A-ZONE
ENVIRONMENTAL SERVICES

April 23, 2021

Commonwealth of Virginia Department of Environmental Quality
Northern Regional Office: Petroleum Remediation
13901 Crown Court
Woodbridge, Virginia 22193

Commonwealth of Virginia Department of Environmental Quality
Office of Remediation Programs
629 East Main Street
Richmond, Virginia 23219

Attention: Mr. Alexander Wardle, Project Manager
Mr. Vincent Maiden, Brownfields Program Coordinator

Subject: **Updated Risk Assessment Report**, Former Robinson Terminal North Property, 500 and 501 North Union Street, Alexandria, Virginia

Reference: VDEQ PC No. 2016-3090
VRP Site No. 00673
A-Zone Project No. 13-CI.001

Dear Mr. Wardle and Mr. Maiden:

Attached for your review is the *Updated Risk Assessment Report* (URAR) prepared by A-Zone Environmental Services, LLC (A-Zone) for the Former Robinson Terminal North property (herein referred to as the SITE) located at 500 and 501 North Union Street in Alexandria, Virginia. The URAR replaces the *Risk Assessment Report* (RAR) previously prepared for the SITE by ICOR, Ltd. (ICOR) and submitted to the Virginia Department of Environmental Quality (VDEQ) Petroleum Storage Tank Program (PSTP) and Voluntary Remediation Program (VRP) for review and comment on November 23, 2018. The primary reason for this update is due to a material change in the future use of the SITE since the submission of the RAR. At the time of the preparation of the RAR, entitlements allowed for future development of the SITE for potential mixed residential, retail, and commercial use. Such entitlements have now lapsed so the redevelopment is not proceeding. The 500 North Union Street parcel (500 Parcel) will continue to be used for warehousing. The warehouse at the 501 North Union Street parcel (501 Parcel) has been removed, although the slab remains. Alexandria Renew Enterprises (AlexRenew) is currently using the 500 Parcel for construction of a portion of its "RiverRenew" project. AlexRenew describes the project on its "riverrenew.com" website as:

> The AlexRenew program is called RiverRenew and features a new tunnel system that will connect to the four combined sewer outfalls, which currently pollute our waterways on rainy days. The tunnel system will capture millions of gallons of sewage mixed with rainwater for treatment at AlexRenew and the cleaned water will be returned to the Potomac River.

A full description of the project can be found on their AlexRenew's website. A generalized description and diagram depicting the proposed location of the tunnel in relation to the 500 Parcel is provided in the URAR. AlexRenew will have possession of 500 Parcel for the RiverRenew project into 2024. Any change in use of the SITE in the future will require at a minimum, City of Alexandria Planning Commission approval. The participant also has decided to prohibit the future use of the SITE for residential purposes as part of the VRP.

The VRP provided comments concerning the RAR on February 4, 2019. No comments were received from the PSTP. In addition to the change in current and future potential use of the SITE, the URAR addresses the VRP's comments and includes supplemental data collected over the past two years. Supplemental data includes several rounds of new groundwater analytical data obtained during Corrective Action Plan (CAP) Implementation Monitoring (IM) conducted by A-Zone.

As part of the CAP approval, the PSTP requested that semi-annual groundwater sampling of the groundwater monitoring well network be initiated in July 2019 and be continued every 6 months until the start of SITE redevelopment. When the CAP was generated, SITE redevelopment was anticipated to include mixed residential, retail, and commercial use multi-story structures; however, as noted the current and planned future use of the SITE has changed and future residential use will be prohibited as part of the VRP closure.

The URAR was prepared in accordance with current Virginia Unified Risk Assessment Model – VURAM User Guide (VURAM) guidelines. The URAR includes an updated Conceptual Site Model, addition of Exposure Pathway Analysis Tables 1.1A and 1.1B, and addresses potential risks to current site users in the SITE's current commercial/industrial land use scenario and future land use scenario with the prohibition on residential use.

In conjunction with submittal of this URAR, A-Zone is formerly requesting that the semi-annual groundwater sampling of the groundwater monitoring well network be amended to annual sampling based upon the continued use of the SITE for warehousing and the RiverRenew project.
If you have any questions concerning the URAR, please feel free to contact me at (703) 608-5969.

Sincerely,

Michael A. Bruzzesi, CPG
Project Manager
VA CPG No. 2801 001428

Attachment
Updated Risk Assessment Report

cc: Mr. Greg Hoffman, Alexandria North Terminal, LLC
Mr. Jim Thornhill, Wire Gill LLP

UPDATED RISK ASSESSMENT REPORT

FORMER ROBINSON TERMINAL NORTH PROPERTY
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VIRGINIA

VDEQ VRP# 00673
VDEQ PC# 2016-3090

Prepared for:

Commonwealth of Virginia Department of Environmental Quality
Northern Regional Office: Petroleum Remediation
13901 Crown Court
Woodbridge, Virginia 22193
(703) 583-3800

and

Office of Remediation Programs
629 East Main Street
Richmond, Virginia 23219
(804) 698-4021

On Behalf of:

Alexandria North Terminal, LLC
c/o Rooney Properties
3330 Washington Boulevard, Suite 220
Arlington, Virginia 22201
(571) 297-4833

Prepared by:

A-Zone Environmental Services, LLC
2181 Berryville Pike
Charles Town, West Virginia 25414
(304) 724-6458

A-Zone Project No. 6078.005

April 23, 2021

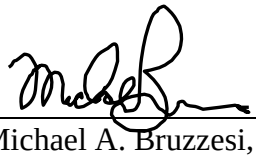
SIGNATURE SHEET

This *Updated Risk Assessment Report* (URAR) for the Former Robinson Terminal North property located at 500 and 501 North Union Street in Alexandria, Virginia, was prepared by:

April 23, 2021

Clifford A. Opdyke, PhD Date
Senior Risk Assessor

The URAR was reviewed and approved for release by:



April 23, 2021

Michael A. Bruzzesi, CPG Date
Project Manager/Senior Geologist
VA CPG No. 2801 001428

TABLE OF CONTENTS

FIGURES

TABLES

ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

AlexRenew	Alexandria Renew Enterprises
A-Zone	A-Zone Environmental Services, LLC
CAP	Corrective Action Plan
COPC	constituents of potential concern
CSM	Conceptual Site Model
EPA	United States Environmental Protection Agency
ICOR	ICOR, Ltd.
IM	Implementation Monitoring
mg/kg	milligram per kilogram
PCB	polychlorinated biphenyls
PC#	Pollution Compliant Number
PID	photo-ionization detector
PSCM	Post Site Characterization Monitoring
PSCMR	Post Site Characterization Monitoring Report
PSTP	Petroleum Storage Tank Program
PVC	polyvinyl chloride
RA	Risk Assessment
RAR	Risk Assessment Report
SCR	Site Characterization Report
SCS	Site Characterization Study
SVOC	semi-VOC
TAL	Target Analyte List
TCLP	Toxic Characteristic Leaching Procedure
TPH	total petroleum hydrocarbons
TPH-DRO	diesel range TPH
TPH-GRO	gasoline range TPH
URAR	Updated Risk Assessment Report
UST	underground storage tank
VDEQ	Commonwealth of Virginia Department of Environmental Quality
VI	vapor intrusion
VOC	volatile organic compound
VOV	volatile organic vapors
VURAM	Virginia Unified Risk Assessment Model
VRP	Voluntary Remediation Program

1.0 INTRODUCTION

This *Updated Risk Assessment Report* (RAR) prepared by A-Zone Environmental Services, LLC (A-Zone) assesses current and future risks associated with impacted media identified and documented at the Former Robinson Terminal North property (herein referred to as the SITE) located at 500 and 501 North Union Street in Alexandria, Virginia. The URAR replaces the *Risk Assessment Report* (RAR) previously prepared for the SITE by ICOR, Ltd. (ICOR) and submitted to the Virginia Department of Environmental Quality (VDEQ) Petroleum Storage Tank Program (PSTP) and Voluntary Remediation Program (VRP) for review and comment on November 23, 2018. The primary reason for this update is due to a material change in the future use of the SITE since the submission of the RAR. At the time of the preparation of the RAR, entitlements allowed for future development of the SITE for potential mixed residential, retail, and commercial use. Such entitlements have now lapsed so the redevelopment is not proceeding. The 500 North Union Street parcel (500 Parcel) will continue to be used for warehousing. The warehouse at the 501 North Union Street parcel (501 Parcel) has been removed, although the slab remains. Alexandria Renew Enterprises (AlexRenew) is currently using the 500 Parcel for construction of a portion of its "RiverRenew" project. AlexRenew describes the project on its "riverrenew.com" website as:

> The AlexRenew program is called RiverRenew and features a new tunnel system that will connect to the four combined sewer outfalls, which currently pollute our waterways on rainy days. The tunnel system will capture millions of gallons of sewage mixed with rainwater for treatment at AlexRenew and the cleaned water will be returned to the Potomac River.

A full description of the project can be found on AlexRenew's website. A generalized description and diagram depicting the proposed location of the tunnel in relation to the 500 Parcel is provided in Attachment 1. AlexRenew will have possession of 500 Parcel for the RiverRenew project into 2024. Any change in use of the SITE in the future will require at a minimum, City of Alexandria Planning Commission approval. The participant also has decided to prohibit the future use of the SITE for residential purposes as part of the VRP.

The VRP provided comments concerning the RAR on February 4, 2019. No comments were received from the PSTP. In addition to the change in current and future potential use of the SITE, the URAR addresses the VRP's comments and includes supplemental data collected over the last two years. Responses to VRP comments are included as Attachment 2. Supplemental data includes new groundwater analytical data obtained during Corrective Action Plan (CAP) Implementation Monitoring (IM) after submittal of the RAR.

As part of the CAP approval, the PSTP requested that semi-annual groundwater sampling of the groundwater monitoring well network be initiated in July 2019 and be continued every 6 months until the start of SITE development. At the time of the development of the CAP, SITE redevelopment was anticipated to include mixed residential, retail, and commercial use multi-story structures; however, as noted the current and planned future use of the SITE has changed and future residential use will be prohibited as part of the VRP closure.

The URAR was prepared in accordance with current Virginia Unified Risk Assessment Model – VURAM User Guide (VURAM) guidelines. The RAR includes an updated Conceptual Site Model (CSM) and addresses potential risks to current site users in a commercial/industrial land use scenario and future land use scenario with the prohibition on residential use. Also included are Exposure Pathway Analysis Tables 1.1A and 1.1B that further note where pathways that would otherwise be open will be closed by use of engineering and institutional controls.

2.0 BACKGROUND

The SITE is comprised of two parcels, the 500 and 501 Parcels, separated by North Union Street. The SITE is in a mixed commercial and residential land use area and is currently improved with a warehouse, paved parking lots, portion of a dock (pier), and landscaping. The warehouse is located at the 500 Parcel. The warehouse is currently used for storage of equipment and supplies and is not occupied on a regular basis. When the CAP was submitted, SITE redevelopment was anticipated to include mixed residential, retail, and commercial use multi-story structures; however, as noted the current and planned future use of the SITE has changed and future residential use will be prohibited. The current and only known future use is construction of the RiverRenew large stormwater infrastructure/utility project by AlexRenew on the 501 Parcel and continued use of the warehouse on the 500 Parcel.

Based on the findings of historical and recent environmental assessments, soil and groundwater beneath the SITE have been impacted by the past use of the SITE for bulk oil storage, fertilizer storage, coal storage, chemical mixing and manufacturing, and warehouse operations. Contributions to impacts from adjacent and nearby properties used in the past for fertilizer storage, city gas works, chemical manufacturing and mixing, and bulk oil storage are also suspected. Constituents of potential concern (COPC) identified at elevated concentrations in soil, groundwater, and soil gas at the SITE include gasoline and diesel range total petroleum hydrocarbons (TPH-GRO and TPH-DRO, respectively), volatile organic compounds (VOCs), semi-VOCs (SVOCs), and metals.

In 2016, the SITE was assigned Pollution Compliant number (PC#) 2016-3090 by the VDEQ PSTP to address a suspect release of petroleum from past storage tanks. When the SITE was assigned the PC#, the VDEQ mandated that a Site Characterization Study (SCS) be conducted to address the suspect release. The SITE was also entered into the VDEQ's VRP in 2016 and was assigned VRP number 00673. The SITE was entered into the VRP to address non-petroleum impacts, which are not typically addressed through the VDEQ's PSTP. The SCS was completed in February 2017 and a *Site Characterization Report* (SCR) was submitted to the VDEQ in August 2017. The VDEQ accepted the findings of the SCS in September 2017. Based on their review of the SCS, the VDEQ mandated further groundwater monitoring as part of a Post-Site Characterization Monitoring (PSCM) program. Several new groundwater monitoring wells were installed, and groundwater samples were collected for laboratory analysis on two occasions as part of the program. The findings of each sampling event were reported to the VDEQ. Based on the findings of PSCM events, the VDEQ mandated that a CAP be prepared for the SITE to address identified petroleum impacts to soil and groundwater. A CAP was submitted to the VDEQ in January 2019 and VDEQ granted approval in May 2019. The CAP detailed corrective

actions and engineering and institutional controls proposed to address the petroleum impacts. The SCS was conducted, and the SCR and CAP were prepared to satisfy PSTP and VRP SCS and SCR and PSTP CAP requirements.

As part of the PSTP CAP approval, the VDEQ requested that semi-annual groundwater sampling of the groundwater monitoring well network be initiated in July 2019 and be continued every 6 months until the start of SITE development. The IM activities were conducted in conformance with a VDEQ-approved SCS Work Plan (WP) prepared by ICOR, Ltd. (dated April 1, 2016) and two PSCM events conducted in January and June 2018. The PSCM activities were conducted to further evaluate the type, degree, and extent of soil and groundwater impacts and to further evaluate general risks posed by the impacts to current and future site users. The findings of the SCS and follow-up PSCM were used to develop a remedial approach (in the form of a CAP) that allows for successful development of the SITE and minimization of risks to human health and the environment.

The history of the SITE and detailed discussion of the SCS activities and findings were provided in the SCR. The corrective actions and engineering and institutional controls proposed to address the identified impacts based upon the then expected future use of the SITE were presented in the CAP.

In general, the historical groundwater sampling results indicate concentrations of target constituents have decreased or remained relatively stable over the last several years (with little variations between time of year); thus, A-Zone believes that the monitoring frequency can be reduced from a semi-annual to annual basis and formerly requests that the VDEQ PSTP approve this change to the monitoring frequency.

The URAR replaces the RAR prepared for the SITE by ICOR and submitted to the VDEQ PSTP and VRP for review and comment on November 23, 2018. The URAR addresses February 4, 2019 comments received by the VRP and includes supplemental data collected over the last two years. Supplemental data includes new groundwater analytical data obtained during CAP IM after submittal of the RAR.

3.0 SITE DESCRIPTION

The SITE is located at 500 and 501 North Union Street in Alexandria, Virginia, at the intersection of Oronoco Street and North Union Street. The 500 and 501 Parcels which comprise the SITE are separated by North Union Street. The two parcels encompass approximately 3.2 acres of land. In past reports, the parcel addresses have also been listed as 1 and 101 Oronoco Street (corresponding to the 500 and 501 Parcels, respectively). A site location map is included as Figure 1. The SITE is situated in a mixed commercial and residential land use area. Adjacent property use is depicted on the aerial photograph included as Figure 2.

The SITE is currently improved with one 1-story, slab-on-grade brick, concrete, and steel warehouse, a portion of a large concrete dock (pier), gravel and asphalt and concrete-paved parking areas, and landscaping. The warehouse is located at the 500 Parcel and is referred to as

Warehouse #16. The warehouse is currently used for storage of equipment and supplies and is not occupied on a regular basis. A vacant warehouse was formerly located at the 501 Parcel along with a small shed and railroad spur. The warehouse (referred to as Warehouse #10, #11, and #12) and shed were recently demolished and removed. The thick concrete building slab was left in place. At the time of demolition, the railroad spur was covered by gravel to create a driveway. Both warehouses were constructed in 1966. Three diesel underground storage tanks (USTs) were formerly buried on the northeastern portion of the 501 Parcel. The USTs were used to store and dispense diesel fuel via two dispensers located on the east-central portion of the 501 Parcel (next to the small woodshed). The tanks were removed in 2016. A site plan depicting existing conditions is included as Figure 3.

Topography at SITE is relatively flat. The SITE is bound to the north by Pendleton Street and railroad tracks across which is Oronoco Bay Park and Oronoco Bay, to the east and northeast by the Potomac River, to the south by Oronoco Street across which is Founders Park and a residential building, and to the west by Dalton Wharf Office Center and North Union Street.

4.0 SAMPLING METHODOLOGY AND ANALYSIS

Site sampling methodology and analytical methods can be found in the SCR, PSCM reports, and CAP IM reports. The sampling methods used were consistent with those recommended and approved by the VDEQ. A broad overview is presented below. Historical sampling locations (i.e., soil, groundwater, and soil gas) are depicted on Figure 4.

During historical assessment events, soil samples were collected using mobile drill rigs and direct-push sampling rigs. When a mobile drill rig was used, soil samples were collected at specified intervals using split-spoon samplers. When a direct-push rig was used, soil samples were collected continuously using acetate-lined barrel samplers. The soil samples were collected for lithologic characterization, visual inspection, field screening, and potential laboratory analysis. Field screening was conducted suing a photo-ionization detector (PID). Field screening was performed to check for the presence of volatile organic vapors (VOVs). Observations and field screening readings were recorded on boring logs.

Soil samples were collected for laboratory analysis from the surface (upper 1.5 feet of soil underlying bare site surface, concrete floor slabs, or pavement) and subsurface. The samples were collected from soil intervals exhibiting the highest degree of impact. Samples were also collected from depths suspected of being impacted based on the findings of a real-time assessment. The real-time assessment was performed using a direct-push rig fitted with downhole sensors that measured contaminant concentrations, soil resistivity, and hydraulic conditions. The samples were also collected to provide good spatial coverage of the SITE and to delineate the vertical extent of impacts. Most of the soil samples were grab samples; however, some of the early soil samples obtained are considered composite samples based on a large sample interval.

Soil samples have been analyzed for some or all of the following: TPH-GRO and TPH-DRO using EPA Method 8015C, Target Compound List (TCL) VOCs using EPA Method 8260B

(more recently using TerraCore® samplers), TCL SVOCs using EPA Method 8270C, polychlorinated biphenyls (PCBs) using EPA Method 8082, pesticides using EPA Method 8081B, herbicides using EPA Method 8151A, 2,3,7-TCDD using EPA Method 8290A, and Resource Conservation and Recovery Act (RCRA) or Priority Pollutant List metals using EPA Method 6020A. Based on the type and concentration of metals detected, some of the samples were additionally analyzed for Toxic Characteristic Leaching Procedure (TCLP) RCRA metals using EPA Method 301A/6020A and chromium VI using EPA Method 7196A.

Over the years, numerous temporary groundwater monitoring wells and 17 permanent groundwater monitoring wells were installed at the SITE. The temporary and permanent wells were installed using mobile drill rigs and direct-push sampling rigs. Permanent wells range from 1 to 2-inch in diameter and are constructed on polyvinyl chloride (PVC) well casing and screen. Screened intervals are typically 10 feet in length and have been positioned to "straddle" the water table (to allow for detection and measurement of petroleum free product if present). All wells were properly developed before sampling. Sampling over the last few years has been performed using low-flow sampling methods. Deep groundwater samples have also been collected at the SITE using discrete water samplers advanced using a direct-push sampling rig.

Groundwater samples collected have been analyzed for some or all of the following: TPH-DRO and TPH-GRO using EPA Method 8015, TCL VOCs using EPA Method 8260B, TCL SVOCs using EPA Method 8270C, and total and dissolved PPL metals using EPA Method 6020A. Samples collected for dissolved metals analysis were filtered in the field.

Sub-slab and deep soil gas samples were collected from the SITE on one occasion. The sub-slab samples were collected using VaporPins® installed through the warehouse slabs. Deep soil gas samples were collected from soil gas sampling points installed using a direct-push sampling rig. The sub-slab and deep soil gas samples were collected using Summa canisters and were analyzed for VOCs using EPA TO15.

5.0 CONCEPTUAL SITE MODEL

A-Zone developed a CSM in the SCR that identified potential receptors and potential exposure pathways under current land use (vacant commercial property with limited access) and future land use scenarios (commercial, retail, residential, or mixed use), and during construction; however, as noted the current and planned future use of the SITE has changed and future residential use will be prohibited as part of the VRP closure. The current and only known future use is construction of the RiverRenew large stormwater infrastructure/utility project by AlexRenew on the 501 Parcel and continued use of the warehouse on the 500 Parcel. Thus, the CSM has been revised to only include current land use (warehousing on 500 Parcel and the RiverRenew project on 501 Parcel). The revised CSM is included as Figure 5. On-site and off-site exposure pathways analysis are also summarized on Exposure Pathway Analysis Tables 1.1A and 1.1B, respectively, included as Attachment 3. The tables further note where pathways that would otherwise be open will be closed by use of engineering and institutional controls as discussed in the Conclusions and Recommendations (Section 7.0).

The CSM details the following:

- **Primary Release Mechanism**. Identification of the primary mechanisms by which the SITE became or continues to be impacted. The impacts appear to be the result of past site operations, with significant contribution from past operations at adjacent and nearby properties. No release mechanisms currently exist.

- **Source Media**. Identification of the affected media that continues to be a source of impacts. Source media at the SITE appears to be limited to impacted surface and subsurface soil.

- **Migration Pathway**. Identification of potential pathways by which impacted media can lead to potential exposure. Potential pathways identified included surface water runoff, biological uptake, leaching, and volatilization and diffusion.

- **Exposure Media**. Identification of media that provides a potential pathway of exposure. Potential exposure media identified includes soil, surface water and sediment, plants and animals, groundwater, and vapor.

- **Exposure Routes**. Identification of the routes by which exposure to impacted media may occur. Exposure routes identified include ingestion, dermal contact, and inhalation.

- **Potential Receptors**. Identification of potential receptors that could be exposed under current land use, future land use, and during construction.

Current Site Use Scenario

A-Zone believes that in the SITE's current use scenario no potential pathways of exposure are complete at the 500 Parcel and for most of the 501 Parcel. Exposure pathways related to the AlexRenew project currently underway at the 501 Parcel are discussed under the future site use scenario section. Potential receptors considered under this scenario include authorized workers and site visitors. A-Zone's opinion is based on the following:

- The 500 Parcel warehouse is currently vacant and access to the SITE is limited to authorized visitors and unauthorized access is restricted by locked building doors. Unauthorized access to the 501 Parcel is currently restricted by fencing.

- Soil and groundwater impacts are limited and localized in extent and most of the SITE surface, including the areas where the highest degree of soil and groundwater impacts was identified, is covered by thick concrete building slabs or pavement limiting the potential for contact with impacted media. The surfaced areas also limit the potential for erosion, surface water runoff, formation of dusts, and vapor intrusion (VI).

- The potential for impacted groundwater to discharge into the nearby Potomac River exists; however, the concentrations of constituents detected in the wells located nearest to the shoreline contained constituents of concern at relatively low concentrations except for benzene, naphthalene, arsenic, lead, and zinc. Arsenic, lead, and zinc have relatively low

mobility and are not expected to migrate readily or extensively. The potential risks to surface water were further assessed through this updated RA and PSCM activities.

- The SITE is not used for agricultural purposes and A-Zone is not aware of any sensitive animal species living on or using the SITE for any purpose.
- Groundwater is not used at the SITE or in the City of Alexandria as a potable or irrigation water source.

- The 500 Parcel warehouse is mostly vacant with small portions occasionally used for storage. The warehouse is not occupied on a regular basis limiting the potential for inhalation of vapors should VI occur. All utilities supplying the 500 Parcel have been disconnected. The building at the 501 Parcel has been removed and the slab remains in place limiting the potential for accumulation and inhalation of vapors should VI occur. In addition, the soil gas analytical data from both parcels does not suggest VOCs are present at concentrations presenting a VI risk (this has been confirmed through VURAM Site Screening, see Section 6.0).

A-Zone also believes that these conditions limit the risk to users of surrounding properties.

Future Site Use Scenario

A-Zone believes that the AlexRenew RiverRenew project presents a potential pathway of exposure for workers during construction. The potential for exposure will be minimized by AlexRenew through implementation of safety and health procedures for workers working in and around impacted areas, and proper management, handling, and disposal of impacted soil and groundwater generated during construction as required under applicable law. Pathways of exposure likely to be considered complete include dermal contact with surface and subsurface soil, groundwater encountered in a trench, and possible vapors from volatile constituents in a trench. It should be noted that the AlexRenew project is being constructed on the northeastern portion of the 501 Parcel which has minimal impacts. Additionally, Alex Renew will have to comply with the City's erosion and sediment control requirements to protect against impacts from runoff from the SITE during construction. Any contaminated soil excavated by AlexRenew in construction will have to be handled in accordance with the Virginia Solid Waste Management Regulations and any contaminated groundwater that AlexRenew may need to discharge will be governed by the State Water Control Law. Such requirements also apply to any other future construction and utility line work that will occur on the SITE.

Surrounding and Nearby Properties

It should be noted that the 501 Parcel is surrounded by roads or the Potomac River. The 500 Parcel is surrounded by roads on its northern, eastern, and southern sides and commercial use property on its western side. The closest residential properties are located across the roads and commercial property to the northwest, west, and southwest. Adjacent property use is depicted on Figure 2.

The exposure risk to surrounding and nearby properties from SITE releases, including residents at residential use properties, workers, and visitors at surrounding commercial use properties, and visitors of Founders and Oronoco Bay Parks, is anticipated to be minimal based on the following:

- Soil and groundwater impacts appear to be limited and localized in extent and most of the impacted media is covered by building slabs or pavement limiting the potential for disturbance of and contact with the impacted media and potential for erosion, surface water runoff, and formation of dusts.

- The potential for impacted groundwater to discharge into the nearby Potomac River exists; however, the concentrations of constituents detected in the wells located nearest to the shoreline contained constituents of concern at relatively low concentrations except for benzene, naphthalene, arsenic, lead, and zinc. Arsenic, lead, and zinc have relatively low mobility and are not expected to migrate readily or extensively. The potential risks to surface water were further assessed through this RA.

- Based on groundwater measurement data obtained from SITE, groundwater flow is towards the east-northeast, away from surrounding properties of concern.

- Historical and recently collected data suggest that the properties bounding the SITE to the west and south are hydraulically upgradient of the SITE and the data does not indicate that they have been impacted by the SITE.

- Groundwater is not used in the City of Alexandria as a potable or irrigation water source.

6.0 RISK ASSESSMENT

According to the VDEQ VRP "The regulatory basis for performing risk assessments under the Virginia Voluntary Remediation Program is found in the Voluntary Remediation Regulations section 9 VAC 20-160-70(A)(1)(a). The risk assessment….should include an evaluation of the risks to human health and the environment posed by the release."

The RA described below was conducted according to the methodology presented in the VRP Risk Assessment Guidance and attempts to quantify potential human health risks posed by constituents released into the environment. The basic steps in completing the RA include identification of the constituents present in the environmental media, assessment of population exposure and exposure pathways, assessment of the constituent's toxicity to the exposed populations, and a summary of human health risks.

The VRP Risk Assessment Guidance allows for the comparison of laboratory data collected from the SITE to any or all three screening levels, Tier I, Tier II, and/or Tier III.

- In Tier I screening, constituent concentrations from the SITE for all media of concern are compared to those from background samples collected from nearby areas that have not been affected by the substances of concern. If concentrations from the affected area exceed background levels, the participant may choose to employ Tier II or Tier III screening methods. Note that Tier I screening is not required and participants in the VRP may choose to begin with Tier II screening.

- In Tier II screening, constituent concentrations from the SITE for all media of concern are compared to medium specific values obtained from published sources, such as the EPA Region III Regional Screening Level Tables, the EPA Soil Screening Guidance, maximum constituent levels or other action levels established by the Safe Drinking Water Act and the National Primary Drinking Water Regulations. Tier II screening is intended for unrestricted use sites (e.g., residential). Tier II levels for soil and groundwater are based on the assumption of residential exposure.

- Tier III screening is based upon site-specific analysis that weighs current and potential exposure scenarios for the population(s) of concern and characteristics for the affected media. Tier III screening is used for sites that are or will be formally restricted to a specified use and is not intended for unrestricted use properties.

Screening of the data has been accomplished and is presented using the VURAM screening module and is presented in Attachment 4. Soil, groundwater, sub-slab soil gas, and deep soil gas samples were collected to characterize and define the extent of impacts at the SITE. Historical sampling locations are depicted on Figure 4. Only the detected compounds and their respective concentrations are shown on Tables 1 through 12, summarizing soil, groundwater, sub-slab soil gas, and deep soil gas results. Those constituents that exceeded VDEQ screening values and determined to be COPCs are listed below by media.

COPCs for Soil

- Arsenic, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Biphenyl, 1,1-, Dibenz(a,h)anthracene, Dibenzofuran, Indeno(1,2,3-c,d)pyrene, Lead, Mercury, Naphthalene, Thallium.

COPCs for Groundwater (only for Construction Worker receptor)

- Arsenic, Benzene, Beryllium, Biphenyl, Cadmium, Chloroform, Chromium, Copper, Cumene, Mercury, 2-Methylnaphthalene, Naphthalene, Pentachlorophenol, Tetrachloroethylene (PCE), Trichloroethylene (TCE), m-Xylene, o-Xylene.

There were no VDEQ screening levels that were exceeded for the tested constituents in soil gas; therefore, there was no risk assessment run for VI. VOCs were generally not at high enough concentrations to pose future risk, as evidenced by lack of COPC selection; however, even if a receptor might be exposed to far longer times indoors at SITE locations the possibility for risk is small. As Site constituents are migrating, slowly, off-site toward the river, the possibility for nearby residents to possibly be impacted by the low concentrations of VOCs that exist at the SITE becomes more remote.

The COPCs for groundwater were only considered for construction worker receptors that could encounter groundwater in a trench and may have incidental ingestion. All other receptor types would not be drinking the groundwater at the SITE or vicinity as the City of Alexandria provides drinking water to residents and workers and the VRP participant intends to prohibit future groundwater use on SITE.

