 1989) had detectable concentrations of VOCs and TPH.
- AOC-14: Building 4-61 Former UST URE-18—This 10,000-gallon steel tank for MEK was removed in March 1987. During the tank removal, approximately 290 cubic yards of soil was removed from the excavation for off-site disposal. VOCs, MEK, and TPH were detected in groundwater samples from the vicinity but none of these analytes were detected in soil samples collected.
- AOC-15: Building 4-61 Former UST URE-24—This 4,000-gallon steel tank for gasoline was removed in September 1985; approximately 50 gallons of gasoline was reportedly recovered from the excavation. Benzene, toluene, ethylbenzene, and xylene (BTEX); TPH; MEK; and VOCs were detected in groundwater samples in the vicinity but none of these analytes were detected in soil samples collected.

- AOC-26: Building 4-61 Former UST URE-54—This 1,000-gallon steel tank for gasoline was removed in September 1985 and holes were noted in the bottom of the tank. An unspecified amount of contaminated soil was removed from the excavation and an unknown quantity of floating hydrocarbon was extracted from the excavation. Dissolved-phase benzene was detected in groundwater samples adjacent to this former UST. TCE and VC were also detected in groundwater samples collected in the vicinity of this AOC.
- AOC-037: Building 4-79 Former UST URE-25—This 500-gallon steel tank was used to store MEK and was removed in September 1987. Soil verification samples collected in 1993 were below RCRA Subpart S action limits. TCE, benzene, and VC were detected in groundwater in the vicinity of this AOC.
- AOC-054: Building 4-78 Former UST URE-23—This 10,000-gallon steel tank was used to store gasoline until it was removed in April 1989. During removal of URE-23, gasoline was observed in the soil and groundwater samples. Approximately 200 cubic yards of soil was excavated. Analysis of soil and groundwater samples identified detectable concentrations of BTEX, TPH, and VOCs.

All of these units noted above are located within the capture zone for the interim action groundwater hydraulic containment system (a pump and treat system) that was installed at this site in 1991. The system consisted of two extraction wells, an air stripper, and a monitoring well network. The groundwater hydraulic containment system operated for more than 10 years and was shut down in November 2003 to allow site hydrogeologic conditions to recover to static conditions and support evaluation of alternative remedial measures.

The RI Report summarized the investigation history for this SWMU/AOC. As described above, many of the AOCs were addressed through tank removal, in some cases limited soil removal, and the pump and treat system prior to the effective date of the Agreed Order. Groundwater monitoring results from 1999 and 2000 presented in the RI Report were used to establish the groundwater COCs; in the FS it was assumed that the soil COCs were the same as the groundwater COCs. Due to the length of time between the RI and the approval of the Draft Final FS Report, and the lack of recent soil data for the site, added sampling was completed prior to development of the DCAP. Twelve additional push probes were completed in April 2008 for soil and groundwater samples during the Pre-CAP investigation and samples were collected from existing groundwater monitoring wells. An additional push probe (PP201) was completed in June 2009 to collect soil and groundwater samples and to determine impacts north of the Building 4-78 loading dock.

These data suggest that former Building 4-78, especially the north side of the building is the primary source of chlorinated VOCs at this SWMU. The highest concentrations of primary VOCs are found directly north of the former building (PP178) and just west of the north end of the building (PP185 and PP188). Data from upgradient locations east of the building and loading dock (GW027D, PP179, PP180, PP181, and PP182) show much lower concentrations that may be the result of vapor transport from the source area.

The historical activities at the site have resulted in two separate source areas for COCs: (1) a chlorinated solvent source associated with the former dangerous waste storage area in Building 4-78 (SWMU-181);

and (2) a fuel and nonchlorinated solvent source areas associated with the former USTs and fuel dispenser island, and related piping.

The initial COCs identified for the Building 4-78/79 SWMU/AOC group were:

- Soil: TCE and related solvent breakdown products, TPH in the gasoline range (TPH-G), benzene, PCE, and carbon disulfide;
- Groundwater: TCE and related solvent breakdown products, TPH-G, and benzene.

The cleanup remedy for this SMWU/AOC group is enhanced bioremediation, SVE, and MA. The SVE system at Building 4-78/79 SWMU/AOC Group was shut down and removed during the first quarter 2018 following the approval of Ecology.

The recent sampling results (eight sampling events) from Building 4-78/79 are shown in Table 4; 16 wells are sampled and the COCs are CVOCs, benzene and TPH-G. The location of wells at the Building 4-78/79 area is presented in Figure 4.

Source Area

GW-031S – Multiple detections over CULs for some COCs, (CVOCS + TPH-G). Cis-1,2DCE is below CUL and TCE with one detection over CUL in last 8 events.

GW-033S – Multiple detections over CULs for CVOCs. TPH-G is below CUL.

GW-034S – VC over CUL in five of eight events (ranging from 0.24 to 0.54 µg/L), one TCE detection above CULs eight events ago (0.29 µg/L). Cis-1,2DCE has two low detections (0.21 and 0.25 µg/L) and is below CUL in eight events. Benzene and TPH-G are non-detect and below CUL.

GW-039S - All analytes are below CULs for the last eight monitoring events. One single detection of benzene at 0.21 µg/L (compared to a CUL of 0.8 µg/L), all other events for this analyte, and all other analytes, are non-detect.

GW-243I - All analytes are below CULs for the last eight monitoring events except one detection of benzene eight events ago at 1.66 µg/L. For the majority of events, all analytes are non-detect including benzene at < 0.2 µg/L for the last 6 events.

GW-244S - Multiple detections over CULs for all COCs except TPH-G which is below CULs.

Downgradient Plume

GW-038S – All analytes are below CULs for the last eight monitoring events. One single detection of VC at 0.20 µg/L (compared to a CUL of 0.2 µg/L), all other analytes and events have been non-detect.

GW-209S - All analytes are below CULs for the last eight monitoring events, except VC with one detection above CUL eight events ago at 0.21 µg/L (compared to a VC CUL of 0.2 µg/L). All other analytes and events have been non-detect.

GW-210S - Below CULs for the last eight monitoring events. One detection of benzene seven events ago at 0.28 µg/L (compared to a CUL of 0.8 µg/L), all other analytes and events have been non-detect.

CPOC Area

GW-143S – Multiple detections of TCE and cis-1,2DCE above CULs. Benzene, VC, and TPH-G below CULs.

GW-237S – Multiple detections of VC, benzene and TPH-G above CUL. TCE and cis-1,2DCE below CULs.

GW-238I - All analytes are below CULs for the last eight monitoring events, except VC with one singular detection above CULs six events ago at 0.21 µg/L (compared to the detection limit and CUL of 0.20 µg/L); every other VC sample has been non-detect (<0.20 µg/L). All other analytes have been non-detect for the eight events.

GW-239I - All analytes are below CULs for the last eight monitoring events and all analytes for eight events have been non-detect.

GW-240D – Low level detections above/near CUL for VC ranging from 0.23 to 0.27 µg/L. Other COCs below CULs and non-detect.

GW-241S - All analytes are below CULs for the last eight monitoring events and all analytes for eight events have been non-detect.

GW-242I - All analytes are below CULs for the last eight monitoring events and all analytes for eight events have been non-detect.

The sampling frequency at the Building 4-78/79 SWMU/AOC group has been quarterly for many years, the data in Table 4 demonstrate very low levels and sufficient stability at the CPOC wells between sampling events. We recommend reducing the sampling frequency to twice a year (wet season in Spring and dry season in Fall). This frequency will provide sufficient data for all decisions related to remedial optimization and performance monitoring.

Summary of recommendations for 4-78/79 SWMU Group:

- Drop:
  - GW-039S, GW-243I (source area wells)
  - GW-038S, GW-209S, and GW-210S (downgradient wells)
  - GW-238I, GW-239I,GW-241S, GW242I (CPOC wells)
- Reduce sampling frequency from quarterly to semi-annual for remaining monitoring wells.

Former Fuel Farm

The Former Fuel Farm (Figure 5) consisted of three steel USTs used to store Jet A fuel (URE-033, URE-034, and URE-035), located near the south end of the Renton Municipal Airport, about 200 feet southeast of Building 5-02. USTs URE-033 and –034 had capacities of 50,000 gallons and UST URE-035 had a capacity of 12,000 gallons. The former USTs were installed in 1956 and 1957 and removed during closure activities at the Former Fuel Farm in 1993. The residual petroleum hydrocarbons remaining in soil associated with the three former USTs were identified in the Agreed Order as AOC-046, -047, and -048, respectively.

Since closure, the Former Fuel Farm site, which is owned by the City of Renton, has been used for parking. Boeing leases a portion of the site and adjacent areas from the City. The nearby Boeing-leased buildings and areas are currently used for industrial purposes.

Soil sampling performed in 1994 assessed the lateral and vertical extent of TPH-impacted soil near this area. The total volume of soil above MTCA Method A cleanup level was estimated to be approximately 4,400 cubic yards. Evaluation of chromatograms from Former Fuel Farm soil samples suggests the presence of Jet A fuel petroleum products and not TPH-G or TPH in the diesel range (TPH-D) (Weston, 1994). The Former Fuel Farm was investigated during the RI in 1999 to 2000.

Previous site cleanup actions in this area have been related to removal of USTs and operation of the interim action in the Former Fuel Farm site. All three of the former Jet A fuel USTs were removed in 1993 and approximately 5,200 tons of TPH-affected soil was excavated for off-site disposal during UST removal. TPH-affected soil and groundwater were observed during removal of the tanks. An interim action at the Former Fuel Farm AOC group was initiated in May 1995 following closure and removal of the three USTs. The interim remedial system, which consisted of a network of bioventing and biosparging wells, operated to address the residual hydrocarbons remaining in the soil and groundwater at the site. The cleanup objective for the interim action was for residual impacted soil to be reduced to the MTCA Interim TPH Policy Standards (Ecology, 1997).

In June 2009 three soil samples were collected from the source area and sample results indicated that soil concentrations had attenuated to less than the MTCA Method A cleanup level for TPH-Diesel Range Organics of 2,000 milligrams per kilogram (mg/kg). Two additional downgradient groundwater monitoring wells were installed in December 2003 to augment the two previously existing groundwater monitoring wells at this site.

During the Pre-CAP investigation (AMEC, 2008), two additional groundwater monitoring wells were installed at the Former Fuel Farm to address Ecology concerns about potential migration of COCs at the site. These wells were sampled in May 2008; the sample results from these new wells indicated that groundwater was impacted by the residual soil contamination at the Former Fuel Farm. The current groundwater monitoring program includes semiannual sampling of groundwater monitoring wells at the site.

The COCs identified for Former Fuel Farm area were:

- Soil: TPH-Jet Fuel, TPH-D, benzene, and 2-methylnaphthalene.
- Groundwater: TPH-Jet Fuel and TPH-D.

Four groundwater monitoring wells have been installed near the source areas and no TPH-impacted soil was observed based on field observations during installation of these wells and during subsequent monitoring (AMEC, 2008).

Regular groundwater monitoring conducted at the site has not detected dissolved TPH-Jet fuel components in groundwater samples collected from monitoring wells located around the Former Fuel Farm. Groundwater samples collected from previous push probes within the source areas contained dissolved TPH-Jet fuel above cleanup levels, but none of the samples collected from the groundwater monitoring wells have contained detectable concentrations of TPH-Jet fuel.

The CAP for this site includes MA and institutional controls.

The recent sampling results (eight sampling events) from the Former Fuel Farm Building are shown in Table 5; ten wells are sampled and the COCs are TPH-D and Jet-A**.** The location of wells at the Former Fuel Farm area is presented in Figure 5.

Source

GW-255S – All analytes below CULs for the last eight monitoring events and all are non-detect.

CPOC Area

GW-183S - All analytes below CULs for the last eight monitoring events and all are non-detect.

GW-184S - All analytes below CULs for the last eight monitoring events and all are non-detect.

GW-211S – CUL exceedances at 7 and 5 events prior for TPH-D and Jet-A, the last 4 samples have been below CULs.

GW-212S - All analytes below CULs for the last eight monitoring events and all are non-detect except one TPH-D detection of 0.109 mg/L.

GW-221S – Multiple detections over CULs.

GW-224S - Multiple detections over CULs.

GW-256S - All analytes below CULs for the last eight monitoring events and all are non-detect except one Jet-A detection of 0.11 mg/L.

GW-257S - All analytes below CULs for the last eight monitoring events and all are non-detect.

GW-258S - All analytes below CULs for the last eight monitoring events and all are non-detect.

Summary of recommendations for Former Fuel Farm:

- Drop:
  - GW-255S (source area well)
  - GW-183S, GW-184S, GW-212S, GW-256S, GW-257S, and GW-258S (CPOC wells)

AOC-003

AOC-003 is located at the north side of the Facility between Buildings 4-20 and 4-81 (Figure 6). AOC-003 represents the former UST URE-03 that was located just west of Building 4-81. The former UST at AOC-003 was installed in 1980 and was used to store MEK and toluene. The UST was constructed of steel within a cylindrical concrete vault for secondary containment and had a capacity of 500 gallons. The RI and the Feasibility Study Work Plan grouped AOC-003 with AOC-001/002 because of their proximal locations and similar COCs. However, AOC-003 is several hundred feet up gradient of AOC-001/002, and the data suggest that there is no commingling of contaminants from these areas. For these reasons, the CAP deals with AOC-001/002 and AOC-003 as separate areas.

Following the removal of this UST in July 1986, toluene was detected in the water found between the tank and concrete vault. Groundwater samples from the area adjacent to former URE-03 did not contain detectable concentrations of solvents.

After URE-03 was removed in 1986, 74 cubic yards of soil was excavated from around the former tank location. Groundwater samples collected near the tank contained elevated levels of dissolved toluene and approximately 3,600 gallons of groundwater was pumped from the URE-03 excavation to recover the dissolved toluene. The RI included soil and groundwater sampling in the area; soil sampling found TCE in soil at levels that were less than the site CULs (which were established years later in the CAP), and CVOCs present in groundwater. The RI did not find MEK or toluene present in soil or groundwater. Based on these results, the FS and CAP identified the following COCs for AOC-003:

- Soil: TCE;
- Groundwater: PCE, TCE, cis-1,2DCE, and VC.

Soil contained trace levels of TCE but observed concentrations were below the cleanup level. PCE and VC were detected at concentrations exceeding their respective groundwater CULs in groundwater samples collected at PP016 in May 1999. More recent groundwater monitoring has identified degradation products VC and cis-1,2DCE in groundwater samples from the downgradient well GW-188S, but at concentrations only marginally higher than the respective CULs.

The CAP for AOC-003 includes enhanced bioremediation, MA, and institutional controls.

The recent sampling results (eight sampling events) from AOC-003 are shown in Table 6; four wells are sampled and the COCs are CVOCs. The location of wells at the AOC-003 area is presented in Figure 6.

Source Area

GW-249S – VC over CUL. PCE, TCE, and cis-1,2DCE below CULs. Recent VC levels in the range of 0.3 to 0.6 µg/L.

Downgradient Plume

GW-188S - VC over CUL. PCE, TCE, and cis-1,2DCE below CULs. Recent VC levels in the range of 0.2 to 0.8 µg/L.

CPOC Area

GW-247S - VC over CUL. PCE, TCE, and cis-1,2DCE below CULs. Recent VC levels in the range of 0.3 to 0.7 µg/L.

GW-248I - VC over CUL. PCE, TCE, and cis-1,2DCE below CULs. Recent VC levels in the range of 0.5 to 1.0 µg/L.

The sampling frequency at AOC-003 has been quarterly for many years, the data in Table 6 demonstrate very low levels of VC (all under 1 µg/L) and sufficient stability between sampling events. We recommend reducing the sampling frequency to twice a year (wet season in Spring and dry season in Fall). This frequency will provide sufficient data for all decisions related to remedial optimization and performance monitoring.

Summary of recommendations for AOC-003:

- Retain existing wells and reduce COCs to VC only (the only analyte detected in the last eight monitoring events over the CULs).
  - GW-249S (source area well)
  - GW-188S (downgradient well)
  - GW-247S, GW248I (CPOC wells)
- Reduce sampling frequency from quarterly to semi-annual for all monitoring wells.

AOC-004

AOC-004 is the designation for former UST URE-04, a 250-gallon steel UST located approximately 10 feet east of Building 4-21 (Figure 7). The former UST at AOC-004 was used for the storage of gasoline and may have contained leaded gasoline prior to the mid-1970s. The installation date for the tank is unknown. The former UST URE-04 was removed in December 1986. During removal of the tank, a thin layer of floating product (gasoline) was observed on the water in the excavation. AOC-004 was investigated during the RI in 1999 and 2000. During the RI, soil samples were collected from five push probes, and groundwater samples were collected from three of the push probe locations and a nearby groundwater monitoring well. Prior to development of the Draft CAP, added soil samples were collected from two additional push probes during the April 2008 Pre-CAP investigation (AMEC, 2008).

During the Pre-CAP investigation it was noted that Boeing had completed other construction related excavations in the area immediately surrounding AOC-004. These excavations were completed around the footings of seismic upgrade structures for the adjacent Building 4-21. These structures limit the possibility of future excavation in the area of AOC-004.

The initial COCs identified for AOC-004 were:

- Soil: TPH-G, benzene, toluene, ethylbenzene, and acetone;
- Groundwater: TPH-G, benzene, and lead.

Results from the 2008 Pre-CAP investigation showed that the source area soils contained TPH-G and fuel-related COCs above the soil cleanup levels. The source of the aromatic VOCs and TPH-G in the shallow soil was attributed to a past release from the former UST.

The CAP for AOC-004 includes enhanced bioremediation, MA, and institutional controls.

Two of the initial groundwater COCs identified in the CAP (TPH-G and benzene) were approved for removal from the monitoring program in 2017 due to results below the cleanup level for eight consecutive sampling events (Amec Foster Wheeler, 2017).

The recent sampling results (eight sampling events) from AOC-004 are shown in Table 7; two wells are sampled and the remaining COC is lead (the other prior COCs, TPH-G and benzene, were dropped with Ecology approval). The location of wells at the AOC-004 area is presented in Figure 7.

<u>Source Area</u>

GW250S – Detections over CUL (0.001 mg/L lead) typical ranges of 0.001 to 0.003 mg/L versus a MTCA criteria for potable water of 0.0150 mg/L (most samples are an order-of-magnitude below the applicable MTCA criterion).

CPOC Area

GW-174S – Two detections of lead over the CUL, but are estimated concentrations at 0.0013J and 0.0016J mg/l. The last six samples have been below the CUL (0.001 mg/L for lead, also considering that the MTCA criteria for potable water is 0.015 mg/L for lead). This well is very close to well GW250s, and GW250S is always at a higher concentration.

Summary of recommendations for AOC-004:

- Drop:
  - GW-174S, (CPOC well)

AOC-060

AOC-060 is located in Building 4-42 (Figure 8). AOC-060 consists of a secondary containment sump for a former vapor degreaser. The former vapor degreaser used TCE for cleaning metal parts. The secondary containment sump was removed in December 1993. Results from assessment activities conducted since December 1993 indicated the presence of VOCs in soil and groundwater in the vicinity of the former degreaser.

During the RI, more than a dozen monitoring wells were installed in the vicinity of AOC-060, and quarterly sampling and analysis of monitoring wells for COCs occurred for almost 10 years. The focus of the RI investigation was groundwater; no data were presented in the RI indicating concentrations of COCs present in soil above cleanup levels.

The initial COCs identified for AOC-0060 were:

- Soil: None
- Groundwater: TCE, cis-1,2DCE, and VC.

The source of VOCs at this AOC was likely releases of TCE from the former vapor degreaser and/or its associated sumps. Subsequent to the release, degradation of the TCE has occurred to form cis-1,2DCE and VC. The extent of groundwater affected by dissolved VOCs extends west of the source area, where the former vapor degreaser and sumps were located. The affected groundwater is migrating to the west toward the discharge area along the Cedar River Waterway.

The CAP selected the following remedial actions for AOC-60: MA and institutional controls. Boeing has elected to implement enhanced bioremediation in this area in order to accelerate site cleanup.

The recent sampling results (eight sampling events) from AOC-060 are shown in Table 8; nine wells are sampled and the COCs are CVOCs**.** The location of wells at the AOC-060 area is presented in Figure 8.

Source Area

GW-009S - Multiple detections of TCE, cis-1,2DCE, and VC over CULs; all analytes below 0.5 µg/L over the last eight sampling events.

Downgradient Plume

GW-012S - Multiple detections of TCE, cis-1,2DCE, and VC over CULs.

GW-014S - Multiple detections of TCE, cis-1,2DCE, and VC over CULs.

GW-147S - Multiple detections of TCE, cis-1,2DCE, and VC over CULs.

CPOC Area

GW-149S - All analytes below CULs for the last eight monitoring events. TCE is non-detect and cis-1,2DCE and VC with low level detections.

GW-150S - Multiple detections of TCE and cis-1,2DCE over CULs; all analytes below 0.1 µg/L over the last eight sampling events.

GW-252S – All analytes below CULs for the last eight monitoring events. TCE and VC are non-detect and cis-1,2DCE with low level detections.

GW-253I - Multiple detections of TCE and cis-1,2DCE over CULs; all analytes below 0.2 µg/L over the last eight sampling events.

GW-254S - Multiple detections over CUL for cis-1,2DCE; all detections below 0.12 µg/L. TCE and VC at levels below CULs. Adjacent CPOC wells GW150S and GW-253I are in the central location of the former plume and are always at higher concentrations and should be considered the only necessary wells (shallow and intermediate) for this CPOC location.

Summary of recommendations for AOC-060:

- Drop:
  - GW-149S, GW-252S, GW-254S (CPOC wells)

AOC – 090

AOC-090 is located near the southwest corner of former Building 4-64 and just east of the Cedar River Trail Park and directly north of North 6th Street (Figure 9). During the installation of an underground fire protection water line and fire hydrant in July 1999, approximately 40 cubic yards of soil was excavated to a depth of 6 feet bgs. Laboratory analysis of soil samples collected from the stockpiled soil indicated elevated concentrations of selected VOCs (TCE and carbon tetrachloride) as well as TPH-G, TPH-D, and TPH in the motor oil range.

This area was investigated in several phases of RI and post-RI investigation to further delineate the nature and extent of affected soil and groundwater. The results of this work indicated that VC was present at elevated concentrations in groundwater near the western Facility boundary with the Cedar

River Trail Park, and elevated VOC and TPH levels were present in soil and groundwater near Building 4-64. No documented release or known source was identified.

Coincident with the building 4-64 demolition, an interim action was conducted at AOC-090 to remove TPH- and VOC-affected soil exceeding cleanup levels in the source area to the extent practicable (some affected soil was left in place due to access constraints resulting from underground utilities). Approximately 250 cubic yards of solvent-affected soil and 1,240 cubic yards of TPH-affected soil were removed during the excavation. The area of excavation extended beneath the former Building 4-64 footprint. Throughout the excavation, soil was excavated to the water table at a depth of approximately 7 feet bgs.

Following soil removal, 16.68 tons of molasses were added to the excavation area (in 2005) to act as an organic carbon source and promote ongoing biodegradation of VOCs. Perforated drainpipe was installed along the southern extent of the excavation area for use during potential future remedial actions, such as reapplication of organic carbon substrate or soil venting. Subsequent monitoring of groundwater beneath and downgradient of the excavation, where the substrate was placed, indicated substantial degradation of TCE in groundwater and a substantial rise in concentration of the final, nontoxic biodegradation products (methane, ethane, and ethene) (Geomatrix, 2004).

The initial COCs identified for AOC-090 were:

- Soil: VOCs including chlorinated solvents and benzene, several metals, several SVOCs, and TPH;
- Groundwater: VOCs, including chlorinated solvents and benzene, and TPH.

The remedial alternative selected in the CAP included enhanced bioremediation and MA. Groundwater has been collected semiannually from AOC-090 monitoring wells since March 2015. The recent sampling results (eight sampling events) from AOC-090 are shown in Table 9; 11 wells are sampled and the COCs are VOCs and TPH**.** The location of wells at the AOC-090 area is presented in Figure 9.

Source Area

GW-189S - Detections of various COCs over CULs. Many COCs at non-detect and below CULs.

Downgradient Plume

GW-175I - All analytes are below CULs for the last eight monitoring events and all analytes are non-detect.

GW-176S – VC is the only COC above CUL.

Shallow Zone CPOC

GW-178S - VC is the only COC above CUL.

GW-180S - All analytes are below CULs for the last eight monitoring events.

GW-207S – All analytes are below CULs for the last eight monitoring events with the exception of two VC detections above CUL with detections at 0.238 and 0.311 J µg/L compared to a CUL of 0.13 µg/L, the most recent sample is non-detect (< 0.02 µg/L).

GW-208S - VC is the only COC above CUL.

Intermediate Zone CPOC

GW-163I - All analytes are below CULs for the last eight monitoring events.

GW-165I - All analytes are below CULs for the last eight monitoring events and all analytes are non-detect.

GW-177I – All analytes are below CULs for the last eight monitoring events with the exception of one detection of VC above CUL seven events ago at 0.182 µg/L, the most recent sample is non-detect (< 0.02 µg/L).

GW-179I – All analytes are below CULs for the last eight monitoring events with the exception of one detection of VC above CUL three events ago at 0.133 µg/L, the most recent sample is non-detect (< 0.02 µg/L).

Summary of recommendations for **AOC-090**:

- Drop:
  - GW-175I, GW-180S, (down gradient wells)
  - GW-163I, GW-165I, GW-177I and GW-179I (CPOC wells)
- Reduce analyte list:
  - GW-176S, GW-178S, GW-207S, and GW-208S to VC only
  - GW-189S to CVOCs and TPH

AOC-92

Ecology approved discontinued monitoring in November 2017; the well sampled (GW261S) was non-detect for TPH from 2015 to 2017.

AOC-034/035

Ecology approved discontinued monitoring in May 2019. The concentrations of COCs at the four CPOC wells were non-detect since May 2015.

AOC-093

Ecology approved discontinued monitoring in February 2017. The concentrations of benzene and TPH-G at GW174Ss were below CULs (and non-detect) since February 2015.

AOC-001/002

All wells in the AOC-001/002 are were closed in support of Apron R construction. Ecology was notified of these Facility construction requirements in December 2017. Selected wells are to be replaced after construction is complete. Prior to well closure, VC levels ranged from <0.05 µg/L in four wells, 0.056 µg/L in one well and 0.38 µg/L in one well sampled in May 2017.

Other Areas

The following three additional remediation areas were not part of the CAP but have been included in the corrective actions for the Renton Site. Each of these areas was identified after the CAP as part of construction related or property due diligence sampling at the Renton Facility. Each of the areas was identified based on the presence of low levels of VOCs in groundwater. There is no documented information regarding a release at these three areas and no sources were identified. Remedial actions have been implemented at each area and these three sites have been regularly monitored in conjunction with the Facility corrective action.

Lot 20/BUILDING 10-71 PARCEL

The Lot 20/Building 10-71 Parcel consists of approximately 4 acres within the southern portion of the Renton Facility, and is bounded by Logan Avenue North on the west, by North 6th Street on the south, and by Boeing property on the north (former 10-80 building) (Figure 10). Localized low-level concentrations of chlorinated VOCs (including cis-1,2DCE and VC) were discovered in groundwater underlying portions of the Building 10-71 parcel during Phase II Environmental Site Assessment. Building 10-71 was demolished in 2008 and additional soil, soil vapor, and groundwater samples were collected. Four groundwater monitoring wells were installed in July 2009 in the southeast portion of the Building 10-71 parcel. The cleanup remedy for the Former Building 10-71 Parcel is enhanced bioremediation and MA.

The recent groundwater sampling results (eight sampling events) from the Lot 20/10-71 area are shown in Table 10; three wells are sampled and the COCs are TCE, cis-1,2DCE, VC and toluene. The location of wells at the Lot 20/10-71 area is presented in Figure 10. Well 10-71-MW3 was not included in the CMP because levels were non-detect prior to preparing the CMP.

Monitoring Wells

10-71-MW1– All analytes are below CULs for the last eight monitoring events.

10-71-MW2– All analytes are below CULs for the last eight monitoring events.

10-71-MW4 - Below CUL for last six of eight monitoring events. Two detections of VC at 0.30 µg/L versus a MTCA cleanup level of 0.29 µg/L and non-detect for all analytes (<0.2 µg/L) for the last 3 years (six sampling events).

Summary of recommendations for Lot 20/Building 10-71 Parcel:

- Drop:
  - 10-71-MW1, 10-71-MW2, 10-71-MW4 (plume area wells)

APRON A

In late 2015, pre-construction sampling in Apron A (Figure 11) within the Renton Municipal Airport identified vinyl chloride in one groundwater sample collected from borings installed to assess soil and groundwater conditions; two samples were non-detect and one sample indicated 16 µg/L VC (boring B-15). A follow-up investigation to delineate the vinyl chloride present at boring B-15 was conducted in April 2016. Four groundwater wells were installed in the immediate area (GW262S, GW263S, GW264S, and GW265S). Sampling from the new wells indicated VC levels from 0.42 to 8.7 µg/L and all data were reported to Ecology at the time of collection. The cleanup remedy for the Apron A area is enhanced bioremediation and MA.

The recent groundwater sampling results (eight sampling events) from the Apron A area are shown in Table 11; two wells are sampled and the COCs are cis-1,2DCE and VC. The location of wells at the Apron A area is presented in Figure 11.

Monitoring Wells

GW-262S – Below CUL for seven of last eight monitoring events. One detection of VC at 0.3 µg/L versus a MTCA cleanup level of 0.29 µg/L and non-detect for the last four events over one and a half years.

GW264S – Continued detections above the CUL for VC.

Summary of recommendations for Apron A Area:

- Drop:
  - GW-262S (plume area well)

4-70 AREA

The 4-70 area represents an area of groundwater contamination located west of Building 4-70 (this was identified after the CAP, but it is included in the EDR). No source was identified for this area. This area is located in the central portion of the Facility and south of the Building 4-78/79 SWMU/AOC Group. The COCs for this area are CVOCs. The cleanup remedy for the 4-70 Area is enhanced bioremediation and MA.

The recent groundwater sampling results (eight sampling events) from the 4-70 area are shown in Table 12; two wells are sampled and the COCs are TCE, cis-1,2DCE, and VC. The location of wells at the 4-70 area is presented in Figure 12.

Monitoring Wells

GW-259S – All analytes below CULs for the last eight monitoring events.

GW-260S – Below CULs for seven of the last eight monitoring events. One detection of VC at 0.30 µg/L versus a MTCA criteria for potable water of 0.29 µg/L and has been below the CULs for three years.

Summary of recommendations for the 4-70 Area:

- Drop:
  - GW-259S, GW-260S (plume area wells)

REFERENCES

AMEC 2008, Draft Final Feasibility Study Report, Boeing Renton Facility, Renton Washington: Prepared for the Boeing Company, June.

AMEC 2016a, Quarterly Report RCRA Corrective Action Program, First Quarter 2016 Boeing Renton Facility. Prepared for: The Boeing Company. May 9, 2016

AMEC 2016b, Quarterly Report RCRA Corrective Action Program, Second Quarter 2016 Boeing Renton Facility. Prepared for: The Boeing Company. August 9, 2016

AMEC 2016c, Quarterly Report RCRA Corrective Action Program, Third Quarter 2016 Boeing Renton Facility. Prepared for: The Boeing Company. November 9, 2016

AMEC 2017a, Quarterly Report RCRA Corrective Action Program, Fourth Quarter 2016 Boeing Renton Facility. Prepared for: The Boeing Company. February 8, 2017

AMEC 2017b, Quarterly Report RCRA Corrective Action Program, First Quarter 2017 Boeing Renton Facility. Prepared for: The Boeing Company. May 10, 2017

AMEC 2017c, Quarterly Report RCRA Corrective Action Program, Second Quarter 2017 Boeing Renton Facility. Prepared for: The Boeing Company. July 14, 2017

AMEC 2017d, Quarterly Report RCRA Corrective Action Program, Third Quarter 2017 Boeing Renton Facility. Prepared for: The Boeing Company. November 15, 2017

AMEC 2017e. Addendum to the Compliance Monitoring Plan, Boeing Commercial Airplane Group, Renton Facility WAD 009-262 171 RCRA Corrective Action Agreed Order No. 8191, Prepared by AMEC Foster Wheeler Environment & Infrastructure. November 28, 2017.

AMEC 2018, Quarterly Report RCRA Corrective Action Program, Fourth Quarter 2017 Boeing Renton Facility. Prepared for: The Boeing Company. February 15, 2018

Geomatrix, 2004, Final AOC-090 Interim Action Work Plan, Boeing Renton Facility, Renton, Washington: Prepared for The Boeing Company, Washington, March.

Weston, 2001, Remedial Investigation Report, Boeing Renton Plant, Renton, Washington: Prepared for The Boeing Company, Boeing Shared Services Group, Energy and Environmental Affairs, August.