VURAM was used to run the risks to SITE media as directed by VDEQ. All exposure defaults, toxicity values, and physical parameters of the constituents of concern chosen for SITE media are contained within databases found in the VURAM model maintained by VDEQ so that VRP RAs will be consistent from site to site. None of the defaults provided by VDEQ within their VURAM model were changed or altered in any way for the risk outputs provided in this RAR.
The VURAM model was run for the following future receptor types: industrial/commercial worker and construction worker. It was assumed that the risk to SITE workers would exceed any risk posed by SITE media to an occasional visitor.

COPCs Exposure Point Concentrations

VDEQ recommends using maximum concentrations for soil and soil gas results. Groundwater results were input into the EPA upper confidence limit model called "ProUCL" and the results and output from using that model to determine the exposure point concentrations are found in Attachment 5. Certain constituents contained too few detected concentrations to enable running the ProUCL model and in those instances (e.g., arsenic) the highest concentration was used as input for VURAM. One constituent, mercury, which was found to be present in several historical groundwater samples, was not detected in samples taken within the past four years; therefore, even though mercury was chosen as a COPC in groundwater, quantitative risk was not run for this constituent. Where quantitative limits of detection were input in the tables for nondetects in certain samples, then the ProUCL model was run using both detected and nondetected concentrations. Groundwater results sample for the past four years (2016 through 2020) were used for derivation of mean concentrations using the ProUCL model.

Surface Water

Benzene, toluene, 2,4-dichlorophenol, and pentachlorophenol were VOCs or SVOCs that exceeded a freshwater criteria as noted in Tables 9 and 10; however, these values were measured in groundwater and not in the Potomac River near the SITE. As the SCR points out, any concentrations of constituents that entered the Potomac River from the SITE groundwater would be subject to the physical dilution and mixing with the river; thus, greatly diminishing the constituent concentrations. The degree of constituent concentration decrease is dependent on the volume of the receiving river, which in this case is large, and the flow of the river, which is considerable. The World Health Organization published some rough dilution factor estimates based on original research cited in their publication: "Protecting Surface Water for Health"[1]. The dilution factors published were based on wastewater effluent being released directly into a river, which is far greater mass flux than what is ever contemplated with groundwater releases to rivers. The dilution factors for this situation ranged from 44 to 529 with the smaller value associated with small rivers possessing low width, depth, and flow rates, to large rivers, such as the Potomac River, with correspondingly higher flow rates, and are both wider and deeper. To be below the screening levels, the dilution factor need only be 2 as there are no VOCs or SVOCs with concentrations that are two times higher than the screening value. Given this reality, there is no concern for VOCs or SVOCs entering the river from the SITE.

[1] *Protecting Surface Water for Health; Identifying, Assessing and Managing Drinking-Water Quality Risks in Surface–Water Catchments* World Health Organization, Geneva, Switzerland, 2016.

Risk Results

- **Industrial/Commercial Worker -** The industrial/commercial receptor module within VURAM was used to assess risk to a possible future SITE worker and results of the model output can be found in Attachment 6. The non-cancer hazard index exceeded 1 at 11.4. The carcinogenic risk also exceeded the 1E-04 action level at 1.24E-03. As dictated by VDEQ within the worker receptor module, a declaration was made that the groundwater use was restricted at the SITE. The non-cancer hazard is due mainly to arsenic at nearly 45% of the total excess hazard. Likewise, the carcinogenic risk is nearly entirely, 67%, due to the presence of arsenic.

- **Construction Worker -** The construction worker receptor module within VURAM was used to assess risk to a possible future SITE construction worker and results of the model output can be found in Attachment 7. The non-cancer hazard index exceeded 1 at 51.9. The carcinogenic risk did not exceed the 1E-04 action level at 1.8E-04. The non-cancer hazard is due mainly to arsenic at over 54% of the total excess hazard. Likewise, arsenic in soil accounts for over 77% of the total carcinogenic risk. It should be noted that although chromium VI presents risk in this assessment, the chromium found in SITE soils and groundwater is most likely in the far less toxic III valent state; however, the testing of SITE media for chromium VI was limited, so this cannot be stated definitively.

Risk is not run within VURAM for lead in soil; however, the exposure point concentration for lead was calculated to be 2,200 milligram per kilogram (mg/kg) in soil (the maximum concentration found historically), which does exceed the commercial/worker EPA screening level of 800 mg/kg and may pose a chronic risk if SITE soils were exposed in that location.

7.0 CONCLUSIONS AND RECOMMENDATIONS

A-Zone believes that in the SITE's current use scenario no potential pathways of exposure are complete at the SITE for industrial/commercial workers. Soil and groundwater impacts are limited and localized in extent and most of the existing SITE surface, including the areas where the highest degree of soil and groundwater impacts was identified, is covered by thick concrete building slabs or pavement limiting the potential for contact with impacted media. Construction associated with AlexRenew's RiverRenew project could result in worker exposures; however, use of a worker health and safety plan for such construction will close such exposure pathway. Additionally, two feet of clean fill or hardscape cover will need to be returned to disturbed areas post construction to assure that the commercial/industrial worker exposure pathway remains closed.

Also, certain potential exposure risks will be minimized during on SITE construction or future utility line work as required under applicable law. Contaminated soil unearthed during excavation is required to be handled and disposed in accordance with the Virginia Solid Waste Management Regulations and contaminated groundwater encountered during excavation is required to be disposed or discharged in accordance with the State Water Control Law.

Based on the findings of the RA, without the implementation of engineering controls and institutional controls there is risk from impacted SITE soil to both future receptor types selected: site commercial worker and construction worker. The risk to these receptors is largely dictated by the presence of arsenic in soil. Naphthalene in groundwater does pose a hazard to the construction worker working in a trench should the worker incidentally drink groundwater; however, this scenario is unlikely and can be minimized through development of worker health and safety procedures and protocols.

VOCs were not at high enough concentrations to pose future onsite risk, as evidenced by lack of COPCs. The soil gas analytical results do not support the presence of a VI risk onsite or offsite from the SITE. It should be noted that many of the surrounding properties are/have been contaminated by historical operations not related to those conducted at the SITE (e.g., fertilizer storage, city gas works, chemical manufacturing and mixing, and bulk oil storage).
A-Zone, after consultation with the VRP participant, proposes the following engineering controls and institutional controls be imposed on the SITE through restrictive covenants recorded with the Certification of Satisfactory Completion of Remediation issued under the VRP to close the potential exposure pathways:

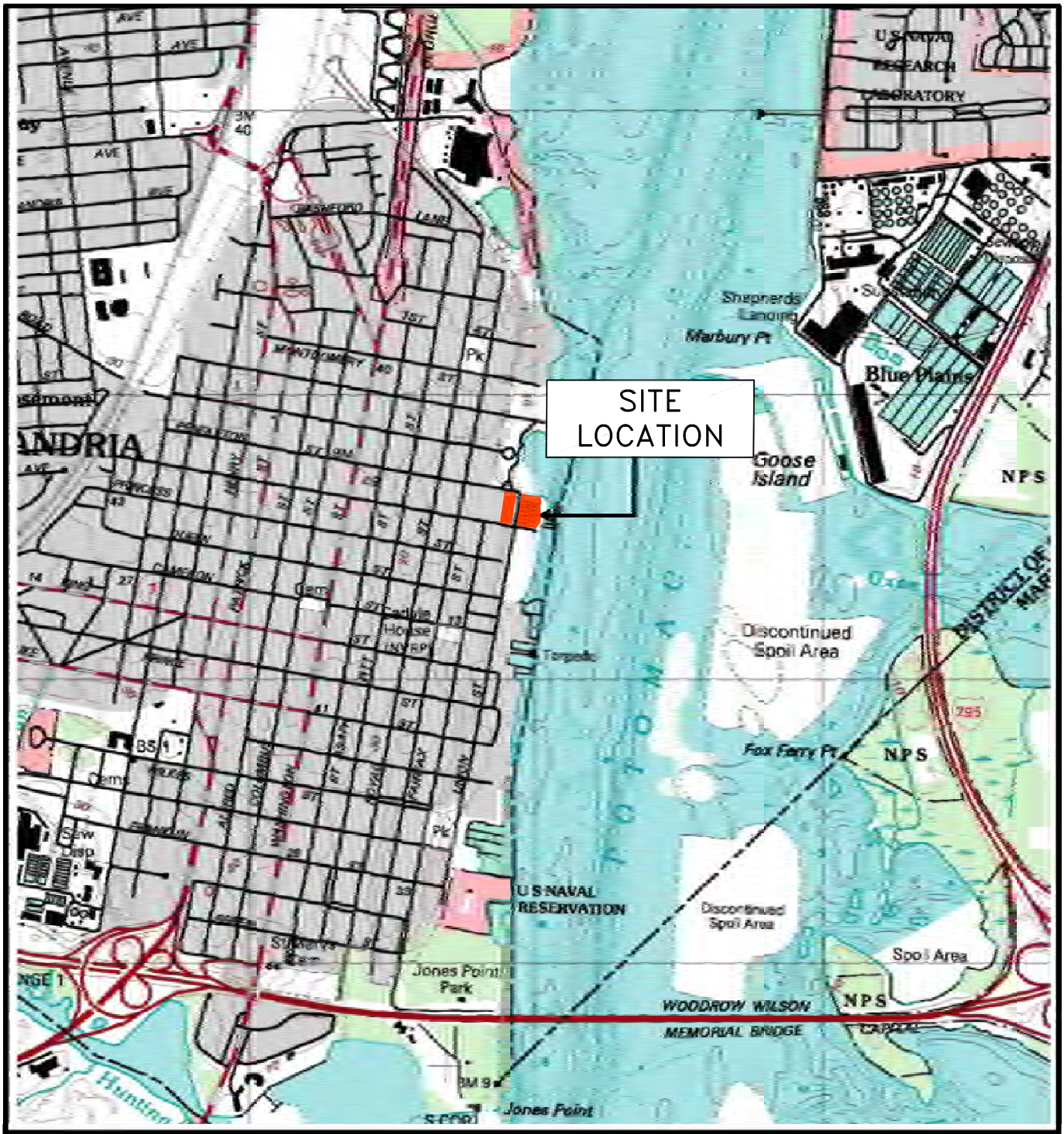
1. No groundwater wells will be installed on the SITE other than for purposes of environmental monitoring and groundwater beneath the SITE shall not be used for any purposes other than for environmental testing and collection for de-watering in compliance with law;

2. The SITE shall not be used for residential purposes or for children's (under the age of 16) daycare facilities, schools or playground purposes (although hotels and motels are not prohibited);

3. The SITE shall be maintained with its existing concrete slabs, asphalt, and other hardscape surfaces. The cover may be removed as necessary for the installation, construction or maintenance of utilities, infrastructure (including the Alexandria Renew Enterprises' RiverRenew project), and other improvements, provided that (i) the requirements of Condition 4 are met in any such installation, construction or maintenance, and (ii) disturbed areas are covered and maintained with two feet of clean fill or a form of hardscape surface after such installation, construction or maintenance is completed; and

4. Any subsurface work or excavation on the SITE shall be completed in accordance with a site-specific health and safety plan, which shall be developed by a qualified health and safety professional and in accordance with applicable federal, state, and local regulations.

FIGURES



REFERENCE:
7.5 MINUTE SERIES TOPOGRAPHIC QUADRANGLE
ALEXANDRIA, VIRGINIA
PHOTOREVISED 1994 SCALE 1:24,000

N

0 1000 2000 4000
SCALE, FEET

SITE LOCATION

DESIGNED BRUZZESI	DATE 04/04/17
DRAWN CONNELLY	DATE 04/04/17

A-ZONE ENVIRONMENTAL SERVICES
2181 BERRYVILLE PIKE
CHARLES TOWN, WV 25414

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

PROJECT NO. 6048.04	SCALE: AS SHOWN
DRAWING NO.	FIGURE 1

6078-04-RTN SCR01-SITE LOC.DWG – July 6, 2016

MICROSOFT CORPORATION 2016

0 125 250 500

SCALE IN FEET

AERIAL PHOTOGRAPH

DESIGNED BRUZZESI	DATE 04/04/17
DRAWN CONNELLY	DATE 04/04/17

A-ZONE ENVIRONMENTAL SERVICES
2181 BERRYVILLE PIKE
CHARLES TOWN, WV 25414

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

PROJECT NO. 6078.04	SCALE: AS SHOWN
DRAWING NO.	FIGURE 2

6078-04-RTN SCR02-AERIAL.DWG — July 6, 2016

APPROXIMATE LIMITS OF
VRP SITE BOUNDARIES

TRACT II
PARCEL "A", "B-1", "B-2", "C" & "D"
LANDS OF
RTN EAST LLC
ZONING: W-1
USE: VACANT LAND COMMERCIAL
TM: 065.01-04-13
TOTAL AREA: 101,406 S.F. 2.32 AC.

PARCEL "B-2"
AREA: 4,843 S.F. 0.111 AC.

TRACT I
LOT 601

LANDS OF
RTN WEST LLC
TM: 065.01-04-12
ZONING: W-1
USE: VACANT LAND
COMMERCIAL
AREA: 43,512 S.F. 0.998 AC.

500 N. UNION STREET
PARCEL

2 STORY BRICK & ALUMINUM BUILDING
36,552 S.F. OR 0.839 AC.
BUILDING HT. = ±37.8

501 N. UNION STREET
PARCEL

WAREHOUSE CONCRETE SLAB
(STRUCTURE REMOVED)

POTOMAC RIVER
OPEN WATER

PARCEL "A"
AREA: 42,650 S.F. 0.979 AC.

PARCEL "C"
AREA: 9,691 S.F. 0.222 AC.

PARCEL "D"
AREA: 39,050 S.F. 0.896 AC.

PARCEL "B-1"
AREA: 4,872 S.F.
0.112 AC.

LIMITS OF
DISTURBANCE =
213,444 SF OR 4.9 AC.

0 30 60 120
SCALE IN FEET

SITE PLAN (EXISTING CONDITIONS)

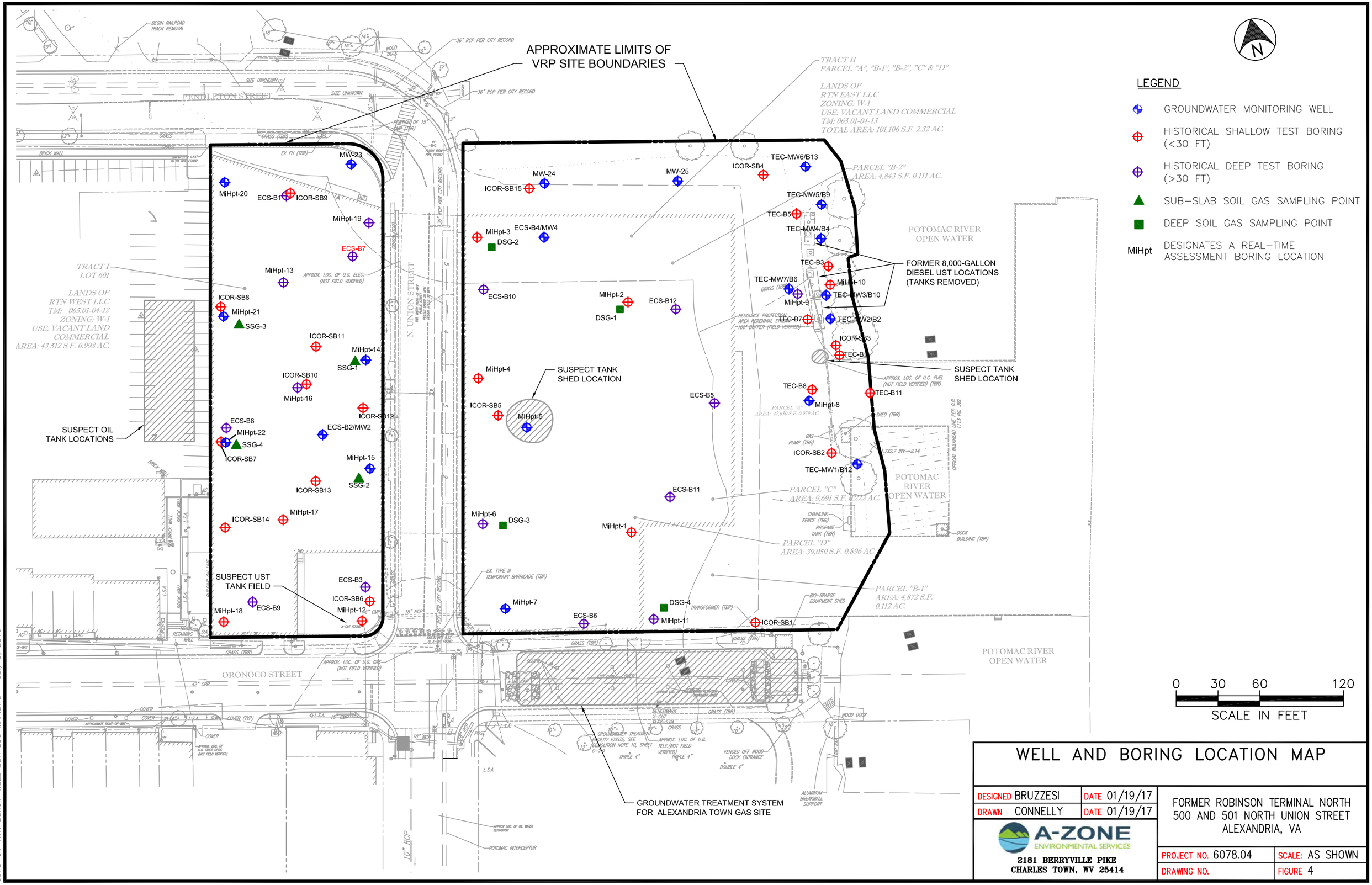
DESIGNED BRUZZESI	DATE 04/04/17
DRAWN CONNELLY	DATE 04/04/17

A-ZONE ENVIRONMENTAL SERVICES
2181 BERRYVILLE PIKE
CHARLES TOWN, WV 25414

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

PROJECT NO. 6078.04	SCALE: AS SHOWN
DRAWING NO.	FIGURE 3

6078-04-RTN SCR03-EXIST SITE.DWG – April 20, 2021



WELL AND BORING LOCATION MAP

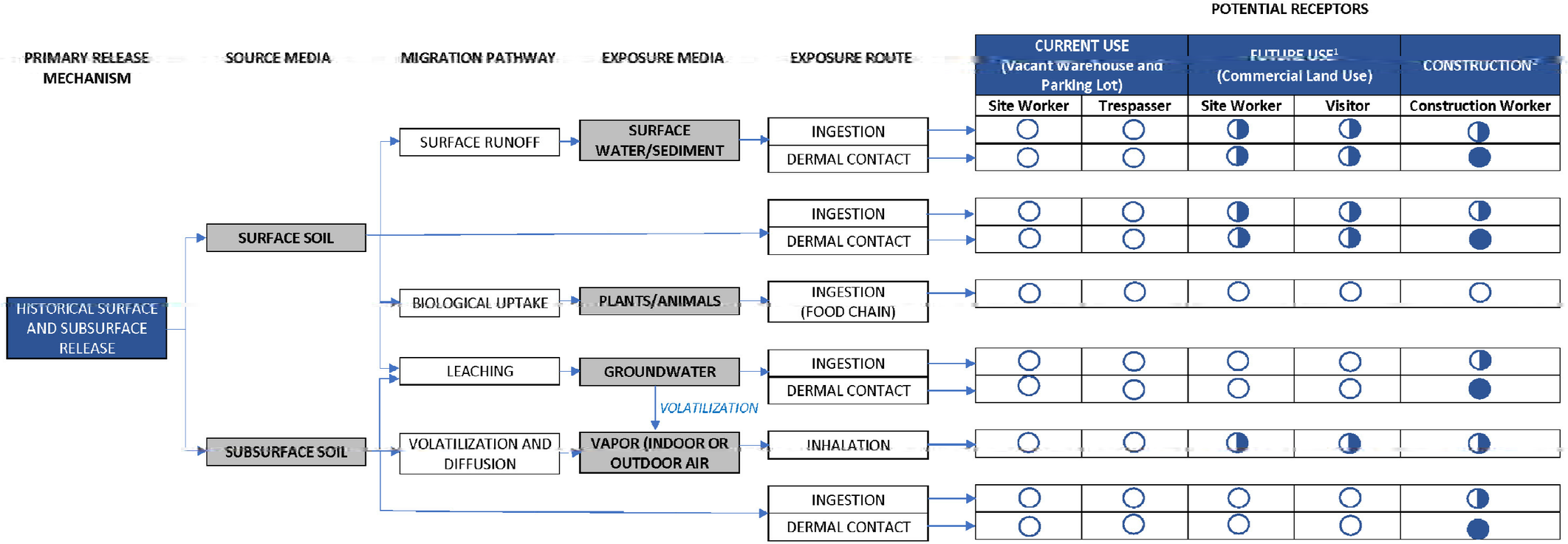
DESIGNED	BRUZZESI	DATE	01/19/17
DRAWN	CONNELLY	DATE	01/19/17

A-ZONE ENVIRONMENTAL SERVICES
2181 BERRYVILLE PIKE
CHARLES TOWN, WV 25414

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

PROJECT NO. 6078.04	SCALE: AS SHOWN
DRAWING NO.	FIGURE 4

6078-04-RTN SCR04-WELL BOR LOC MAP.DWG – July 6, 2016



Note:

1. Identified pathways will be addressed via remedial actions, engineering controls, and/or institutional controls.
2. Identified pathways will be addressed via remedial actions, engineering controls, and/or establishment of health and safety controls.

- COMPLETE PATHWAY
- POTENTIALLY COMPLETE PATHWAY
- INCOMPLETE PATHWAY

CONCEPTUAL SITE MODEL

DESIGNED BRUZZESI	DATE 04/04/17
DRAWN CONNELLY	DATE 04/04/17

A-ZONE ENVIRONMENTAL SERVICES
2181 BERRYVILLE PIKE
CHARLES TOWN, WV 25414

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

PROJECT NO. 6078.04	SCALE: AS SHOWN
DRAWING NO.	FIGURE 5

6078-04-RTN SCR05-CSM.DWG — July 6, 2016

TABLES

TABLE 1. TEC GROUNDWATER ANALYTICAL RESULTS

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	TEC-MW1	TEC-MW2	TEC-MW3	TEC-MW4	TEC-MW5	TEC-MW6	TEC-MW7
Date:								5/1/06	5/1/06	5/1/06	5/1/06	5/1/06	5/1/06	5/1/06
TPH														
TPH-GRO	mg/L	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	ND	ND	ND	ND	ND	ND	ND
TPH-DRO	mg/L	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	ND	ND	ND	ND	ND	ND	ND
VOCs														
Benzene	ug/L	**13.7**	**57.3**	**14.2**	**12**	**22**	**510**	ND	ND	ND	ND	ND	ND	ND
Toluene	ug/L	**1920**	**8100**	**949**	**43**	**510**	**6000**	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ug/L	**34.1**	**152**	**591**	**4.3**	**530**	**2100**	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	ug/L	**36.9**	**162**	**83.1**	**2070**	**NE**	**NE**	ND	ND	ND	ND	ND	ND	ND
Methyl-t-butyl ether	ug/L	**4580**	**19600**	**524**	**15**	**NE**	**NE**	**2**	**2**	**1**	**67**	ND	ND	ND
Naphthalene	ug/L	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	ND	ND	ND	ND	ND	ND	ND

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
VOCs = volatile organic compounds
ug/L = micrograms per liter
mg/L = milligrams per liter
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 2. 2008 ECS SOIL ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-PSSS	VDEQ-T2RSL	VDEQ-T3ISL	ECS-B1				ECS-B2				ECS-B3				
					(1-2.5)	(2.5-4)	(8.5-10)	(18.5-20)	(2.5-4)	(5-6.5)	(8.5-10)	(13.5-15)	(1-2.5)	(2.5-4)	(8.5-10)	(13.5-15)	(28.5-30)
Date:					1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08
TPH																	
TPH-DRO	mg/kg	**11000**	**NE**	**NE**	NA	**10200**	**7060**	ND	**56**	NA	**17**	**70**	**115**	NA	**40**	ND	**27**
VOCs																	
Benzene	ug/kg	**NE**	**51.1**	**42000**	NA	ND	**2.8**	ND	ND	NA	ND	**11**	**9.8**	NA	**5120**	ND	ND
2-Butanone (MEK)	ug/kg	**NE**	**2340**	**19000000**	NA	ND	ND	ND	ND	NA	**7.3**	ND	ND	NA	ND	ND	ND
n-Butylbenzene	ug/kg	**NE**	**6440**	**5800000**	NA	ND	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
sec-Butylbenzene	ug/kg	**NE**	**11700**	**12000000**	NA	ND	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
tert-Butylbenzene	ug/kg	**NE**	**3100**	**12000000**	NA	ND	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Carbon Disulfide	ug/kg	**NE**	**477**	**350000**	NA	ND	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Ethylbenzene	ug/kg	**NE**	**15700**	**250000**	NA	ND	ND	ND	ND	NA	ND	**17**	**8.6**	NA	ND	ND	ND
Isopropylbenzene (Cumene)	ug/kg	**NE**	**1470**	**990000**	NA	ND	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
p-Isopropyltoluene	ug/kg	**NE**	**1470**	**990000**	NA	ND	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Methyl-t-butyl ether	ug/kg	**NE**	**631**	**2100000**	NA	ND	ND	ND	ND	NA	ND	ND	**4.2**	NA	ND	**2.7**	**3.2**
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	NA	**136**	**70**	ND	ND	NA	ND	**204**	**7.4**	NA	ND	**84**	ND
n-Propylbenzene	ug/kg	**NE**	**2460**	**2400000**	NA	ND	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Styrene	ug/kg	**NE**	**2200**	**3500000**	NA	ND	ND	ND	ND	NA	ND	ND	**4.2**	NA	ND	ND	ND
Toluene	ug/kg	**NE**	**13800**	**4700000**	NA	**7.7**	**13**	**3.4**	**4.2**	NA	**4.2**	**4.7**	**70**	NA	**196**	**5.6**	**2.7**
1,2,4-Trimethylbenzene	ug/kg	**NE**	**162**	**180000**	NA	ND	**13**	ND	ND	NA	ND	**14**	**16**	NA	ND	**10**	ND
1,3,5-Trimethylbenzene	ug/kg	**NE**	**172**	**150000**	NA	ND	**13**	ND	ND	NA	ND	**14**	**7.5**	NA	ND	**11**	ND
Total Xylenes	ug/kg	**NE**	**58000**	**250000**	NA	**3.4**	**14.1**	ND	ND	NA	ND	**16.3**	**58**	NA	ND	**11.1**	ND
RCRA Metals																	
Arsenic	mg/kg	**NE**	**3.5**	**30**	**4.3**	NA	NA	NA	NA	**1090**	NA	NA	NA	NA	NA	NA	NA
Barium	mg/kg	**NE**	**1500**	**22000**	**82.3**	NA	NA	NA	NA	**90.9**	NA	NA	NA	NA	NA	NA	NA
Cadmium	mg/kg	**NE**	**7.1**	**98**	ND	NA	NA	NA	NA	**23.6**	NA	NA	NA	NA	NA	NA	NA
Chromium	mg/kg	**NE**	**0.134**	**63***	**16.3**	NA	NA	NA	NA	**17.5**	NA	NA	NA	NA	NA	NA	NA
Lead	mg/kg	**NE**	**270**	**800**	**14.9**	NA	NA	NA	NA	**297**	NA	NA	NA	NA	NA	NA	NA
Mercury	mg/kg	**NE**	**1.1**	**4.6**	ND	NA	NA	NA	NA	**75.1**	NA	NA	NA	NA	NA	NA	NA
Selenium	mg/kg	**NE**	**5.2**	**580**	ND	NA	NA	NA	NA	**10.3**	NA	NA	NA	NA	NA	NA	NA
Silver	mg/kg	**NE**	**1.6**	**580**	ND	NA	NA	NA	NA	**1.41**	NA	NA	NA	NA	NA	NA	NA
Pesticides, PCBs, and Herbicides																	
Pesticides					NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
PCBs					NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Herbicides					NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA

NOTES:
(10-13.5) = designates depth sample was collected below ground surface
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
VOCs = volatile organic compounds
RCRA = Resource Conservation and Recovery Act
PCBs = polychlorinated biphenyls
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
NA = not analyzed
ND = not detected above the analytical method reporting limit
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-PSS = VDEQ petroleum saturated soil standard
VDEQ-T2RSL = VDEQ Tier II residential screening level
VDEQ-T3ISL = VDEQ Tier III industrial screening level
Bold and right justification designates target compound was detected at a concentration above RL
* = total chromium (chromium III and VI)
Yellow highlighting designates target compound was detected at a concentration above a VDEQ screening concentration in at least 1 sample