Wood 2018a, Quarterly Monitoring Report RCRA Corrective Action Program, First Quarter 2018 Boeing Renton Facility. Prepared for: The Boeing Company. May 15, 2018

Wood 2018b, Quarterly Report, Second Quarter 2018 RCRA Corrective Action Program. Prepared for: The Boeing Company. August 15, 2018

Wood 2018c, Quarterly Report, Third Quarter 2018 RCRA Corrective Action Program. Prepared for: The Boeing Company. November 15, 2018

Wood 2019a, Quarterly Report, Fourth Quarter 2018 RCRA Corrective Action Program. Prepared for: The Boeing Company. February 19, 2019

Wood 2019b, Quarterly Report, First Quarter 2019 RCRA Corrective Action Program. Prepared for: The Boeing Company. Revised June 19, 2019

Wood 2019c, Quarterly Report, Second Quarter 2019 RCRA Corrective Action Program. Prepared for: The Boeing Company. August 15, 2019

Wood 2019d, Quarterly Report, Third Quarter 2019 RCRA Corrective Action Program. Prepared for: The Boeing Company. November 15, 2019

Wood 2020a, Quarterly Report, Fourth Quarter 2019 RCRA Corrective Action Program. Prepared for: The Boeing Company. February 17, 2020

Wood 2020b, Quarterly Report, First Quarter 2020 RCRA Corrective Action Program. Prepared for: The Boeing Company. May 15, 2020

Tables

Table 1: Boeing Renton Facility SWMUs/AOCs Status

SWMU/AOC	Release Source	COCs Remaining in GW	Current Treatment	Other Notes
SWMUs/AOCs Identified in the CAP				
SWMU-168:				
5-50 bldg (Renton Airport)	Former Solvent Waste UST	Trace VC in one well at 0.087 µg/L	GW monitoring only (no bio treatment/injections)	None
SWMU-172 and SWMU-174				
5-08/5-09 bldgs (Renton Airport)	Former Steam Clean Wastewater USTs	PCE, TCE, VC, metals (As, Pb, Cu) Concentrations of COCs exceed current CULs	Bioremediation, soil vapor extraction	Need to compare As & Pb with typical of background levels published by Ecology
Building 4-78/79 SWMU/AOC				
Grouping of SWMUs and AOCs from several former USTs	Former fueling USTs, solvent sources unknown (not a listed waste)	TCE, cis-1,2-DCE, VC, Bz, TPH-G; however, only Bz, VC and TPH-G above proposed CULs	Bioremediation (sugar for CVOCs, nitrate/sulfate for benzene), SVE (decommissioned)	Limited soil excavation planned in Fall to address TPH in clay soil
Former Fuel Farm AOC Group				
Now partially on Ace Aviation Site and Boeing leased property (Renton Airport)	Decommissioned Jet-A fuel farm (operated from 1956 to 1993)	Residual TPH in three wells. CPOC wells have been ND	Monitoring only (decommissioned air sparging system)	None
AOC-001 and AOC-002 (a.k.a. Apron R)				
General Area between the 4-20 and 4-81 bldgs, north end of Renton Site	Former USTs and other non-identified source areas	CVOCs found in areas of the former 4-01 bldg (GW193S); VC in secondary source area (GW213S, 214S, 215S)	Excavated soil in a source area during 2005 location of GW193S. Bioremediation for CVOCs (injection piping in backfill)	Wells closed for Apron R construction in 2019. Abandonment plan and replacement plan
AOC-003				
South of AOC-001/002	Former UST for MEK and Toluene	VC in 0.3 to 0.5 µg/L range	Bioremediation and monitoring	None
AOC-004				
	Former gasoline UST	1 well with Pb slightly above the CUL of 0.001 ppm, vs MTCA criteria for potable water of 0.015 ppm	Bioremediation and monitored attenuation	Request to be removed from program
AOC-060				
4-42 bldg.	Former TCE degreaser	Trace TCE in source well in the building (under 0.05 µg/L TCE); 1 downgradient well (GW147S) with TCE 1.2 µg/L; 5 CPOC wells with TCE <0.02 µg/L, 1 CPOC well (GW253I) with TCE at 0.021 vs CUL of 0.02 µg/L	Bioremediation and monitored attenuation	COCs, except VC are below the proposed CULs in source and CPOC wells; request to limit.
AOC-090				
Former ditch area near the truck inspection	Multiple VOCs found during utility installation in 1999. No sources identified	Trace VC in 2 CPOC wells (GW178S @ 0.18 ug/l and GW208S @ 0.42 ug/L), the other 6 CPOC wells are ND for VC at <0.02 ug/L	Bioremediation for CVOCs, ongoing monitoring	Request to limit COC analyte to VC
AOC-092				
Along the east side of building 4-20	Petroleum hydrocarbons found during utility installation.	none	sampling terminated in 2107 (CULs met)	None
AOC-093				
Near Lake WA (located within AOC-001/002)	No source areas identified	none	sampling terminated in 2107 (CULs met)	None
AOC-034/035				
Near the south side of Building 4-41	Former USTs for MEK and Toluene	none	sampling terminated in 2109 (CULs met)	None
Other Areas Not Part of CAP				
Building 4-70				
South of 4-79 Area, west of Building 4-70	TCE discovered during utility installation. No source area identified	VC in 1 CPOC well at 0.30 µg/L vs MTCA criteria of potable water at 0.29 µg/L	Bioremediation and ongoing monitoring	Request to be removed from program
Lot 20/Former Building 10-71 Parcel				
Parking lot west of the 10-20 bldg	10-71 bldg demolition. No source areas identified.	VC at ND levels <0.20 ug/L in all wells sampled	Bioremediation and monitoring	Request to be removed from program
Apron A				
	No source areas identified	Residual VC only ~ 1-2 µg/L	Bioremediation and monitoring	None

TABLE 2: SWMU-168 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level [3]	Well ID [2]																							
		CPOC Area																							
		GW229S								GW230I								GW231S							
		11/7/2016	3/1/2017	8/14/2017	3/5/2018	8/13/2018	3/4/2019	8/12/2019	3/9/2020	11/7/2016	3/1/2017	8/14/2017	3/5/2018	8/13/2018	3/4/2019	8/12/2019	3/9/2020	11/7/2016	3/1/2017	8/14/2017	3/5/2018	8/13/2018	3/4/2019	8/12/2019	3/9/2020
Volatile Organic Compounds (µg/L)																									
Vinyl Chloride	0.11	0.020 U	0.020 U	0.021	0.0273	0.020 U	0.0211	0.020 U	0.020 U	0.032	0.020 U	**0.20**	0.0873	**0.14**	0.0566	**0.336**	0.087	0.020 U	0.020 U	0.020 U	0.0393	0.0326	0.0327	0.026	0.020 U
Proposed Monitoring		**Drop**								**Continue Monitoring**								**Drop**							

Notes:

1. **Bolded** values exceed the cleanup levels.
2. S = shallow well; I = intermediate well.
3. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations:

µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit

Table copied from Wood 1st Quarter 2020 Groundwater Sampling Report

TABLE 3: SWMU-172 AND SWMU-174 GROUP HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID[3]															
		Source Area															
		GW152S								GW153S							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020	5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	**0.348**	**0.981**	**1.7**	**0.678**	**0.655**	**0.627**	**0.530**	**0.892**	**0.0649**	**0.171**	**0.238**	**0.107**	**0.108**	**0.278**	**0.204**	**0.0736**
Tetrachloroethene	0.02	**1.39**	**1.09**	**0.846**	**0.086**	**0.0594**	**0.176**	**0.384**	**1.12**	0.020 U	**0.0845**	**0.370**	0.020 U	0.020 U	**0.0544**	**0.164**	**0.024**
Trichloroethene	0.02	**0.226**	**0.833**	**0.223**	**0.152**	**0.157**	**0.203**	**0.145**	**0.278**	0.020 U	**0.241**	**0.394**	0.020 U	**0.0212**	**0.0326**	**0.131**	0.02 U
Vinyl Chloride	0.11	0.0972	**0.187 J**	**0.246**	**0.128**	**0.173**	0.0705	0.0366	**0.15**	**0.313 J**	**0.248**	**0.289**	**0.333**	**0.242**	**0.153**	0.0859	**0.249**
Total Metals (µg/L)																	
Arsenic	1.0	**2.99 J**	**75.7**	**22.6**	**7.54**	**4.49**	**23.4**	**7.48**	**3.84**	**3.51**	**5.67**	**7.84**	**4.49**	**5.97**	**4.72**	**11.9**	**5.48**
Copper	3.5	2.86	**24.1**	**4.76**	**5.12**	2.35	**21.8**	**16.6**	**8.03**	1.01	2.55	**16.2**	2.00	1.25	1.58	**10.2**	3.09
Lead	1.0	**1.52 J**	**12.7**	**2.48 J**	**3.33**	**1.26**	**14.8**	**12.1**	**6.13**	0.207	**3.06**	0.381	0.352	0.198	0.351	**2.76**	0.712
Proposed Monitoring		**Continue Monitoring**								**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3]															
		Downgradient Plume Area															
		GW081S								GW172S							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020	5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	**0.0311**	0.0243	**0.0327**	**0.0355**	0.025	0.0282	**0.0311**	**0.0357**	**0.641**	**0.129**	**0.116**	**0.111**	**0.0581**	0.027	**0.0561**	**0.305**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0663**	0.020 U	0.020 U	0.020 U	**0.0376**	0.020 U	0.020 U	**0.0451**	**0.0287**	**0.976**
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0872**	**0.0370**	0.020 U	0.020 U	0.020 U	0.020 U	**0.384**
Vinyl Chloride	0.11	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**1.41**	**1.24**	0.0742	**0.167**	0.0808	0.0376	0.0905	**0.209**
Total Metals (µg/L)																	
Arsenic	1.0	**1.63**	**2.30**	**2.20**	**2.33**	**2.49**	**2.49**	**2.69**	**1.87**	**5.52**	**8.84**	**7.24**	**6.52**	**7.71**	**10.6**	**20.5**	**32.8**
Copper	3.5	0.534	0.811	0.561	0.536	0.546	1.38	1.96	0.791	0.989	2.50 U	1.77	2.07	2.13	**3.86**	**9.25**	**27.6**
Lead	1.0	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.116	0.210	0.100 U	0.772	**1.02**	**1.13**	0.774	0.991	**1.02**	**7.44**	**15.1**
Proposed Monitoring		**Drop**								**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3]															
		Downgradient Plume Area															
		GW173S								GW226S							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020	3/5/2018	5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	0.020 U	**0.111**	**0.0753**	**0.0756**	**0.037**	0.022	**0.0378**	**0.0504**	**0.0408**	**0.0401**	0.0262	0.020 U	**0.0387**	0.0223	0.0259	0.0235
Tetrachloroethene	0.02	**0.061**	**0.0301**	**0.218**	**0.0842**	**0.0416**	**0.0561**	**0.0246**	**0.0224**	0.020 U	0.020 U	**0.0733**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Trichloroethene	0.02	**0.0344**	**0.0681**	**0.206**	**0.149**	**0.0742**	**0.0256**	**0.0379**	**0.0305**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.11	0.046	0.0969 J	0.0448 J	0.0312	0.0486	0.0613	0.072	0.144	0.0428	0.026	0.0409 J	0.0655	0.0432	0.0459	0.029	0.0615
Total Metals (µg/L)																	
Arsenic	1.0	**1.80**	**13.0**	**4.59**	**6.72**	**7.38**	**12.2**	**15.6**	**11.8**	**4.14**	**3.27**	**2.78**	**3.44**	**5.07**	**2.97**	**2.85**	**12.0**
Copper	3.5	3.48	**6.95**	**3.85**	**4.38**	1.11	1.39	**4.68**	1.51	2.60	1.05	1.19	2.28	**4.55**	0.500 U	0.626	**15.6**
Lead	1.0	0.314	**2.88**	0.706	0.712	0.251	0.290	**1.36**	0.442	0.297	0.129	0.141	0.422	0.413	0.100 U	0.100 U	**2.43**
Proposed Monitoring		**Continue Monitoring**								**Continue Monitoring**							

All data tables from 1st quarter 2020 GW Monitoring Report (Wood 2020)

Analyte	Current Cleanup Level[4]	Well ID [3]															
		CPOC Area															
		GW232S								GW233I							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020	5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	**0.367**	**0.489**	**0.426**	**0.250**	**0.319**	**0.378**	**0.659**	**0.221**	**0.0598**	**0.0587**	**0.0692**	**0.075**	**0.054**	**0.0697**	**0.0546**	**0.0552**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	**0.0331**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0225**	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.11	**0.419**	**0.544 J**	**0.564**	**0.242**	**0.348**	**0.412**	**0.860**	**0.264**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Total Metals (µg/L)																	
Arsenic	1.0	**5.36**	**6.52**	**8.01**	**5.12**	**3.96**	**6.29**	**8.09**	**2.73**	0.532	0.421	0.481	0.529	0.428	0.397	0.594	0.467
Copper	3.5	0.500 U	0.628	**13.3**	1.70	1.15	0.878	**3.85**	2.22	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.774	0.500 U
Lead	1.0	0.100 U	0.275	0.338	0.167	0.167	0.102	0.378	0.354	0.100 U	0.100 U	0.100 U	0.102	0.100 U	0.100 U	0.100 U	0.100 U
Proposed Monitoring		**Continue Monitoring**								**Drop**							

Analyte	Current Cleanup Level[4]	Well ID [3]															
		CPOC Area															
		GW234S								GW235I							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020	5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	**0.0672**	**0.0758**	**0.112**	**0.0869**	**0.0630**	**0.0738**	**0.0850**	**0.0984**	**0.166**	**0.121**	**0.158**	**0.135**	**0.109**	**0.0638**	**0.109**	**0.127**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0297**	**0.0253**	**0.0305**	**0.0338**	**0.0353**	**0.0342**	0.020 U	**0.0287**	**0.0336**
Vinyl Chloride	0.11	0.020 U	0.0282 J	0.0488	0.0273	0.0235	0.0252	0.0309	0.0302	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Total Metals (µg/L)																	
Arsenic	1.0	0.820	**2.07**	**1.72**	**2.11**	**2.22**	**1.31**	**10.1**	**27.4**	0.200 U	0.200 U	0.230	0.200 U	0.403	0.292	0.237	0.251
Copper	3.5	NA	0.748	1.27	1.75	1.93	0.869	**33.2**	**32.9**	0.500 U	0.500 U	0.500 U	0.500 U	1.58	0.714	0.573	0.935
Lead	1.0	NA	0.425	0.781	0.701	0.843	0.280	**15.5**	**11.8**	0.100 U	0.100 U	0.104	0.322	0.405	0.182	0.127	0.235
Proposed Monitoring		**Continue Monitoring**								**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID [3]							
		CPOC Area							
		GW236S							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	0.03	0.0297	**0.0427**	**0.0690**	**0.0443**	0.0281	**0.0468**	**0.108**	0.0241
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	**0.0206**	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.11	0.020 U	0.020 U	0.0323	0.020 U	0.020 U	0.020 U	0.0437	0.020 U
Total Metals (µg/L)									
Arsenic	1.0	**1.80**	**2.69**	**3.35**	**2.81**	**2.10**	**3.70**	**36.5**	**6.29**
Copper	3.5	2.05	0.500 U	0.924	0.919	2.17	0.893	**66.9**	**21.2**
Lead	1.0	**2.49**	0.874	**1.48**	**1.94**	**1.90**	**1.53**	**117**	**18.7**
Proposed Monitoring		**Continue Monitoring**							

Notes

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is an estimate.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC

Abbreviations

µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit

Table copied from Wood 1st Quarter 2020 Groundwater Sampling Report

TABLE 4: BUILDING 4-78/79 SWMU/AOC GROUP HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]
Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID[3]																							
		Source Area																							
		GW031S								GW033S								GW034S							
		5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/11/2020	5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/11/2020	5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/11/2020
Volatile Organic Compounds (µg/L)																									
Benzene	0.80	**8.95**	**3.21**	**28.3 J**	**55.9**	**7.13**	**3.47**	**4.77**	**37.1**	**12.8**	**13.3**	**13.6**	**11.7**	**12.5**	**10.4**	**11.5**	**10.2**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethene	0.70	0.20 U	0.56 J	0.63 J	0.20 U	0.43	0.47	0.40	0.61	**40.7**	**1.94**	**9.35**	**0.79**	0.41	**0.78**	**2.78**	**21.4**	0.20 U	0.21	0.25	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.23	**1.13**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**0.40 U**	0.20 U	**1.00 U**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**0.29**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.20	0.20 U	**0.28**	**0.31 J**	0.20 U	**0.29**	**0.21**	**0.25**	0.20 U	**110**	**6.46**	**36.7**	**3.26**	**0.53**	**1.16**	**13.0**	**52.2**	**0.24**	**0.53**	**0.54**	0.20	0.20 U	**0.39**	**0.39**	0.20 U
Total Petroleum Hydrocarbons (µg/L)																									
TPH-G (C7-C12)	800	**917**	**1,640**	**2,010**	**4200**	**1020**	**1390**	**1540**	**2,980**	239	258	500 U	395	297	277	347	296	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Proposed Monitoring		**Continue Monitoring**								**Continue Monitoring**								**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3]																							
		Source Area																							
		GW039S								GW243I								GW244S							
		5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/11/202	5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/10/2020	5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/11/2020
Volatile Organic Compounds (µg/L)																									
Benzene	0.80	0.20 U	0.20 U	0.20 U	0.20 U	0.21	0.20 U	0.20 U	0.20 U	**1.66**	0.34	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**3.63**	**4.64**	**2.95**	**1.73**	**1.47**	**1.77**	**0.87**	0.52
cis-1,2-Dichloroethene	0.70	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**1.80**	0.44	0.26	0.82	**2.03**	0.37	0.20 U	0.68
Trichloroethene	0.23	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**0.92**	0.20 U	0.20 U	0.22	0.20 U	0.20 U	0.20 U	0.23
Vinyl Chloride	0.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**1.06**	**0.62**	**0.55**	**0.86**	**1.45**	**0.71**	**0.35**	**0.7**
Total Petroleum Hydrocarbons (µg/L)																									
TPH-G (C7-C12)	800	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	132	100 U	106	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Proposed Monitoring		**Drop**								**Drop**								**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3]																							
		Downgradient Plume Area																							
		GW038S								GW209S								GW210S							
		5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/10/2020	5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/10/2020	5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/11/2020
Volatile Organic Compounds (µg/L)																									
Benzene	0.80	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.28	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethene	0.70	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.23	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.20	0.20 U	0.20 U	0.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**0.21**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Total Petroleum Hydrocarbons (µg/L)																									
TPH-G (C7-C12)	800	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Proposed Monitoring		**Drop**								**Drop**								**Drop**							

Analyte	Current Cleanup Level[4]	Well ID[3]																							
		CPOC Area																							
		GW143S								GW237S								GW238I							
		5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/10/2020	5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/10/2020	5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/10/2020
Volatile Organic Compounds (µg/L)																									
Benzene	0.80	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**8.57**	0.43	**0.93**	**9.58**	**2.20**	0.43	0.66	**3.48**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethene	0.70	0.33	**1.82**	0.20 U	0.20 U	0.20 U	**2.20**	0.20 U	0.21	0.20 U	0.20 U	0.20 U	0.21	0.20 U	0.25	0.22	1.00 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.23	0.20 U	**0.60**	0.20 U	0.20 U	0.20 U	**1.05**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	1.00 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**0.28**	**0.29**	**0.25**	0.20 U	**0.38**	**0.34**	1.00 U	0.20 U	0.20 U	**0.21**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Total Petroleum Hydrocarbons (µg/L)																									
TPH-G (C7-C12)	800	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	**1,740**	499	100 U	**1,680**	100 U	329	100 U	**961**	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Proposed Monitoring		**Continue Monitoring**								**Continue Monitoring**								**Drop**							

Analyte	Current Cleanup Level[4]	Well ID[3]																									
		CPOC Area																									
		GW239I								GW240D								GW241S									
		5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/10/2020	5/7/2018	8/14/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/10/2020	5/7/2018	8/13/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/10/2020
Volatile Organic Compounds (µg/L)																											
Benzene	0.80	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethene	0.70	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.23	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**0.23**	**0.23**	**0.24**	**0.23**	**0.27**	**0.26**	**0.24**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Total Petroleum Hydrocarbons (µg/L)																											
TPH-G (C7-C12)	800	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Proposed Monitoring		**Drop**								**Continue Monitoring**								**Drop**									

Analyte	Current Cleanup Level[4]	Well ID[3]							
		CPOC Area							
		GW242I							
		5/7/2018	8/13/2018	11/13/2018	3/5/2019	5/7/2019	8/13/2019	11/12/2019	3/10/2020
Volatile Organic Compounds (µg/L)									
Benzene	0.80	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethene	0.70	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.23	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Total Petroleum Hydrocarbons (µg/L)									
TPH-G (C7-C12)	800	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Proposed Monitoring		**Drop**							

Notes
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is an estimate.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well; D = deep well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit
TPH-G = total petroleum hydrocarbons as gasoline

Table copied from Wood 1st Quarter 2020 Groundwater Sampling Report

TABLE 5: FORMER FUEL FARM HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID[3]							
		Source Area							
		GW255S							
		5/5/2016	11/7/2016	5/10/2017	11/14/2017	5/7/2018	11/12/2018	5/7/2019	11/11/2019
Total Petroleum Hydrocarbons (mg/L)									
TPH-D (C12-C24)	0.5	0.094 U	0.095 U	0.095 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Jet A	0.5	0.094 U	0.095 U	0.095 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Proposed Monitoring		**Drop**							

Analyte	Current Cleanup Level[4]	Well ID[3]							
		CPOC Area							
		GW183S							
		5/5/2016	11/7/2016	5/10/2017	11/14/2017	5/7/2018	11/12/2018	5/7/2019	11/11/2019
Total Petroleum Hydrocarbons (mg/L)									
TPH-D (C12-C24)	0.5	0.095 U	0.096 U	0.095 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Jet A	0.5	0.095 U	0.096 U	0.095 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Proposed Monitoring		**Drop**							

Analyte	Current Cleanup Level[4]	Well ID[3]							
		CPOC Area							
		GW184S							
		5/5/2016	11/7/2016	5/10/2017	11/14/2017	5/7/2018	11/12/2018	5/7/2019	11/11/2019
Total Petroleum Hydrocarbons (mg/L)									
TPH-D (C12-C24)	0.5	0.095 U	0.096 U	0.095 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Jet A	0.5	0.095 U	0.096 U	0.095 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Proposed Monitoring		**Drop**							

Analyte	Current Cleanup Level[4]	Well ID[3]							
		GW211S							
		5/5/2016	11/7/2016	5/10/2017	11/14/2017	5/7/2018	11/12/2018	5/7/2019	11/11/2019
Total Petroleum Hydrocarbons (mg/L)									
TPH-D (C12-C24)	0.5	0.32	**0.75**	0.22	**0.903**	0.272	0.341	0.124	0.120
Jet A	0.5	0.37	**0.58**	0.24	0.245	0.214	0.191	0.117	0.117
Proposed Monitoring		**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3]							
		CPOC Area							
		GW212S							
		5/5/2016	11/7/2016	5/10/2017	11/14/2017	5/7/2018	11/12/2018	5/7/2019	11/11/2019
Total Petroleum Hydrocarbons (mg/L)									
TPH-D (C12-C24)	0.5	0.12 U	0.095 U	0.094 U	0.100 U	0.100 U	0.109	0.100 U	0.100 U
Jet A	0.5	0.12 U	0.095 U	0.094 U	0.100 U	0.100 U	0.108 U	0.100 U	0.100 U
Proposed Monitoring		**Drop**							

Analyte	Current Cleanup Level[4]	Well ID[3]							
		CPOC Area							
		GW221S							
		5/5/2016	11/7/2016	5/10/2017	11/14/2017	5/7/2018	11/12/2018	5/7/2019	11/11/2019
Total Petroleum Hydrocarbons (mg/L)									
TPH-D (C12-C24)	0.5	**0.64**	**0.63**	**0.55**	**3.63**	**0.746**	**1.50**	**0.630**	**1.65**
Jet A	0.5	**0.58**	**0.52**	0.48	**2.12**	**0.635**	**0.863**	**0.397**	**1.09**
Proposed Monitoring		**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3]							
		GW224S							
		5/5/2016	11/7/2016	5/10/2017	11/14/2017	5/7/2018	11/12/2018	5/7/2019	11/11/2019
Total Petroleum Hydrocarbons (mg/L)									
TPH-D (C12-C24)	0.5	**1.2**	**1.4**	**0.73**	**1.84**	**0.560**	**1.56**	**0.256**	**1.46**
Jet A	0.5	**2.3**	**2.2**	**1.4**	**1.97**	**0.933**	**1.64**	**0.388**	**1.80**
Proposed Monitoring		**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3]							
		CPOC Area							
		GW256S							
		5/5/2016	11/7/2016	5/10/2017	11/14/2017	5/7/2018	11/12/2018	5/7/2019	11/11/2019
Total Petroleum Hydrocarbons (mg/L)									
TPH-D (C12-C24)	0.5	0.094 U	0.095 U	0.096 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Jet A	0.5	0.11	0.095 U	0.096 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Proposed Monitoring		**Drop**							

Analyte	Current Cleanup Level[4]	Well ID[3]							
		CPOC Area							
		GW257S							
		5/5/2016	11/7/2016	5/10/2017	11/14/2017	5/7/2018	11/12/2018	5/7/2019	11/11/2019
Total Petroleum Hydrocarbons (mg/L)									
TPH-D (C12-C24)	0.5	0.095 U	0.095 U	0.095 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Jet A	0.5	0.095 U	0.095 U	0.095 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Proposed Monitoring		**Drop**							

Analyte	Current Cleanup Level[4]	Well ID[3]							
		CPOC Area							
		GW258S							
		5/5/2016	11/7/2016	5/10/2017	11/14/2017	5/7/2018	11/12/2018	5/7/2019	11/11/2019
Total Petroleum Hydrocarbons (mg/L)									
TPH-D (C12-C24)	0.5	0.095 U	0.095 U	0.095 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Jet A	0.5	0.095 U	0.095 U	0.095 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Proposed Monitoring		**Drop**							

Notes

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations

AOC = area of concern
CPOC = conditional point of compliance
mg/L = milligrams per liter
SWMU = solid waste management unit
TPH-D = total petroleum hydrocarbons as diesel

Table copied from Wood 1st Quarter 2020 Groundwater Sampling Report

TABLE 6: AOC-003 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID [3]															
		Source Area								Downgradient Plume Area							
		GW249S								GW188S							
		11/14/2017	3/7/2018	5/8/2018	8/15/2018	11/13/2018	3/5/2019	8/14/2019	3/12/2020	11/14/2017	3/7/2018	5/8/2018	8/15/2018	11/13/2018	3/5/2019	8/14/2019	3/12/2020
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.78	NS	0.102	0.0757	0.0524	0.0829	0.079	0.0526	0.0604	NS	0.0606	0.0531	0.0386	0.0636	0.0493	0.0361	0.0362
Tetrachloroethene	0.02	NS	0.0496	0.020 U	0.020 U	0.020 U	0.0105	0.020 U	0.020 U	NS	0.020 U	0.020 U	0.020 U	0.020 U	0.0107	0.020 U	0.0244
Trichloroethene	0.16	NS	0.0475	0.0211	0.020 U	0.020 U	0.0157	0.020 U	0.020 U	NS	0.020 U	0.020 U	0.020 U	0.020 U	0.0125	0.020 U	0.020 U
Vinyl Chloride	0.24	NS	0.114	**0.428**	**0.413**	**0.629**	**0.424**	**0.367**	**0.334**	**NS**	**0.443**	**0.505**	**0.404**	**0.813**	**0.537**	**0.545**	**0.235**
Proposed Monitoring		**Continue Monitoring for Vinyl Chloride. Drop Remaining VOCs**								**Continue Monitoring for Vinyl Chloride. Drop Remaining VOCs**							

Analyte	Current Cleanup Level[4]	Well ID [3]															
		CPOC Area															
		GW247S								GW248I							
		5/8/2018	8/15/2018	11/13/2018	3/5/2019	5/8/2019	8/14/2019	11/12/2019	3/12/2020	5/8/2018	8/15/2018	11/13/2018	3/5/2019	5/8/2019	8/14/2019	11/12/2019	3/12/2020
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.78	0.0949	0.081	0.102	0.0728	0.0584	0.065	0.0635	0.039	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.02 U
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.126	0.020 U	0.020 U	0.020 U	0.02 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Trichloroethene	0.16	0.0257	0.0291	0.0208	0.018	0.020 U	0.020 U	0.148	0.02 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0514	0.020 U
Vinyl Chloride	0.24	**0.46**	**0.453**	**0.679**	**0.392**	**0.497**	**0.613**	**0.504**	**0.305**	**0.573**	**0.526**	**0.987**	**0.707**	**0.551**	**0.541**	**0.62**	**0.499**
Proposed Monitoring		**Continue Monitoring for Vinyl Chloride. Drop Remaining VOCs**								**Continue Monitoring for Vinyl Chloride. Drop Remaining VOCs**							

Notes

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations

µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit

Table copied from Wood 1st Quarter 2020 Groundwater Sampling Report

TABLE 7: AOC-004 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[3]	Well ID [3]							
		Source Area							
		GW250S							
		11/10/2016	3/1/2017	8/17/2017	3/6/2018	8/15/2018	3/5/2019	8/14/2019	3/9/2020
Metals (mg/L)									
Lead	0.001	**0.0020**	**0.0030**	0.00026	0.000941	**0.00107**	**0.00154**	0.000714	**0.00119**
Proposed Monitoring		**Continue Monitoring**							

Analyte	Current Cleanup Level[3]	Well ID [3]							
		CPOC Area							
		GW174S							
		11/10/2016	3/1/2017	8/17/2017	3/6/2018	8/15/2018	3/5/2019	8/14/2019	3/9/2020
Metals (mg/L)									
Lead	0.001	**0.0013 J**	**0.0016 J**	0.0010	0.000449	0.000762	0.000815	0.000549	0.000974
Proposed Monitoring		**Drop**							

Notes

1. Data qualifiers are as follows:
   J = The value is an estimate.
2. S = shallow well
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations

mg/L = milligrams per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit

Table copied from Wood 1st Quarter 2020 Groundwater Sampling Report

TABLE 8: AOC-060 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Levels [4]	Well ID [3]							
		Source Area							
		GW009S							
		8/23/2016	3/6/2017	8/16/2017	3/6/2018	8/14/2018	3/5/2019	8/14/2019	3/10/2020
Volatile Organic Compounds (µg/L)									
cis -1,2-Dichloroethene	0.08	**0.16**	**0.093**	**0.15**	**0.0948**	**0.126**	**0.107**	**0.127**	**0.093**
Trichloroethene	0.02	**0.032**	**0.022**	**0.033**	**0.0252**	**0.0238**	**0.0239**	0.020 U	**0.0242**
Vinyl Chloride	0.26	**0.40**	0.26	**0.39**	0.241 J	**0.318**	**0.285**	**0.300**	0.183
Proposed Monitoring		**Continue Monitoring**							

Analyte	Current Cleanup Levels [4]	Well ID [3]																							
		Downgradient Plume Area																							
		GW012S								GW014S								GW147S							
		8/23/2016	3/6/2017	8/16/2017	3/6/2018	8/14/2018	3/5/2019	8/14/2019	3/10/2020	8/23/2016	3/6/2017	8/16/2017	3/6/2018	8/14/2018	3/5/2019	8/14/2019	3/10/2020	8/23/2016	3/6/2017	8/16/2017	3/6/2018	8/14/2018	3/5/2019	8/14/2019	3/10/2020
Volatile Organic Compounds (µg/L)																									
cis -1,2-Dichloroethene	0.08	**5.2**	**1.6**	**0.95**	**0.609**	**1.29**	**1.23**	**0.798**	**0.482**	**0.17**	**0.13**	**0.18**	**0.134**	**0.122**	**0.119**	**0.143**	**0.151**	**16**	**0.16**	**3.0**	**0.211**	**4.63**	**0.955**	**4.11**	**0.287**
Trichloroethene	0.02	**3.0**	**0.11**	**0.098**	**0.0568**	**0.656**	**0.0546**	**0.0471**	**0.0505**	**0.025**	**0.043**	**0.039**	**0.0347**	**0.0273**	**0.0254**	0.020 U	**0.0419**	**3.6**	**1.5**	**2.6**	**1.91**	**4.23**	**0.475**	**1.46**	**1.20**
Vinyl Chloride	0.26	**2.5**	**2.0**	**1.4**	**0.586**	**0.605**	**1.35**	**0.893**	**0.603**	**0.30**	**0.30**	**0.31**	**0.266**	0.232 J	0.214	**0.365**	0.195	**3.1**	0.020 U	0.21	0.020 U	**1.07 J**	0.0514	0.215	0.020 U
Proposed Monitoring		**Continue Monitoring**								**Continue Monitoring**								**Continue Monitoring**							

Analyte	Current Cleanup Levels [4]	Well ID [3]																							
		CPOC Area																							
		GW149S								GW252S								GW150S							
		8/23/2016	3/6/2017	8/16/2017	3/6/2018	8/14/2018	3/5/2019	8/14/2019	3/10/2020	8/23/2016	3/6/2017	8/16/2017	3/6/2018	8/14/2018	3/5/2019	8/14/2019	3/10/2020	8/23/2016	3/6/2017	8/16/2017	3/6/2018	8/14/2018	3/5/2019	8/14/2019	3/10/2020
Volatile Organic Compounds (µg/L)																									
cis -1,2-Dichloroethene	0.08	0.076	0.067	0.070	0.0565	0.0441	0.0623	0.0427	0.0574	0.034	0.024	0.039	0.0215	0.0266	0.020 U	0.0342	0.0259	**0.1**	0.055	**0.091**	0.0388	0.0506	0.0737	**0.0824**	0.0525
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.022**	0.020 U	**0.026**	0.020 U	**0.0305**	0.020 U	**0.0228**	0.02 U
Vinyl Chloride	0.26	0.080	0.11	0.068	0.0854	0.0399	0.0843	0.0482	0.085	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.20	0.092	0.096	0.0596	0.0203	0.103	0.020 U	0.0541
Proposed Monitoring		**Drop**								**Drop**								**Continue Monitoring**							

Analyte	Current Cleanup Levels [4]	Well ID [3]															
		CPOC Area															
		GW253I								GW254S							
		8/23/2016	3/6/2017	8/16/2017	3/6/2018	8/14/2018	3/5/2019	8/14/2019	3/10/2020	8/23/2016	3/6/2017	8/16/2017	3/6/2018	8/14/2018	3/5/2019	8/14/2019	3/10/2020
Volatile Organic Compounds (µg/L)																	
cis -1,2-Dichloroethene	0.08	**0.089**	**0.10**	**0.11**	**0.0991**	0.0796	**0.127**	**0.0917**	**0.0915**	**0.11**	0.062	**0.11**	0.0589	**0.0926**	**0.0983**	**0.116**	0.0736
Trichloroethene	0.02	**0.023**	**0.024**	**0.029**	0.020 U	**0.0204**	**0.0221**	0.020 U	**0.0212**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.26	0.13	0.13	0.14	0.132	0.113	0.143	0.131	0.184	0.067	0.038	0.043	0.0303	0.0418	0.0749	0.0465	0.0405
Proposed Monitoring		**Continue Monitoring**								**Drop**							

Notes:

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations:

µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit

Table copied from Wood 1st Quarter 2020 Groundwater Sampling Report

TABLE 9: AOC-090 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Levels [4]	Well ID [3]																							
		Source Area								Downgradient Plume Area															
		GW189S [5]								GW175I								GW176S							
		11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020	11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020	11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020
Volatile Organic Compounds (µg/L)																									
1,1,2,2-Tetrachloroethane	0.17	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
1,1,2-Trichloroethane	0.2	**1.00 U**	**0.40 U**	0.20 U	0.20 U	2.00 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloroethene	0.057	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Acetone	300	25.1	10.0 U	5.0 U	5.00 U	70	5.00 U	5.0 U	5.0 U	NA	5.00 U	5.0 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	NA	5.00 U	5.38	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U
Benzene	0.8	**1.00 U**	0.41	**1.69**	0.55	**2.42**	0.20	0.49	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Carbon Tetrachloride	0.23	**1.00 U**	**0.40 U**	0.20 U	0.20 U	2.00 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chloroform	2	1.00 U	0.40 U	0.20 U	0.20 U	**2.23**	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethene	2.4	1.16	1.18	2.23	1.74	**22.3**	0.92	**6.87**	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.25	0.34	0.26	0.27	0.25	0.27	0.25
Methylene Chloride	2	5.00 U	2.00 U	1.0 U	1.00 U	10.9 UJ	1.00 U	1.0 U	1.0 U	NA	1.00 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	NA	1.00 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U
Tetrachloroethene	0.05	**0.0549**	0.020 U	0.020 U	0.020 U	0.20 U	0.028	0.020 U	0.0263	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Toluene	75	13.1	18.7	2.84	6.34	21.7	4.96	3.11	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.42	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,2-Dichloroethene	53.9	1.00 U	0.56	0.40	0.48	2.00 U	0.20 U	0.39	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.08	**0.19**	**0.156**	**0.279**	**0.224**	**2.38**	**0.156**	**0.414**	0.0745	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.13	0.020 U	**0.48**	**1.00**	**0.508 J**	**2.09 J**	**0.50**	**1.20**	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	**0.260**	**0.286**	**0.208**	**0.230**	**0.294**	**0.301**	**0.207**
Total Petroleum Hydrocarbons (µg/L)																									
TPH-G (C7-C12)	800	**2,290**	**2,260**	**2,010**	**1,860**	**9,440**	**1,070**	**943**	189	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U
TPH-D (C12-C24)	500	146	398	**689**	200	**4,120**	362	432	100 U	NA	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U
TPH-O (C24-C40)	500	200 U	**582**	**949**	298	**2,000 U**	**522**	**853**	200 U	NA	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U
Proposed Monitoring		**Continue Monitoring for CVOCs and TPH. Drop the other VOCs**								**Drop**								**Continue Monitoring for Vinyl Chloride. Drop Remaining VOCs**							