TABLE 2. 2008 ECS SOIL ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-PSSS	VDEQ-T2RSL	VDEQ-T3ISL	ECS-B4					ECS-B5				
					(5-6.5)	(13.5-15)	(18.5-20)	(23.5-25)	(28.5-30)	(2.5-4)	(5-6.5)	(8.5-10)	(28.5-30)	(33.5-35)
Date:					1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08
TPH														
TPH-DRO	mg/kg	**11000**	**NE**	**NE**	**123**	**22**	NA	**22**	ND	**95**	NA	**20**	**58**	ND
VOCs														
Benzene	ug/kg	**NE**	**51.1**	**42000**	ND	**6.3**	NA	**4.6**	ND	ND	NA	ND	ND	**3.7**
2-Butanone (MEK)	ug/kg	**NE**	**2340**	**19000000**	ND	ND	NA	ND	ND	ND	NA	ND	**7.3**	ND
n-Butylbenzene	ug/kg	**NE**	**6440**	**5800000**	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
sec-Butylbenzene	ug/kg	**NE**	**11700**	**12000000**	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
tert-Butylbenzene	ug/kg	**NE**	**3100**	**12000000**	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Carbon Disulfide	ug/kg	**NE**	**477**	**350000**	ND	ND	NA	ND	ND	ND	NA	**3.3**	ND	**11**
Ethylbenzene	ug/kg	**NE**	**15700**	**250000**	**2.2**	**5.1**	NA	**4.9**	ND	ND	NA	ND	ND	**7**
Isopropylbenzene (Cumene)	ug/kg	**NE**	**1470**	**990000**	ND	ND	NA	**2.5**	ND	ND	NA	ND	ND	ND
p-Isopropyltoluene	ug/kg	**NE**	**1470**	**990000**	ND	ND	NA	ND	ND	ND	NA	**166**	**226**	**419**
Methyl-t-butyl ether	ug/kg	**NE**	**631**	**2100000**	ND	ND	NA	**2.6**	ND	ND	NA	ND	ND	ND
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	ND	**66**	NA	**155**	**4.9**	ND	NA	**14**	**5.9**	**27**
n-Propylbenzene	ug/kg	**NE**	**2460**	**2400000**	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Styrene	ug/kg	**NE**	**2200**	**3500000**	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Toluene	ug/kg	**NE**	**13800**	**4700000**	**16**	**11**	NA	**29**	ND	ND	NA	**4.5**	**5.7**	**8.4**
1,2,4-Trimethylbenzene	ug/kg	**NE**	**162**	**180000**	**4.9**	**6.5**	NA	**12**	ND	**4**	NA	**11**	**9.8**	**9.3**
1,3,5-Trimethylbenzene	ug/kg	**NE**	**172**	**150000**	**4.7**	**2.8**	NA	**5**	ND	ND	NA	**4.6**	**3.8**	**2.8**
Total Xylenes	ug/kg	**NE**	**58000**	**250000**	**12.2**	**9**	NA	**24.7**	ND	ND	NA	ND	**3.3**	**3.7**
RCRA Metals														
Arsenic	mg/kg	**NE**	**3.5**	**30**	NA	NA	NA	NA	NA	NA	**7**	NA	NA	NA
Barium	mg/kg	**NE**	**1500**	**22000**	NA	NA	NA	NA	NA	NA	**99.7**	NA	NA	NA
Cadmium	mg/kg	**NE**	**7.1**	**98**	NA	NA	NA	NA	NA	NA	**3.79**	NA	NA	NA
Chromium	mg/kg	**NE**	**0.134**	**63***	NA	NA	NA	NA	NA	NA	**25.8**	NA	NA	NA
Lead	mg/kg	**NE**	**270**	**800**	NA	NA	NA	NA	NA	NA	**11.5**	NA	NA	NA
Mercury	mg/kg	**NE**	**1.1**	**4.6**	NA	NA	NA	NA	NA	NA	**0.25**	NA	NA	NA
Selenium	mg/kg	**NE**	**5.2**	**580**	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Silver	mg/kg	**NE**	**1.6**	**580**	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Pesticides, PCBs, and Herbicides														
Pesticides					NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
PCBs					NA	NA	ND	NA	NA	NA	NA	NA	NA	NA
Herbicides					NA	NA	ND	NA	NA	NA	NA	NA	NA	NA

NOTES:
(10-13.5) = designates depth sample was collected below ground surface
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
VOCs = volatile organic compounds
RCRA = Resource Conservation and Recovery Act
PCBs = polychlorinated biphenyls
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
NA = not analyzed
ND = not detected above the analytical method reporting limit
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-PSS = VDEQ petroleum saturated soil standard
VDEQ-T2RSL = VDEQ Tier II residential screening level
VDEQ-T3ISL = VDEQ Tier III industrial screening level
Bold and right justification designates target compound was detected at a concentration above RL
* = total chromium (chromium III and VI)
Yellow highlighting designates target compound was detected at a concentration above a VDEQ screening concentration in at least 1 sample

TABLE 2. 2008 ECS SOIL ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-PSSS	VDEQ-T2RSL	VDEQ-T3ISL	ECS-B6						
					(1-2.5)	(5-6.5)	(8.5-10)	(13.5-15)	(18.5-20)	(23.5-25)	(28.5-30)
Date:					1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08	1/3/08
TPH											
TPH-DRO	mg/kg	**11000**	**NE**	**NE**	NA	**142**	**111**	**31**	**68**	NA	**33**
VOCs											
Benzene	ug/kg	**NE**	**51.1**	**42000**	NA	**977**	ND	**16**	ND	NA	ND
2-Butanone (MEK)	ug/kg	**NE**	**2340**	**19000000**	NA	ND	ND	ND	ND	NA	ND
n-Butylbenzene	ug/kg	**NE**	**6440**	**5800000**	NA	**366**	ND	**3.2**	ND	NA	**3.6**
sec-Butylbenzene	ug/kg	**NE**	**11700**	**12000000**	NA	ND	ND	**26**	ND	NA	ND
tert-Butylbenzene	ug/kg	**NE**	**3100**	**12000000**	NA	ND	ND	**11**	ND	NA	ND
Carbon Disulfide	ug/kg	**NE**	**477**	**350000**	NA	ND	ND	ND	ND	NA	ND
Ethylbenzene	ug/kg	**NE**	**15700**	**250000**	NA	**1360**	ND	**6.4**	ND	NA	ND
Isopropylbenzene (Cumene)	ug/kg	**NE**	**1470**	**990000**	NA	ND	ND	**8.4**	ND	NA	ND
p-Isopropyltoluene	ug/kg	**NE**	**1470**	**990000**	NA	**473**	ND	**3.8**	ND	NA	ND
Methyl-t-butyl ether	ug/kg	**NE**	**631**	**2100000**	NA	ND	ND	ND	ND	NA	ND
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	NA	ND	ND	**5.2**	**5500**	NA	ND
n-Propylbenzene	ug/kg	**NE**	**2460**	**2400000**	NA	ND	ND	**5.8**	ND	NA	**2.7**
Styrene	ug/kg	**NE**	**2200**	**3500000**	NA	ND	ND	ND	ND	NA	ND
Toluene	ug/kg	**NE**	**13800**	**4700000**	NA	**3800**	**238**	**36**	ND	NA	**2.9**
1,2,4-Trimethylbenzene	ug/kg	**NE**	**162**	**180000**	NA	**1050**	ND	**18**	ND	NA	**19**
1,3,5-Trimethylbenzene	ug/kg	**NE**	**172**	**150000**	NA	**1870**	ND	**11**	ND	NA	**9.8**
Total Xylenes	ug/kg	**NE**	**58000**	**250000**	NA	**4209**	**361**	**38**	ND	NA	**3.5**
RCRA Metals											
Arsenic	mg/kg	**NE**	**3.5**	**30**	NA	NA	NA	NA	NA	**6.6**	NA
Barium	mg/kg	**NE**	**1500**	**22000**	NA	NA	NA	NA	NA	**46**	NA
Cadmium	mg/kg	**NE**	**7.1**	**98**	NA	NA	NA	NA	NA	ND	NA
Chromium	mg/kg	**NE**	**0.134**	**63***	NA	NA	NA	NA	NA	**19.9**	NA
Lead	mg/kg	**NE**	**270**	**800**	NA	NA	NA	NA	NA	**39.5**	NA
Mercury	mg/kg	**NE**	**1.1**	**4.6**	NA	NA	NA	NA	NA	**0.06**	NA
Selenium	mg/kg	**NE**	**5.2**	**580**	NA	NA	NA	NA	NA	ND	NA
Silver	mg/kg	**NE**	**1.6**	**580**	NA	NA	NA	NA	NA	ND	NA
Pesticides, PCBs, and Herbicides											
Pesticides					ND	NA	NA	NA	ND	NA	NA
PCBs					ND	NA	NA	NA	ND	NA	NA
Herbicides					ND	NA	NA	NA	ND	NA	NA

NOTES:
(10-13.5) = designates depth sample was collected below ground surface
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
VOCs = volatile organic compounds
RCRA = Resource Conservation and Recovery Act
PCBs = polychlorinated biphenyls
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
NA = not analyzed
ND = not detected above the analytical method reporting limit
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-PSS = VDEQ petroleum saturated soil standard
VDEQ-T2RSL = VDEQ Tier II residential screening level
VDEQ-T3ISL = VDEQ Tier III industrial screening level
Bold and right justification designates target compound was detected at a concentration above RL
* = total chromium (chromium III and VI)
Yellow highlighting designates target compound was detected at a concentration above a VDEQ screening concentration in at least 1 sample

TABLE 3. 2008 ECS GROUNDWATER ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	ECS-MW2	ECS-MW4
Date:								1/4/08	1/4/08
TPH									
TPH-DRO	mg/L	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**2.87**	**0.99**
VOCs									
Benzene	ug/L	**13.7**	**57.3**	**14.2**	**12**	**22**	**510**	**60**	ND
Naphthalene	ug/L	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	ND	**8.6**
Total Xylenes	ug/L	**36.9**	**162**	**83.1**	**2070**	**NE**	**NE**	**3.1**	**4.2**
SVOCs									
Acenaphthene	ug/L	**NE**	**NE**	**2950**	**NE**	**670**	**990**	ND	**17**
Acenaphthylene	ug/L	**NE**	**NE**	**1430**	**NE**	**NE**	**NE**	ND	**10**
Dimethyl phthalate	ug/L	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**3.9**	ND
Fluorene	ug/L	**NE**	**NE**	**4370**	**NE**	**1100**	**5300**	ND	**5.6**
2-Methylnaphthalene	ug/L	**NE**	**NE**	**59**	**NE**	**NE**	**NE**	ND	**2.3**
Naphthalene	ug/L	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	ND	**8.3**
Phenanthrene	ug/L	**NE**	**NE**	**1430**	**NE**	**NE**	**NE**	ND	**2.2**
Total RCRA Metals									
Arsenic	mg/L	**NE**	**NE**	**0.197**	**NE**	**0.001**	**0.15**	**0.020**	**0.009**
Barium	mg/L	**NE**	**NE**	**20.2**	**NE**	**2**	**NE**	**0.129**	**0.581**
Cadmium	mg/L	**NE**	**NE**	**0.0192**	**NE**	**0.0011**	**0.0011**	**0.160**	ND
Chromium	mg/L	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**0.015**	**0.048**
Lead	mg/L	**NE**	**NE**	**NE**	**NE**	**0.011**	**0.011**	**0.044**	**0.112**
Mercury	mg/L	**0.0000881**	**0.000369**	**0.0000086**	**NE**	**0.00077**	**0.00077**	ND	ND
Selenium	mg/L	**NE**	**NE**	**3.28**	**NE**	**0.005**	**0.005**	**0.005**	**0.002**
Silver	mg/L	**NE**	**NE**	**0.0484**	**NE**	**NE**	**NE**	ND	ND

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
VOCs = volatile organic compounds
SVOCs = semi-VOCs
RCRA = Resource Conservation and Recovery Act
ug/L = micrograms per liter
mg/L = milligrams per liter
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 4. 2013 ICOR SOIL ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-PSSS	VDEQ-T2RSL	VDEQ-T3ISL	ICOR-SB2(3-4)	ICOR-SB2(5-6)	ICOR-SB5(6-7)	ICOR-SB6(2-3)	ICOR-SB7(7.5-8.5)	ICOR-SB8(2-3)	ICOR-SB8(7.5-8.5)	ICOR-SB9(4.5-5.5)
Date:					10/8/13	10/8/13	10/8/13	10/8/13	10/8/13	10/8/13	10/8/13	10/8/13
TPH EPA 8015												
TPH-GRO	mg/kg	**8300**	**NE**	**NE**	NA	**1.2**	<0.11	NA	**240**	NA	**370**	NA
TPH-DRO	mg/kg	**11000**	**NE**	**NE**	NA	**77**	**420**	NA	**3800**	NA	**42**	NA
TCL VOCs EPA 8260B												
Acetone	ug/kg	**NE**	**574000**	**67000000**	NA	<23	<23	NA	<2200	NA	<2400	NA
Isopropylbenzene	ug/kg	**NE**	**1470**	**990000**	NA	**15**	<5.6	NA	<560	NA	<600	NA
Methylcyclohexane	ug/kg	**NE**	**NE**	**NE**	NA	**41**	<23	NA	<2200	NA	**16000**	NA
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	NA	**14**	**7.4**	NA	<560	NA	<600	NA
TCL SVOCs EPA 8270C												
Fluoranthene	ug/kg	**NE**	**178000**	**3000000**	NA	**260**	<190	NA	<740	NA	<200	NA
Pyrene	ug/kg	**NE**	**26100**	**2300000**	NA	**210**	<190	NA	<740	NA	<200	NA
PPL Metals EPA 6020A												
Antimony	mg/kg	**NE**	**3.1**	**47**	<2.4	NA	<2.1	<2.6	<2.8	<2.8	<2.2	<2.8
Arsenic	mg/kg	**NE**	**3.5**	**30**	**2.8**	NA	**3.8**	**11**	**130**	**600**	**12**	**3.6**
Chromium	mg/kg	**NE**	**3600000***	**NE***	**20**	NA	<2.1	**26**	**11**	**22**	**12**	**10**
Copper	mg/kg	**NE**	**310**	**4700**	**18**	NA	**4.6**	**200**	**7.6**	**18**	**5.0**	**12**
Lead	mg/kg	**NE**	**270**	**800**	**15**	NA	**16**	**32**	**4.7**	**9.1**	**7.2**	**60**
Mercury	mg/kg	**NE**	**1.1**	**4.6**	<0.095	NA	<0.084	<0.10	<0.11	<0.11	<0.089	**0.56**
Nickel	mg/kg	**NE**	**50.9**	**2200**	**22**	NA	<2.1	**26**	**5.9**	**21**	**22**	**9.4**
Selenium	mg/kg	**NE**	**5.2**	**580**	<2.4	NA	<2.1	<2.6	<2.8	<2.8	<2.2	<2.8
Silver	mg/kg	**NE**	**1.6**	**580**	<2.4	NA	<2.1	<2.6	<2.8	<2.8	<2.2	<2.8
Thallium	mg/kg	**NE**	**0.078**	**1.2**	<1.9	NA	<1.7	<2.1	<2.2	<2.2	<1.8	<2.2
Zinc	mg/kg	**NE**	**746**	**35000**	**68**	NA	<8.4	**1100**	**33**	**63**	**37**	5000
Chromium VI EPA 7196A												
Chromium VI	mg/kg	**NE**	**0.134**	**63**	NA	NA	NA	NA	NA	NA	NA	NA
TCLP RCRA Metals EPA 3010A/6020A												
Arsenic	ug/L	**NE**	**NE**	**NE**	NA	NA	NA	NA	NA	NA	NA	NA
Lead	ug/L	**NE**	**NE**	**NE**	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
(0.5-1.5) = designates depth sample was collected below ground surface
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
PCBs = polychlorinated biphenyls
PPL = Priority Pollutant List
TCLP = Toxic Characteristic Leaching Procedure
RCRA = Resource Conservation and Recovery Act
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter
NA = not analyzed
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-PSS = VDEQ petroleum saturated soil standard
VDEQ-T2RSL = VDEQ Tier II residential screening level
VDEQ-T3ISL = VDEQ Tier III industrial screening level
Bold and right justification designates target compound was detected at a concentration above RL
* = total chromium (chromium III and VI)
Yellow highlighting designates target compound was detected at a concentration above a VDEQ screening concentration in at least 1 sample

TABLE 4. 2013 ICOR SOIL ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-PSSS	VDEQ-T2RSL	VDEQ-T3ISL	ICOR-SB10(2-3)	ICOR-SB10(5.5-6.5)	ICOR-SB11(5.5-6.5)	ICOR-SB12(6-7)	ICOR-SB13(5.5-6.5)
Date:					10/8/13	10/8/13	10/8/13	10/8/13	10/8/13
TPH EPA 8015									
TPH-GRO	mg/kg	**8300**	**NE**	**NE**	NA	NA	<0.12	NA	<0.12
TPH-DRO	mg/kg	**11000**	**NE**	**NE**	NA	NA	<4.8	NA	<5.1
TCL VOCs EPA 8260B									
Acetone	ug/kg	**NE**	**574000**	**67000000**	NA	NA	**77**	NA	NA
Isopropylbenzene	ug/kg	**NE**	**1470**	**990000**	NA	NA	<5.9	NA	NA
Methylcyclohexane	ug/kg	**NE**	**NE**	**NE**	NA	NA	<24	NA	NA
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	NA	NA	<5.9	NA	NA
TCL SVOCs EPA 8270C									
Fluoranthene	ug/kg	**NE**	**178000**	**3000000**	NA	NA	<210	NA	NA
Pyrene	ug/kg	**NE**	**26100**	**2300000**	NA	NA	<210	NA	NA
PPL Metals EPA 6020A									
Antimony	mg/kg	**NE**	**3.1**	**47**	**12**	<2.3	<3.0	<2.0	<2.8
Arsenic	mg/kg	**NE**	**3.5**	**30**	**1300**	**190**	**3.9**	**3.1**	**9.9**
Chromium	mg/kg	**NE**	**3600000***	**NE***	**18**	**19**	**24**	**22**	**30**
Copper	mg/kg	**NE**	**310**	**4700**	**1800**	**270**	**21**	**16**	**59**
Lead	mg/kg	**NE**	**270**	**800**	**2200**	**10**	**12**	**14**	**17**
Mercury	mg/kg	**NE**	**1.1**	**4.6**	**7.8**	**0.17**	**0.19**	**0.15**	**0.24**
Nickel	mg/kg	**NE**	**50.9**	**2200**	**13**	**18**	**23**	**24**	**21**
Selenium	mg/kg	**NE**	**5.2**	**580**	**8.2**	<2.3	<3.0	<2.0	<2.8
Silver	mg/kg	**NE**	**1.6**	**580**	**15**	<2.3	<3.0	<2.0	<2.8
Thallium	mg/kg	**NE**	**0.078**	**1.2**	**3.0**	<1.8	<2.4	<1.6	<2.2
Zinc	mg/kg	**NE**	**746**	**35000**	**2100**	**620**	**61**	**1700**	**1700**
Chromium VI EPA 7196A									
Chromium VI	mg/kg	**NE**	**0.134**	**63**	NA	NA	NA	NA	<0.97
TCLP RCRA Metals EPA 3010A/6020A									
Arsenic	ug/L	**NE**	**NE**	**NE**	**1.4**	NA	NA	NA	NA
Lead	ug/L	**NE**	**NE**	**NE**	**7.8**	NA	NA	NA	NA

NOTES:
(0.5-1.5) = designates depth sample was collected below ground surface
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
PCBs = polychlorinated biphenyls
PPL = Priority Pollutant List
TCLP = Toxic Characteristic Leaching Procedure
RCRA = Resource Conservation and Recovery Act
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
ug/L = micrograms per liter
NA = not analyzed
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-PSS = VDEQ petroleum saturated soil standard
VDEQ-T2RSL = VDEQ Tier II residential screening level
VDEQ-T3ISL = VDEQ Tier III industrial screening level
Bold and right justification designates target compound was detected at a concentration above RL
* = total chromium (chromium III and VI)
Yellow highlighting designates target compound was detected at a concentration above a VDEQ screening concentration in at least 1 sample

TABLE 5. 2014 GEOTECHNICAL INVESTIGATION SOIL ANALYTICAL RESULTS

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-T2RSL	VDEQ-T3ISL	ECS-B7(2.5-10)	ECS-B8(2.5-4)	ECS-B9(2.5-10)	ECS-B10(4-10)	ECS-B11(5-10)	ECS-B12(5-10)
Date:				10/6/14	10/7/14	10/7/14	10/8/14	10/10/14	10/8/14
RCRA Metals EPA 6020A									
Arsenic	mg/kg	**3.5**	**30**	**1600**	**1900**	**11**	**6.8**	**18**	**7.7**
Barium	mg/kg	**1500**	**22000**	**320**	**190**	**81**	**170**	**140**	**81**
Cadmium	mg/kg	**7.1**	**98**	**17**	**12**	<2.7	<2.6	<2.7	<2.9
Chromium	mg/kg	**3600000***	**NE***	**27**	**20**	**21**	**5.4**	**15**	**3.4**
Lead	mg/kg	**270**	**800**	**1500**	**370**	**15**	**59**	**600**	**160**
Mercury	mg/kg	**1.1**	**4.6**	**27**	**20**	<0.11	**0.18**	**0.23**	**0.27**
Selenium	mg/kg	**5.2**	**580**	**10**	**6.0**	<2.7	<2.6	**3.2**	<2.9
Silver	mg/kg	**1.6**	**580**	**12**	**2.8**	<2.7	<2.6	**5.9**	<2.9
TCLP RCRA Metals EPA 3010A/6020A									
Arsenic	ug/L	**NE**	**NE**	**2.0**	**6.3**	NA	NA	NA	NA
Barium	ug/L	**NE**	**NE**	<1.0	**1.0**	NA	NA	NA	NA
Cadmium	ug/L	**NE**	**NE**	**0.063**	**0.070**	NA	NA	NA	NA
Chromium	ug/L	**NE**	**NE**	<0.050	<0.050	NA	NA	NA	NA
Lead	ug/L	**NE**	**NE**	**0.75**	<0.050	NA	NA	NA	NA
Mercury	ug/L	**NE**	**NE**	<0.0020	<0.0020	NA	NA	NA	NA
Selenium	ug/L	**NE**	**NE**	<0.050	<0.050	NA	NA	NA	NA
Silver	ug/L	**NE**	**NE**	<0.050	<0.050	NA	NA	NA	NA

NOTES:
(2.5-4) = designates depth sample was collected below ground surface
TCLP = Toxic Characteristic Leaching Procedure
RCRA = Resource Conservation and Recovery Act
EPA 6020A = United States Environmental Protection Agency SW-846 analytical method
mg/kg = milligrams per kilogram
ug/L = micrograms per liter
NA = not analyzed
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-PSS = VDEQ petroleum saturated soil standard
VDEQ-T2RSL = VDEQ Tier II residential screening level
VDEQ-T3ISL = VDEQ Tier III industrial screening level
Bold and right justification designates target compound was detected at a concentration above RL
* = total chromium (chromium III and VI)
Yellow highlighting designates target compound was detected at a concentration above a VDEQ screening concentration in at least 1 sample

TABLE 6. 2016 ICOR SOIL ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-PSSS	VDEQ-T2RSL	VDEQ-T3ISL	ECS-B7(1-2)	ECS-B7(5-6)	ICOR-SB3(10.5-11.5)	ICOR-SB9(4-5)	ICOR-SB14(1-2)	ICOR-SB14(4-5)	ICOR-SB15(1-2)	MiHpt-03(1-2)	MiHpt-03(4-5)	MiHpt-04(1-2)	MiHpt-04(4-5)	MiHpt-05(1-2)	MiHpt-06(1-2)	MiHpt-06(4-5)	MiHpt-07(1-2)	MiHpt-07(7-8)	MiHpt-08(4-5)
Sample Date:					9/7/16	9/7/16	9/7/16	9/7/16	9/7/16	9/7/16	9/7/16	9/6/16	9/6/16	9/6/16	9/6/16	9/7/16	9/6/16	9/6/16	9/6/16	9/6/16	9/6/16
TPH 8015																					
TPH-GRO (C6-C10)	mg/kg	**8300**	**NE**	**NE**	NA	<0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1300**	**0.260**
TPH-DRO (C10-C28)	mg/kg	**11000**	**NE**	**NE**	NA	**100**	**13**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**59**	<12
TCL VOCs 8260B																					
Acetone	ug/kg	**NE**	**574000**	**67000000**	NA	<23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1900	<17
Cyclohexane	ug/kg	**NE**	**26600**	**2700000**	NA	<23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1900	<17
Ethylbenzene	ug/kg	**NE**	**15700**	**250000**	NA	<5.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<460	<4.3
Isopropylbenzene	ug/kg	**NE**	**1470**	**990000**	NA	<5.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<460	<4.3
Methylcyclohexane	ug/kg	**NE**	**NE**	**NE**	NA	<23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1900	<17
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	NA	**260**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<460	<4.3
Tetrachloroethene	ug/kg	**NE**	**45.3**	**39000**	NA	<5.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<460	<4.3
Toluene	ug/kg	**NE**	**13800**	**4700000**	NA	<5.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<460	<4.3
m,p-Xylenes	ug/kg	**NE**	**371**	**240000**	NA	<11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<930	<8.6
o-Xylene	ug/kg	**NE**	**374**	**280000**	NA	<5.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<460	<4.3
TCL SVOCs 8270C																					
2-Methylnaphthalene	ug/kg	**NE**	**371**	**300000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	ug/kg	**NE**	**10900**	**4500000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	ug/kg	**NE**	**119000**	**23000000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	ug/kg	**NE**	**2120**	**210000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	ug/kg	**NE**	**1100**	**21000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	ug/kg	**NE**	**11000**	**210000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	ug/kg	**NE**	**26100**	**2300000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	ug/kg	**NE**	**110000**	**2100000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	ug/kg	**NE**	**1100000**	**21000000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)Anthracene	ug/kg	**NE**	**1100**	**21000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	ug/kg	**NE**	**293**	**100000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	ug/kg	**NE**	**178000**	**3000000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	ug/kg	**NE**	**10700**	**3000000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)Pyrene	ug/kg	**NE**	**11000**	**210000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	ug/kg	**NE**	**26100**	**2300000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	ug/kg	**NE**	**26100**	**2300000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs 8082																					
PCBs	mg/kg				<0.055	NA	<0.060	<0.058	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides 8081B																					
4,4-DDD	ug/kg	**NE**	**29.6**	**2500**	**6.1**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4-DDE	ug/kg	**NE**	**2160**	**35000**	**15**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4-DDT	ug/kg	**NE**	**3700**	**52000**	**7.0**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Herbicides 8151A																					
2,4,5-T	ug/kg	**NE**	**NE**	**NE**	<22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins 8290A																					
2,3,7,8-TCDD	ng/kg	**NE**	**NE**	**NE**	NA	NA	NA	NA	NA	NA	**0.0670** JQ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PPL Metals 6020A																					
Antimony	mg/kg	**NE**	**3.1**	**47**	<2.5	NA	NA	NA	NA	NA	NA	<2.6	NA	<2.0	NA	NA	<2.5	**17**	NA	NA	NA
Arsenic	mg/kg	**NE**	**3.5**	**30**	**49**	NA	NA	NA	**9.1**	**9.2**	NA	**1.1**	**190**	**3.9**	**320**	**2.2**	**1.2**	**150**	**1.0**	NA	NA
Cadmium	mg/kg	**NE**	**7.1**	**98**	<2.5	NA	NA	NA	NA	NA	NA	<2.6	NA	<2.0	NA	NA	<2.5	<2.5	NA	NA	NA
Chromium	mg/kg	**NE**	**3600000***	**NE***	**17**	NA	NA	NA	NA	NA	NA	**5.5**	NA	**4.0**	NA	NA	**8.1**	**11**	NA	NA	NA
Copper	mg/kg	**NE**	**310**	**4700**	**39**	NA	NA	NA	NA	NA	NA	**4.2**	NA	**6.7**	NA	NA	**6.0**	**410**	NA	NA	NA
Lead	mg/kg	**NE**	**270**	**800**	**160**	NA	NA	NA	NA	NA	NA	**22**	NA	**94**	NA	NA	**6.7**	**1800**	NA	NA	NA
Mercury	mg/kg	**NE**	**1.1**	**4.6**	**1.3**	NA	NA	NA	NA	NA	NA	<0.10	NA	**0.094**	NA	NA	**0.12**	**0.47**	NA	NA	NA
Nickel	mg/kg	**NE**	**50.9**	**2200**	**14**	NA	NA	NA	NA	NA	NA	<2.6	NA	<2.0	NA	NA	**3.2**	**6.5**	NA	NA	NA
Selenium	mg/kg	**NE**	**5.2**	**580**	<2.5	NA	NA	NA	NA	NA	NA	<2.6	NA	<2.0	NA	NA	<2.5	**6.3**	NA	NA	NA
Silver	mg/kg	**NE**	**1.6**	**580**	<2.5	NA	NA	NA	NA	NA	NA	<2.6	NA	<2.0	NA	NA	<2.5	**3.3**	NA	NA	NA
Thallium	mg/kg	**NE**	**0.078**	**1.2**	<2.0	NA	NA	NA	NA	NA	NA	<2.1	NA	<1.6	NA	NA	<2.0	**2.4**	NA	NA	NA
Zinc	mg/kg	**NE**	**746**	**35000**	**130**	NA	NA	NA	NA	NA	NA	<10	NA	**16**	NA	NA	**15**	**370**	NA	NA	NA

NOTES:
(0.5-1.5) = designates depth sample was collected below ground surface
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
PCBs = polychlorinated biphenyls
PPL = Priority Pollutant List
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ng/kg = nanograms per kilogram
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
NA = not analyzed
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-PSS = VDEQ petroleum saturated soil standard
VDEQ-T2RSL = VDEQ Tier II residential screening level
VDEQ-T3ISL = VDEQ Tier III industrial screening level
Bold and right justification designates target compound was detected at a concentration above RL
* = total chromium (chromium III and VI)
Yellow highlighting designates target compound was detected at a concentration above a VDEQ screening concentration in at least 1 sample