Analyte	Current Cleanup Levels [4]	Well ID [3]																							
		Shallow Zone CPOC Area																							
		GW178S								GW180S								GW207S							
		11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020	11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020	11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020
Volatile Organic Compounds (µg/L)																									
1,1,2,2-Tetrachloroethane	0.17	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
1,1,2-Trichloroethane	0.2	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloroethene	0.057	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.023	0.020 U	0.020 U	0.020 U
Acetone	300	NA	5.00 U	5.0 U	5.00 U	5.00 U	5.54	5.0 U	5.0 U	NA	5.00 U	5.0 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	NA	5.00 U	5.0 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U
Benzene	0.8	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.23	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Carbon Tetrachloride	0.23	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chloroform	2	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethene	2.4	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.29	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methylene Chloride	2	NA	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	0.05	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Toluene	75	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,2-Dichloroethene	53.9	NA	0.20 U	0.26	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.08	NA	0.020 U	0.0277	0.0214	0.0213	0.0213	0.020 U	0.021	NA	0.020 U	0.026	0.020 U	0.020 U	0.020 U	0.0239	0.020 U	NA	0.020 U	0.0412	0.020 U	0.0388	0.020 U	0.0305	0.020 U
Vinyl Chloride	0.13	NA	**0.699**	**0.191**	**0.409**	**0.378**	**0.392**	**0.3840**	**0.1840**	NA	0.020 U	0.0395	0.020 U	0.020 U	0.020 U	0.0485	0.020 U	NA	0.0758	**0.2380**	0.0300	**0.311 J**	0.0692	0.020 U	0.020 U
Total Petroleum Hydrocarbons (µg/L)																									
TPH-G (C7-C12)	800	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U
TPH-D (C12-C24)	500	NA	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U
TPH-O (C24-C40)	500	NA	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U
Proposed Monitoring		**Continue Monitoring for Vinyl Chloride. Drop Remaining VOCs**								**Drop**								**Continue Monitoring for Vinyl Chloride. Drop Remaining VOCs**							

All data tables from 1st quarter 2020 GW Monitoring Report (Wood 2020)

Analyte	Current Cleanup Levels [4]	Well ID [3]																							
		Shallow Zone CPOC Area								Intermediate Zone CPOC Area															
		GW208S								GW163I								GW165I							
		11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020	11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020	11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020
Volatile Organic Compounds (µg/L)																									
1,1,2,2-Tetrachloroethane	0.17	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
1,1,2-Trichloroethane	0.2	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloroethene	0.057	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Acetone	300	NA	5.00 U	5.0 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	NA	5.00 U	5.0 U	5.00 U	5.00 U	6.90	5.0 U	5.0 U	NA	5.00 U	5.0 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U
Benzene	0.8	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Carbon Tetrachloride	0.23	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chloroform	2	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethene	2.4	NA	0.20 U	0.23	0.20	0.20 U	0.21	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methylene Chloride	2	NA	1.00 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	NA	1.00 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	NA	1.00 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U
Tetrachloroethene	0.05	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Toluene	75	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,2-Dichloroethene	53.9	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.08	NA	0.020 U	0.0281	0.020 U	0.0234	0.020 U	0.0293	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.13	NA	**0.565**	**0.330**	**0.388**	0.097	**0.437**	**0.245**	**0.419**	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Total Petroleum Hydrocarbons (µg/L)																									
TPH-G (C7-C12)	800	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U
TPH-D (C12-C24)	500	NA	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U
TPH-O (C24-C40)	500	NA	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U
Proposed Monitoring		**Continue Monitoring for Vinyl Chloride. Drop Remaining VOCs**								**Drop**								**Drop**							

Analyte	Current Cleanup Levels [4]	Well ID [3]															
		Intermediate Zone CPOC Area															
		GW177I								GW179I							
		11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020	11/8/2016	3/2/2017	8/15/2017	3/5/2018	8/13/2018	3/5/2019	8/12/2019	3/11/2020
Volatile Organic Compounds (µg/L)																	
1,1,2,2-Tetrachloroethane	0.17	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
1,1,2-Trichloroethane	0.2	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloroethene	0.057	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Acetone	300	NA	5.00 U	7.08	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	NA	5.00 U	5.0 U	5.00 U	5.00 U	7.16	5.0 U	5.0 U
Benzene	0.8	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Carbon Tetrachloride	0.23	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chloroform	2	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethene	2.4	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methylene Chloride	2	NA	1.00 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	NA	1.00 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U
Tetrachloroethene	0.05	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Toluene	75	NA	0.20 U	0.20 U	0.25	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,2-Dichloroethene	53.9	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.08	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	NA	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.13	NA	**0.1820**	0.0871	0.0454	0.0303	0.0573	0.0339	0.020 U	NA	0.0632	0.020 U	0.0332	0.020 U	**0.1330**	0.0368	0.020 U
Total Petroleum Hydrocarbons (µg/L)																	
TPH-G (C7-C12)	800	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	100 U	100 U
TPH-D (C12-C24)	500	NA	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 UJ	100 U	100 U
TPH-O (C24-C40)	500	NA	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 UJ	200 U	200 U
Proposed Monitoring		**Drop**								**Drop**							

Notes:
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is an estimate.
   UJ = The analyte was not detected at the estimated reporting limit indicated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.
5. GW189S is the replacement well for GW168S.

Abbreviations:
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
NA = well not available for sampling
SWMU = solid waste management unit
TPH-D = total petroleum hydrocarbons as diesel
TPH-G = total petroleum hydrocarbons as gasoline
TPH-O = total petroleum hydrocarbons as oil

Table copied from Wood 1st Quarter 2020 Groundwater Sampling Report

TABLE 10: BUILDING 10-71 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1,2]

Boeing Renton Facility, Renton, Washington

Analyte	MTCA Cleanup Levels [3]	Well ID: 10-71-MW1							
		5/18/2016	11/10/2016	5/9/2017	11/14/2017	5/8/2018	11/12/2018	5/8/2019	11/11/2019
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	16	0.2 U	0.2 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Toluene	640	0.2 U	0.2 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	4	NA	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.29	0.2	0.2 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Proposed monitoring		**Drop**							

Analyte	MTCA Cleanup Levels [3]	Well ID: 10-71-MW2							
		5/18/2016	11/10/2016	5/9/2017	11/14/2017	5/8/2018	11/12/2018	5/8/2019	11/11/2019
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	16	0.2 U	0.2 U	0.20 U	0.20 U	0.20 U	0.25	0.20 U	0.20 U
Toluene	640	8.6	0.2 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	4	NA	NA	0.20 U	0.20 U	0.20 U	0.28	0.20 U	0.20 U
Vinyl Chloride	0.29	0.2	0.2 U	0.20 U	0.20 U	0.24	0.20 U	0.20 U	0.20 U
Proposed monitoring		**Drop**							

Analyte	MTCA Cleanup Levels [3]	Well ID: 10-71-MW4							
		5/18/2016	11/10/2016	5/9/2017	11/14/2017	5/8/2018	11/12/2018	5/8/2019	11/11/2019
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	16	0.2 U	0.2 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Toluene	640	0.2 U	0.2 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	4	NA	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.29	**0.3**	**0.3**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Proposed monitoring		**Drop**							

Notes

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the cleanup levels.
3. WAC 173-340-720 (7), Method B cleanup level based on applicable state or federal law with the level reduced such that the excess cancer risk does not exceed 1 x 10-5 or HI of 1.

Abbreviations

µg/L = micrograms per liter

TABLE 11: APRON A HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	MTCA Cleanup Levels [4]	Well ID [3] GW262S							
		11/17/2016	5/9/2017	11/14/2017	5/7/2018	11/13/2018	5/7/2019	11/11/2019	5/12/2020
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	16	0.2 U	0.20 U	0.21	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.29	0.2 U	**0.30**	0.29	0.25	0.20 U	0.20 U	0.20 U	0.20 U
Proposed monitoring		**Drop**							

Analyte	MTCA Cleanup Levels [4]	Well ID [3] GW264S							
		11/17/2016	5/9/2017	11/14/2017	5/7/2018	11/13/2018	5/7/2019	11/11/2019	5/12/2020
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	16	0.2 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.29	0.2 U	**3.4**	**0.97**	**1.63**	**0.55**	**1.39**	**0.38**	**1.48**
Proposed monitoring		**Continue Monitoring**							

Notes:

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well
4. WAC 173-340-720 (7), Method B cleanup level based on applicable state or federal law with the level reduced such that the excess cancer risk does not exceed 1 x 10-5 or HI of 1.

Abbreviations:

µg/L = micrograms per liter

TABLE 12: BUILDING 4-70 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	MTCA Cleanup Levels [4]	Well ID [3]							
		GW259S							
		8/23/2016	3/1/2017	8/17/2017	3/5/2018	8/15/2018	3/4/2019	8/13/2019	3/11/2020
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	16	0.6	0.2 U	0.3	0.20 U	0.49	0.42	0.61	0.26
Trichloroethene	4	1.0	0.2 U	0.6	0.26	0.70	0.39	0.71	0.37
Vinyl Chloride	0.29	0.2 U	0.2 U	0.2 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Proposed monitoring		**Drop**							

Analyte	MTCA Cleanup Levels [4]	Well ID [3]							
		GW260S							
		8/23/2016	3/1/2017	8/17/2017	3/5/2018	8/15/2018	3/4/2019	8/13/2019	3/11/2020
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	16	0.2 U	0.2 U	0.2 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	4	0.2 U	0.2 U	0.2 U	0.53	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.29	0.2	**0.3**	0.2	0.22	0.22	0.21	0.20 U	0.21
Proposed monitoring		**Drop**							

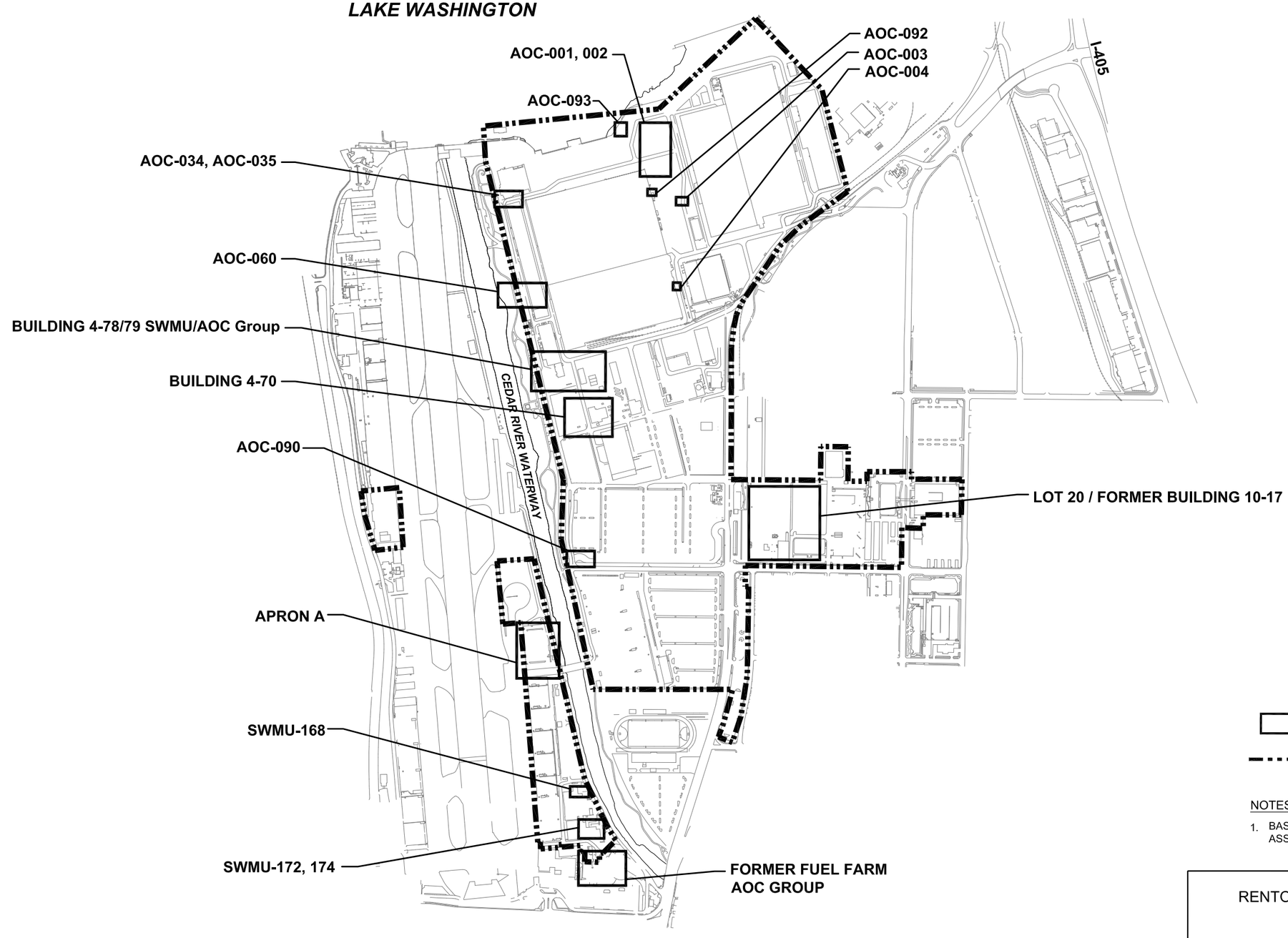
Notes:

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well
4. WAC 173-340-720 (7), Method B cleanup level based on applicable state or federal law with the level reduced such that the excess cancer risk does not exceed 1 x 10-5 or HI of 1.

Abbreviations:

µg/L = micrograms per liter

Figures



LEGEND

GENERAL LOCATION OF SWMUs AND AOCs

FACILITY BOUNDARY

NOTES

1. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES INC., DECEMBER, 1994

0 400 800

APPROXIMATE SCALE IN FEET

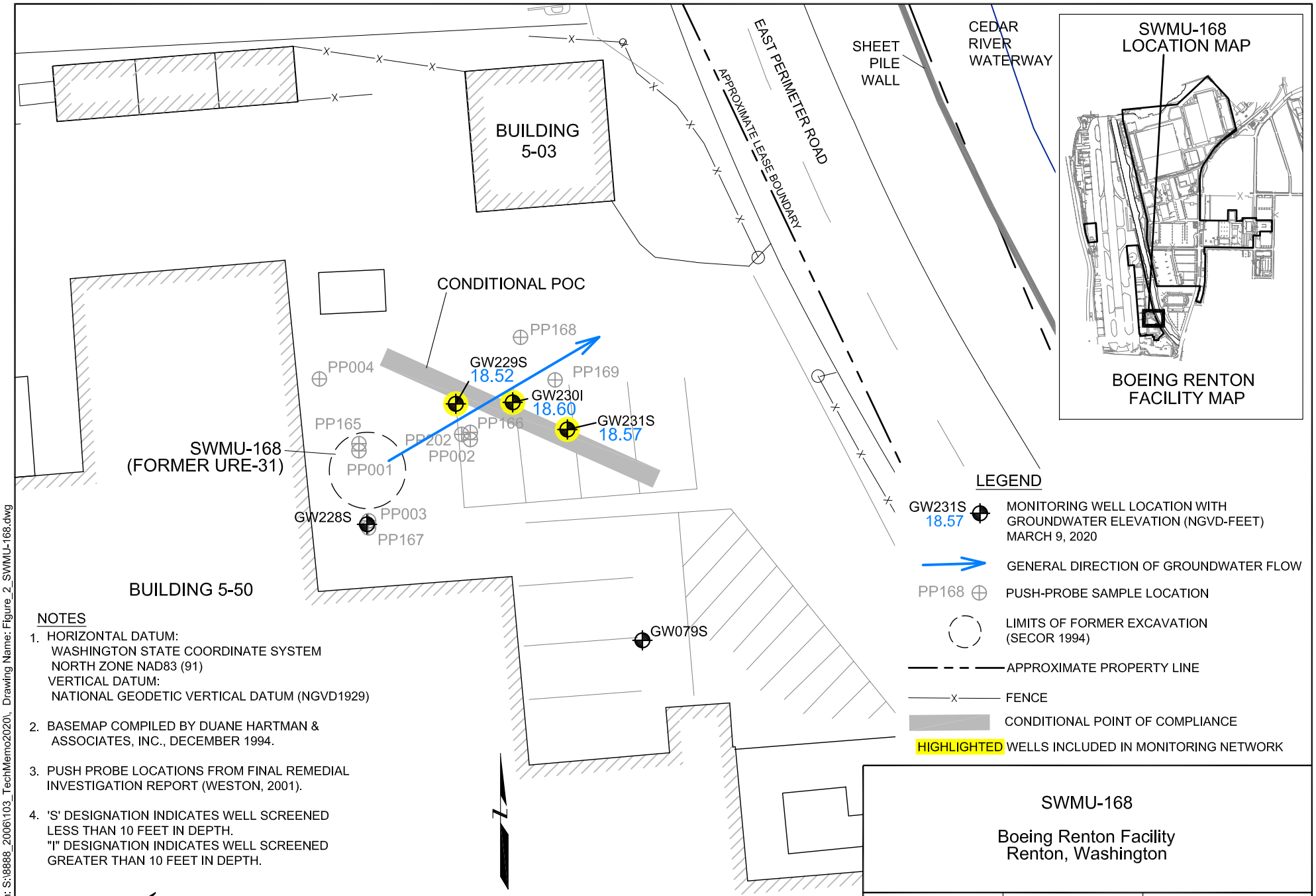
RENTON SWMU AND AOC LOCATIONS

Boeing Renton Facility
Renton, Washington

By: APS	Date: 06/30/20	Project No. PS20203450
wood.		Figure 1

BOEING

Plot Date: 06/30/20 - 8:37am, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\103_Tech\Mem\2020\, Drawing Name: BoeingRentonSiteMap_062920.dwg



NOTES

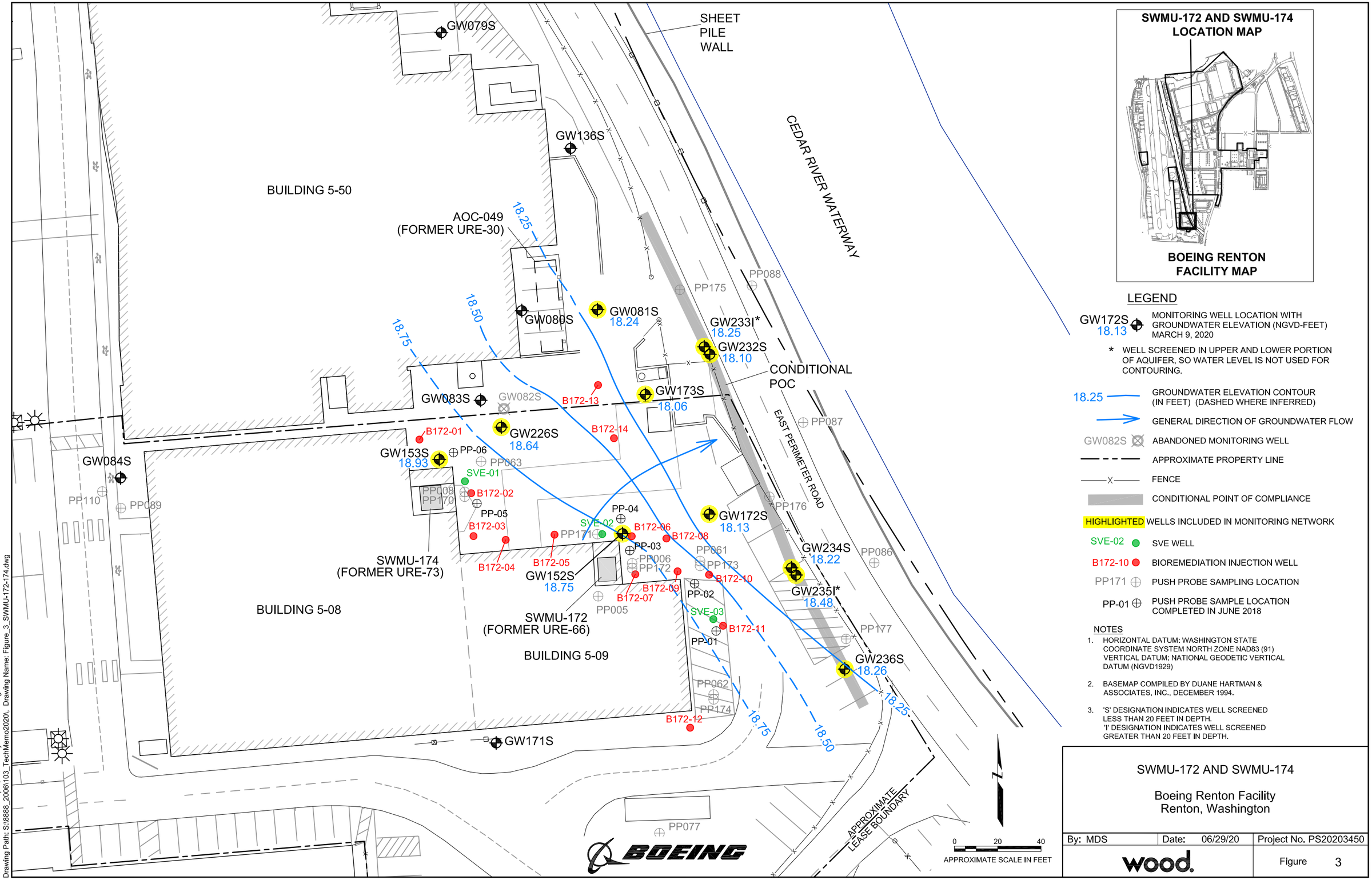
1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. PUSH PROBE LOCATIONS FROM FINAL REMEDIAL INVESTIGATION REPORT (WESTON, 2001).
4. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 10 FEET IN DEPTH.
   "I" DESIGNATION INDICATES WELL SCREENED GREATER THAN 10 FEET IN DEPTH.

0 10 20
APPROXIMATE SCALE IN FEET

SWMU-168

Boeing Renton Facility
Renton, Washington

By: APS	Date: 06/29/20	Project No. PS20203450
wood.	Figure	2



SWMU-172 AND SWMU-174 LOCATION MAP

BOEING RENTON FACILITY MAP

LEGEND

- GW172S 18.13 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET) MARCH 9, 2020
- * WELL SCREENED IN UPPER AND LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
- 18.25 — GROUNDWATER ELEVATION CONTOUR (IN FEET) (DASHED WHERE INFERRED)
- GENERAL DIRECTION OF GROUNDWATER FLOW
- GW082S — ABANDONED MONITORING WELL
- APPROXIMATE PROPERTY LINE
- FENCE
- CONDITIONAL POINT OF COMPLIANCE
- HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK
- SVE-02 — SVE WELL
- B172-10 — BIOREMEDIATION INJECTION WELL
- PP171 — PUSH PROBE SAMPLING LOCATION
- PP-01 — PUSH PROBE SAMPLE LOCATION COMPLETED IN JUNE 2018

NOTES

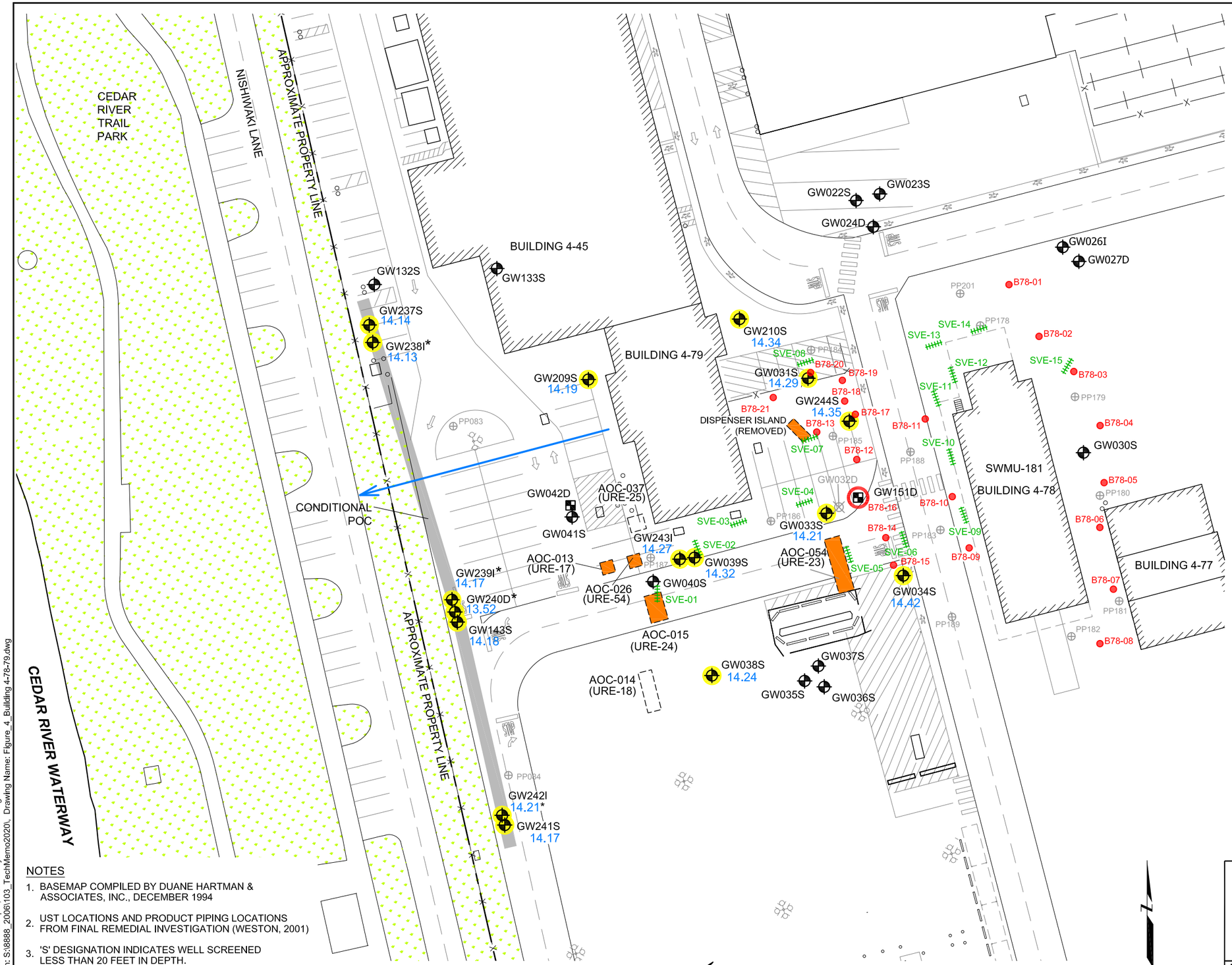
1. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE NAD83 (91)
   VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 20 FEET IN DEPTH.
   'I' DESIGNATION INDICATES WELL SCREENED GREATER THAN 20 FEET IN DEPTH.

SWMU-172 AND SWMU-174

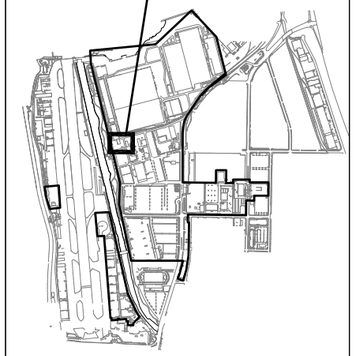
Boeing Renton Facility
Renton, Washington

By: MDS	Date: 06/29/20	Project No. PS20203450
wood.		Figure 3

Plot Date: 06/29/20 - 3:28pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\103_TechMemo2020\, Drawing Name: Figure_3_SWMU-172-174.dwg



4-78/79 SWMU/AOC GROUP LOCATION MAP



BOEING RENTON FACILITY MAP

LEGEND

- GW033S 14.21 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET) MARCH 10 and 11, 2020
- * WELL SCREENED IN UPPER AND LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
- GENERAL DIRECTION OF GROUNDWATER FLOW
- GW042D — EXTRACTION WELL
- GW032D — ABANDONED MONITORING WELL
- SVE-15 — HORIZONTAL SVE WELL
- B78-12 — BIOREMEDIATION INJECTION WELL
- EXTRACTION WELL CONVERTED TO INJECTION WELL
- PP083 — PUSH-PROBE SAMPLE LOCATION
- FENCE
- APPROXIMATE FUEL AND NON-CHLORINATED VOC SOURCE AREAS
- REMOVED UST (WESTON, 2001)
- CONDITIONAL POINT OF COMPLIANCE
- HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

NOTES

1. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994
2. UST LOCATIONS AND PRODUCT PIPING LOCATIONS FROM FINAL REMEDIAL INVESTIGATION (WESTON, 2001)
3. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 20 FEET IN DEPTH.
   'I' DESIGNATION INDICATES WELL SCREENED BETWEEN 20 AND 25 FEET IN DEPTH.
   'D' DESIGNATION INDICATES WELL SCREENED GREATER THAN 25 FEET IN DEPTH.

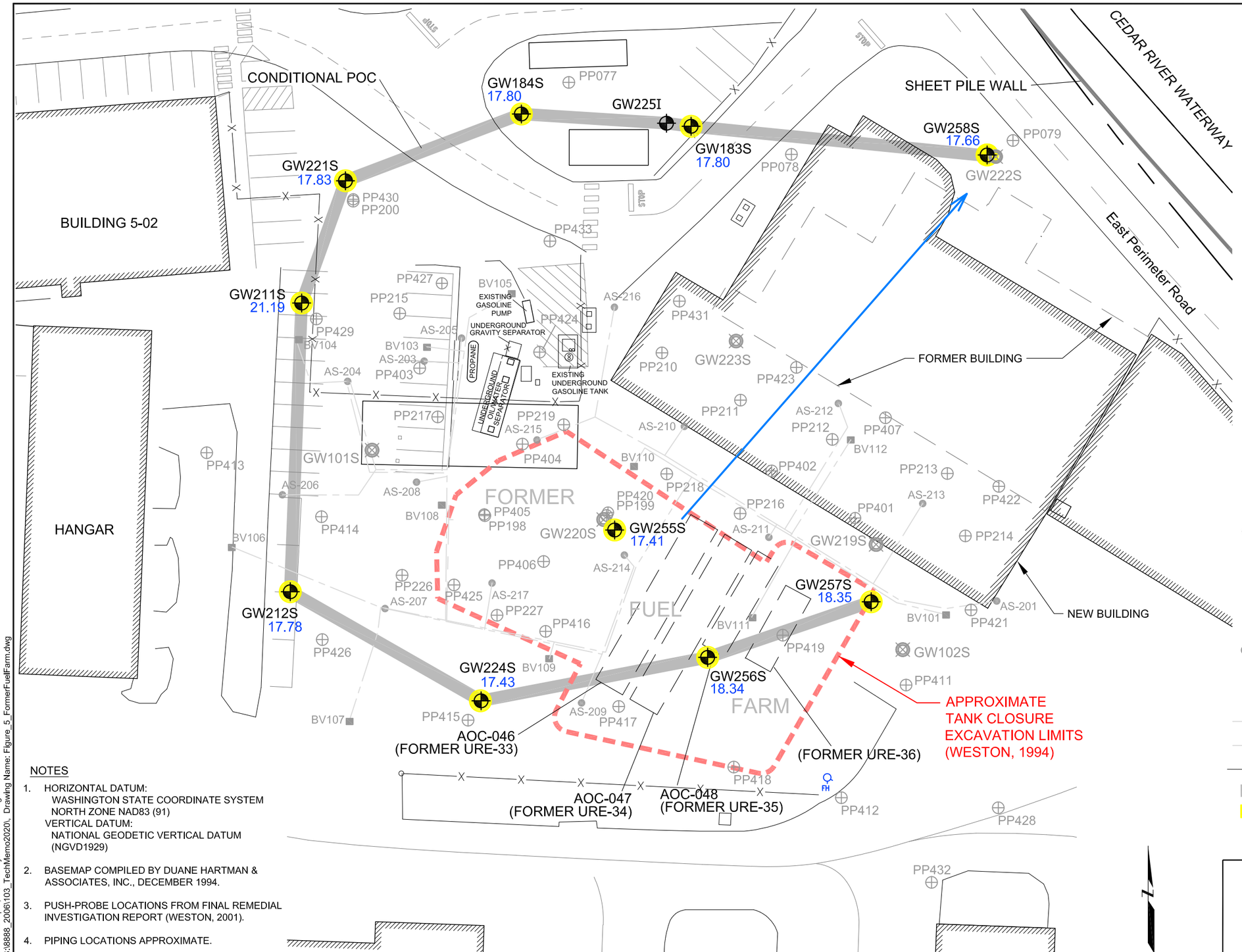
BOEING

BUILDING 4-78/79 SWMU/AOC GROUP

Boeing Renton Facility
Renton, Washington

By: MDS	Date: 06/29/20	Project No. PS20203450
wood.		Figure 4

Plot Date: 06/29/20 - 3:31pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\103_Tech\Memo2020\, Drawing Name: Figure_4_Building 4-78-79.dwg



LEGEND

- GW184S 17.80 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET) NOVEMBER 11, 2019
- * WELL SCREENED IN LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
- GENERAL DIRECTION OF GROUNDWATER FLOW
- PP042 — PUSH PROBE LOCATION
- GW222S — ABANDONED GROUNDWATER MONITORING WELL
- AS-204 — FORMER UNDERGROUND AIR SPARGING WELL
- BV112 — FORMER UNDERGROUND BIOVENTING WELL
- FORMER UNDERGROUND BIOVENTING LINE
- FORMER UNDERGROUND AIR SPARGING LINE
- FENCE
- CONDITIONAL POINT OF COMPLIANCE
- HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

NOTES

1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM
   (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. PUSH-PROBE LOCATIONS FROM FINAL REMEDIAL INVESTIGATION REPORT (WESTON, 2001).
4. PIPING LOCATIONS APPROXIMATE.
5. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 20 FEET IN DEPTH.
   'I' DESIGNATION INDICATES WELL SCREENED GREATER THAN 20 FEET IN DEPTH.