TABLE 6. 2016 ICOR SOIL ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-PSSS	VDEQ-T2RSL	VDEQ-T3ISL	MiHpt-08(37.8-38.8)	MiHpt-10(24.5-25.5)	MiHpt-12(1-2)	MiHpt-13(1-2)	MiHpt-13(4-5)	MiHpt-14(1-2)	MiHpt-14(4-5)	MiHpt-14(5-6)	MiHpt-14(25-26)	MiHpt-15(1-2)	MiHpt-15(4-5)	MiHpt-16(1-2)	MiHpt-16(4-5)	MiHpt-16(8-9)	MiHpt-17(1-2)	MiHpt-17(4-5)	MiHpt-18(1-2)
Sample Date:					9/6/16	9/6/16	9/7/16	9/7/16	9/7/16	9/8/16	9/8/16	9/8/16	9/8/16	9/8/16	9/8/16	9/8/16	9/8/16	9/8/16	9/7/16	9/7/16	9/7/16
TPH 8015																					
TPH-GRO (C6-C10)	mg/kg	**8300**	**NE**	**NE**	**0.160**	**0.180**	NA	NA	NA	NA	NA	NA	<0.11	NA	NA	NA	NA	NA	NA	NA	NA
TPH-DRO (C10-C28)	mg/kg	**11000**	**NE**	**NE**	<15	**150**	NA	NA	NA	NA	NA	NA	<12	NA	NA	NA	NA	NA	NA	NA	NA
TCL VOCs 8260B																					
Acetone	ug/kg	**NE**	**574000**	**67000000**	**66**	**84**	NA	NA	NA	NA	NA	**45**	<20	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	ug/kg	**NE**	**26600**	**2700000**	<27	<27	NA	NA	NA	NA	NA	<19	<20	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	ug/kg	**NE**	**15700**	**250000**	<6.8	<6.9	NA	NA	NA	NA	NA	<4.7	<5.0	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	ug/kg	**NE**	**1470**	**990000**	<6.8	<6.9	NA	NA	NA	NA	NA	<4.7	<5.0	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	ug/kg	**NE**	**NE**	**NE**	<27	<27	NA	NA	NA	NA	NA	<19	<20	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	<6.8	**10**	NA	NA	NA	NA	NA	<4.7	<5.0	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	ug/kg	**NE**	**45.3**	**39000**	<6.8	<6.9	NA	NA	NA	NA	NA	<4.7	<5.0	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	ug/kg	**NE**	**13800**	**4700000**	<6.8	<6.9	NA	NA	NA	NA	NA	<4.7	<5.0	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylenes	ug/kg	**NE**	**371**	**240000**	<14	<14	NA	NA	NA	NA	NA	<9.5	<10	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	ug/kg	**NE**	**374**	**280000**	<6.8	<6.9	NA	NA	NA	NA	NA	<4.7	<5.0	NA	NA	NA	NA	NA	NA	NA	NA
TCL SVOCs 8270C																					
2-Methylnaphthalene	ug/kg	**NE**	**371**	**300000**	<250	**560**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	ug/kg	**NE**	**10900**	**4500000**	<250	**2300**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	ug/kg	**NE**	**119000**	**23000000**	<250	**3400**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	ug/kg	**NE**	**2120**	**210000**	<250	**5500**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	ug/kg	**NE**	**1100**	**21000**	<250	**5200**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	ug/kg	**NE**	**11000**	**210000**	<250	**3800**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	ug/kg	**NE**	**26100**	**2300000**	<250	**2700**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	ug/kg	**NE**	**110000**	**2100000**	<250	**3500**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	ug/kg	**NE**	**1100000**	**21000000**	<250	**4800**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)Anthracene	ug/kg	**NE**	**1100**	**21000**	<250	**1200**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	ug/kg	**NE**	**293**	**100000**	<250	**1200**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	ug/kg	**NE**	**178000**	**3000000**	<250	**8700**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	ug/kg	**NE**	**10700**	**3000000**	<250	**2200**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)Pyrene	ug/kg	**NE**	**11000**	**210000**	<250	**3100**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	<250	**570**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	ug/kg	**NE**	**26100**	**2300000**	<250	**8200**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	ug/kg	**NE**	**26100**	**2300000**	<250	**7400**	NA	NA	NA	NA	NA	NA	<190	NA	NA	NA	NA	NA	NA	NA	NA
PCBs 8082																					
PCBs	mg/kg				NA	NA	NA	NA	NA	<0.056	NA	NA	NA	NA	NA	<0.059	<0.061	NA	NA	NA	NA
Pesticides 8081B																					
4,4-DDD	ug/kg	**NE**	**29.6**	**2500**	NA	NA	NA	NA	NA	<4.5	NA	NA	NA	NA	NA	<4.7	<4.9	NA	NA	NA	NA
4,4-DDE	ug/kg	**NE**	**2160**	**35000**	NA	NA	NA	NA	NA	<4.5	NA	NA	NA	NA	NA	<4.7	<4.9	NA	NA	NA	NA
4,4-DDT	ug/kg	**NE**	**3700**	**52000**	NA	NA	NA	NA	NA	<4.5	NA	NA	NA	NA	NA	<4.7	<4.9	NA	NA	NA	NA
Herbicides 8151A																					
2,4,5-T	ug/kg	**NE**	**NE**	**NE**	NA	NA	NA	NA	NA	<22	NA	NA	NA	NA	NA	<25	<25	NA	NA	NA	NA
Dioxins 8290A																					
2,3,7,8-TCDD	ng/kg	**NE**	**NE**	**NE**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.115** J	NA	NA	NA	NA	NA
PPL Metals 6020A																					
Antimony	mg/kg	**NE**	**3.1**	**47**	NA	NA	NA	**12**	NA	**18**	NA	NA	NA	<2.7	NA	NA	NA	NA	**14**	NA	NA
Arsenic	mg/kg	**NE**	**3.5**	**30**	NA	NA	**400**	**810**	**32**	**730**	**93**	NA	NA	**9.6**	**1800**	NA	NA	**6.6**	**670**	**6.9**	**12**
Cadmium	mg/kg	**NE**	**7.1**	**98**	NA	NA	NA	**17**	NA	**7.7**	NA	NA	NA	<2.7	NA	NA	NA	NA	**12**	NA	NA
Chromium	mg/kg	**NE**	**3600000***	**NE***	NA	NA	NA	**29**	NA	**16**	NA	NA	NA	**15**	NA	NA	NA	NA	**27**	NA	NA
Copper	mg/kg	**NE**	**310**	**4700**	NA	NA	NA	**11000**	NA	**780**	NA	NA	NA	**35**	NA	NA	NA	NA	**6900**	NA	NA
Lead	mg/kg	**NE**	**270**	**800**	NA	NA	NA	**1800**	NA	**380**	NA	NA	NA	**100**	NA	NA	NA	NA	**1500**	NA	NA
Mercury	mg/kg	**NE**	**1.1**	**4.6**	NA	NA	NA	**26**	NA	**18**	NA	NA	NA	**0.61**	NA	NA	NA	NA	**20**	NA	NA
Nickel	mg/kg	**NE**	**50.9**	**2200**	NA	NA	NA	**18**	NA	**12**	NA	NA	NA	**12**	NA	NA	NA	NA	**16**	NA	NA
Selenium	mg/kg	**NE**	**5.2**	**580**	NA	NA	NA	**11**	NA	**5.0**	NA	NA	NA	<2.7	NA	NA	NA	NA	**12**	NA	NA
Silver	mg/kg	**NE**	**1.6**	**580**	NA	NA	NA	**16**	NA	**2.3**	NA	NA	NA	<2.7	NA	NA	NA	NA	**16**	NA	NA
Thallium	mg/kg	**NE**	**0.078**	**1.2**	NA	NA	NA	**6.5**	NA	**5.6**	NA	NA	NA	<2.2	NA	NA	NA	NA	<21	NA	NA
Zinc	mg/kg	**NE**	**746**	**35000**	NA	NA	NA	**7200**	NA	**1300**	NA	NA	NA	**83**	NA	NA	NA	NA	**4300**	NA	NA

NOTES:
(0.5-1.5) = designates depth sample was collected below ground surface
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
PCBs = polychlorinated biphenyls
PPL = Priority Pollutant List
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ng/kg = nanograms per kilogram
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
NA = not analyzed
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-PSS = VDEQ petroleum saturated soil standard
VDEQ-T2RSL = VDEQ Tier II residential screening level
VDEQ-T3ISL = VDEQ Tier III industrial screening level
Bold and right justification designates target compound was detected at a concentration above RL
* = total chromium (chromium III and VI)
Yellow highlighting designates target compound was detected at a concentration above a VDEQ screening concentration in at least 1 sample

TABLE 6. 2016 ICOR SOIL ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-PSSS	VDEQ-T2RSL	VDEQ-T3ISL	MiHpt-19(1-2)	MiHpt-19(4-5)	MiHpt-20(1.5-2.5)	MiHpt-20(4-5)	MiHpt-21(1-2)	MiHpt-21(4.5-5.5)	MiHpt-21(9-10)	MiHpt-21(24-25)	MiHpt-22(1-2)	MiHpt-22(4.5-5.5)	MiHpt-22(19-20)	MiHpt-22(24-25)
Sample Date:					9/7/16	9/7/16	9/8/16	9/8/16	9/9/16	9/9/16	9/9/16	9/9/16	9/9/16	9/9/16	9/9/16	9/9/16
TPH 8015																
TPH-GRO (C6-C10)	mg/kg	**8300**	**NE**	**NE**	NA	NA	NA	NA	NA	NA	**760**	<0.12	NA	NA	**2.5**	<0.12
TPH-DRO (C10-C28)	mg/kg	**11000**	**NE**	**NE**	NA	NA	NA	NA	NA	NA	**49**	<12	NA	NA	**71**	<12
TCL VOCs 8260B																
Acetone	ug/kg	**NE**	**574000**	**67000000**	NA	NA	NA	NA	NA	NA	<1900	<21	NA	NA	<24000	<22
Cyclohexane	ug/kg	**NE**	**26600**	**2700000**	NA	NA	NA	NA	NA	NA	**190000**	<21	NA	NA	**35000**	<22
Ethylbenzene	ug/kg	**NE**	**15700**	**250000**	NA	NA	NA	NA	NA	NA	**8500**	<5.2	NA	NA	**15000**	<5.5
Isopropylbenzene	ug/kg	**NE**	**1470**	**990000**	NA	NA	NA	NA	NA	NA	**1900**	<5.2	NA	NA	<6000	<5.5
Methylcyclohexane	ug/kg	**NE**	**NE**	**NE**	NA	NA	NA	NA	NA	NA	**400000**	<21	NA	NA	**200000**	<22
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	NA	NA	NA	NA	NA	NA	<490	<5.2	NA	NA	**46000**	<5.5
Tetrachloroethene	ug/kg	**NE**	**45.3**	**39000**	NA	NA	NA	NA	NA	NA	**3800**	<5.2	NA	NA	<6000	<5.5
Toluene	ug/kg	**NE**	**13800**	**4700000**	NA	NA	NA	NA	NA	NA	**990**	<5.2	NA	NA	<6000	<5.5
m,p-Xylenes	ug/kg	**NE**	**371**	**240000**	NA	NA	NA	NA	NA	NA	**14000**	<10	NA	NA	**18000**	<11
o-Xylene	ug/kg	**NE**	**374**	**280000**	NA	NA	NA	NA	NA	NA	**700**	<5.2	NA	NA	**7300**	<5.5
TCL SVOCs 8270C																
2-Methylnaphthalene	ug/kg	**NE**	**371**	**300000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Acenaphthene	ug/kg	**NE**	**10900**	**4500000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Anthracene	ug/kg	**NE**	**119000**	**23000000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Benzo(a)anthracene	ug/kg	**NE**	**2120**	**210000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Benzo(a)pyrene	ug/kg	**NE**	**1100**	**21000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Benzo(b)fluoranthene	ug/kg	**NE**	**11000**	**210000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Benzo(g,h,i)perylene	ug/kg	**NE**	**26100**	**2300000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Benzo(k)fluoranthene	ug/kg	**NE**	**110000**	**2100000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Chrysene	ug/kg	**NE**	**1100000**	**21000000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Dibenz(a,h)Anthracene	ug/kg	**NE**	**1100**	**21000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Dibenzofuran	ug/kg	**NE**	**293**	**100000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Fluoranthene	ug/kg	**NE**	**178000**	**3000000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Fluorene	ug/kg	**NE**	**10700**	**3000000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Indeno(1,2,3-c,d)Pyrene	ug/kg	**NE**	**11000**	**210000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Phenanthrene	ug/kg	**NE**	**26100**	**2300000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
Pyrene	ug/kg	**NE**	**26100**	**2300000**	NA	NA	NA	NA	NA	NA	NA	<200	NA	NA	NA	<210
PCBs 8082																
PCBs	mg/kg				NA	NA	<0.062	NA	<0.061	<0.060	NA	NA	<0.061	<0.059	NA	NA
Pesticides 8081B																
4,4-DDD	ug/kg	**NE**	**29.6**	**2500**	NA	NA	<5.0	NA	<4.9	<4.8	NA	NA	<4.9	<4.7	NA	NA
4,4-DDE	ug/kg	**NE**	**2160**	**35000**	NA	NA	<5.0	NA	<4.9	<4.8	NA	NA	<4.9	<4.7	NA	NA
4,4-DDT	ug/kg	**NE**	**3700**	**52000**	NA	NA	<5.0	NA	<4.9	<4.8	NA	NA	<4.9	<4.7	NA	NA
Herbicides 8151A																
2,4,5-T	ug/kg	**NE**	**NE**	**NE**	NA	NA	<26	NA	**52**	**42**	NA	NA	<24	<23	NA	NA
Dioxins 8290A																
2,3,7,8-TCDD	ng/kg	**NE**	**NE**	**NE**	**12.4**	NA	**0.691** J	NA	NA	NA	NA	NA	NA	NA	NA	NA
PPL Metals 6020A																
Antimony	mg/kg	**NE**	**3.1**	**47**	NA	NA	**13**	NA	NA	NA	NA	NA	<2.6	NA	NA	NA
Arsenic	mg/kg	**NE**	**3.5**	**30**	**130**	**480**	**480**	**5.8**	NA	**7.7**	NA	NA	**2500**	**810**	NA	NA
Cadmium	mg/kg	**NE**	**7.1**	**98**	NA	NA	**5.9**	NA	NA	NA	NA	NA	<2.6	NA	NA	NA
Chromium	mg/kg	**NE**	**3600000***	**NE***	NA	NA	**21**	NA	NA	NA	NA	NA	**22**	NA	NA	NA
Copper	mg/kg	**NE**	**310**	**4700**	NA	NA	**1400**	NA	NA	NA	NA	NA	**25**	NA	NA	NA
Lead	mg/kg	**NE**	**270**	**800**	NA	NA	**690**	NA	NA	NA	NA	NA	**69**	NA	NA	NA
Mercury	mg/kg	**NE**	**1.1**	**4.6**	NA	NA	**3.5**	NA	NA	NA	NA	NA	**0.26**	NA	NA	NA
Nickel	mg/kg	**NE**	**50.9**	**2200**	NA	NA	**14**	NA	NA	NA	NA	NA	**22**	NA	NA	NA
Selenium	mg/kg	**NE**	**5.2**	**580**	NA	NA	**4.4**	NA	NA	NA	NA	NA	<2.6	NA	NA	NA
Silver	mg/kg	**NE**	**1.6**	**580**	NA	NA	**4.5**	NA	NA	NA	NA	NA	<2.6	NA	NA	NA
Thallium	mg/kg	**NE**	**0.078**	**1.2**	NA	NA	<2.1	NA	NA	NA	NA	NA	<2.1	NA	NA	NA
Zinc	mg/kg	**NE**	**746**	**35000**	NA	NA	**2700**	NA	NA	NA	NA	NA	**79**	NA	NA	NA

NOTES:
(0.5-1.5) = designates depth sample was collected below ground surface
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
PCBs = polychlorinated biphenyls
PPL = Priority Pollutant List
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ng/kg = nanograms per kilogram
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
NA = not analyzed
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-PSS = VDEQ petroleum saturated soil standard
VDEQ-T2RSL = VDEQ Tier II residential screening level
VDEQ-T3ISL = VDEQ Tier III industrial screening level
Bold and right justification designates target compound was detected at a concentration above RL
* = total chromium (chromium III and VI)
Yellow highlighting designates target compound was detected at a concentration above a VDEQ screening concentration in at least 1 sample

TABLE 7. 2018 ICOR SOIL ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-PSSS	VDEQ-T2RSL	VDEQ-T3ISL	MW-23(11.5-12.5)	MW-24(8-9)	MW-25(9-10)
Sample Date:					1/22/18	1/22/18	1/22/18
TPH 8015							
TPH-GRO (C6-C10)	mg/kg	**8300**	**NE**	**NE**	**3.2**	<0.11	<0.12
TPH-DRO (C10-C28)	mg/kg	**11000**	**NE**	**NE**	**9000**	**58**	**220**
TCL VOCs 8260B							
Acetone	ug/kg	**NE**	**574000**	**67000000**	<3000	**34**	<25
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	**9700**	<4.7	<6.2
TCL SVOCs 8270C							
2-Methylnaphthalene	ug/kg	**NE**	**371**	**300000**	**16000**	<20	<110
Acenaphthene	ug/kg	**NE**	**10900**	**4500000**	**850000**	**35**	<110
Acenaphthylene	ug/kg	**NE**	**26100**	**2300000**	**52000**	**57**	<110
Anthracene	ug/kg	**NE**	**119000**	**23000000**	**780000**	**100**	<110
Benzo(a)anthracene	ug/kg	**NE**	**2120**	**210000**	**680000**	**430**	<110
Benzo(a)pyrene	ug/kg	**NE**	**1100**	**21000**	**570000**	**450**	<110
Benzo(b)fluoranthene	ug/kg	**NE**	**11000**	**210000**	**390000**	**400**	<110
Benzo(g,h,i)perylene	ug/kg	**NE**	**26100**	**2300000**	**190000**	**220**	<110
Benzo(k)fluoranthene	ug/kg	**NE**	**110000**	**2100000**	**420000**	**320**	<110
Biphenyl (Diphenyl)	ug/kg	**NE**	**17.4**	**20000**	**160000**	<200	<1100
Carbazole	ug/kg	**NE**	**NE**	**NE**	**180000**	<200	<1100
Chrysene	ug/kg	**NE**	**1100000**	**21000000**	**530000**	**440**	<110
Dibenz(a,h)Anthracene	ug/kg	**NE**	**1100**	**21000**	**130000**	**80**	<110
Dibenzofuran	ug/kg	**NE**	**293**	**100000**	**600000**	<200	<1100
Fluoranthene	ug/kg	**NE**	**178000**	**3000000**	**1600000**	**720**	**190**
Fluorene	ug/kg	**NE**	**10700**	**3000000**	**800000**	**43**	<110
Indeno(1,2,3-c,d)Pyrene	ug/kg	**NE**	**11000**	**210000**	**280000**	**280**	<110
Naphthalene	ug/kg	**NE**	**40.1**	**59000**	**62000**	<20	<110
Phenanthrene	ug/kg	**NE**	**26100**	**2300000**	**2100000**	**400**	**130**
Pyrene	ug/kg	**NE**	**26100**	**2300000**	**1300000**	**660**	**190**

NOTES:
(11.5-12.5) = designates depth sample was collected below ground surface
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ-PSS = Commonwealth of Virginia Department of Environmental Quality (VDEQ) petroleum saturated soil standard
VDEQ-T2RSL = VDEQ Tier II residential screening level
VDEQ-T3ISL = VDEQ Tier III industrial screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above a VDEQ screening concentration in at least 1 sample

TABLE 8. 2013 ICOR GROUNDWATER ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	ECS-MW2	ECS-MW4	ICOR-SB1(GW)	ICOR-SB5(GW)	ICOR-SB6(GW)	ICOR-SB7(GW)	ICOR-SB8(GW)	ICOR-SB9(GW)
Date:								10/08/2013	10/08/2013	10/08/2013	10/08/2013	10/08/2013	10/08/2013	10/08/2013	10/08/2013
TPH EPA 8015															
TPH-GRO	mg/L	NE	NE	NE	15	NE	NE	2.8	<0.1	<0.1	0.25	0.21	0.18	11	0.25
TPH-DRO	mg/L	NE	NE	NE	15	NE	NE	0.91	0.15	0.17	0.30	0.11	0.16	0.93	0.77
TCL VOCs EPA 8260B															
Benzene	ug/L	13.7	57.3	14.2	12	22	510	160	<1.0	<1.0	49	50	1.7	57	7.4
Cyclohexane	ug/L	103	424	3330	NE	NE	NE	150	<10	<10	<10	<10	<10	710	<10
Ethylbenzene	ug/L	34.1	152	591	4.3	530	2100	47	<1.0	<1.0	15	7.7	<1.0	80	<1.0
Isopropylbenzene	ug/L	89.3	383	19.9	NE	NE	NE	6.7	<1.0	<1.0	3.5	<1.0	1.2	<10	<1.0
Methylcyclohexane	ug/L	NE	NE	NE	NE	NE	NE	230	<10	<10	<10	<10	<10	520	<10
Naphthalene	ug/L	17.2	72.3	0.722	8.9	NE	NE	73	<1.0	<1.0	29	27	<1.0	50	19
Toluene	ug/L	1920	8100	949	43	510	6000	5.8	<1.0	<1.0	<1.0	<1.0	<1.0	16	1.7
m,p-Xylenes	ug/L	150	1290	20.8	33	NE	NE	17	<2.0	<2.0	4.8	2.9	<2.0	76	<2.0
o-Xylene	ug/L	47.2	208	20.9	33	NE	NE	28	<1.0	<1.0	21	3.2	<1.0	<10	<1.0
TCL SVOCs EPA 8270C															
Acenaphthene	ug/L	NE	NE	2950	NE	670	990	<11	17	7.2	<5.0	<5.0	<5.0	<11	27
Acenaphthylene	ug/L	NE	NE	1430	NE	NE	NE	<11	<5.0	<5.0	<5.0	<5.0	<5.0	<11	8.5
Anthracene	ug/L	NE	NE	7850	NE	8300	40000	<11	<5.0	<5.0	<5.0	<5.0	<5.0	<11	7.3
Biphenyl (Diphenyl)	ug/L	3.34	14.3	1.18	NE	NE	NE	<11	<5.0	<5.0	<5.0	<5.0	<5.0	<11	9.3
Carbazole	ug/L	NE	NE	NE	NE	NE	NE	<11	<5.0	<5.0	<5.0	<5.0	<5.0	<11	8.7
Dibenzofuran	ug/L	NE	NE	48.4	NE	NE	NE	<11	<5.0	<5.0	<5.0	<5.0	<5.0	<11	22
Fluoranthene	ug/L	NE	NE	311	NE	130	140	<11	<5.0	<5.0	<5.0	<5.0	<5.0	<11	12
Fluorene	ug/L	NE	NE	4370	NE	1100	5300	<11	5.9	<5.0	<5.0	<5.0	<5.0	<11	30
Naphthalene	ug/L	17.2	72.3	0.722	8.9	NE	NE	36	<5.0	<5.0	<5.0	8.4	<5.0	<11	13
Phenanthrene	ug/L	NE	NE	1430	NE	NE	NE	<11	<5.0	<5.0	<5.0	<5.0	<5.0	<11	25
Pyrene	ug/L	NE	NE	1430	NE	830	4000	<11	<5.0	<5.0	<5.0	<5.0	<5.0	<11	8.7
Total PPL Metals EPA 6020A															
Antimony	ug/L	NE	NE	78.6	NE	5.6	640	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA	9.9
Arsenic	ug/L	NE	NE	197	NE	1	150	95	38	120	480	400	15	NA	370
Beryllium	ug/L	NE	NE	55	NE	NE	NE	26	<1.0	<1.0	60	1.8	<1.0	NA	<1.0
Cadmium	ug/L	NE	NE	19.2	NE	1.1	1.1	31	<1.0	13	32	6.7	<1.0	NA	2.5
Chromium	ug/L	NE	NE	NE	NE	NE	NE	180	<1.0	24	270	39	3.7	NA	3.5
Copper	ug/L	NE	NE	6570	NE	9	9	3300	<1.0	700	2000	790	1.4	NA	150
Lead	ug/L	NE	NE	NE	NE	11	11	1100	14	530	610	290	3.2	NA	76
Mercury	ug/L	0.0881	0.369	0.0086	NE	0.77	0.77	0.72	<0.20	0.38	0.26	<0.20	<0.20	NA	0.40
Nickel	ug/L	NE	NE	4950	NE	20	20	160	<1.0	38	1500	33	2.9	NA	6.6
Selenium	ug/L	NE	NE	3280	NE	5	5	<5.0	<1.0	3.7	5.8	7.6	<1.0	NA	<1.0
Silver	ug/L	NE	NE	48.4	NE	NE	NE	<1.0	<1.0	3.7	<1.0	<1.0	<1.0	NA	<1.0
Thallium	ug/L	NE	NE	26.3	NE	0.24	0.47	1.1	<1.0	1.0	1.0	<1.0	<1.0	NA	<1.0
Zinc	ug/L	NE	NE	236000	NE	120	120	19000	<20	6900	21000	1800	28	NA	8200
Dissolved PPL Metals EPA 6020A															
Arsenic	ug/L	NE	NE	197	NE	1	150	1.4	<1.0	14	420	38	5.0	NA	25
Beryllium	ug/L	NE	NE	55	NE	NE	NE	<1.0	<1.0	<1.0	32	<1.0	<1.0	NA	<1.0
Cadmium	ug/L	NE	NE	19.2	NE	1.1	1.1	<1.0	<1.0	6.4	39	<1.0	<1.0	NA	<1.0
Chromium	ug/L	NE	NE	NE	NE	NE	NE	<1.0	<1.0	<1.0	250	<1.0	<1.0	NA	<1.0
Copper	ug/L	NE	NE	6570	NE	9	9	<1.0	<1.0	52	1000	3.0	<1.0	NA	<1.0
Lead	ug/L	NE	NE	NE	NE	11	11	<1.0	<1.0	2.9	820	<1.0	<1.0	NA	<1.0
Mercury	ug/L	0.0881	0.369	0.0086	NE	0.77	0.77	<0.20	<0.20	<0.20	0.25	<0.20	<0.20	NA	<0.20
Nickel	ug/L	NE	NE	4950	NE	20	20	1.5	<1.0	24	1500	3.8	<1.0	NA	3.0

TABLE 8. 2013 ICOR GROUNDWATER ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	ECS-MW2	ECS-MW4	ICOR-SB1(GW)	ICOR-SB5(GW)	ICOR-SB6(GW)	ICOR-SB7(GW)	ICOR-SB8(GW)	ICOR-SB9(GW)
Date:								10/08/2013	10/08/2013	10/08/2013	10/08/2013	10/08/2013	10/08/2013	10/08/2013	10/08/2013
Selenium	ug/L	**NE**	**NE**	**3280**	**NE**	**5**	**5**	<1.0	<1.0	**1.7**	**4.3**	**7.2**	<1.0	NA	<1.0
Zinc	ug/L	**NE**	**NE**	**236000**	**NE**	**120**	**120**	**130**	<20	**4200**	**23000**	**530**	<20	NA	**6400**

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
PCBs = polychlorinated biphenyls
PPL = Priority Pollutant List
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/L = micrograms per liter
mg/L = milligrams per liter
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 9. GROUNDWATER ANALYTICAL RESULTS (OBTAINED DURING UST REMOVAL AND INCLUDES COMPARISON TO HISTORICAL DATA)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	TEC-MW2		TEC-MW3		TEC-MW4		TEC-MW5	
Date:								5/1/06	3/30/16	5/1/06	3/30/16	5/1/06	3/30/16	5/1/06	3/30/16
TPH 8015															
TPH-DRO	mg/L	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	ND	**0.29**	ND	**0.13**	ND	**0.75**	ND	<0.12
VOCs 8021B															
Benzene	ug/L	**13.7**	**57.3**	**14.2**	**12**	**22**	**510**	ND	<1.0	ND	<1.0	ND	<1.0	ND	<1.0
Toluene	ug/L	**1920**	**8100**	**949**	**43**	**510**	**6000**	ND	<1.0	ND	<1.0	ND	<1.0	ND	<1.0
Ethylbenzene	ug/L	**34.1**	**152**	**591**	**4.3**	**530**	**2100**	ND	<1.0	ND	<1.0	ND	<1.0	ND	<1.0
m,p-Xylenes	ug/L	**150**	**1290**	**20.8**	**33**	**NE**	**NE**	ND	<2.0	ND	<2.0	ND	<2.0	ND	<2.0
o-Xylenes	ug/L	**47.2**	**208**	**20.9**	**33**	**NE**	**NE**	ND	<1.0	ND	<1.0	ND	<1.0	ND	<1.0
Naphthalene	ug/L	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	ND	**4.9**	ND	<1.0	ND	**4.3**	ND	<1.0

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
VOCs = volatile organic compounds
ug/L = micrograms per liter
mg/L = milligrams per liter
ND = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 10. 2016-2020 A-ZONE/ICOR GROUNDWATER ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	CAS No.	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	TEC-MW2							TEC-MW4						
Sample Date:									9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20	9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20
TPH 8015																						
TPH-GRO (C6-C10)	mg/L	C6C10GRO	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TPH-DRO (C10-C28)	mg/L	C10C28DRO	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	**0.21**	**0.18**	**0.28**	**0.22**	<0.13	**0.12**	**0.15**	**0.21**	**0.26**	**0.30**	**0.17**	**0.11**	**0.19**	**0.60**
TCL VOCs 8260B																						
Acetone	ug/L	67-64-1	**2240000**	**9780000**	**13400**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<10	<10	<10	<10	<5.0	<5.0
Benzene	ug/L	71-43-2	**13.7**	**57.3**	**14.2**	**12**	**22**	**510**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon Disulfide	ug/L	75-15-0	**124**	**527**	**122**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<1.0	<1.0	<10	<10	<10	<10	<10	<1.0	<1.0
Chloroform	ug/L	67-66-3	**8**	**35.3**	**54.3**	**80**	**340**	**11000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	ug/L	74-87-3	**26.07**	**108.16**	**432.29**	**NE**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cyclohexane	ug/L	110-82-7	**103**	**424**	**3330**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	ug/L	100-41-4	**34.1**	**152**	**591**	**4.3**	**530**	**2100**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Isopropylbenzene	ug/L	98-82-8	**89.3**	**383**	**19.9**	**NE**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl-t-butyl ether	ug/L	1634-04-4	**4580**	**19600**	**524**	**15**	**NE**	**NE**	**2.5**	**2.8**	**2.3**	**1.5**	<1.0	**1.1**	**1.0**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylcyclohexane	ug/L	108-87-2	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene (PCE)	ug/L	127-18-4	**5.8**	**24.9**	**10.4**	**5**	**6.9**	**33**	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/L	108-88-3	**1920**	**8100**	**949**	**43**	**510**	**6000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene (TCE)	ug/L	79-01-6	**0.521**	**2.19**	**0.46**	**5**	**25**	**300**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/L	156-59-2	**NE**	**NE**	**2260**	**70**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	ug/L	156-60-5	**NE**	**NE**	**157**	**100**	**140**	**10000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylenes	ug/L	108-38-3	**150**	**1290**	**20.8**	**33**	**NE**	**NE**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	ug/L	95-47-6	**47.2**	**208**	**20.9**	**33**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TCL SVOCs 8270C																						
2,4,5-Trichlorophenol	ug/L	95-95-4	**NE**	**NE**	**7860**	**NE**	**300**	**600**	NA	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4,6-Trichlorophenol	ug/L	88-06-2	**NE**	**NE**	**27.37**	**NE**	**14**	**24**	NA	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dichlorophenol	ug/L	120-83-2	**NE**	**NE**	**1060**	**NE**	**77**	**290**	NA	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dimethylphenol	ug/L	105-67-9	**NE**	**NE**	**5388.61**	**NE**	**380**	**850**	NA	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2-Chlorophenol	ug/L	95-57-8	**NE**	**NE**	**1110**	**NE**	**81**	**150**	NA	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
2-Methylnaphthalene	ug/L	91-57-6	**NE**	**NE**	**59**	**NE**	**NE**	**NE**	NA	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
2-Methyl phenol	ug/L	95-48-7	**NE**	**NE**	**30174.44**	**NE**	**NE**	**NE**	NA	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
3&4-Methylphenol	ug/L		**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	NA	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Acenaphthene	ug/L	83-32-9	**NE**	**NE**	**2950**	**NE**	**670**	**990**	NA	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	**0.30**	<0.25
Acenaphthylene	ug/L	208-96-8	**NE**	**NE**	**1430**	**NE**	**NE**	**NE**	NA	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Anthracene	ug/L	120-12-7	**NE**	**NE**	**7850**	**NE**	**8300**	**40000**	NA	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Benzo(a)anthracene	ug/L	56-55-3	**346.52**	**4076.67**	**69.33**	**NE**	**0.038**	**0.18**	NA	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Biphenyl (Diphenyl)	ug/L	92-52-4	**3.34**	**14.3**	**1.18**	**NE**	**NE**	**NE**	NA	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Carbazole	ug/L	86-74-8	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	NA	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Dibenzofuran	ug/L	132-64-9	**NE**	**NE**	**48.4**	**NE**	**NE**	**NE**	NA	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Fluoranthene	ug/L	206-44-0	**NE**	**NE**	**311**	**NE**	**130**	**140**	NA	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Fluorene	ug/L	86-73-7	**NE**	**NE**	**4370**	**NE**	**1100**	**5300**	NA	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	NA	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Pentachlorophenol	ug/L	87-86-5	**NE**	**NE**	**5.54**	**NE**	**0.03**	**0.04**	NA	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<5.0	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0
Phenanthrene	ug/L	85-01-8	**NE**	**NE**	**1430**	**NE**	**NE**	**NE**	NA	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Pyrene	ug/L	129-00-0	**NE**	**NE**	**1430**	**NE**	**830**	**4000**	NA	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
bis(2-ethylhexyl) phthalate	ug/L	117-81-7	**0.00252**	**0.01122**	**0.02572**	**NE**	**12**	**22**	NA	<0.50	<0.50	<0.50	<0.50	**0.83**	<0.50	<5.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/L = micrograms per liter
mg/L = milligrams per liter
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 10. 2016-2020 A-ZONE/ICOR GROUNDWATER ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	CAS No.	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	ECS-MW4							MiHpt-05						
Sample Date:									9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20	9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20
TPH 8015																						
TPH-GRO (C6-C10)	mg/L	C6C10GRO	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.81**	**0.79**	**0.6**	**0.95**	**0.45**	**0.49**	**0.19**
TPH-DRO (C10-C28)	mg/L	C10C28DRO	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	<0.10	<0.10	**0.11**	<0.10	<0.10	<0.11	<0.11	**0.52**	**0.41**	**0.41**	**0.48**	**0.70**	**0.44**	**0.18**
TCL VOCs 8260B																						
Acetone	ug/L	67-64-1	**2240000**	**9780000**	**13400**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<10	<10	<10	<10	<5.0	<5.0
Benzene	ug/L	71-43-2	**13.7**	**57.3**	**14.2**	**12**	**22**	**510**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**110**	**150**	**130**	**130**	**100**	**91**	**67**
Carbon Disulfide	ug/L	75-15-0	**124**	**527**	**122**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<1.0	<1.0	<10	<10	<10	<10	<10	<1.0	<1.0
Chloroform	ug/L	67-66-3	**8**	**35.3**	**54.3**	**80**	**340**	**11000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	ug/L	74-87-3	**26.07**	**108.16**	**432.29**	**NE**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cyclohexane	ug/L	110-82-7	**103**	**424**	**3330**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	ug/L	100-41-4	**34.1**	**152**	**591**	**4.3**	**530**	**2100**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**26**	**14**	**13**	**24**	**30**	**48**	<1.0
Isopropylbenzene	ug/L	98-82-8	**89.3**	**383**	**19.9**	**NE**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**4.5**	**4.4**	**5.5**	**7.9**	**10**	**12**	**2.4**
Methyl-t-butyl ether	ug/L	1634-04-4	**4580**	**19600**	**524**	**15**	**NE**	**NE**	**3.7**	**4.7**	**4.9**	**4.8**	**5.9**	**5.1**	**3.9**	<1.0	<1.0	<1.0	<1.0	<1.0	**1.7**	<1.0
Methylcyclohexane	ug/L	108-87-2	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**170**	**250**	**220**	**340**	**390**	**430**	**96**
Tetrachloroethene (PCE)	ug/L	127-18-4	**5.8**	**24.9**	**10.4**	**5**	**6.9**	**33**	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/L	108-88-3	**1920**	**8100**	**949**	**43**	**510**	**6000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.4**	**1.0**	**1.5**	**2.6**	**2.9**	**2.8**	<1.0
Trichloroethene (TCE)	ug/L	79-01-6	**0.521**	**2.19**	**0.46**	**5**	**25**	**300**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/L	156-59-2	**NE**	**NE**	**2260**	**70**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	ug/L	156-60-5	**NE**	**NE**	**157**	**100**	**140**	**10000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylenes	ug/L	108-38-3	**150**	**1290**	**20.8**	**33**	**NE**	**NE**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**12**	**18**	**19**	**22**	**27**	**26**	**6.4**
o-Xylene	ug/L	95-47-6	**47.2**	**208**	**20.9**	**33**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**23**	**38**	**39**	**37**	**45**	**47**	**17**
TCL SVOCs 8270C																						
2,4,5-Trichlorophenol	ug/L	95-95-4	**NE**	**NE**	**7860**	**NE**	**300**	**600**	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4,6-Trichlorophenol	ug/L	88-06-2	**NE**	**NE**	**27.37**	**NE**	**14**	**24**	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dichlorophenol	ug/L	120-83-2	**NE**	**NE**	**1060**	**NE**	**77**	**290**	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dimethylphenol	ug/L	105-67-9	**NE**	**NE**	**5388.61**	**NE**	**380**	**850**	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2-Chlorophenol	ug/L	95-57-8	**NE**	**NE**	**1110**	**NE**	**81**	**150**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
2-Methylnaphthalene	ug/L	91-57-6	**NE**	**NE**	**59**	**NE**	**NE**	**NE**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	**16**	**1.9**	**1.4**	**8.0**	**36**	**53**	**0.65**
2-Methyl phenol	ug/L	95-48-7	**NE**	**NE**	**30174.44**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
3&4-Methylphenol	ug/L		**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Acenaphthene	ug/L	83-32-9	**NE**	**NE**	**2950**	**NE**	**670**	**990**	<5.0	**2.5**	**2.1**	**1.1**	**5.0**	**7.4**	**7.1**	<5.3	**1.0**	<0.50	**1.7**	**8.7**	**15**	<0.25
Acenaphthylene	ug/L	208-96-8	**NE**	**NE**	**1430**	**NE**	**NE**	**NE**	<5.0	<0.50	<0.50	<0.50	**0.70**	**0.93**	**0.82**	<5.3	<0.50	<0.50	<0.50	<0.50	**0.50**	<0.25
Anthracene	ug/L	120-12-7	**NE**	**NE**	**7850**	**NE**	**8300**	**40000**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.3	<0.50	<0.50	<0.50	<0.50	**0.29**	<0.25
Benzo(a)anthracene	ug/L	56-55-3	**346.52**	**4076.67**	**69.33**	**NE**	**0.038**	**0.18**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.3	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Biphenyl (Diphenyl)	ug/L	92-52-4	**3.34**	**14.3**	**1.18**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<5.0	**3.1**	<0.50
Carbazole	ug/L	86-74-8	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<5.0	**0.78**	<0.50
Dibenzofuran	ug/L	132-64-9	**NE**	**NE**	**48.4**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<5.0	**5.6**	<0.50
Fluoranthene	ug/L	206-44-0	**NE**	**NE**	**311**	**NE**	**130**	**140**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.3	<0.50	<0.50	<0.50	<0.50	**0.68**	<0.25
Fluorene	ug/L	86-73-7	**NE**	**NE**	**4370**	**NE**	**1100**	**5300**	<5.0	**0.75**	**0.66**	<0.50	**1.3**	**1.9**	**1.8**	<5.3	**1.1**	<0.50	**1.3**	**4.9**	**7.0**	<0.25
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	**83**	**47**	**16**	**48**	**190**	**230**	**29**
Pentachlorophenol	ug/L	87-86-5	**NE**	**NE**	**5.54**	**NE**	**0.03**	**0.04**	<5.0	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<5.3	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0
Phenanthrene	ug/L	85-01-8	**NE**	**NE**	**1430**	**NE**	**NE**	**NE**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.3	<0.50	<0.50	**0.55**	**1.8**	**3.1**	<0.25
Pyrene	ug/L	129-00-0	**NE**	**NE**	**1430**	**NE**	**830**	**4000**	<5.0	<0.50	<0.50	<0.50	<0.50	**0.28**	<0.25	<5.3	<0.50	<0.50	<0.50	<0.50	**0.48**	<0.25
bis(2-ethylhexyl) phthalate	ug/L	117-81-7	**0.00252**	**0.01122**	**0.02572**	**NE**	**12**	**22**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/L = micrograms per liter
mg/L = milligrams per liter
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 10. 2016-2020 A-ZONE/ICOR GROUNDWATER ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	CAS No.	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	MiHpt-07							MiHpt-08						
Sample Date:									9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20	9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20
TPH 8015																						
TPH-GRO (C6-C10)	mg/L	C6C10GRO	NE	NE	NE	15	NE	NE	0.88	0.89	1.4	2.1	1	0.97	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TPH-DRO (C10-C28)	mg/L	C10C28DRO	NE	NE	NE	15	NE	NE	2.0	1.8	2.6	3.6	2.7	1.5	0.92	0.15	0.20	0.22	0.17	<0.12	<0.10	<0.11
TCL VOCs 8260B																						
Acetone	ug/L	67-64-1	2240000	9780000	13400	NE	NE	NE	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<10	<10	<10	<10	<5.0	<5.0
Benzene	ug/L	71-43-2	13.7	57.3	14.2	12	22	510	25	31	59	75	88	93	5.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon Disulfide	ug/L	75-15-0	124	527	122	NE	NE	NE	<10	<10	<10	<10	<10	<1.0	<1.0	<10	<10	<10	<10	<10	<1.0	<1.0
Chloroform	ug/L	67-66-3	8	35.3	54.3	80	340	11000	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	ug/L	74-87-3	26.07	108.16	432.29	NE	NE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cyclohexane	ug/L	110-82-7	103	424	3330	NE	NE	NE	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	ug/L	100-41-4	34.1	152	591	4.3	530	2100	61	57	94	110	140	120	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Isopropylbenzene	ug/L	98-82-8	89.3	383	19.9	NE	NE	NE	12	13	15	23	25	21	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl-t-butyl ether	ug/L	1634-04-4	4580	19600	524	15	NE	NE	1.0	1.6	1.4	1.7	1.7	1.6	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylcyclohexane	ug/L	108-87-2	NE	NE	NE	NE	NE	NE	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	ug/L	91-20-3	17.2	72.3	0.722	8.9	NE	NE	830	720	970	1400	1900	1500	1.0	14	14	<1.0	21	20	16	1.1
Tetrachloroethene (PCE)	ug/L	127-18-4	5.8	24.9	10.4	5	6.9	33	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/L	108-88-3	1920	8100	949	43	510	6000	3.7	2.7	2.9	2.9	4.2	3.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene (TCE)	ug/L	79-01-6	0.521	2.19	0.46	5	25	300	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/L	156-59-2	NE	NE	2260	70	NE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	ug/L	156-60-5	NE	NE	157	100	140	10000	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylenes	ug/L	108-38-3	150	1290	20.8	33	NE	NE	32	30	39	52	110	78	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	ug/L	95-47-6	47.2	208	20.9	33	NE	NE	32	38	56	61	77	70	1.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TCL SVOCs 8270C																						
2,4,5-Trichlorophenol	ug/L	95-95-4	NE	NE	7860	NE	300	600	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4,6-Trichlorophenol	ug/L	88-06-2	NE	NE	27.37	NE	14	24	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dichlorophenol	ug/L	120-83-2	NE	NE	1060	NE	77	290	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dimethylphenol	ug/L	105-67-9	NE	NE	5388.61	NE	380	850	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2-Chlorophenol	ug/L	95-57-8	NE	NE	1110	NE	81	150	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
2-Methylnaphthalene	ug/L	91-57-6	NE	NE	59	NE	NE	NE	40	28	4.7	37	190	270	<0.25	<5.3	<0.50	<0.50	0.74	1.0	1.9	<0.25
2-Methyl phenol	ug/L	95-48-7	NE	NE	30174.44	NE	NE	NE	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
3&4-Methylphenol	ug/L		NE	NE	NE	NE	NE	NE	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.3	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Acenaphthene	ug/L	83-32-9	NE	NE	2950	NE	670	990	36	38	14	25	74	130	61	<5.3	1.6	0.66	1.4	1.8	4.2	7.7
Acenaphthylene	ug/L	208-96-8	NE	NE	1430	NE	NE	NE	<5.0	1.2	<0.50	0.57	0.92	0.91	1.3	<5.3	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Anthracene	ug/L	120-12-7	NE	NE	7850	NE	8300	40000	<5.0	1.6	0.61	1.7	3.3	5.1	3.1	<5.3	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Benzo(a)anthracene	ug/L	56-55-3	346.52	4076.67	69.33	NE	0.038	0.18	<5.3	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.3	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Biphenyl (Diphenyl)	ug/L	92-52-4	3.34	14.3	1.18	NE	NE	NE	7.0	7.1	<5.0	5.4	17	29	2.7	<5.3	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Carbazole	ug/L	86-74-8	NE	NE	NE	NE	NE	NE	<5.0	<5.0	<5.0	<5.0	<5.0	6.0	2.5	<5.3	<5.0	<5.0	<5.0	<5.0	2.0	<0.50
Dibenzofuran	ug/L	132-64-9	NE	NE	48.4	NE	NE	NE	<5.0	<5.0	<5.0	<5.0	5.3	7.4	3.3	<5.3	<5.0	<5.0	<5.0	<5.0	1.4	<0.50
Fluoranthene	ug/L	206-44-0	NE	NE	311	NE	130	140	<5.0	<0.50	<0.50	<0.50	0.67	1.1	0.64	<5.3	<0.50	<0.50	<0.50	<0.50	0.38	0.29
Fluorene	ug/L	86-73-7	NE	NE	4370	NE	1100	5300	8.2	9.5	3.5	7.2	18	28	16	<5.3	0.51	<0.50	0.68	0.70	1.6	0.54
Naphthalene	ug/L	91-20-3	17.2	72.3	0.722	8.9	NE	NE	200	170	73	170	740	1100	<0.25	<5.3	2.2	<0.50	4.1	4.8	7.6	0.91
Pentachlorophenol	ug/L	87-86-5	NE	NE	5.54	NE	0.03	0.04	<5.0	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	<5.3	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0
Phenanthrene	ug/L	85-01-8	NE	NE	1430	NE	NE	NE	8.7	8.8	3.2	8.3	17	27	12	<5.3	<0.50	<0.50	<0.50	<0.50	1.2	0.30
Pyrene	ug/L	129-00-0	NE	NE	1430	NE	830	4000	<5.0	<0.50	<0.50	<0.50	0.77	1.3	0.74	<5.3	<0.50	<0.50	<0.50	<0.50	<0.25	0.26
bis(2-ethylhexyl) phthalate	ug/L	117-81-7	0.00252	0.01122	0.02572	NE	12	22	<5.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/L = micrograms per liter
mg/L = milligrams per liter
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 10. 2016-2020 A-ZONE/ICOR GROUNDWATER ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	CAS No.	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	MiHpt-14							MiHpt-15						
Sample Date:									9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20	9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20
TPH 8015																						
TPH-GRO (C6-C10)	mg/L	C6C10GRO	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	**0.33**	**0.41**	**0.28**	**0.41**	**0.22**	**0.21**	**0.18**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TPH-DRO (C10-C28)	mg/L	C10C28DRO	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	**0.75**	**1.2**	**1.5**	**1.3**	**0.59**	**0.84**	**1.0**	<0.10	<0.10	<0.10	<0.10	<0.11	<0.10	<0.13
TCL VOCs 8260B																						
Acetone	ug/L	67-64-1	**2240000**	**9780000**	**13400**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<10	<10	<10	<10	<5.0	<5.0
Benzene	ug/L	71-43-2	**13.7**	**57.3**	**14.2**	**12**	**22**	**510**	**66**	**70**	**66**	**92**	**73**	**49**	**36**	**9.9**	**6.2**	<1.0	**1.6**	**11**	**4.7**	<1.0
Carbon Disulfide	ug/L	75-15-0	**124**	**527**	**122**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<1.0	<1.0	<10	<10	<10	<10	<10	<1.0	<1.0
Chloroform	ug/L	67-66-3	**8**	**35.3**	**54.3**	**80**	**340**	**11000**	**1.4**	**1.3**	**2.2**	**1.1**	**6.8**	**9.1**	**10**	**7.7**	**63**	**12**	**43**	**1.7**	**5.8**	**49**
Chloromethane	ug/L	74-87-3	**26.07**	**108.16**	**432.29**	**NE**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cyclohexane	ug/L	110-82-7	**103**	**424**	**3330**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	ug/L	100-41-4	**34.1**	**152**	**591**	**4.3**	**530**	**2100**	**5.4**	**7.4**	**6.0**	**9.8**	**10**	**6.4**	**3.3**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Isopropylbenzene	ug/L	98-82-8	**89.3**	**383**	**19.9**	**NE**	**NE**	**NE**	<1.0	<1.0	<1.0	**1.3**	**1.2**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl-t-butyl ether	ug/L	1634-04-4	**4580**	**19600**	**524**	**15**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	**1.2**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylcyclohexane	ug/L	108-87-2	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	**37**	**48**	**48**	**62**	**56**	**39**	**39**	<1.0	**1.1**	<1.0	<1.0	**1.1**	**1.5**	<1.0
Tetrachloroethene (PCE)	ug/L	127-18-4	**5.8**	**24.9**	**10.4**	**5**	**6.9**	**33**	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/L	108-88-3	**1920**	**8100**	**949**	**43**	**510**	**6000**	**5.6**	**5.6**	**4.7**	**6.1**	**6.2**	**5.0**	**4.2**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene (TCE)	ug/L	79-01-6	**0.521**	**2.19**	**0.46**	**5**	**25**	**300**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/L	156-59-2	**NE**	**NE**	**2260**	**70**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	ug/L	156-60-5	**NE**	**NE**	**157**	**100**	**140**	**10000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylenes	ug/L	108-38-3	**150**	**1290**	**20.8**	**33**	**NE**	**NE**	**2.8**	**4.5**	**3.8**	**4.9**	**5.8**	**4.0**	**2.6**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	ug/L	95-47-6	**47.2**	**208**	**20.9**	**33**	**NE**	**NE**	**4.8**	**7.4**	**5.7**	**8.5**	**9.2**	**6.1**	**3.3**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TCL SVOCs 8270C																						
2,4,5-Trichlorophenol	ug/L	95-95-4	**NE**	**NE**	**7860**	**NE**	**300**	**600**	<5.0	<5.0	<5.3	<5.0	<2.0	**0.70**	<0.50	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4,6-Trichlorophenol	ug/L	88-06-2	**NE**	**NE**	**27.37**	**NE**	**14**	**24**	<5.0	<5.0	<5.3	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dichlorophenol	ug/L	120-83-2	**NE**	**NE**	**1060**	**NE**	**77**	**290**	**13**	<5.0	<5.3	<5.0	<2.0	**7.8**	**8.5**	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dimethylphenol	ug/L	105-67-9	**NE**	**NE**	**5388.61**	**NE**	**380**	**850**	<5.3	<5.0	<5.3	<5.0	<2.0	**0.63**	**0.56**	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50
2-Chlorophenol	ug/L	95-57-8	**NE**	**NE**	**1110**	**NE**	**81**	**150**	<5.0	<5.0	<5.3	<5.0	<5.0	**1.2**	**0.92**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
2-Methylnaphthalene	ug/L	91-57-6	**NE**	**NE**	**59**	**NE**	**NE**	**NE**	<5.0	**0.68**	<0.53	**0.54**	**1.1**	**2.1**	**2.4**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
2-Methyl phenol	ug/L	95-48-7	**NE**	**NE**	**30174.44**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.3	<5.0	<5.0	**0.78**	**0.92**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
3&4-Methylphenol	ug/L		**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.3	<5.0	<5.0	**1.7**	**1.2**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Acenaphthene	ug/L	83-32-9	**NE**	**NE**	**2950**	**NE**	**670**	**990**	**12**	**8.5**	**2.5**	**5.9**	**18**	**34**	**28**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Acenaphthylene	ug/L	208-96-8	**NE**	**NE**	**1430**	**NE**	**NE**	**NE**	<5.0	<0.50	<0.53	<0.50	**1.2**	**2.0**	**2.1**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Anthracene	ug/L	120-12-7	**NE**	**NE**	**7850**	**NE**	**8300**	**40000**	**6.3**	**2.4**	**0.83**	**1.6**	**3.8**	**9.1**	**8.9**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Benzo(a)anthracene	ug/L	56-55-3	**346.52**	**4076.67**	**69.33**	**NE**	**0.038**	**0.18**	<5.3	<0.50	<0.50	<0.50	<0.50	**0.41**	**0.36**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Biphenyl (Diphenyl)	ug/L	92-52-4	**3.34**	**14.3**	**1.18**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.3	<5.0	<5.0	**6.5**	**5.4**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Carbazole	ug/L	86-74-8	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**7.4**	<5.0	<5.3	<5.0	**13**	**20**	**14**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Dibenzofuran	ug/L	132-64-9	**NE**	**NE**	**48.4**	**NE**	**NE**	**NE**	**13**	**7.2**	<5.3	<5.0	**14**	**28**	**24**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Fluoranthene	ug/L	206-44-0	**NE**	**NE**	**311**	**NE**	**130**	**140**	<5.0	**1.9**	**0.60**	**1.1**	**2.5**	**6.0**	**5.2**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Fluorene	ug/L	86-73-7	**NE**	**NE**	**4370**	**NE**	**1100**	**5300**	**18**	**9.6**	**2.9**	**6.0**	**17**	**35**	**31**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	**10**	**8.8**	**2.9**	**7.1**	**17**	**29**	**20**	<5.0	**1.7**	**1.8**	<0.50	**0.62**	**0.66**	<0.25
Pentachlorophenol	ug/L	87-86-5	**NE**	**NE**	**5.54**	**NE**	**0.03**	**0.04**	<5.0	<5.0	<5.3	<5.0	<5.0	<2.0	<2.0	<5.0	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0
Phenanthrene	ug/L	85-01-8	**NE**	**NE**	**1430**	**NE**	**NE**	**NE**	**21**	**6.9**	**2.3**	**4.1**	**10**	**24**	**25**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Pyrene	ug/L	129-00-0	**NE**	**NE**	**1430**	**NE**	**830**	**4000**	<5.0	**1.3**	<0.53	**0.71**	**1.8**	**4.0**	**3.6**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
bis(2-ethylhexyl) phthalate	ug/L	117-81-7	**0.00252**	**0.01122**	**0.02572**	**NE**	**12**	**22**	<5.0	<0.50	<0.53	<0.50	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/L = micrograms per liter
mg/L = milligrams per liter
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 10. 2016-2020 A-ZONE/ICOR GROUNDWATER ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	CAS No.	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	MiHpt-20							MiHpt-21						
Sample Date:									9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20	9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20
TPH 8015																						
TPH-GRO (C6-C10)	mg/L	C6C10GRO	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	**0.18**	**0.14**	**0.16**	<0.1	<0.1	<0.1	<0.1	**7.5**	**15**	**4.5**	**12**	**12**	**12**	**8.9**
TPH-DRO (C10-C28)	mg/L	C10C28DRO	**NE**	**NE**	**NE**	**15**	**NE**	**NE**	**0.72**	**0.62**	**0.77**	<0.10	<0.10	<0.10	<0.11	**1.7**	**1.2**	**2.3**	**2.4**	**2.2**	**1.5**	**2.5**
TCL VOCs 8260B																						
Acetone	ug/L	67-64-1	**2240000**	**9780000**	**13400**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<5.0	<5.0	<50	<100	**19**	<10	<10	<5.0	<5.0
Benzene	ug/L	71-43-2	**13.7**	**57.3**	**14.2**	**12**	**22**	**510**	**14**	**13**	**14**	<1.0	<1.0	<1.0	<1.0	**58**	**59**	**75**	**74**	**77**	**71**	**58**
Carbon Disulfide	ug/L	75-15-0	**124**	**527**	**122**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<1.0	<1.0	<10	<10	<10	<10	<10	<1.0	<1.0
Chloroform	ug/L	67-66-3	**8**	**35.3**	**54.3**	**80**	**340**	**11000**	<1.0	<1.0	<1.0	**1.2**	**1.4**	**1.3**	**1.4**	<5.0	<10	<1.0	**8.4**	<1.0	<1.0	<1.0
Chloromethane	ug/L	74-87-3	**26.07**	**108.16**	**432.29**	**NE**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**10**	<1.0
Cyclohexane	ug/L	110-82-7	**103**	**424**	**3330**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<10	<10	**560**	**710**	**460**	**1200**	**1500**	**1600**	**490**
Ethylbenzene	ug/L	100-41-4	**34.1**	**152**	**591**	**4.3**	**530**	**2100**	**1.4**	<1.0	**1.5**	<1.0	<1.0	<1.0	<1.0	**150**	**160**	**73**	**140**	**170**	**150**	**130**
Isopropylbenzene	ug/L	98-82-8	**89.3**	**383**	**19.9**	**NE**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**17**	**15**	**8.4**	**15**	**14**	**12**	**11**
Methyl-t-butyl ether	ug/L	1634-04-4	**4580**	**19600**	**524**	**15**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0
Methylcyclohexane	ug/L	108-87-2	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	<10	<10	<10	<10	<10	<10	<10	**460**	**690**	**340**	**670**	**740**	**690**	**280**
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	**67**	**42**	**64**	<1.0	<1.0	<1.0	<1.0	**6.4**	<10	**3.2**	**3.2**	**3.1**	**3.3**	**2.2**
Tetrachloroethene (PCE)	ug/L	127-18-4	**5.8**	**24.9**	**10.4**	**5**	**6.9**	**33**	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	**47**	**64**	**26**	**60**	**76**	**70**	**46**
Toluene	ug/L	108-88-3	**1920**	**8100**	**949**	**43**	**510**	**6000**	**2.6**	**2.0**	**2.2**	<1.0	<1.0	<1.0	<1.0	**45**	**44**	**31**	**46**	**67**	**62**	**52**
Trichloroethene (TCE)	ug/L	79-01-6	**0.521**	**2.19**	**0.46**	**5**	**25**	**300**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**10**	**11**	**10**	**14**	**27**	**26**	**24**
cis-1,2-Dichloroethene	ug/L	156-59-2	**NE**	**NE**	**2260**	**70**	**NE**	**NE**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.1**	**2.1**	**5.4**	**4.4**	**6.4**
trans-1,2-Dichloroethene	ug/L	156-60-5	**NE**	**NE**	**157**	**100**	**140**	**10000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.3**	**6.1**	**5.5**	**4.4**
m,p-Xylenes	ug/L	108-38-3	**150**	**1290**	**20.8**	**33**	**NE**	**NE**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**190**	**240**	**110**	**200**	**250**	**240**	**190**
o-Xylene	ug/L	95-47-6	**47.2**	**208**	**20.9**	**33**	**NE**	**NE**	**1.4**	**1.1**	**1.6**	<1.0	<1.0	<1.0	<1.0	**9.1**	**11**	**4.6**	**7.6**	**11**	**9.6**	**8.2**
TCL SVOCs 8270C																						
2,4,5-Trichlorophenol	ug/L	95-95-4	**NE**	**NE**	**7860**	**NE**	**300**	**600**	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	**53**	**19**	**11**	**32**	**32**	**75**	**50**
2,4,6-Trichlorophenol	ug/L	88-06-2	**NE**	**NE**	**27.37**	**NE**	**14**	**24**	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<2.0	**3.3**	**1.6**
2,4-Dichlorophenol	ug/L	120-83-2	**NE**	**NE**	**1060**	**NE**	**77**	**290**	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	**710**	**220**	**120**	**370**	**290**	**920**	**700**
2,4-Dimethylphenol	ug/L	105-67-9	**NE**	**NE**	**5388.61**	**NE**	**380**	**850**	<5.0	<5.0	<5.0	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<2.0	**0.61**	**0.78**
2-Chlorophenol	ug/L	95-57-8	**NE**	**NE**	**1110**	**NE**	**81**	**150**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	**8.3**	<5.0	<5.0	**5.1**	**13**	**47**	**42**
2-Methylnaphthalene	ug/L	91-57-6	**NE**	**NE**	**59**	**NE**	**NE**	**NE**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	**0.35**	**0.32**
2-Methyl phenol	ug/L	95-48-7	**NE**	**NE**	**30174.44**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
3&4-Methylphenol	ug/L		**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	**1.1**	<0.50
Acenaphthene	ug/L	83-32-9	**NE**	**NE**	**2950**	**NE**	**670**	**990**	**6.3**	**1.7**	**2.0**	<0.50	<0.50	**0.30**	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Acenaphthylene	ug/L	208-96-8	**NE**	**NE**	**1430**	**NE**	**NE**	**NE**	<5.0	**0.94**	**1.2**	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Anthracene	ug/L	120-12-7	**NE**	**NE**	**7850**	**NE**	**8300**	**40000**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Benzo(a)anthracene	ug/L	56-55-3	**346.52**	**4076.67**	**69.33**	**NE**	**0.038**	**0.18**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Biphenyl (Diphenyl)	ug/L	92-52-4	**3.34**	**14.3**	**1.18**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Carbazole	ug/L	86-74-8	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Dibenzofuran	ug/L	132-64-9	**NE**	**NE**	**48.4**	**NE**	**NE**	**NE**	**11**	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Fluoranthene	ug/L	206-44-0	**NE**	**NE**	**311**	**NE**	**130**	**140**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Fluorene	ug/L	86-73-7	**NE**	**NE**	**4370**	**NE**	**1100**	**5300**	**12**	**2.5**	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	**NE**	**NE**	**13**	**4.3**	**5.7**	**0.52**	<0.50	**0.62**	<0.25	**35**	**0.66**	<0.50	**26**	**48**	**1.1**	<0.25
Pentachlorophenol	ug/L	87-86-5	**NE**	**NE**	**5.54**	**NE**	**0.03**	**0.04**	<5.0	<5.0	<5.0	<5.0	<5.0	<2.0	<2.0	**13**	<5.0	<5.0	**6.8**	**7.8**	**22**	**15**
Phenanthrene	ug/L	85-01-8	**NE**	**NE**	**1430**	**NE**	**NE**	**NE**	**10**	**1.5**	**1.7**	<0.50	<0.50	**0.25**	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
Pyrene	ug/L	129-00-0	**NE**	**NE**	**1430**	**NE**	**830**	**4000**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25	<5.0	<0.50	<0.50	<0.50	<0.50	<0.25	<0.25
bis(2-ethylhexyl) phthalate	ug/L	117-81-7	**0.00252**	**0.01122**	**0.02572**	**NE**	**12**	**22**	<5.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/L = micrograms per liter
mg/L = milligrams per liter
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 10. 2016-2020 A-ZONE/ICOR GROUNDWATER ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	CAS No.	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	MiHpt-22							MW-23				
Sample Date:									9/21/16	2/7/17	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20
TPH 8015																				
TPH-GRO (C6-C10)	mg/L	C6C10GRO	NE	NE	NE	15	NE	NE	**0.38**	**2.3**	**0.27**	**0.56**	**0.23**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TPH-DRO (C10-C28)	mg/L	C10C28DRO	NE	NE	NE	15	NE	NE	**0.27**	**0.19**	**33**	**0.38**	**0.12**	<0.11	**0.16**	**0.28**	**0.15**	<0.10	<0.10	**0.46**
TCL VOCs 8260B																				
Acetone	ug/L	67-64-1	**2240000**	**9780000**	**13400**	NE	NE	NE	<10	<10	<10	<10	<10	<5.0	<5.0	<10	<10	<10	<5.0	**5.2**
Benzene	ug/L	71-43-2	**13.7**	**57.3**	**14.2**	12	22	510	**130**	**630**	**34**	**200**	**93**	**33**	<1.0	<1.0	<1.0	<1.0	<1.0	**2.8**
Carbon Disulfide	ug/L	75-15-0	**124**	**527**	**122**	NE	NE	NE	<10	<10	<10	<10	<10	<1.0	<1.0	<10	<10	<10	<1.0	<1.0
Chloroform	ug/L	67-66-3	**8**	**35.3**	**54.3**	80	340	11000	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	ug/L	74-87-3	**26.07**	**108.16**	**432.29**	NE	NE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cyclohexane	ug/L	110-82-7	**103**	**424**	**3330**	NE	NE	NE	**10**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	ug/L	100-41-4	**34.1**	**152**	**591**	**4.3**	**530**	**2100**	**1.6**	**16**	<1.0	**2.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Isopropylbenzene	ug/L	98-82-8	**89.3**	**383**	**19.9**	NE	NE	NE	<1.0	**1.6**	**1.2**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl-t-butyl ether	ug/L	1634-04-4	**4580**	**19600**	**524**	**15**	NE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**4.3**	**5.5**	**5.7**	**6.4**	<1.0
Methylcyclohexane	ug/L	108-87-2	NE	NE	NE	NE	NE	NE	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	NE	NE	<1.0	**3.1**	**1.3**	<1.0	**1.1**	<1.0	<1.0	**1.4**	**1.3**	<1.0	<1.0	<1.0
Tetrachloroethene (PCE)	ug/L	127-18-4	**5.8**	**24.9**	**10.4**	**5**	**6.9**	**33**	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/L	108-88-3	**1920**	**8100**	**949**	**43**	**510**	**6000**	<1.0	**3.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene (TCE)	ug/L	79-01-6	**0.521**	**2.19**	**0.46**	**5**	**25**	**300**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/L	156-59-2	NE	NE	**2260**	**70**	NE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	ug/L	156-60-5	NE	NE	**157**	**100**	**140**	**10000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylenes	ug/L	108-38-3	**150**	**1290**	**20.8**	**33**	NE	NE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	ug/L	95-47-6	**47.2**	**208**	**20.9**	**33**	NE	NE	<1.0	**8.4**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TCL SVOCs 8270C																				
2,4,5-Trichlorophenol	ug/L	95-95-4	NE	NE	**7860**	NE	**300**	**600**	<5.0	<5.0	<5.6	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<2.0	<0.50	<0.50
2,4,6-Trichlorophenol	ug/L	88-06-2	NE	NE	**27.37**	NE	**14**	**24**	<5.0	<5.0	<5.6	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dichlorophenol	ug/L	120-83-2	NE	NE	**1060**	NE	**77**	**290**	<5.0	<5.0	<5.6	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dimethylphenol	ug/L	105-67-9	NE	NE	**5388.61**	NE	**380**	**850**	<5.0	<5.0	<5.6	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<2.0	<0.50	<0.50
2-Chlorophenol	ug/L	95-57-8	NE	NE	**1110**	NE	**81**	**150**	<5.0	<5.0	<5.6	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<0.50	<0.50
2-Methylnaphthalene	ug/L	91-57-6	NE	NE	**59**	NE	NE	NE	<5.0	<0.50	<0.56	<0.50	**0.69**	<0.25	<0.25	<0.50	<0.50	<0.50	<0.25	<0.25
2-Methyl phenol	ug/L	95-48-7	NE	NE	**30174.44**	NE	NE	NE	<5.0	<5.0	<5.6	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<0.50	<0.50
3&4-Methylphenol	ug/L		NE	NE	NE	NE	NE	NE	<5.0	<5.0	<5.6	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<0.50	<0.50
Acenaphthene	ug/L	83-32-9	NE	NE	**2950**	NE	**670**	**990**	<5.0	<0.50	<0.56	<0.50	**0.75**	<0.25	<0.25	**0.90**	**1.5**	**7.2**	**6.8**	**19**
Acenaphthylene	ug/L	208-96-8	NE	NE	**1430**	NE	NE	NE	<5.0	<0.50	<0.56	<0.50	<0.50	<0.25	<0.25	<0.50	<0.50	<0.50	<0.25	**1.2**
Anthracene	ug/L	120-12-7	NE	NE	**7850**	NE	**8300**	**40000**	<5.0	<0.50	<0.56	<0.50	<0.50	<0.25	<0.25	<0.50	<0.50	**0.50**	**0.47**	**4.7**
Benzo(a)anthracene	ug/L	56-55-3	**346.52**	**4076.67**	**69.33**	NE	**0.038**	**0.18**	<5.0	<0.50	<0.56	<0.50	<0.50	<0.25	<0.25	<0.50	<0.50	<0.50	<0.25	<0.25
Biphenyl (Diphenyl)	ug/L	92-52-4	**3.34**	**14.3**	**1.18**	NE	NE	NE	<5.0	<5.0	<5.6	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<0.50	<0.50
Carbazole	ug/L	86-74-8	NE	NE	NE	NE	NE	NE	<5.0	<5.0	<5.6	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	**3.7**	**23**
Dibenzofuran	ug/L	132-64-9	NE	NE	**48.4**	NE	NE	NE	<5.0	<5.0	<5.6	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	**3.7**	**15**
Fluoranthene	ug/L	206-44-0	NE	NE	**311**	NE	**130**	**140**	<5.0	<0.50	<0.56	<0.50	<0.50	<0.25	<0.25	<0.50	<0.50	**0.67**	**0.77**	**6.5**
Fluorene	ug/L	86-73-7	NE	NE	**4370**	NE	**1100**	**5300**	<5.0	<0.50	<0.56	<0.50	<0.50	<0.25	<0.25	**0.52**	**0.77**	**3.8**	**3.4**	**7.4**
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	NE	NE	<5.0	<0.50	<0.56	<0.50	**0.99**	<0.25	<0.25	<0.50	<0.50	<0.50	<0.25	<0.25
Pentachlorophenol	ug/L	87-86-5	NE	NE	**5.54**	NE	**0.03**	**0.04**	<5.0	<5.0	<5.6	<5.0	<5.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<2.0
Phenanthrene	ug/L	85-01-8	NE	NE	**1430**	NE	NE	NE	<5.0	<0.50	<0.56	<0.50	<0.50	<0.25	<0.25	**0.60**	<0.50	**1.5**	**1.5**	**0.48**
Pyrene	ug/L	129-00-0	NE	NE	**1430**	NE	**830**	**4000**	<5.0	<0.50	<0.56	<0.50	<0.50	<0.25	<0.25	<0.50	<0.50	<0.50	**0.56**	**4.5**
bis(2-ethylhexyl) phthalate	ug/L	117-81-7	**0.00252**	**0.01122**	**0.02572**	NE	**12**	**22**	<5.0	<0.50	<0.56	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/L = micrograms per liter
mg/L = milligrams per liter
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 10. 2016-2020 A-ZONE/ICOR GROUNDWATER ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	CAS No.	VDEQ-T3RGSL	VDEQ-T3IGSL	VDEQ-T3CDSL	VDEQ-PDS	VDEQ-T2PWSSL	VDEQ-T2SWFSL	MW-24					MW-25				
Sample Date:									1/29/18	6/7/18	7/11/19	2/5/20	8/20/20	1/29/18	6/7/18	7/11/19	2/5/20	8/20/20
TPH 8015																		
TPH-GRO (C6-C10)	mg/L	C6C10GRO	NE	NE	NE	15	NE	NE	<0.1	<0.1	<0.1	<0.1	<0.1	**0.11**	**0.16**	<0.1	<0.1	<0.1
TPH-DRO (C10-C28)	mg/L	C10C28DRO	NE	NE	NE	15	NE	NE	**1.1**	**0.61**	**0.13**	**0.47**	**0.16**	**0.45**	**0.33**	**0.16**	**0.26**	**0.18**
TCL VOCs 8260B																		
Acetone	ug/L	67-64-1	**2240000**	**9780000**	**13400**	NE	NE	NE	<10	<10	<10	<5.0	<5.0	<10	<10	<10	<5.0	<5.0
Benzene	ug/L	71-43-2	**13.7**	**57.3**	**14.2**	**12**	**22**	**510**	<1.0	<1.0	<1.0	<1.0	<1.0	**14**	**17**	**26**	**23**	**11**
Carbon Disulfide	ug/L	75-15-0	**124**	**527**	**122**	NE	NE	NE	<10	<10	<10	<1.0	<1.0	<10	<10	**15**	**11**	**5.6**
Chloroform	ug/L	67-66-3	**8**	**35.3**	**54.3**	**80**	**340**	**11000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	ug/L	74-87-3	**26.07**	**108.16**	**432.29**	NE	NE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cyclohexane	ug/L	110-82-7	**103**	**424**	**3330**	NE	NE	NE	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	ug/L	100-41-4	**34.1**	**152**	**591**	**4.3**	**530**	**2100**	<1.0	<1.0	<1.0	<1.0	<1.0	**2.3**	**2.1**	**2.8**	**2.3**	**1.1**
Isopropylbenzene	ug/L	98-82-8	**89.3**	**383**	**19.9**	NE	NE	NE	**1.7**	**2.7**	<1.0	**2.8**	<1.0	**1.6**	**1.7**	**1.5**	**1.3**	<1.0
Methyl-t-butyl ether	ug/L	1634-04-4	**4580**	**19600**	**524**	**15**	NE	NE	**3.9**	**1.9**	**1.5**	**3.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylcyclohexane	ug/L	108-87-2	NE	NE	NE	NE	NE	NE	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	NE	NE	**2.6**	**3.4**	<1.0	**2.1**	<1.0	**83**	**77**	**78**	**65**	**24**
Tetrachloroethene (PCE)	ug/L	127-18-4	**5.8**	**24.9**	**10.4**	**5**	**6.9**	**33**	<5.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/L	108-88-3	**1920**	**8100**	**949**	**43**	**510**	**6000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene (TCE)	ug/L	79-01-6	**0.521**	**2.19**	**0.46**	**5**	**25**	**300**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	ug/L	156-59-2	NE	NE	**2260**	**70**	NE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	ug/L	156-60-5	NE	NE	**157**	**100**	**140**	**10000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylenes	ug/L	108-38-3	**150**	**1290**	**20.8**	**33**	NE	NE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	ug/L	95-47-6	**47.2**	**208**	**20.9**	**33**	NE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	**2.4**	**1.9**	**2.5**	**2.1**	<1.0
TCL SVOCs 8270C																		
2,4,5-Trichlorophenol	ug/L	95-95-4	NE	NE	**7860**	NE	**300**	**600**	<5.0	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<2.0	<0.50	<0.50
2,4,6-Trichlorophenol	ug/L	88-06-2	NE	NE	**27.37**	NE	**14**	**24**	<5.0	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dichlorophenol	ug/L	120-83-2	NE	NE	**1060**	NE	**77**	**290**	<5.0	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<2.0	<0.50	<0.50
2,4-Dimethylphenol	ug/L	105-67-9	NE	NE	**5388.61**	NE	**380**	**850**	<5.0	<5.0	<2.0	<0.50	<0.50	<5.0	<5.0	<2.0	**0.54**	<0.50
2-Chlorophenol	ug/L	95-57-8	NE	NE	**1110**	NE	**81**	**150**	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<0.50	<0.50
2-Methylnaphthalene	ug/L	91-57-6	NE	NE	**59**	NE	NE	NE	<0.50	<0.50	<0.50	<0.25	<0.25	<0.50	**0.58**	**1.9**	**3.5**	**0.85**
2-Methyl phenol	ug/L	95-48-7	NE	NE	**30174.44**	NE	NE	NE	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<0.50	<0.50
3&4-Methylphenol	ug/L		NE	NE	NE	NE	NE	NE	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	<0.50	<0.50
Acenaphthene	ug/L	83-32-9	NE	NE	**2950**	NE	**670**	**990**	**2.5**	**8.3**	**8.0**	**56**	**15**	**0.81**	**1.5**	**5.0**	**11**	**5.3**
Acenaphthylene	ug/L	208-96-8	NE	NE	**1430**	NE	NE	NE	<0.50	<0.50	<0.50	**0.38**	<0.25	<0.50	<0.50	<0.50	<0.25	<0.25
Anthracene	ug/L	120-12-7	NE	NE	**7850**	NE	**8300**	**40000**	**0.55**	**1.1**	**0.73**	**7.2**	**1.2**	<0.50	<0.50	<0.50	**0.71**	**0.54**
Benzo(a)anthracene	ug/L	56-55-3	**346.52**	**4076.67**	**69.33**	NE	**0.038**	**0.18**	<0.50	<0.50	<0.50	**0.25**	<0.25	<0.50	<0.50	<0.50	<0.25	<0.25
Biphenyl (Diphenyl)	ug/L	92-52-4	**3.34**	**14.3**	**1.18**	NE	NE	NE	<5.0	<5.0	<5.0	<0.50	<0.50	<5.0	<5.0	<5.0	**1.3**	<0.50
Carbazole	ug/L	86-74-8	NE	NE	NE	NE	NE	NE	<5.0	<5.0	<5.0	**0.79**	<0.50	<5.0	<5.0	<5.0	**5.8**	**2.9**
Dibenzofuran	ug/L	132-64-9	NE	NE	**48.4**	NE	NE	NE	<5.0	<5.0	<5.0	**23**	**2.1**	<5.0	<5.0	<5.0	**3.7**	**1.6**
Fluoranthene	ug/L	206-44-0	NE	NE	**311**	NE	**130**	**140**	**1.1**	**0.91**	**0.87**	**6.7**	**2.9**	<0.50	<0.50	<0.50	**1.1**	**0.79**
Fluorene	ug/L	86-73-7	NE	NE	**4370**	NE	**1100**	**5300**	**1.3**	**3.9**	**3.8**	**28**	**5.8**	<0.50	**0.75**	**2.5**	**5.3**	**2.6**
Naphthalene	ug/L	91-20-3	**17.2**	**72.3**	**0.722**	**8.9**	NE	NE	<0.50	<0.50	<0.50	**0.98**	<0.25	**3.5**	**6.1**	**20**	**35**	**8.3**
Pentachlorophenol	ug/L	87-86-5	NE	NE	**5.54**	NE	**0.03**	**0.04**	<5.0	<5.0	<5.0	<2.0	<2.0	<5.0	<5.0	<5.0	<2.0	<2.0
Phenanthrene	ug/L	85-01-8	NE	NE	**1430**	NE	NE	NE	**2.2**	**5.8**	**3.5**	**34**	**0.50**	<0.50	**1.1**	**2.6**	**5.7**	**3.1**
Pyrene	ug/L	129-00-0	NE	NE	**1430**	NE	**830**	**4000**	**0.88**	**0.59**	**0.56**	**4.3**	**2.2**	<0.50	<0.50	<0.50	**0.70**	**0.62**
bis(2-ethylhexyl) phthalate	ug/L	117-81-7	**0.00252**	**0.01122**	**0.02572**	NE	**12**	**22**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