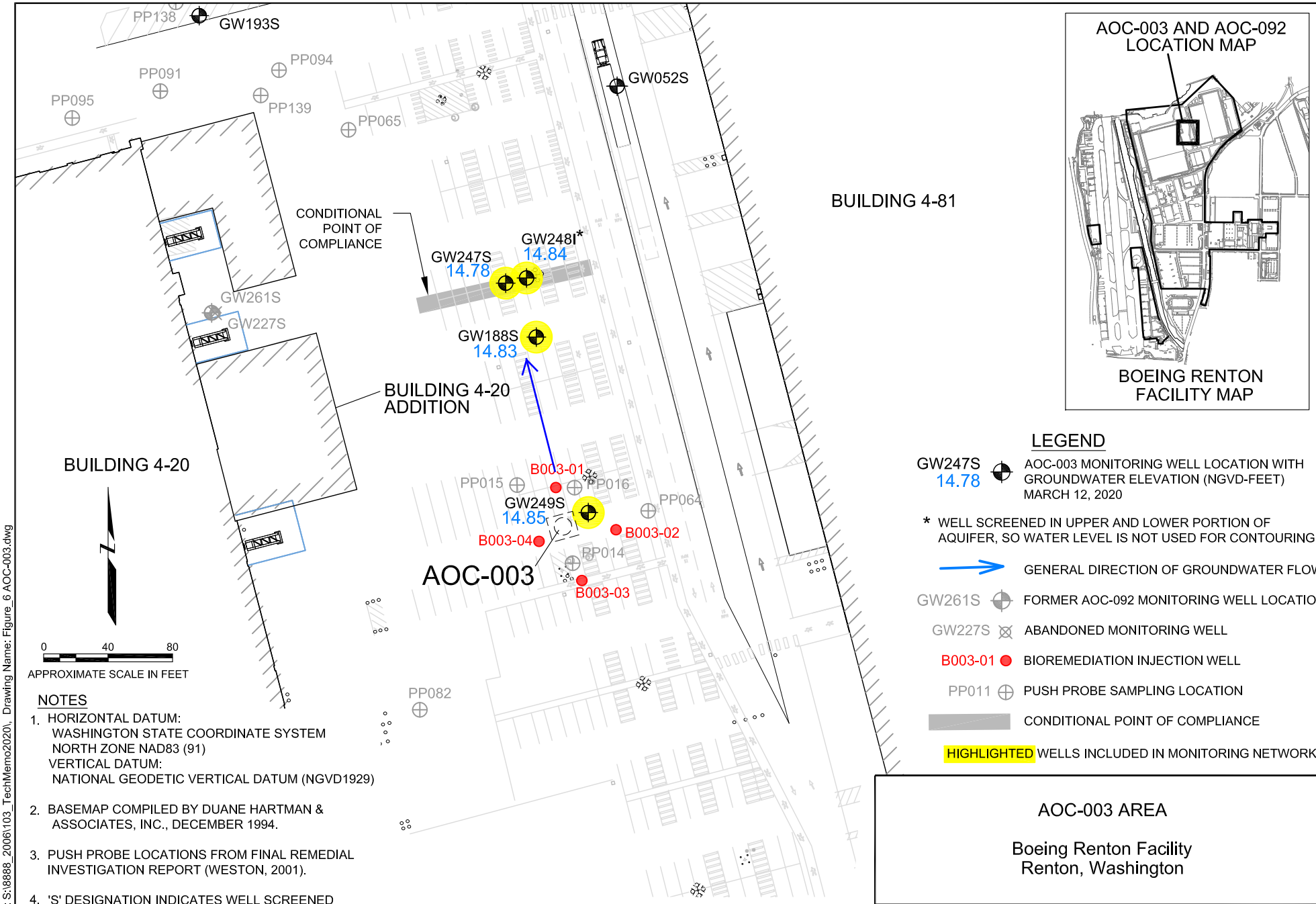
0 20 40
APPROXIMATE SCALE IN FEET

FORMER FUEL FARM AOC GROUP

Boeing Renton Facility
Renton, Washington

By: MDS	Date: 06/29/20	Project No. PS20203450
wood.		Figure 5

Plot Date: 06/29/20 - 3:33pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_20061\03_Tech\Memo2020\, Drawing Name: Figure_5_FormerFuelFarm.dwg



AOC-003 AND AOC-092
LOCATION MAP

BOEING RENTON
FACILITY MAP

LEGEND

GW247S 14.78 — AOC-003 MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET) MARCH 12, 2020

* WELL SCREENED IN UPPER AND LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.

GENERAL DIRECTION OF GROUNDWATER FLOW

GW261S — FORMER AOC-092 MONITORING WELL LOCATION

GW227S — ABANDONED MONITORING WELL

B003-01 — BIOREMEDIATION INJECTION WELL

PP011 — PUSH PROBE SAMPLING LOCATION

CONDITIONAL POINT OF COMPLIANCE

HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

NOTES

1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. PUSH PROBE LOCATIONS FROM FINAL REMEDIAL INVESTIGATION REPORT (WESTON, 2001).
4. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 10 FEET IN DEPTH.
   "I" DESIGNATION INDICATES WELL SCREENED GREATER THAN 10 FEET IN DEPTH.

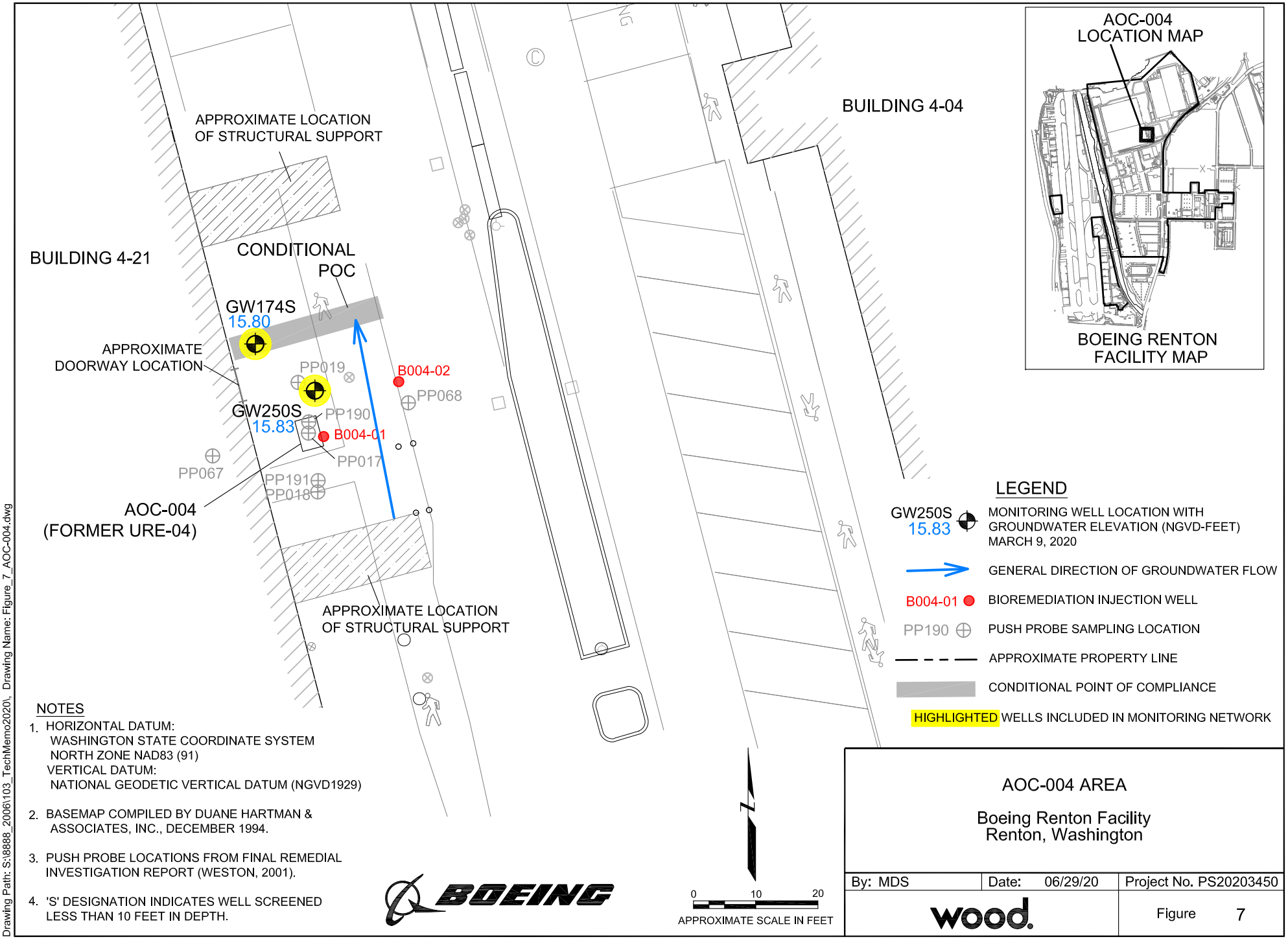
BOEING

AOC-003 AREA

Boeing Renton Facility
Renton, Washington

By: MDS	Date: 06/29/20	Project No. PS20203450
wood.		Figure 6

Plot Date: 06/29/20 - 3:38pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\103_TechMemo2020\, Drawing Name: Figure_6 AOC-003.dwg



NOTES

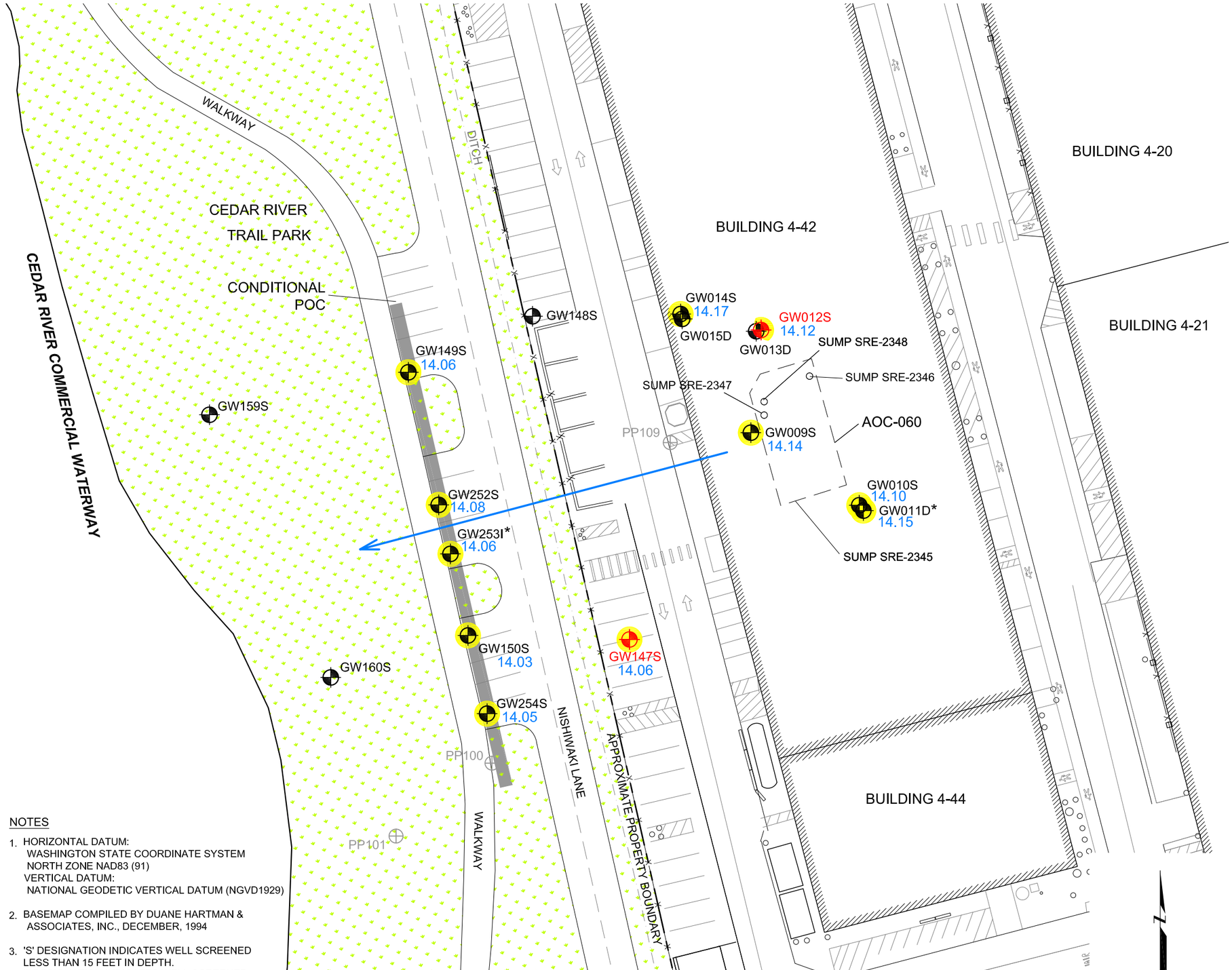
1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. PUSH PROBE LOCATIONS FROM FINAL REMEDIAL INVESTIGATION REPORT (WESTON, 2001).
4. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 10 FEET IN DEPTH.

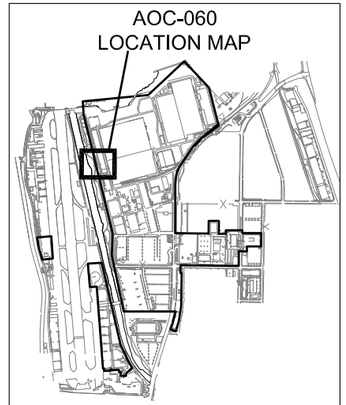
BOEING

AOC-004 AREA

Boeing Renton Facility
Renton, Washington

By: MDS	Date: 06/29/20	Project No. PS20203450
wood.		Figure 7





NOTES

1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)

2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER, 1994

3. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 15 FEET IN DEPTH.
   'I' DESIGNATION INDICATES WELL SCREENED BETWEEN 15 AND 29 FEET.
   'D' DESIGNATION INDICATES WELL SCREENED GREATER THAN 29 FEET IN DEPTH.

LEGEND

- GW252S 14.08 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET) MARCH 10, 2020
- * — WELL SCREENED IN LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
- GENERAL DIRECTION OF GROUNDWATER FLOW
- GW147S — ELECTRON DONOR INJECTION WELL AND MONITORING WELL
- PP109 — PUSH PROBE SAMPLING LOCATION
- APPROXIMATE PROPERTY LINE
- FENCE LINE
- CONDITIONAL POINT OF COMPLIANCE
- HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

0 20 40
APPROXIMATE SCALE IN FEET

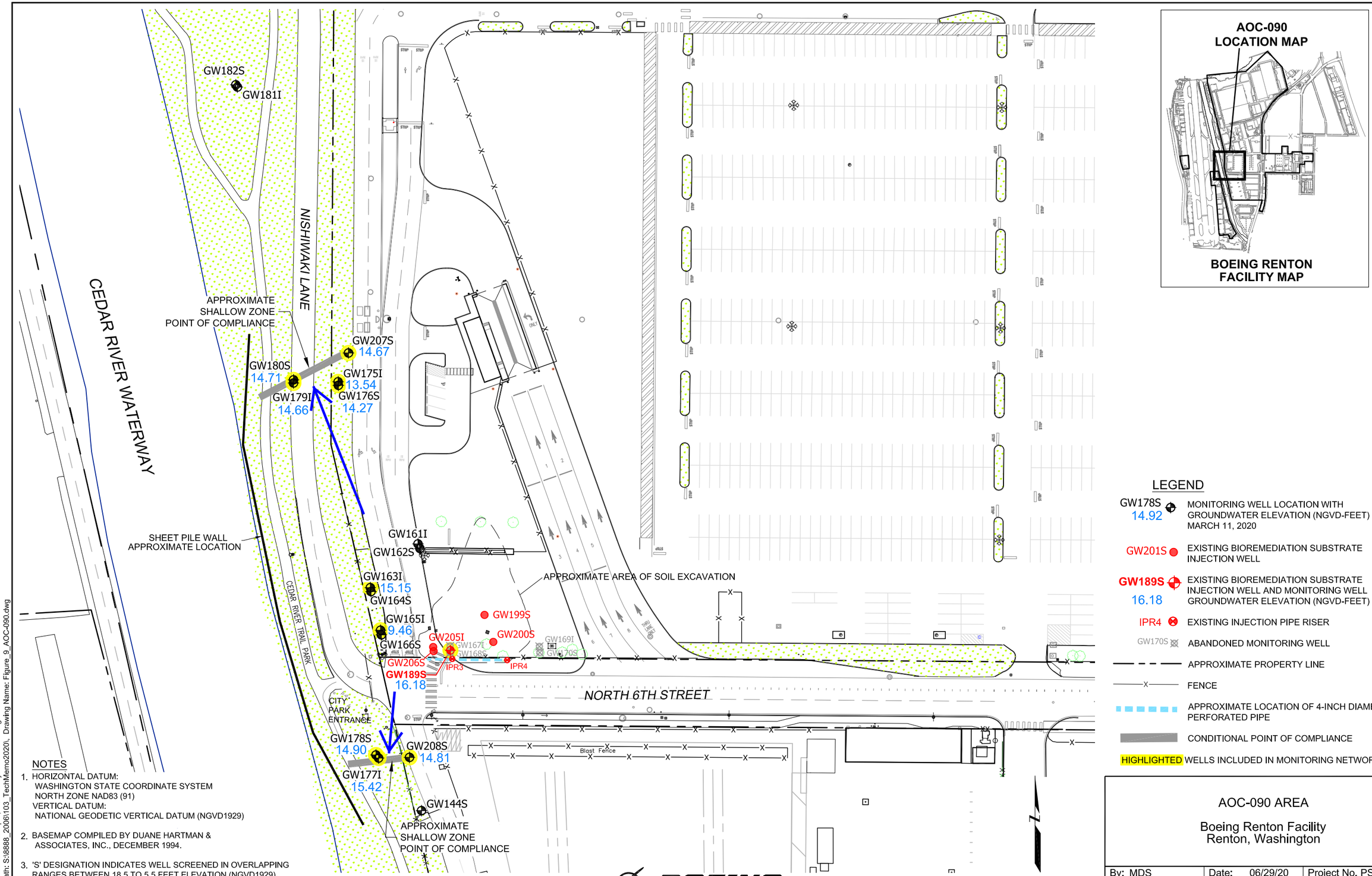
BOEING

AOC-060 AREA

Boeing Renton Facility
Renton, Washington

By: MDS	Date: 06/29/20	Project No. PS20203450
wood.		Figure 8

Plot Date: 06/29/20 - 3:44pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\103_Tech\Memo2020\, Drawing Name: Figure_8_AOC-060.dwg