NOTES:
TPH = total petroleum hydrocarbons
TPH-DRO = diesel range TPH
TPH-GRO = gasoline range TPH
TCL = Target Compound List
VOCs = volatile organic compounds
SVOCs = semi-VOCs
EPA 8260B = United States Environmental Protection Agency SW-846 analytical method
ug/L = micrograms per liter
mg/L = milligrams per liter
<1.0 = not detected above analytical method reporting limit (RL)
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RGSL = VDEQ Tier III residential groundwater vapor intrusion screening level
VDEQ-T3CGSL = VDEQ Tier III industrial groundwater vapor intrusion screening level
VDEQ-T3CDSL = VDEQ Tier III construction direct (<15 feet) screening level
VDEQ-PDS = general permit discharge standard for petroleum contaminated water
VDEQ-T2PWSSL = VDEQ Tier II public water supply screening level
VDEQ-T2SWFSL = VDEQ Tier II surface water fresh screening level
NE = not established
Bold and right justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ groundwater screening level in at least 1 sample
Blue highlighting designates target compound was detected at a concentration above the VDEQ surface water screening level in at least 1 sample
Green highlighting designates target compound was detected at a concentration above the VDEQ groundwater and surface water screening level in at least 1 sample

TABLE 11. SUB-SLAB SOIL GAS ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-T3RSSG	VDEQ-T3ISSG	ICOR-SSG1	ICOR-SSG2	ICOR-SSG3	ICOR-SSG4
Sample Date:				12/5/16	12/5/16	12/5/16	12/5/16
VOCs TO15							
1,2,4-Trimethylbenzene	ug/m3	**210**	**867**	**6.5**	**6.3**	<25	**6.1**
2,2,4-Trimethylpentane	ug/m3	**NE**	**NE**	**8.6**	**9.9**	**63**	**11**
2-Butanone (MEK)	ug/m3	**17300**	**73300**	**11**	**18**	<37	**16**
Acetone	ug/m3	**10700**	**467000**	**46**	**260**	<240	**540**
Benzene	ug/m3	**103**	**433**	**2.4**	**3.0**	<16	**4.0**
Chloroform	ug/m3	**40**	**177**	**7.0**	<2.4	<24	**23**
Cyclohexane	ug/m3	**21000**	**86700**	**1.8**	**4.9**	**150**	**18**
Dichlorodifluoromethane	ug/m3	**333**	**1470**	**3.6**	**4.9**	<25	**8.8**
Ethylbenzene	ug/m3	**367**	**1630**	**7.5**	**7.9**	<22	**8.0**
Propylene	ug/m3	**10300**	**43300**	**9.9**	**8.5**	<43	**37**
Tetrahydrofuran	ug/m3	**7000**	**29300**	**22**	**28**	**26**	**29**
Toluene	ug/m3	**17300**	**73300**	**32**	**43**	**35**	**38**
m,p-Xylenes	ug/m3	**333**	**1470**	**27**	**28**	**47**	**29**
n-Heptane	ug/m3	**1400**	**6000**	**2.7**	**3.4**	<20	**5.3**
o-Xylene	ug/m3	**333**	**1470**	**14**	**14**	**26**	**15**

NOTES:
VOCs = volatile organic compounds
TO15 = United States Environmental Protection Agency analytical method
ug/m3 = micrograms per meter cubed
<0.86 = not detected above the analytical method reporting limit (RL)
Bold and right justification designates constituent was detected above the RL
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RSSG = VDEQ Tier III residential Shallow/Subslab Soil Gas screening Level
VDEQ-T3ISSG = VDEQ Tier III industrial Shallow/Subslab Soil Gas Screening Level
NE = not established
Bold and center justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ screening level in at least 1 sample

TABLE 12. DEEP SOIL GAS ANALYTICAL RESULTS (DETECTIONS ONLY)

FORMER ROBINSON TERMINAL NORTH
500 AND 501 NORTH UNION STREET
ALEXANDRIA, VA

Sample ID:	Units	VDEQ-T3RDSG	VDEQ-T3IDSG	VDEQ-T3CSG	ICOR-DSG1	ICOR-DSG2	ICOR-DSG3	ICOR-DSG4
Sample Date:					12/5/16	12/5/16	12/5/16	12/5/16
Depth Collected (feet bgs):					6 - 6.5	5 - 5.5	3.5 - 4	2 - 2.5
VOCs TO15								
1,2,4-Trimethylbenzene	ug/m3	**630**	**2600**	**9689**	**7.7**	**8.2**	**4.8**	<25
1,3,5-Trimethylbenzene	ug/m3	**630**	**2600**	**1390**	<2.5	**2.9**	<2.5	<25
2,2,4-Trimethylpentane	ug/m3	**NE**	**NE**	**NE**	**490**	**4.0**	**11**	**400**
2-Butanone (MEK)	ug/m3	**52000**	**220000**	**91700**	<3.7	**5.6**	**4.1**	**180**
4-Methyl-2-Pentanone	ug/m3	**31000**	**130000**	**365000**	<5.1	<5.1	<5.1	**300**
Acetone	ug/m3	**320000**	**1400000**	**2450000**	**65**	**43**	**30**	**19000**
Benzene	ug/m3	**310**	**1300**	**7500**	**18**	**130**	**5.4**	<16
Carbon Disulfide	ug/m3	**7300**	**31000**	**55200**	**76**	**53**	<31	<310
Chloroethane	ug/m3	**NE**	**NE**	**NE**	<1.3	<1.3	**1.5**	<13
Chloroform	ug/m3	**120**	**530**	**2660**	**5.9**	**17**	**5.5**	<24
Cyclohexane	ug/m3	**63000**	**260000**	**1890000**	**190**	**68**	**73**	**320**
Ethylbenzene	ug/m3	**1100**	**4900**	**358000**	**7.2**	**2.7**	**5.8**	<22
Naphthalene	ug/m3	**31**	**130**	**416**	**6.7**	<2.6	<2.6	<26
Propylene	ug/m3	**31000**	**130000**	**229000**	**450**	**640**	**870**	**600**
Toluene	ug/m3	**52000**	**220000**	**539000**	**20**	**8.1**	**18**	**22**
m,p-Xylenes	ug/m3	**1000**	**4400**	**12300**	**22**	**11**	**21**	<43
n-Heptane	ug/m3	**4200**	**18000**	**51700**	**20**	**9.8**	**8.6**	**130**
n-Hexane	ug/m3	**7300**	**31000**	**230000**	**100**	<35	<35	**640**
n-Propylbenzene	ug/m3	**10000**	**44000**	**139000**	**2.5**	<2.5	<2.5	<25
o-Xylene	ug/m3	**1000**	**4400**	**12200**	**13**	**7.5**	**12**	<22

NOTES:
bgs = below ground surface
VOCs = volatile organic compounds
TO15 = United States Environmental Protection Agency analytical method
ug/m3 = micrograms per meter cubed
<1.3 = not detected above the analytical method reporting limit (RL)
Bold and right justification designates constituent was detected above the RL
VDEQ = Commonwealth of Virginia Department of Environmental Quality
VDEQ-T3RDSG = VDEQ Tier III residential Deep Soil Gas Screening Level
VDEQ-T3IDSG = VDEQ Tier III commercial Deep Soil Gas Screening Level
VDEQ-T3CSG = VDEQ Tier III Construction Soil Gas Screening Level
NE = not established
Bold and center justification designates target compound was detected at a concentration above RL
Yellow highlighting designates target compound was detected at a concentration above the VDEQ screening level in at least 1 sample

ATTACHMENT 1

ALEXRENEW PROJECT SUMMARY

RiverRenew™

INVESTING IN HEALTHIER WATERWAYS FOR ALEXANDRIA

The oldest parts of Alexandria are served by a sewer system that dates back to the 1800s. In this sewer system, called a combined sewer system, only one kind of pipe is designated for transporting both sewage and rainwater. When it's not raining, these pipes transport sewage for treatment at AlexRenew's Water Resource Recovery Facility.

On rainy days, the capacity of the combined sewer pipes is often exceeded. Instead of being transported and treated at the Water Resource Recovery Facility, sewage mixed with rainwater overflows into our waterways via four discharge points, or "outfalls." In April 2017, the Virginia General Assembly passed a law requiring the remediation of these outfalls by July 1, 2025.

AlexRenew is leading a major infrastructure program in response to the 2017 Virginia law to achieve cleaner, healthier waterways in Alexandria. The AlexRenew program is called RiverRenew and features a new tunnel system that will connect to the four combined sewer outfalls, which currently pollute our waterways on rainy days. The tunnel system will capture millions of gallons of sewage mixed with rainwater for treatment at AlexRenew and the cleaned water will be returned to the Potomac River.

AlexRenew's Board of Directors and employees look forward to our continued collaboration with City partners as we implement this historic and environmentally significant program.

Community members can learn more about AlexRenew's RiverRenew Program and keep track of our progress at riverrenew.com.


Alexandria
Diversion Facilities
Proposed Outfalls
Diversion Chamber
Mining Shaft/Pumping Station
Waterfront Tunnel
Hooffs Run Interceptor
Point of Interest
Manhole
Oronoco Bay Park
Pendleton St
Outfall 001
Patrick St
Henry St
King St Metro Station
Daingerfield Rd
King St
Founders Park
City Hall
Market Square
Torpedo Art Factory
Prince St
Outfall 003
Outfall 004
Duke St
The Lyceum
Waterfront Park
Jamieson Ave
Holland Ln
Lee St
Union St
Hooffs Run Interceptor
Wilkes Tunnel
Washington St
S Royal St
POTOMAC RIVER
AlexRenew
Waterfront Tunnel
Green St
Church St
495
N
Woodrow Wilson Bridge
Outfall 002
Jones Point Park
0
500
1,000 ft.

ATTACHMENT 2

RESPONSES TO VRP COMMENTS (FEBRUARY 4, 2019)

Mr. Hoffman,

DEQ received a Risk Assessment report dated November 23, 2018 for the above referenced site. This document has not been accepted as submitted. Please consider the following comments and submit a revised Risk Assessment report to DEQ.

General Comments:

1) Please include the VRP site boundary were included on figure 5.

A-Zone Response: The approximate VRP site boundary has been added to Figures 3 and 4 (the figures relevant to your comment).

2) Please include at a general overview of sampling methodology, analytical methods etc. used at the site.

A-Zone Response: Section 4.0 has been added to the URAR to address this comment.

Risk Assessment Comments:

1) Provide table 1.1A and 1.1B to present the various exposure pathways at the site.

A-Zone Response: Tables 1.1A and 1.1B have been added to the URAR to address this comment.

2) Pg 6: Although screening of COPCs has been conducted in the past, please provide a VURAM screening output (including soil gas data) using the VURAM screening module for proper documentation purposes. In addition, please note that MDLs should not be exceed VRP screening values.

A-Zone Response: The VURAM screening module was used for the screening output and MDLs exceeding VRP screening values were identified and addressed.

3) For groundwater data, I would recommend using recent data (2016-2018) in UCL calculations and risk assessment.

A-Zone Response: The most recent groundwater analytical data was used to generate the UCL calculations for the RA.

4) Considering the available data, please rely on maximum concentrations (for soil and soil gas) for risk assessment. Refer comments # 5, 6 and 7 for more info, if needed.

A-Zone Response: Maximum concentrations for soil were used for the updated RA. There are no soil gas COPCs; therefore, RA calculations were not run for this pathway.

5) Unless the vapor plume underneath the second building-501 parcel is delineated further, the Remedial Action Plan should include plans to mitigate the presented vapor intrusion risk.

A-Zone Response: There are no vapor intrusion COPCs; therefore, RA calculations were not run for this pathway.

6) Please discuss the potential of any offsite VI risk or plume migration, if any.

A-Zone Response: The soil gas analytical results do not support the presence of a vapor intrusion risk offsite and many of the surrounding properties are/have been contaminated by historical operations not related to those conducted at the SITE (e.g., fertilizer storage, city gas works, chemical manufacturing and mixing, and bulk oil storage). Additionally, some of these properties already include protections for this pathway.

7) Briefly describe how presented risk will be addressed in the Remedial Action Plan, to include plans for confirmation if removal actions are proposed.

A-Zone Response: With the change in the future use of the SITE, the institutional/engineering controls described in the URAR will be utilized to address open exposure pathways.

8) Include a discussion on how potential surface water impacts have been evaluated and addressed.

A-Zone Response: Sections 4.0 and 6.0 provide a discussion on how surface water impacts have been evaluated and addressed. As discussed, surface water impacts are most likely negligible from SITE groundwater.

ATTACHMENT 3

EXPOSURE PATHWAY ANALYSIS 1.1A AND 1.1B

TABLE 1.1A: ON-SITE EXPOSURE PATHWAY ANALYSIS

Medium	Exposure Medium	Receptor Population	Receptor Age	Exposure Route	Complete?	Rationale
Soil	Soil	Resident	Adult	Dermal	No	Current zoning will allow a form of residential use, so the Participant proposes to close the exposure pathway through a residential use prohibition. Such prohibition will be included in the Declaration of Restrictive Covenants.
				Ingestion	No	
			Child	Dermal	No	
				Ingestion	No	
	Air		Adult	Inhalation	No	
			Child	Inhalation	No	
	Soil	Trespasser/Visitor	Adult	Dermal	No	The Site commercial/Industrial worker scenario is more exposed than the trespasser/visitor so this exposure scenario was not quantitatively evaluated
				Ingestion	No	
			Child	Dermal	No	
				Ingestion	No	
	Air		Adult	Inhalation	No	
			Child	Inhalation	No	
	Soil	Construction Worker	Adult	Dermal	No	Construction workers could either now or in the future be exposed to Site contaminants, so the Participant proposes to close the exposure pathway with a worker health and safety plan requirement. Such requirement will be included in the Declaration of Restrictive Covenants.
				Ingestion	No	
	Air			Inhalation	No	
	Soil	Commercial/Industrial Worker	Adult	Dermal	No	Commercial/Industrial workers could either now or in the future be exposed to Site contamination, so the Participant proposes to close the exposure pathway with a worker health and safety plan requirement. Such requirement will be included in the Declaration of Restrictive Covenants.
				Ingestion	No	
	Air			Inhalation	No	
Groundwater	Groundwater	Resident	Adult	Dermal	No	Groundwater is not at the Site or in the City of Alexandria as a potable or irrigation water source. Additionally, the Participant proposes to impose a ground water use prohibition. Such requirement will be included in the Declaration of Restrictive Covenants.
				Ingestion	No	
			Child	Dermal	No	
				Ingestion	No	
	Shower Air		Adult	Inhalation	No	
	Building Air		Adult	Inhalation	No	
			Child	Inhalation	No	
	Groundwater	Construction Worker	Adult	Dermal	No	Construction workers could either now or in the future be exposed to Site contaminants, so the Participant proposes to close the exposure pathway with a worker health and safety plan requirement. Such requirement will be included in the Declaration of Restrictive Covenants.
				Ingestion	No	
	Air			Inhalation	No	
	Groundwater	Commercial/Industrial Worker	Adult	Dermal	No	Commercial/Industrial workers could either now or in the future be exposed to Site contamination, so the Participant proposes to close the exposure pathway with a worker health and safety plan requirement. Such requirement will be included in the Declaration of Restrictive Covenants.
				Ingestion	No	
	Building Air			Inhalation	No	
Surface Water	Surface Water	Recreational/Trespasser	Adult	Dermal	No	There is no surface water or sediment on the Site
				Ingestion	No	
			Child	Dermal	No	
				Ingestion	No	
	Aquatic Organisms		Adult	Ingestion	No	
			Child	Ingestion	No	
Sediment	Sediment	Recreational/ Trespasser	Adult	Dermal	No	There is no surface water or sediment on the Site
				Ingestion	No	
			Child	Dermal	No	
				Ingestion	No	
	Aquatic Organisms		Adult	Ingestion	No	
			Child	Ingestion	No	

TABLE 1.1B: OFF-SITE EXPOSURE PATHWAY ANALYSIS

Medium	Exposure Medium	Receptor Population	Receptor Age	Exposure Route	Complete?	Rationale
Soil	Soil	Resident	Adult	Dermal	No	Soil impacts are limited and localized in extent and most of the Site surface, including the areas where the highest degree of soil and groundwater impacts was identified, is covered by thick concrete building slabs or pavement that does not allow for soil exposure to Off-Site receptors.
				Ingestion	No	
			Child	Dermal	No	
				Ingestion	No	
	Air		Adult	Inhalation	No	Soil and groundwater impacts are limited and localized in extent and most of the existing Site surface, including the areas where the highest degree of soil and groundwater impacts was identified, is covered by thick concrete building slabs or pavement that does not allow for soil-to-airentrainment to be available for off-Site receptor exposure.
			Child	Inhalation	No	
	Soil	Trespasser/Visitor	Adult	Dermal	No	Soil and groundwater impacts are limited and localized in extent and most of the existing Site surface, including the areas where the highest degree of soil and groundwater impacts was identified, is covered by thick concrete building slabs or pavement that does not allow for soil exposure to Off-Site receptors.
				Ingestion	No	
			Child	Dermal	No	
				Ingestion	No	
	Air		Adult	Inhalation	No	
			Child	Inhalation	No	
	Soil	Construction Worker	Adult	Dermal	No	Soil and groundwater impacts are limited and localized in extent and most of the existing Site surface, including the areas where the highest degree of soil and groundwater impacts was identified, is covered by thick concrete building slabs or pavement that does not allow for soil exposure to Off-Site receptors.
				Ingestion	No	
	Air			Inhalation	No	
	Soil	Commercial/Industrial Worker	Adult	Dermal	No	
				Ingestion	No	
	Air			Inhalation	No	

TABLE 1.1B: OFF-SITE EXPOSURE PATHWAY ANALYSIS

Medium	Exposure Medium	Receptor Population	Receptor Age	Exposure Route	Complete?	Rationale
Groundwater	Groundwater	Resident	Adult	Dermal	No	Groundwater is not at the Site or in the City of Alexandria as a potable or irrigation water source.
				Ingestion	No	
			Child	Dermal	No	
				Ingestion	No	
	Shower Air		Adult	Inhalation	No	
	Building Air		Adult	Inhalation	No	Groundwater is not at the Site or in the City of Alexandria as a potable or irrigation water source.
			Child	Inhalation	No	
	Groundwater	Construction Worker	Adult	Dermal	No	Groundwater is not at the Site or in the City of Alexandria as a potable or irrigation water source.
				Ingestion	No	
	Air			Inhalation	No	
	Groundwater	Commercial/Industrial Worker	Adult	Dermal	No	Groundwater is not at the Site or in the City of Alexandria as a potable or irrigation water source.
				Ingestion	No	
	Building Air			Inhalation	No	
Surface Water	Surface Water	Recreational/Trespasser	Adult	Dermal	No	There is no surface water or sediment on the Site.
				Ingestion	No	
			Child	Dermal	No	
				Ingestion	No	
	Aquatic Organisms		Adult	Ingestion	No	
			Child	Ingestion	No	
Sediment	Sediment	Recreational/ Trespasser	Adult	Dermal	No	There is no surface water or sediment on the Site.
				Ingestion	No	
			Child	Dermal	No	
				Ingestion	No	
	Aquatic Organisms		Adult	Ingestion	No	
			Child	Ingestion	No	

ATTACHMENT 4

VURAM MEDIA SCREENING OUTPUT

Virginia Department of Environmental Quality

VURAM

Virginia Unified Risk Assessment Model

VERSION: 3.1

Screening Report: Voluntary Remediation Program (VRP)

Site Name: RTN500501UNIONST

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 **Individual Cancer Risk: 1.00E-05**

Construction Worker Groundwater Contact Depth

Direct Less Than 15ft

All Report Pages are Required for Risk Assessment Submission

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Soil

mg/kg

Screening Type: Residential Soil Tier II

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acenaphthene	83-32-9	Y	8.50E+02	1.09E+01	Y
Acenaphthylene	208-96-8	Y	5.20E+01	2.61E+01	Y
Acetone	67-64-1	Y	8.40E-02	5.74E+00	
Anthracene	120-12-7	Y	7.80E+02	1.19E+02	Y
Antimony (metallic)	7440-36-0		1.80E+01	3.10E+00	Y
Arsenic, Inorganic	7440-38-2		2.50E+03	3.50E+00	Y
Benz[a]anthracene	56-55-3	Y	6.80E+02	2.12E+00	Y
Benzene	71-43-2	Y	5.12E+00	5.11E-02	Y
Benzo(g,h,i)perylene	191-24-2	Y	1.90E+02	2.61E+01	Y
Benzo[a]pyrene	50-32-8		5.70E+02	1.10E+00	Y
Benzo[b]fluoranthene	205-99-2		3.90E+02	1.10E+01	Y
Benzo[k]fluoranthene	207-08-9		4.20E+02	1.10E+02	Y
Biphenyl, 1,1'-	92-52-4	Y	1.60E+02	1.74E-02	Y
Butylbenzene, n-	104-51-8	Y	3.66E-01	6.44E+00	
Butylbenzene, sec-	135-98-8	Y	2.60E-02	1.17E+01	
Butylbenzene, tert-	98-06-6	Y	1.10E-02	3.10E+00	
Cadmium (Diet)	7440-43-9-Diet		2.36E+01	7.10E+00	Y
Carbazole	86-74-8		1.80E+02		NE
Carbon Disulfide	75-15-0	Y	1.10E-02	4.77E-01	
Chromium(VI)	18540-29-9		3.00E+01	1.34E-01	Y
Chrysene	218-01-9		5.30E+02	1.10E+03	
Copper	7440-50-8		1.80E+03	3.10E+02	Y

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Soil

mg/kg

Screening Type: Residential Soil Tier II

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Cumene	98-82-8	Y	1.90E+00	1.47E+00	Y
Cyclohexane	110-82-7	Y	1.90E+02	2.66E+01	Y
DDD, p,p`- (DDD)	72-54-8		6.10E-03	2.96E-02	
DDE, p,p'-	72-55-9	Y	1.50E-02	2.16E+00	
DDT	50-29-3		7.00E-03	3.70E+00	
Dibenz[a,h]anthracene	53-70-3		1.30E+02	1.10E+00	Y
Dibenzofuran	132-64-9	Y	6.00E+02	2.93E-01	Y
Ethylbenzene	100-41-4	Y	1.50E+01	1.57E+01	
Fluoranthene	206-44-0		1.60E+03	1.78E+02	Y
Fluorene	86-73-7	Y	8.00E+02	1.07E+01	Y
Indeno[1,2,3-cd]pyrene	193-39-5		2.80E+02	1.10E+01	Y
isopropyltoluene	99-87-6	Y	4.73E-01	1.47E+00	
Lead and Compounds	7439-92-1		2.20E+03	4.00E+02	Y
Mercury (elemental)	7439-97-6	Y	7.51E+01	1.10E+00	Y
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	7.30E-02	2.34E+00	
Methyl tert-Butyl Ether (MTBE)	1634-04-4	Y	4.20E-03	6.31E-01	
Methylcyclohexane	108-87-2		4.00E+02		NE
Methylnaphthalene, 2-	91-57-6	Y	1.60E+01	3.71E-01	Y
Naphthalene	91-20-3	Y	6.20E+01	4.01E-02	Y
Nickel Soluble Salts	7440-02-0		2.60E+01	5.09E+01	
Phenanthrene	85-01-8	Y	2.10E+03	2.61E+01	Y
Propyl benzene	103-65-1	Y	5.80E-03	2.46E+00	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Soil

mg/kg

Screening Type: Residential Soil Tier II

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Pyrene	129-00-0	Y	1.30E+03	2.61E+01	Y
Selenium	7782-49-2		1.20E+01	5.20E+00	Y
Silver	7440-22-4		1.60E+01	1.60E+00	Y
Styrene	100-42-5	Y	4.20E-03	2.20E+00	
TCDD, 2,3,7,8-	1746-01-6	Y	1.24E-05	5.10E-06	Y
Tetrachloroethylene	127-18-4	Y	3.80E+00	4.53E-02	Y
Thallium (Soluble Salts)	7440-28-0		6.50E+00	7.80E-02	Y
Toluene	108-88-3	Y	3.80E+00	1.38E+01	
Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5		5.20E-02	1.32E-01	
Trimethylbenzene, 1,2,4-	95-63-6	Y	1.05E+00	1.62E-01	Y
Trimethylbenzene, 1,3,5-	108-67-8	Y	1.87E+00	1.72E-01	Y
Xylene, m-	108-38-3	Y	1.80E+01	3.71E-01	Y
Xylene, o-	95-47-6	Y	7.30E+00	3.74E-01	Y
Xylenes	1330-20-7	Y	4.21E+00	5.80E+01	
Zinc and Compounds	7440-66-6		7.20E+03	7.46E+02	Y

Screening Type: Industrial Soil Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acenaphthene	83-32-9	Y	8.50E+02	4.50E+03	
Acenaphthylene	208-96-8	Y	5.20E+01	2.30E+03	
Acetone	67-64-1	Y	8.40E-02	6.70E+04	
Anthracene	120-12-7	Y	7.80E+02	2.30E+04	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Soil

mg/kg

Screening Type: Industrial Soil Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Antimony (metallic)	7440-36-0		1.80E+01	4.70E+01	
Arsenic, Inorganic	7440-38-2		2.50E+03	3.00E+01	Y
Benz[a]anthracene	56-55-3	Y	6.80E+02	2.10E+02	Y
Benzene	71-43-2	Y	5.12E+00	4.20E+01	
Benzo(g,h,i)perylene	191-24-2	Y	1.90E+02	2.30E+03	
Benzo[a]pyrene	50-32-8		5.70E+02	2.10E+01	Y
Benzo[b]fluoranthene	205-99-2		3.90E+02	2.10E+02	Y
Benzo[k]fluoranthene	207-08-9		4.20E+02	2.10E+03	
Biphenyl, 1,1'-	92-52-4	Y	1.60E+02	2.00E+01	Y
Butylbenzene, n-	104-51-8	Y	3.66E-01	5.80E+03	
Butylbenzene, sec-	135-98-8	Y	2.60E-02	1.20E+04	
Butylbenzene, tert-	98-06-6	Y	1.10E-02	1.20E+04	
Cadmium (Diet)	7440-43-9-Diet		2.36E+01	9.80E+01	
Carbazole	86-74-8		1.80E+02		NE
Carbon Disulfide	75-15-0	Y	1.10E-02	3.50E+02	
Chromium(VI)	18540-29-9		3.00E+01	6.30E+01	
Chrysene	218-01-9		5.30E+02	2.10E+04	
Copper	7440-50-8		1.80E+03	4.70E+03	
Cumene	98-82-8	Y	1.90E+00	9.90E+02	
Cyclohexane	110-82-7	Y	1.90E+02	2.70E+03	
DDD, p,p`- (DDD)	72-54-8		6.10E-03	2.50E+00	
DDE, p,p'-	72-55-9	Y	1.50E-02	3.50E+01	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Soil

mg/kg

Screening Type: Industrial Soil Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
DDT	50-29-3		7.00E-03	5.20E+01	
Dibenz[a,h]anthracene	53-70-3		1.30E+02	2.10E+01	Y
Dibenzofuran	132-64-9	Y	6.00E+02	1.20E+02	Y
Ethylbenzene	100-41-4	Y	1.50E+01	2.50E+02	
Fluoranthene	206-44-0		1.60E+03	3.00E+03	
Fluorene	86-73-7	Y	8.00E+02	3.00E+03	
Indeno[1,2,3-cd]pyrene	193-39-5		2.80E+02	2.10E+02	Y
isopropyltoluene	99-87-6	Y	4.73E-01	9.90E+02	
Lead and Compounds	7439-92-1		2.20E+03	8.00E+02	Y
Mercury (elemental)	7439-97-6	Y	7.51E+01	4.60E+00	Y
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	7.30E-02	1.90E+04	
Methyl tert-Butyl Ether (MTBE)	1634-04-4	Y	4.20E-03	2.10E+03	
Methylcyclohexane	108-87-2		4.00E+02		NE
Methylnaphthalene, 2-	91-57-6	Y	1.60E+01	3.00E+02	
Naphthalene	91-20-3	Y	6.20E+01	5.90E+01	Y
Nickel Soluble Salts	7440-02-0		2.60E+01	2.20E+03	
Phenanthrene	85-01-8	Y	2.10E+03	2.30E+03	
Propyl benzene	103-65-1	Y	5.80E-03	2.40E+03	
Pyrene	129-00-0	Y	1.30E+03	2.30E+03	
Selenium	7782-49-2		1.20E+01	5.80E+02	
Silver	7440-22-4		1.60E+01	5.80E+02	
Styrene	100-42-5	Y	4.20E-03	3.50E+03	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Soil

mg/kg

Screening Type: Industrial Soil Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
TCDD, 2,3,7,8-	1746-01-6	Y	1.24E-05	7.20E-05	
Tetrachloroethylene	127-18-4	Y	3.80E+00	3.90E+01	
Thallium (Soluble Salts)	7440-28-0		6.50E+00	1.20E+00	Y
Toluene	108-88-3	Y	3.80E+00	4.70E+03	
Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5		5.20E-02	8.20E+02	
Trimethylbenzene, 1,2,4-	95-63-6	Y	1.05E+00	1.80E+02	
Trimethylbenzene, 1,3,5-	108-67-8	Y	1.87E+00	1.50E+02	
Xylene, m-	108-38-3	Y	1.80E+01	2.40E+02	
Xylene, o-	95-47-6	Y	7.30E+00	2.80E+02	
Xylenes	1330-20-7	Y	4.21E+00	2.50E+02	
Zinc and Compounds	7440-66-6		7.20E+03	3.50E+04	

Groundwater

ug/L

Screening Type: Residential Tapwater Tier II

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acenaphthene	83-32-9	Y	1.30E+02	5.30E+01	Y
Acenaphthylene	208-96-8	Y	2.10E+00	1.20E+01	
Acetone	67-64-1	Y	1.90E+01	1.40E+03	
Anthracene	120-12-7	Y	9.10E+00	1.80E+02	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Groundwater

ug/L

Screening Type: Residential Tapwater Tier II

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Antimony (metallic)	7440-36-0		6.10E+01	6.00E+00	Y
Arsenic, Inorganic	7440-38-2		4.60E+03	1.00E+01	Y
Benz[a]anthracene	56-55-3	Y	4.10E-01	3.00E-01	Y
Benzene	71-43-2	Y	6.30E+02	5.00E+00	Y
Beryllium and compounds	7440-41-7		8.90E+01	4.00E+00	Y
Biphenyl, 1,1'-	92-52-4	Y	2.90E+01	8.30E-02	Y
Bis(2-ethylhexyl)phthalate	117-81-7		8.30E-01	6.00E+00	
Cadmium (Water)	7440-43-9-Water		1.30E+02	5.00E+00	Y
Carbazole	86-74-8		2.30E+01		NE
Carbon Disulfide	75-15-0	Y	1.50E+01	8.10E+01	
Chloroform	67-66-3	Y	6.30E+01	2.20E+00	Y
Chloromethane	74-87-3	Y	1.00E+01	1.90E+01	
Chlorophenol, 2-	95-57-8	Y	4.70E+01	9.10E+00	Y
Chromium(VI)	18540-29-9		8.00E+02	3.50E-01	Y
Copper	7440-50-8		2.60E+04	1.30E+03	Y
Cresol, m-	108-39-4		1.70E+00	9.30E+01	
Cresol, o-	95-48-7		9.20E-01	9.30E+01	
Cumene	98-82-8	Y	2.50E+01	4.50E+01	
Cyclohexane	110-82-7	Y	1.60E+03	1.30E+03	Y
Dibenzofuran	132-64-9	Y	2.80E+01	7.90E-01	Y
Dichloroethylene, 1,2-cis-	156-59-2	Y	6.40E+00	7.00E+01	
Dichloroethylene, 1,2-trans-	156-60-5	Y	6.10E+00	1.00E+02	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Groundwater

ug/L

Screening Type: Residential Tapwater Tier II

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Dichlorophenol, 2,4-	120-83-2		9.20E+02	4.60E+00	Y
Dimethylphenol, 2,4-	105-67-9		7.80E-01	3.60E+01	
Ethylbenzene	100-41-4	Y	1.70E+02	7.00E+02	
Fluoranthene	206-44-0		6.70E+00	8.00E+01	
Fluorene	86-73-7	Y	3.50E+01	2.90E+01	Y
Lead and Compounds	7439-92-1		2.10E+03	1.50E+01	Y
Mercury (elemental)	7439-97-6	Y	7.20E-01	2.00E+00	
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	4.00E-02	5.60E+02	
Methyl tert-Butyl Ether (MTBE)	1634-04-4	Y	6.40E+00	1.40E+02	
Methylcyclohexane	108-87-2		7.40E+02		NE
Methylnaphthalene, 2-	91-57-6	Y	2.70E+02	3.60E+00	Y
Naphthalene	91-20-3	Y	1.90E+03	6.10E-01	Y
Nickel Soluble Salts	7440-02-0		2.10E+03	3.90E+01	Y
Pentachlorophenol	87-86-5		2.20E+01	1.00E+00	Y
Phenanthrene	85-01-8	Y	3.40E+01	1.20E+01	Y
Pyrene	129-00-0	Y	4.50E+00	1.20E+01	
Selenium	7782-49-2		1.80E+01	5.00E+01	
Silver	7440-22-4		4.50E+00	9.40E+00	
Tetrachloroethylene	127-18-4	Y	7.60E+01	5.00E+00	Y
Thallium (Soluble Salts)	7440-28-0		6.50E+00	2.00E+00	Y
Toluene	108-88-3	Y	6.70E+01	1.00E+03	
Trichloroethylene	79-01-6	Y	2.70E+01	5.00E+00	Y

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Groundwater

ug/L

Screening Type: Residential Tapwater Tier II

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Trichlorophenol, 2,4,5-	95-95-4		7.50E+01	1.20E+02	
Trichlorophenol, 2,4,6-	88-06-2		3.30E+00	1.20E+00	Y
Xylene, m-	108-38-3	Y	2.50E+02	1.90E+01	Y
Xylene, o-	95-47-6	Y	7.70E+01	1.90E+01	Y
Zinc and Compounds	7440-66-6		4.30E+04	6.00E+02	Y

Screening Type: Residential Groundwater VI Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acenaphthene	83-32-9	Y	1.30E+02		NE
Acenaphthylene	208-96-8	Y	2.10E+00		NE
Acetone	67-64-1	Y	1.90E+01	2.24E+06	
Anthracene	120-12-7	Y	9.10E+00		NE
Antimony (metallic)	7440-36-0		6.10E+01		NE
Arsenic, Inorganic	7440-38-2		4.60E+03		NE
Benz[a]anthracene	56-55-3	Y	4.10E-01	3.47E+02	
Benzene	71-43-2	Y	6.30E+02	1.37E+01	Y
Beryllium and compounds	7440-41-7		8.90E+01		NE
Biphenyl, 1,1'-	92-52-4	Y	2.90E+01	3.34E+00	Y
Bis(2-ethylhexyl)phthalate	117-81-7		8.30E-01		NE
Cadmium (Water)	7440-43-9-Water		1.30E+02		NE
Carbazole	86-74-8		2.30E+01		NE
Carbon Disulfide	75-15-0	Y	1.50E+01	1.24E+02	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Groundwater

ug/L

Screening Type: Residential Groundwater VI Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Chloroform	67-66-3	Y	6.30E+01	8.00E+00	Y
Chloromethane	74-87-3	Y	1.00E+01	2.61E+01	
Chlorophenol, 2-	95-57-8	Y	4.70E+01		NE
Chromium(VI)	18540-29-9		8.00E+02		NE
Copper	7440-50-8		2.60E+04		NE
Cresol, m-	108-39-4		1.70E+00		NE
Cresol, o-	95-48-7		9.20E-01		NE
Cumene	98-82-8	Y	2.50E+01	8.93E+01	
Cyclohexane	110-82-7	Y	1.60E+03	1.03E+02	Y
Dibenzofuran	132-64-9	Y	2.80E+01		NE
Dichloroethylene, 1,2-cis-	156-59-2	Y	6.40E+00		NE
Dichloroethylene, 1,2-trans-	156-60-5	Y	6.10E+00		NE
Dichlorophenol, 2,4-	120-83-2		9.20E+02		NE
Dimethylphenol, 2,4-	105-67-9		7.80E-01		NE
Ethylbenzene	100-41-4	Y	1.70E+02	3.41E+01	Y
Fluoranthene	206-44-0		6.70E+00		NE
Fluorene	86-73-7	Y	3.50E+01		NE
Lead and Compounds	7439-92-1		2.10E+03		NE
Mercury (elemental)	7439-97-6	Y	7.20E-01	8.81E-02	Y
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	4.00E-02	2.24E+05	
Methyl tert-Butyl Ether (MTBE)	1634-04-4	Y	6.40E+00	4.58E+03	
Methylcyclohexane	108-87-2		7.40E+02		NE

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Groundwater

ug/L

Screening Type: Residential Groundwater VI Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Methylnaphthalene, 2-	91-57-6	Y	2.70E+02		NE
Naphthalene	91-20-3	Y	1.90E+03	1.72E+01	Y
Nickel Soluble Salts	7440-02-0		2.10E+03		NE
Pentachlorophenol	87-86-5		2.20E+01		NE
Phenanthrene	85-01-8	Y	3.40E+01		NE
Pyrene	129-00-0	Y	4.50E+00		NE
Selenium	7782-49-2		1.80E+01		NE
Silver	7440-22-4		4.50E+00		NE
Tetrachloroethylene	127-18-4	Y	7.60E+01	5.80E+00	Y
Thallium (Soluble Salts)	7440-28-0		6.50E+00		NE
Toluene	108-88-3	Y	6.70E+01	1.92E+03	
Trichloroethylene	79-01-6	Y	2.70E+01	5.21E-01	Y
Trichlorophenol, 2,4,5-	95-95-4		7.50E+01		NE
Trichlorophenol, 2,4,6-	88-06-2		3.30E+00		NE
Xylene, m-	108-38-3	Y	2.50E+02	3.41E+01	Y
Xylene, o-	95-47-6	Y	7.70E+01	4.72E+01	Y
Zinc and Compounds	7440-66-6		4.30E+04		NE

Screening Type: Industrial Groundwater VI Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acenaphthene	83-32-9	Y	1.30E+02		NE
Acenaphthylene	208-96-8	Y	2.10E+00		NE

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Groundwater

ug/L

Screening Type: Industrial Groundwater VI Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acetone	67-64-1	Y	1.90E+01	9.78E+06	
Anthracene	120-12-7	Y	9.10E+00		NE
Antimony (metallic)	7440-36-0		6.10E+01		NE
Arsenic, Inorganic	7440-38-2		4.60E+03		NE
Benz[a]anthracene	56-55-3	Y	4.10E-01	4.08E+03	
Benzene	71-43-2	Y	6.30E+02	5.73E+01	Y
Beryllium and compounds	7440-41-7		8.90E+01		NE
Biphenyl, 1,1'-	92-52-4	Y	2.90E+01	1.43E+01	Y
Bis(2-ethylhexyl)phthalate	117-81-7		8.30E-01		NE
Cadmium (Water)	7440-43-9-Water		1.30E+02		NE
Carbazole	86-74-8		2.30E+01		NE
Carbon Disulfide	75-15-0	Y	1.50E+01	5.27E+02	
Chloroform	67-66-3	Y	6.30E+01	3.53E+01	Y
Chloromethane	74-87-3	Y	1.00E+01	1.08E+02	
Chlorophenol, 2-	95-57-8	Y	4.70E+01		NE
Chromium(VI)	18540-29-9		8.00E+02		NE
Copper	7440-50-8		2.60E+04		NE
Cresol, m-	108-39-4		1.70E+00		NE
Cresol, o-	95-48-7		9.20E-01		NE
Cumene	98-82-8	Y	2.50E+01	3.83E+02	
Cyclohexane	110-82-7	Y	1.60E+03	4.24E+02	Y
Dibenzofuran	132-64-9	Y	2.80E+01		NE

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Groundwater

ug/L

Screening Type: Industrial Groundwater VI Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Dichloroethylene, 1,2-cis-	156-59-2	Y	6.40E+00		NE
Dichloroethylene, 1,2-trans-	156-60-5	Y	6.10E+00		NE
Dichlorophenol, 2,4-	120-83-2		9.20E+02		NE
Dimethylphenol, 2,4-	105-67-9		7.80E-01		NE
Ethylbenzene	100-41-4	Y	1.70E+02	1.52E+02	Y
Fluoranthene	206-44-0		6.70E+00		NE
Fluorene	86-73-7	Y	3.50E+01		NE
Lead and Compounds	7439-92-1		2.10E+03		NE
Mercury (elemental)	7439-97-6	Y	7.20E-01	3.69E-01	Y
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	4.00E-02	9.46E+05	
Methyl tert-Butyl Ether (MTBE)	1634-04-4	Y	6.40E+00	1.96E+04	
Methylcyclohexane	108-87-2		7.40E+02		NE
Methylnaphthalene, 2-	91-57-6	Y	2.70E+02		NE
Naphthalene	91-20-3	Y	1.90E+03	7.23E+01	Y
Nickel Soluble Salts	7440-02-0		2.10E+03		NE
Pentachlorophenol	87-86-5		2.20E+01		NE
Phenanthrene	85-01-8	Y	3.40E+01		NE
Pyrene	129-00-0	Y	4.50E+00		NE
Selenium	7782-49-2		1.80E+01		NE
Silver	7440-22-4		4.50E+00		NE
Tetrachloroethylene	127-18-4	Y	7.60E+01	2.49E+01	Y
Thallium (Soluble Salts)	7440-28-0		6.50E+00		NE

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Groundwater

ug/L

Screening Type: Industrial Groundwater VI Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Toluene	108-88-3	Y	6.70E+01	8.10E+03	
Trichloroethylene	79-01-6	Y	2.70E+01	2.19E+00	Y
Trichlorophenol, 2,4,5-	95-95-4		7.50E+01		NE
Trichlorophenol, 2,4,6-	88-06-2		3.30E+00		NE
Xylene, m-	108-38-3	Y	2.50E+02	1.50E+02	Y
Xylene, o-	95-47-6	Y	7.70E+01	2.08E+02	
Zinc and Compounds	7440-66-6		4.30E+04		NE

Screening Type: Construction Worker Groundwater Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acenaphthene	83-32-9	Y	1.30E+02	2.95E+03	
Acenaphthylene	208-96-8	Y	2.10E+00	1.43E+03	
Acetone	67-64-1	Y	1.90E+01	1.34E+04	
Anthracene	120-12-7	Y	9.10E+00	7.85E+03	
Antimony (metallic)	7440-36-0		6.10E+01	7.86E+01	
Arsenic, Inorganic	7440-38-2		4.60E+03	1.97E+02	Y
Benz[a]anthracene	56-55-3	Y	4.10E-01	6.93E+01	
Benzene	71-43-2	Y	6.30E+02	1.42E+01	Y
Beryllium and compounds	7440-41-7		8.90E+01	5.50E+01	Y
Biphenyl, 1,1'-	92-52-4	Y	2.90E+01	1.18E+00	Y
Bis(2-ethylhexyl)phthalate	117-81-7		8.30E-01	3.16E+01	
Cadmium (Water)	7440-43-9-Water		1.30E+02	3.71E+01	Y