AOC-090
LOCATION MAP

BOEING RENTON
FACILITY MAP

LEGEND

- GW178S 14.92 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET) MARCH 11, 2020
- GW201S — EXISTING BIOREMEDIATION SUBSTRATE INJECTION WELL
- GW189S 16.18 — EXISTING BIOREMEDIATION SUBSTRATE INJECTION WELL AND MONITORING WELL GROUNDWATER ELEVATION (NGVD-FEET)
- IPR4 — EXISTING INJECTION PIPE RISER
- GW170S — ABANDONED MONITORING WELL
- APPROXIMATE PROPERTY LINE
- FENCE
- APPROXIMATE LOCATION OF 4-INCH DIAMETER PERFORATED PIPE
- CONDITIONAL POINT OF COMPLIANCE
- HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

NOTES

1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. 'S' DESIGNATION INDICATES WELL SCREENED IN OVERLAPPING RANGES BETWEEN 18.5 TO 5.5 FEET ELEVATION (NGVD1929).
   'I' DESIGNATION INDICATES WELL SCREENED IN OVERLAPPING RANGES BETWEEN 1.0 TO -13.7 FEET IN ELEVATION (NGVD1929).

BOEING

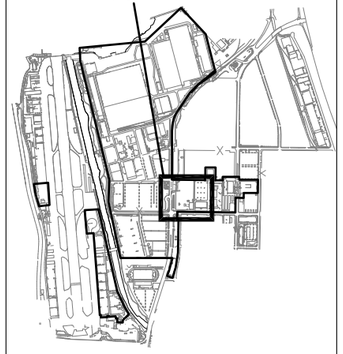
AOC-090 AREA

Boeing Renton Facility
Renton, Washington

By: MDS	Date: 06/29/20	Project No. PS20203450
wood.		Figure 9

Plot Date: 06/29/20 - 3:46pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\103_Tech\Memo2020\, Drawing Name: Figure_9_AOC-090.dwg

FORMER BUILDING 10-71 LOCATION MAP



BOEING RENTON FACILITY MAP

FORMER BUILDING 10-71 (DEMOLISHED)

MULTI-LEVEL PARKING GARAGE

10-71-MW4 20.21

10-71-MW3 NM

10-71-MW2 20.92

10-71-MW1 21.38

BUILDING 10-20

FORMER BUILDING 10-72

LOGAN AVE N

N 6TH ST

PAVED PARKING

LEGEND

10-71-MW4 20.21	MONITORING WELL LOCATION GROUNDWATER ELEVATION (NGVD-FT) NOVEMBER 11, 2019
NM	NOT MEASURED
→	GENERAL DIRECTION OF GROUNDWATER FLOW
10-71-MW2	ELECTRON DONOR INJECTION WELL AND MONITORING WELL LOCATION
— — —	APPROXIMATE PROPERTY LINE
— X —	FENCE
HIGHLIGHTED	WELLS INCLUDED IN MONITORING NETWORK

NOTES

1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.

0 40 80

APPROXIMATE SCALE IN FEET

BOEING

LOT 20 / FORMER BUILDING 10-71 AREA

Boeing Renton Facility
Renton, Washington

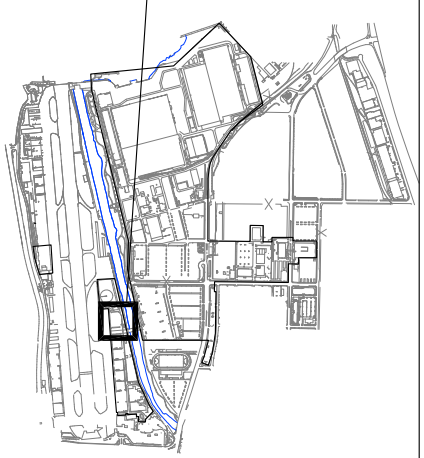
By: MDS	Date: 06/29/20	Project No. 8888
wood.		Figure 10

Plot Date: 06/29/20 - 3:57pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\103_Tech\Memo\2020_Drawing Name: Figure_10_FormerBldg10-71.dwg

Plot Date: 06/29/20 - 4:20pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\103_TechMemo2020\, Drawing Name: Figure_11_APRON A.dwg

B-4
B-3
B-6
SHED
SHED
SHED
SHED
SHED
CB
B-10
B-12
B-2
B-9
B-8
B-7
CB
B-17
B-1
B-16
BUILDING
B-13
B-14
B-15
GW265S
GW263S
NM
GW264S
6.04' DTW
GW262S
5.33' DTW
APPROXIMATE AREA
OF TRENCH INJECTION
CEDAR RIVER WATERWAY
EAST PERIMETER ROAD

APRON A
LOCATION MAP



BOEING RENTON
FACILITY MAP

LEGEND

GW264S 6.04' DTW	MONITORING WELL LOCATION WITH DEPTH TO WATER (BGS IN FEET) NOVEMBER 11, 2019
NM	NOT MEASURED
B-1	SOIL SAMPLE LOCATION
	APPROXIMATE PROPERTY LINE
x	FENCE

HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

N

0 20 40
APPROXIMATE SCALE IN FEET

BOEING

APRON A AREA

Boeing Renton Facility
Renton, Washington

By: MDS	Date: 06/29/20	Project No. 16096
wood.		Figure 11

GW038S

GW035S

GW036S

GW259S
14.41

GW260S
14.49

B70-1

B70-2

B70-3

B70-4

B70-5

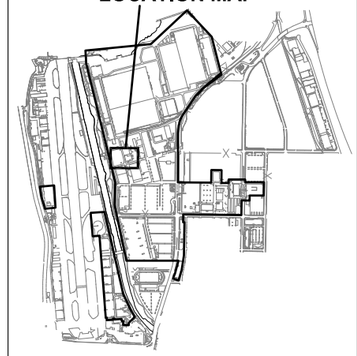
BUILDING 4-70

BUILDING 4-68

STOP

15 MPH

BUILDING 4-70 LOCATION MAP



BOEING RENTON FACILITY MAP

LEGEND

GW259S 14.41 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET) MARCH 11, 2020

GENERAL DIRECTION OF GROUNDWATER FLOW

B70-2 — ELECTRON DONOR INJECTION WELL

APPROXIMATE PROPERTY LINE

FENCE

CONDITIONAL POINT OF COMPLIANCE

HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

NOTES

1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. 'S' DESIGNATION INDICATES WELL SCREENED IN OVERLAPPING RANGES BETWEEN 18.5 TO 5.5 FEET ELEVATION (NGVD1929).
   'I' DESIGNATION INDICATES WELL SCREENED IN OVERLAPPING RANGES BETWEEN 1.0 TO -13.7 FEET IN ELEVATION (NGVD1929).

N

0 20 40

APPROXIMATE SCALE IN FEET

BOEING

BUILDING 4-70 AREA

Boeing Renton Facility
Renton, Washington

By: MDS	Date: 06/29/20	Project No. PS20203450
wood.		Figure 12

Plot Date: 06/29/20 - 4:34pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\103_Tech\Memo2020\, Drawing Name: Figure_12_Building 4-70.dwg

Attachment 1 – Revised Sampling Plan Table

(1st copy is marked-up version &
2nd copy includes all recommended modifications incorporated)

Revised Compliance Monitoring Plan, Addendum # 3, Boeing Renton Facility (as markup)

Cleanup Action Area	Frequency as [1]			Source Area Wells	Downgradient Plume Wells	CPOC Wells	Constituents of Concern	Analyses[2]
	Quarterly	Semiannual						
SWMU-168		X (3)		GW228S[3]	NA	~~GW229S,~~ GW230I, ~~and GW231S~~	VC	SW8260C SIM
SWMU-172/SWMU-174	~~X~~	X		GW152S and GW153S	~~GW081S,~~ GW172S, GW173S, and GW226S	GW232S, ~~GW233I,~~ GW234S, GW235I, and GW236S	*cis* -1,2-DCE, PCE, TCE, VC Arsenic, copper, and lead	SW8260C SIM EPA 6020A
Building 4-78/79 SWMU/AOC Group	~~X~~	X		GW031S, GW033S, GW034S, ~~GW039S, GW243I~~, and GW244S	~~GW038S, GW209S, and GW210S~~	GW143S, GW237S, ~~GW238I, GW239I,~~ GW240D, ~~GW241S, and GW242I~~	VC, TCE, *cis* -1,2-DCE, benzene TPH-gasoline	SW8260C NWTPH-Gx
Former Fuel Farm SWMU/AOC Group		X		~~GW255S~~	NA	~~GW183S, GW184S,~~ GW211S, ~~GW212S,~~ GW221S, GW224S, ~~GW256S, GW257S, and GW258S~~	TPH-jet fuel, TPH-diesel	NWTPH-Dx
AOC-001/AOC-002[4]				All wells closed with start of the Apron R construction			Benzene	SW8260C
							TCE, *cis* -1,2-DCE, 1,1-dichloroethene, VC	SW8260C SIM
AOC-003	~~X (CPOC wells~~)	X (all wells)		GW249S	GW188S	GW247S and GW248I	~~PCE, TCE cis -1,2-DCE,~~ VC	SW8260C ~~SIM~~
AOC-004		X		GW250S	NA	~~GW174S~~	Lead	EPA 6020A
AOC-034/AOC-035[5]	All sampling ended with Ecology approval (CULs met)							
AOC-92	All sampling ended with Ecology approval (CULs met)							
AOC-93	All sampling ended with Ecology approval (CULs met)							
AOC-060		X		GW009S	GW012S GW014S, GW147S	~~GW149S, GW252S,~~ GW150S GW253I, ~~and GW254S~~	VC TCE, cis -1,2-DCE	SW8260C SIM
AOC-090		X		GW189S	~~GW175I and~~ GW176S	~~GW163I, GW165I, GW177I,~~ GW178S, ~~GW179I, GW180S,~~ GW207S, and GW208S	~~1,1,2-Trichloroethane, acetone, benzene, toluene, carbon tetrachloride, chloroform, cis -1,2-DCE, trans -1,2-DCE, methylene chloride, 1,1-Dichloroethene, 1,1,2,2-tetrachloroethane~~, VC~~,~~ ~~PCE, TCE~~ ~~TPH-gasoline~~ ~~TPH-diesel, TPH-motor oil~~ CVOCs and TPH at GW189S and VC at remaining wells.	~~SW8260C~~ SW8260C SIM NWPTH-Gx NWTPH-Dx
Building 4-70 Area		~~X~~		NA	NA	~~GW259S and GW260S~~	~~TCE, *cis* -1,2-DCE, VC~~	~~SW8260C~~
Lot 20/Former Building 10-71		~~X~~		~~10-71-MW1, 10-71-MW2, and 10-71-MW4~~	NA	NA	~~Toluene, cis-1,2-DCE, TCE, VC~~	~~SW8260C~~
Apron A		X		~~GW262S and~~ GW264S	NA	NA	*cis* -1,2-DCE and VC	SW8260C

Notes:
1. The EDR presents the groundwater monitoring frequency for each SWMU/AOC. For sites with semiannual monitoring frequency, specific quarters when monitoring will be conducted is indicated by 1 for quarter 1, 2 for quarter 2, etc.
2. SIM methods will be used if the cleanup level is lower than the reporting limit achieved by the conventional 8260 method. If cleanup levels become higher or if the conventional 8260 methods are updated and able to achieve reporting limits below the cleanup levels, then the conventional method rather than the SIM method will be used.
3. GW228S will not be monitored - only the CPOC wells will be monitored on a semiannual basis for SWMU-168.
4. All wells in this area (AOC-001/002) were closed with start of the Apron R construction. Replacement of selected wells planned after construction is complete.
5. All sampling at AOC-034/035 was ended with Ecology approval dated April 30, 2019. Ecology noted the cleanup standards had been attained at the AOC-034/035 conditional point of compliance and further sampling dropped.

Abbreviations:
AOC = area of concern
cis -1,2-DCE = *cis* -1,2 dichloroethene
COCs = constituents of concern
CPOC = conditional point of compliance
Cr = chromium
EDR = Engineering Design Report
EPA = Environmental Protection Agency
NA = not applicable
PCE = tetrachloroethene
SIM = selected ion monitoring
SWMU = solid waste management unit
TCE = trichloroethene
TPH = total petroleum hydrocarbons
trans -1,2-DCE = *trans* -1,2 dichloroethene
VC = vinyl chloride

Cleanup Action Area	Frequency as [1]		Source Area Wells	Downgradient Plume Wells	CPOC Wells	Constituents of Concern	Analyses[2]
	Quarterly	Semiannual					
SWMU-168		X (3)	GW228S[3]	NA	GW230I	VC	SW8260C SIM
SWMU-172/SWMU-174		X	GW152S and GW153S	GW172S, GW173S, and GW226S	GW232S, GW234S, GW235I, and GW236S	*cis* -1,2-DCE, PCE, TCE, VC Arsenic, copper, and lead	SW8260C SIM EPA 6020A
Building 4-78/79 SWMU/AOC Group		X	GW031S, GW033S, GW034Sand GW244S		GW143S, GW237S, GW240D,	VC, TCE, *cis* -1,2-DCE, benzene TPH-gasoline	SW8260C NWTPH-Gx
Former Fuel Farm SWMU/AOC Group		X		NA	GW211S, GW221S, GW224S,	TPH-jet fuel, TPH-diesel	NWTPH-Dx
AOC-001/AOC-002[4]			All wells closed with start of the Apron R construction			Benzene	SW8260C
						TCE, *cis* -1,2-DCE, 1,1-dichloroethene, VC	SW8260C SIM
AOC-003		X (all wells)	GW249S	GW188S	GW247S and GW248I	VC	SW8260C
AOC-004		X	GW250S	NA		Lead	EPA 6020A
AOC-034/AOC-035[5]	All sampling ended with Ecology approval (CULs met)						
AOC-92	All sampling ended with Ecology approval (CULs met)						
AOC-93	All sampling ended with Ecology approval (CULs met)						
AOC-060		X	GW009S	GW012S GW014S, GW147S	GW150S, GW253I	VC TCE, cis -1,2-DCE	SW8260C SIM
AOC-090		X	GW189S	GW176S	GW178S, GW207S, and GW208S	CVOCs and TPH at GW189S and VC at remaining wells.	SW8260C SW8260 SIM NWPTH-Gx NWTPH-Dx
Building 4-70 Area			NA	NA	NA		
Lot 20/Former Building 10-71			NA	NA	NA		
Apron A		X	GW264S	NA	NA	*cis* -1,2-DCE and VC	SW8260C

Notes:
1. The EDR presents the groundwater monitoring frequency for each SWMU/AOC. For sites with semiannual monitoring frequency, specific quarters when monitoring will be conducted is indicated by 1 for quarter 1, 2 for quarter 2, etc.
2. SIM methods will be used if the cleanup level is lower than the reporting limit achieved by the conventional 8260 method. If cleanup levels become higher or if the conventional 8260 methods are updated and able to achieve reporting limits below the cleanup levels, then the conventional method rather than the SIM method will be used.
3. GW228S will not be monitored - only the CPOC wells will be monitored on a semiannual basis for SWMU-168.
4. All wells in this area (AOC-001/002) were closed with start of the Apron R construction. Replacement of selected wells planned after construction is complete.
5. All sampling at AOC-034/035 was ended with Ecology approval dated April 30, 2019. Ecology noted the cleanup standards had been attained at the AOC-034/035 conditional point of compliance and further sampling dropped.

Abbreviations:
AOC = area of concern
cis -1,2-DCE = *cis* -1,2 dichloroethene
COCs = constituents of concern
CPOC = conditional point of compliance
Cr = chromium
EDR = Engineering Design Report
EPA = Environmental Protection Agency
NA = not applicable
PCE = tetrachloroethene
SIM = selected ion monitoring
SWMU = solid waste management unit
TCE = trichloroethene
TPH = total petroleum hydrocarbons
VC = vinyl chloride