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Groundwater

ug/L

Screening Type: Construction Worker Groundwater Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Carbazole	86-74-8		2.30E+01		NE
Carbon Disulfide	75-15-0	Y	1.50E+01	1.22E+02	
Chloroform	67-66-3	Y	6.30E+01	5.43E+01	Y
Chloromethane	74-87-3	Y	1.00E+01	4.32E+02	
Chlorophenol, 2-	95-57-8	Y	4.70E+01	1.11E+03	
Chromium(VI)	18540-29-9		8.00E+02	9.75E+01	Y
Copper	7440-50-8		2.60E+04	6.57E+03	Y
Cresol, m-	108-39-4		1.70E+00	5.96E+04	
Cresol, o-	95-48-7		9.20E-01	3.02E+04	
Cumene	98-82-8	Y	2.50E+01	1.99E+01	Y
Cyclohexane	110-82-7	Y	1.60E+03	3.33E+03	
Dibenzofuran	132-64-9	Y	2.80E+01	4.84E+01	
Dichloroethylene, 1,2-cis-	156-59-2	Y	6.40E+00	2.26E+03	
Dichloroethylene, 1,2-trans-	156-60-5	Y	6.10E+00	1.57E+02	
Dichlorophenol, 2,4-	120-83-2		9.20E+02	1.06E+03	
Dimethylphenol, 2,4-	105-67-9		7.80E-01	5.39E+03	
Ethylbenzene	100-41-4	Y	1.70E+02	5.91E+02	
Fluoranthene	206-44-0		6.70E+00	3.11E+02	
Fluorene	86-73-7	Y	3.50E+01	4.37E+03	
Lead and Compounds	7439-92-1		2.10E+03		NE
Mercury (elemental)	7439-97-6	Y	7.20E-01	8.60E-02	Y
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	4.00E-02	3.58E+02	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Groundwater

ug/L

Screening Type: Construction Worker Groundwater Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Methyl tert-Butyl Ether (MTBE)	1634-04-4	Y	6.40E+00	5.24E+02	
Methylcyclohexane	108-87-2		7.40E+02		NE
Methylnaphthalene, 2-	91-57-6	Y	2.70E+02	5.90E+01	Y
Naphthalene	91-20-3	Y	1.90E+03	7.72E-01	Y
Nickel Soluble Salts	7440-02-0		2.10E+03	4.95E+03	
Pentachlorophenol	87-86-5		2.20E+01	5.54E+00	Y
Phenanthrene	85-01-8	Y	3.40E+01	1.43E+03	
Pyrene	129-00-0	Y	4.50E+00	1.43E+03	
Selenium	7782-49-2		1.80E+01	3.28E+03	
Silver	7440-22-4		4.50E+00	4.84E+02	
Tetrachloroethylene	127-18-4	Y	7.60E+01	1.02E+01	Y
Thallium (Soluble Salts)	7440-28-0		6.50E+00	2.63E+01	
Toluene	108-88-3	Y	6.70E+01	9.49E+02	
Trichloroethylene	79-01-6	Y	2.70E+01	4.94E-01	Y
Trichlorophenol, 2,4,5-	95-95-4		7.50E+01	7.86E+03	
Trichlorophenol, 2,4,6-	88-06-2		3.30E+00	2.74E+01	
Xylene, m-	108-38-3	Y	2.50E+02	2.08E+01	Y
Xylene, o-	95-47-6	Y	7.70E+01	2.09E+01	Y
Zinc and Compounds	7440-66-6		4.30E+04	2.36E+05	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Air

µg/m3

Screening Type: Residential Shallow/Sub-Slab Soil Gas Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acetone	67-64-1	Y	5.40E+02	1.07E+05	
Benzene	71-43-2	Y	4.00E+00	1.03E+02	
Carbon Disulfide	75-15-0	Y	1.60E+01	2.43E+03	
Chloroform	67-66-3	Y	2.30E+01	4.00E+01	
Cyclohexane	110-82-7	Y	1.50E+02	2.10E+04	
Dichlorodifluoromethane	75-71-8	Y	8.80E+00	3.33E+02	
Ethyl Chloride (Chloroethane)	75-00-3	Y	7.00E+00	3.33E+04	
Ethylbenzene	100-41-4	Y	8.00E+00	3.67E+02	
Heptane, N-	142-82-5	Y	5.30E+00	1.40E+03	
Hexane, N-	110-54-3	Y	1.80E+01	2.43E+03	
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	1.80E+01	1.73E+04	
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	Y	2.50E+00	1.03E+04	
Naphthalene	91-20-3	Y	1.30E+01	1.03E+01	Y
Propyl benzene	103-65-1	Y	1.30E+01	3.33E+03	
Propylene	115-07-1	Y	3.70E+01	1.03E+04	
Tetrahydrofuran	109-99-9	Y	2.90E+01	7.00E+03	
Toluene	108-88-3	Y	4.30E+01	1.73E+04	
Trimethylbenzene, 1,2,4-	95-63-6	Y	6.50E+00	2.10E+02	
Xylene, m-	108-38-3	Y	4.70E+01	3.33E+02	
Xylene, o-	95-47-6	Y	2.60E+01	3.33E+02	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Air

µg/m3

Screening Type: Residential Deep Soil Gas Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acetone	67-64-1	Y	1.90E+04	3.20E+05	
Benzene	71-43-2	Y	1.30E+02	3.10E+02	
Carbon Disulfide	75-15-0	Y	7.60E+01	7.30E+03	
Chloroform	67-66-3	Y	1.70E+01	1.20E+02	
Cyclohexane	110-82-7	Y	3.20E+02	6.30E+04	
Dichlorodifluoromethane	75-71-8	Y	1.20E+01	1.00E+03	
Ethyl Chloride (Chloroethane)	75-00-3	Y	1.50E+00	1.00E+05	
Ethylbenzene	100-41-4	Y	7.20E+00	1.10E+03	
Heptane, N-	142-82-5	Y	1.30E+02	4.20E+03	
Hexane, N-	110-54-3	Y	6.40E+02	7.30E+03	
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	1.80E+02	5.20E+04	
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	Y	3.00E+02	3.10E+04	
Naphthalene	91-20-3	Y	6.70E+00	3.10E+01	
Propyl benzene	103-65-1	Y	2.50E+00	1.00E+04	
Propylene	115-07-1	Y	8.70E+02	3.10E+04	
Tetrahydrofuran	109-99-9	Y	1.20E+01	2.10E+04	
Toluene	108-88-3	Y	2.20E+01	5.20E+04	
Trimethylbenzene, 1,2,4-	95-63-6	Y	8.20E+00	6.30E+02	
Xylene, m-	108-38-3	Y	2.20E+01	1.00E+03	
Xylene, o-	95-47-6	Y	1.30E+01	1.00E+03	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Air

µg/m3

Screening Type: Industrial Shallow/Sub-Slab Soil Gas Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acetone	67-64-1	Y	5.40E+02	4.67E+05	
Benzene	71-43-2	Y	4.00E+00	4.33E+02	
Carbon Disulfide	75-15-0	Y	1.60E+01	1.03E+04	
Chloroform	67-66-3	Y	2.30E+01	1.77E+02	
Cyclohexane	110-82-7	Y	1.50E+02	8.67E+04	
Dichlorodifluoromethane	75-71-8	Y	8.80E+00	1.47E+03	
Ethyl Chloride (Chloroethane)	75-00-3	Y	7.00E+00	1.47E+05	
Ethylbenzene	100-41-4	Y	8.00E+00	1.63E+03	
Heptane, N-	142-82-5	Y	5.30E+00	6.00E+03	
Hexane, N-	110-54-3	Y	1.80E+01	1.03E+04	
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	1.80E+01	7.33E+04	
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	Y	2.50E+00	4.33E+04	
Naphthalene	91-20-3	Y	1.30E+01	4.33E+01	
Propyl benzene	103-65-1	Y	1.30E+01	1.47E+04	
Propylene	115-07-1	Y	3.70E+01	4.33E+04	
Tetrahydrofuran	109-99-9	Y	2.90E+01	2.93E+04	
Toluene	108-88-3	Y	4.30E+01	7.33E+04	
Trimethylbenzene, 1,2,4-	95-63-6	Y	6.50E+00	8.67E+02	
Xylene, m-	108-38-3	Y	4.70E+01	1.47E+03	
Xylene, o-	95-47-6	Y	2.60E+01	1.47E+03	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Air

µg/m3

Screening Type: Industrial Deep Soil Gas Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acetone	67-64-1	Y	1.90E+04	1.40E+06	
Benzene	71-43-2	Y	1.30E+02	1.30E+03	
Carbon Disulfide	75-15-0	Y	7.60E+01	3.10E+04	
Chloroform	67-66-3	Y	1.70E+01	5.30E+02	
Cyclohexane	110-82-7	Y	3.20E+02	2.60E+05	
Dichlorodifluoromethane	75-71-8	Y	1.20E+01	4.40E+03	
Ethyl Chloride (Chloroethane)	75-00-3	Y	1.50E+00	4.40E+05	
Ethylbenzene	100-41-4	Y	7.20E+00	4.90E+03	
Heptane, N-	142-82-5	Y	1.30E+02	1.80E+04	
Hexane, N-	110-54-3	Y	6.40E+02	3.10E+04	
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	1.80E+02	2.20E+05	
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	Y	3.00E+02	1.30E+05	
Naphthalene	91-20-3	Y	6.70E+00	1.30E+02	
Propyl benzene	103-65-1	Y	2.50E+00	4.40E+04	
Propylene	115-07-1	Y	8.70E+02	1.30E+05	
Tetrahydrofuran	109-99-9	Y	1.20E+01	8.80E+04	
Toluene	108-88-3	Y	2.20E+01	2.20E+05	
Trimethylbenzene, 1,2,4-	95-63-6	Y	8.20E+00	2.60E+03	
Xylene, m-	108-38-3	Y	2.20E+01	4.40E+03	
Xylene, o-	95-47-6	Y	1.30E+01	4.40E+03	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Air

µg/m3

Screening Type: Construction Worker Soil Gas Tier III

Analyte	CAS	VOC	Concentration	Screening Level	COPC
Acetone	67-64-1	Y	5.40E+02	2.45E+06	
Benzene	71-43-2	Y	4.00E+00	7.50E+03	
Carbon Disulfide	75-15-0	Y	1.60E+01	5.52E+04	
Chloroform	67-66-3	Y	2.30E+01	2.66E+04	
Cyclohexane	110-82-7	Y	1.50E+02	1.89E+06	
Dichlorodifluoromethane	75-71-8	Y	8.80E+00	1.10E+05	
Ethyl Chloride (Chloroethane)	75-00-3	Y	7.00E+00	3.23E+05	
Ethylbenzene	100-41-4	Y	8.00E+00	3.58E+05	
Heptane, N-	142-82-5	Y	5.30E+00	5.17E+05	
Hexane, N-	110-54-3	Y	1.80E+01	2.30E+05	
Methyl Ethyl Ketone (2-Butanone)	78-93-3	Y	1.80E+01	9.17E+04	
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	Y	2.50E+00	9.62E+04	
Naphthalene	91-20-3	Y	1.30E+01	4.16E+02	
Propyl benzene	103-65-1	Y	1.30E+01	1.39E+05	
Propylene	115-07-1	Y	3.70E+01	2.29E+05	
Tetrahydrofuran	109-99-9	Y	2.90E+01	1.69E+05	
Toluene	108-88-3	Y	4.30E+01	5.39E+05	
Trimethylbenzene, 1,2,4-	95-63-6	Y	6.50E+00	2.77E+04	
Xylene, m-	108-38-3	Y	4.70E+01	1.23E+04	
Xylene, o-	95-47-6	Y	2.60E+01	1.22E+04	

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Summary of COPCs

Summarized by Tier II (Unrestricted) and Tier III (Restricted) screening for all screened media.

Tier II

Analyte	CAS
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Anthracene	120-12-7
Antimony (metallic)	7440-36-0
Arsenic, Inorganic	7440-38-2
Benz[a]anthracene	56-55-3
Benzene	71-43-2
Benzo(g,h,i)perylene	191-24-2
Benzo[a]pyrene	50-32-8
Benzo[b]fluoranthene	205-99-2
Benzo[k]fluoranthene	207-08-9
Beryllium and compounds	7440-41-7
Biphenyl, 1,1'-	92-52-4
Cadmium (Diet)	7440-43-9-Diet
Cadmium (Water)	7440-43-9-Water
Chloroform	67-66-3
Chlorophenol, 2-	95-57-8
Chromium(VI)	18540-29-9
Copper	7440-50-8
Cumene	98-82-8

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Summary of COPCs

Summarized by Tier II (Unrestricted) and Tier III (Restricted) screening for all screened media.

Cyclohexane	110-82-7
Dibenz[a,h]anthracene	53-70-3
Dibenzofuran	132-64-9
Dichlorophenol, 2,4-	120-83-2
Fluoranthene	206-44-0
Fluorene	86-73-7
Indeno[1,2,3-cd]pyrene	193-39-5
Lead and Compounds	7439-92-1
Mercury (elemental)	7439-97-6
Methylnaphthalene, 2-	91-57-6
Naphthalene	91-20-3
Nickel Soluble Salts	7440-02-0
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8
Pyrene	129-00-0
Selenium	7782-49-2
Silver	7440-22-4
TCDD, 2,3,7,8-	1746-01-6
Tetrachloroethylene	127-18-4
Thallium (Soluble Salts)	7440-28-0
Trichloroethylene	79-01-6
Trichlorophenol, 2,4,6-	88-06-2
Trimethylbenzene, 1,2,4-	95-63-6
Trimethylbenzene, 1,3,5-	108-67-8

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Summary of COPCs

Summarized by Tier II (Unrestricted) and Tier III (Restricted) screening for all screened media.

Xylene, m-	108-38-3
Xylene, o-	95-47-6
Zinc and Compounds	7440-66-6

Tier III

Analyte	**CAS**
Arsenic, Inorganic	7440-38-2
Benz[a]anthracene	56-55-3
Benzene	71-43-2
Benzo[a]pyrene	50-32-8
Benzo[b]fluoranthene	205-99-2
Beryllium and compounds	7440-41-7
Biphenyl, 1,1'-	92-52-4
Cadmium (Water)	7440-43-9-Water
Chloroform	67-66-3
Chromium(VI)	18540-29-9
Copper	7440-50-8
Cumene	98-82-8
Cyclohexane	110-82-7
Dibenz[a,h]anthracene	53-70-3
Dibenzofuran	132-64-9
Ethylbenzene	100-41-4
Indeno[1,2,3-cd]pyrene	193-39-5
Lead and Compounds	7439-92-1

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Summary of COPCs

Summarized by Tier II (Unrestricted) and Tier III (Restricted) screening for all screened media.

Mercury (elemental)	7439-97-6
Methylnaphthalene, 2-	91-57-6
Naphthalene	91-20-3
Pentachlorophenol	87-86-5
Tetrachloroethylene	127-18-4
Thallium (Soluble Salts)	7440-28-0
Trichloroethylene	79-01-6
Xylene, m-	108-38-3
Xylene, o-	95-47-6

Not Evaluated - NE

Analyte	**CAS**
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Anthracene	120-12-7
Antimony (metallic)	7440-36-0
Arsenic, Inorganic	7440-38-2
Beryllium and compounds	7440-41-7
Bis(2-ethylhexyl)phthalate	117-81-7
Cadmium (Water)	7440-43-9-Water
Carbazole	86-74-8
Chlorophenol, 2-	95-57-8
Chromium(VI)	18540-29-9
Copper	7440-50-8

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

Cresol, m-	108-39-4
Cresol, o-	95-48-7
Dibenzofuran	132-64-9
Dichloroethylene, 1,2-cis-	156-59-2
Dichloroethylene, 1,2-trans-	156-60-5
Dichlorophenol, 2,4-	120-83-2
Dimethylphenol, 2,4-	105-67-9
Fluoranthene	206-44-0
Fluorene	86-73-7
Lead and Compounds	7439-92-1
Methylcyclohexane	108-87-2
Methylnaphthalene, 2-	91-57-6
Nickel Soluble Salts	7440-02-0
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8
Pyrene	129-00-0
Selenium	7782-49-2
Silver	7440-22-4
Thallium (Soluble Salts)	7440-28-0
Trichlorophenol, 2,4,5-	95-95-4
Trichlorophenol, 2,4,6-	88-06-2
Zinc and Compounds	7440-66-6

†Not Evaluated (NE): COPCs are listed as NE (not evaluated) where there is no screening level. Some analytes have screening levels for some, but not all, screened media. An analyte may be in both the COPC and NE summary lists, e.g. analyte has screening values available in soil but not air.

*Individual trihalomethanes and haloacetic acids have a listed MCL which is applicable to total constituent concentrations.

Detailed Screening Report

Trihalomethanes (THMs) and/or Haloacetic Acids (HAAs)*

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program (VRP)

Screening Threshold Criteria

Non-Cancer Hazard Quotient: 0.1 Individual Cancer Risk: 1.00E-05

Construction Worker Groundwater Contact Depth: Direct Less Than 15ft

COPCs are listed as NE (not evaluated) where there is no screening level. A summary of NE analytes is provided at the end of the report.†

END OF REPORT

ATTACHMENT 5

PROUCL OUTPUT

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.13/1/2021 3:28:09 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

BENZENE RTN GW

General Statistics

Total Number of Observations	92	Number of Distinct Observations	39
Number of Detects	48	Number of Non-Detects	44
Number of Distinct Detects	38	Number of Distinct Non-Detects	1
Minimum Detect	1.6	Minimum Non-Detect	1
Maximum Detect	630	Maximum Non-Detect	1
Variance Detects	8784	Percent Non-Detects	47.83%
Mean Detects	70.15	SD Detects	93.72
Median Detects	59	CV Detects	1.336
Skewness Detects	4.734	Kurtosis Detects	27.76
Mean of Logged Detects	3.683	SD of Logged Detects	1.185

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.56	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.237	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.127	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	37.08	KM Standard Error of Mean	7.941
KM SD	75.37	95% KM (BCA) UCL	51.65
95% KM (t) UCL	50.27	95% KM (Percentile Bootstrap) UCL	52.06
95% KM (z) UCL	50.14	95% KM Bootstrap t UCL	58.81
90% KM Chebyshev UCL	60.9	95% KM Chebyshev UCL	71.69
97.5% KM Chebyshev UCL	86.67	99% KM Chebyshev UCL	116.1

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.732	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.778	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.124	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.132	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.014	k star (bias corrected MLE)	0.965
Theta hat (MLE)	69.15	Theta star (bias corrected MLE)	72.7
nu hat (MLE)	97.38	nu star (bias corrected)	92.63
Mean (detects)	70.15		

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.01					Mean	36.6
59					Maximum	630					Median	3.75
60					SD	76.01					CV	2.077
61					k hat (MLE)	0.191					k star (bias corrected MLE)	0.192
62					Theta hat (MLE)	191.7					Theta star (bias corrected MLE)	190.6
63					nu hat (MLE)	35.14					nu star (bias corrected)	35.33
64					Adjusted Level of Significance (β)	0.0474						
65					Approximate Chi Square Value (35.33, α)	22.73					Adjusted Chi Square Value (35.33, β)	22.57
66					95% Gamma Approximate UCL (use when n>=50)	56.89					95% Gamma Adjusted UCL (use when n<50)	57.3
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	37.08					SD (KM)	75.37
70					Variance (KM)	5680					SE of Mean (KM)	7.941
71					k hat (KM)	0.242					k star (KM)	0.241
72					nu hat (KM)	44.53					nu star (KM)	44.41
73					theta hat (KM)	153.2					theta star (KM)	153.6
74					80% gamma percentile (KM)	53.16					90% gamma percentile (KM)	111.5
75					95% gamma percentile (KM)	181.3					99% gamma percentile (KM)	368.1
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (44.41, α)	30.12					Adjusted Chi Square Value (44.41, β)	29.94
79					95% Gamma Approximate KM-UCL (use when n>=50)	54.66					95% Gamma Adjusted KM-UCL (use when n<50)	55
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.945					**Shapiro Wilk GOF Test**	
83					5% Shapiro Wilk Critical Value	0.947					Detected Data Not Lognormal at 5% Significance Level	
84					Lilliefors Test Statistic	0.188					**Lilliefors GOF Test**	
85					5% Lilliefors Critical Value	0.127					Detected Data Not Lognormal at 5% Significance Level	
86	**Detected Data Not Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	38.16					Mean in Log Scale	2.301
90					SD in Original Scale	75.29					SD in Log Scale	1.824
91					95% t UCL (assumes normality of ROS data)	51.2					95% Percentile Bootstrap UCL	51.35
92					95% BCA Bootstrap UCL	59.1					95% Bootstrap t UCL	60.39
93					95% H-UCL (Log ROS)	96.64						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	1.921					KM Geo Mean	6.83
97					KM SD (logged)	2.025					95% Critical H Value (KM-Log)	3.426
98					KM Standard Error of Mean (logged)	0.213					95% H-UCL (KM -Log)	109.9
99					KM SD (logged)	2.025					95% Critical H Value (KM-Log)	3.426
100					KM Standard Error of Mean (logged)	0.213						

	A	B	C	D	E	F	G	H	I	J	K	L
101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104	Mean in Original Scale					36.84	Mean in Log Scale					1.59
105	SD in Original Scale					75.9	SD in Log Scale					2.357
106	95% t UCL (Assumes normality)					49.99	95% H-Stat UCL					204.5
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Gamma Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113	95% KM Approximate Gamma UCL					54.66						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.13/1/2021 3:43:29 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

BIPHENYL RTN GW

General Statistics

Total Number of Observations	91.000000	Number of Distinct Observations	13.000000
Number of Detects	10.000000	Number of Non-Detects	81.000000
Number of Distinct Detects	9.0000000	Number of Distinct Non-Detects	4.0000000
Minimum Detect	1.3000000	Minimum Non-Detect	0.5000000
Maximum Detect	29.000000	Maximum Non-Detect	5.6000000
Variance Detects	70.505000	Percent Non-Detects	89.010989%
Mean Detects	8.4500000	SD Detects	8.3967256
Median Detects	5.9500000	CV Detects	0.9936953
Skewness Detects	1.9999877	Kurtosis Detects	3.9327742
Mean of Logged Detects	1.7738132	SD of Logged Detects	0.8855108

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.7420422	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.8420000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3638655	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.2616000	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.5380411	KM Standard Error of Mean	0.4188202
KM SD	3.6336792	95% KM (BCA) UCL	2.2499669
95% KM (t) UCL	2.2341040	95% KM (Percentile Bootstrap) UCL	2.2495671
95% KM (z) UCL	2.2269390	95% KM Bootstrap t UCL	2.7883599
90% KM Chebyshev UCL	2.7945017	95% KM Chebyshev UCL	3.3636361
97.5% KM Chebyshev UCL	4.1535725	99% KM Chebyshev UCL	5.7052496

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.4808532	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7389897	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.2736659	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.2710338	Detected Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.5329138	k star (bias corrected MLE)	1.1397064
Theta hat (MLE)	5.5123776	Theta star (bias corrected MLE)	7.4141904
nu hat (MLE)	30.658277	nu star (bias corrected)	22.794127
Mean (detects)	8.4500000		

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000				Mean	1.0030849	
59					Maximum	29.000000				Median	0.0100000	
60					SD	3.7595561				CV	3.7479938	
61					k hat (MLE)	0.1973073				k star (bias corrected MLE)	0.1981286	
62					Theta hat (MLE)	5.0838726				Theta star (bias corrected MLE)	5.0627966	
63					nu hat (MLE)	35.909920				nu star (bias corrected)	36.059410	
64					Adjusted Level of Significance (β)	0.0473626						
65					Approximate Chi Square Value (36.06, α)	23.316532				Adjusted Chi Square Value (36.06, β)	23.151662	
66					95% Gamma Approximate UCL (use when n>=50)	1.5512878				95% Gamma Adjusted UCL (use when n<50)	1.5623349	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	1.5380411				SD (KM)	3.6336792	
70					Variance (KM)	13.203625				SE of Mean (KM)	0.4188202	
71					k hat (KM)	0.1791607				k star (KM)	0.1805803	
72					nu hat (KM)	32.607244				nu star (KM)	32.865613	
73					theta hat (KM)	8.5847023				theta star (KM)	8.5172146	
74					80% gamma percentile (KM)	1.9120053				90% gamma percentile (KM)	4.6391857	
75					95% gamma percentile (KM)	8.1300693				99% gamma percentile (KM)	17.908850	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (32.87, α)	20.759677				Adjusted Chi Square Value (32.87, β)	20.604808	
79					95% Gamma Approximate KM-UCL (use when n>=50)	2.4349446				95% Gamma Adjusted KM-UCL (use when n<50)	2.4532460	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.9608684				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.8420000				Detected Data appear Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.2166909				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.2616000				Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	1.3321473				Mean in Log Scale	-1.341123	
90					SD in Original Scale	3.7074497				SD in Log Scale	1.8317710	
91					95% t UCL (assumes normality of ROS data)	1.9780625				95% Percentile Bootstrap UCL	2.0289498	
92					95% BCA Bootstrap UCL	2.2860721				95% Bootstrap t UCL	2.7986962	
93					95% H-UCL (Log ROS)	2.5872208						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	-0.291314				KM Geo Mean	0.7472813	
97					KM SD (logged)	0.8903722				95% Critical H Value (KM-Log)	2.1431275	
98					KM Standard Error of Mean (logged)	0.1333085				95% H-UCL (KM -Log)	1.3582643	
99					KM SD (logged)	0.8903722				95% Critical H Value (KM-Log)	2.1431275	
100					KM Standard Error of Mean (logged)	0.1333085						

101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104	Mean in Original Scale					2.6675824	Mean in Log Scale					0.5076276
105	SD in Original Scale					3.4759841	SD in Log Scale					1.0815324
106	95% t UCL (Assumes normality)					3.2731714	95% H-Stat UCL					3.8866366
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113	95% KM Approximate Gamma UCL					2.4349446	95% GROS Approximate Gamma UCL					1.5512878
114												
115	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
116	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
117												
118	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
119	Recommendations are based upon data size, data distribution, and skewness.											
120	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
121	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
122												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.13/1/2021 5:58:59 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

CADMIUM RTN GW

General Statistics

Total Number of Observations	21.000000	Number of Distinct Observations	9.0000000
Number of Detects	8.0000000	Number of Non-Detects	13.000000
Number of Distinct Detects	8.0000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	3.4000000	Minimum Non-Detect	1.0000000
Maximum Detect	130.00000	Maximum Non-Detect	1.0000000
Variance Detects	1817.0629	Percent Non-Detects	61.904762%
Mean Detects	38.100000	SD Detects	42.627020
Median Detects	19.000000	CV Detects	1.1188194
Skewness Detects	1.6907074	Kurtosis Detects	2.8624602
Mean of Logged Detects	3.0671210	SD of Logged Detects	1.2008221

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.8009856	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.8180000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.2545932	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.2825000	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	15.133333	KM Standard Error of Mean	7.1153114
KM SD	30.500544	95% KM (BCA) UCL	28.933333
95% KM (t) UCL	27.405240	95% KM (Percentile Bootstrap) UCL	27.390476
95% KM (z) UCL	26.836979	95% KM Bootstrap t UCL	37.909290
90% KM Chebyshev UCL	36.479267	95% KM Chebyshev UCL	46.148257
97.5% KM Chebyshev UCL	59.568439	99% KM Chebyshev UCL	85.929787

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.2550796	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7354089	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.1938562	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.3014270	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.0064367	k star (bias corrected MLE)	0.7123563
Theta hat (MLE)	37.856329	Theta star (bias corrected MLE)	53.484472
nu hat (MLE)	16.102988	nu star (bias corrected)	11.397701
Mean (detects)	38.100000		

51											
52	**Gamma ROS Statistics using Imputed Non-Detects**										
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs										
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)										
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs										
56	This is especially true when the sample size is small.										
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates										
58					Minimum	0.0100000			Mean	14.520476	
59					Maximum	130.00000			Median	0.0100000	
60					SD	31.547260			CV	2.1726051	
61					k hat (MLE)	0.1727151			k star (bias corrected MLE)	0.1797875	
62					Theta hat (MLE)	84.071856			Theta star (bias corrected MLE)	80.764652	
63					nu hat (MLE)	7.2540328			nu star (bias corrected)	7.5510757	
64					Adjusted Level of Significance (β)	0.0383000					
65					Approximate Chi Square Value (7.55, α)	2.4778853			Adjusted Chi Square Value (7.55, β)	2.2601411	
66					95% Gamma Approximate UCL (use when n>=50)	44.249512			95% Gamma Adjusted UCL (use when n<50)	48.512553	
67											
68	**Estimates of Gamma Parameters using KM Estimates**										
69					Mean (KM)	15.133333			SD (KM)	30.500544	
70					Variance (KM)	930.28317			SE of Mean (KM)	7.1153114	
71					k hat (KM)	0.2461807			k star (KM)	0.2427581	
72					nu hat (KM)	10.339590			nu star (KM)	10.195839	
73					theta hat (KM)	61.472456			theta star (KM)	62.339156	
74					80% gamma percentile (KM)	21.744355			90% gamma percentile (KM)	45.512430	
75					95% gamma percentile (KM)	73.891981			99% gamma percentile (KM)	149.75089	
76											
77	**Gamma Kaplan-Meier (KM) Statistics**										
78					Approximate Chi Square Value (10.20, α)	4.0645330			Adjusted Chi Square Value (10.20, β)	3.7708913	
79					95% Gamma Approximate KM-UCL (use when n>=50)	37.961810			95% Gamma Adjusted KM-UCL (use when n<50)	40.917921	
80											
81	**Lognormal GOF Test on Detected Observations Only**										
82					Shapiro Wilk Test Statistic	0.9795878			**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.8180000			Detected Data appear Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.1442151			**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.2825000			Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Lognormal at 5% Significance Level**										
87											
88	**Lognormal ROS Statistics Using Imputed Non-Detects**										
89					Mean in Original Scale	15.020794			Mean in Log Scale	0.5634902	
90					SD in Original Scale	31.314936			SD in Log Scale	2.4365730	
91					95% t UCL (assumes normality of ROS data)	26.806620			95% Percentile Bootstrap UCL	26.993621	
92					95% BCA Bootstrap UCL	31.702232			95% Bootstrap t UCL	40.756214	
93					95% H-UCL (Log ROS)	493.63396					
94											
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**										
96					KM Mean (logged)	1.1684270			KM Geo Mean	3.2169286	
97					KM SD (logged)	1.6429070			95% Critical H Value (KM-Log)	3.5417755	
98					KM Standard Error of Mean (logged)	0.3832651			95% H-UCL (KM -Log)	45.564259	
99					KM SD (logged)	1.6429070			95% Critical H Value (KM-Log)	3.5417755	
100					KM Standard Error of Mean (logged)	0.3832651					

101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	14.823810				Mean in Log Scale	0.7393359	
105					SD in Original Scale	31.401368				SD in Log Scale	2.0014818	
106					95% t UCL (Assumes normality)	26.642165				95% H-Stat UCL	99.158142	
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Approximate Normal Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					95% KM (t) UCL	27.405240						
114												
115	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
116	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
117												
118	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
119	Recommendations are based upon data size, data distribution, and skewness.											
120	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
121	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
122												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.13/1/2021 3:46:15 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

CHLOROFORM RTN GW

General Statistics

Total Number of Observations	92.000000	Number of Distinct Observations	18.000000
Number of Detects	19.000000	Number of Non-Detects	73.000000
Number of Distinct Detects	16.000000	Number of Distinct Non-Detects	3.0000000
Minimum Detect	1.1000000	Minimum Non-Detect	1.0000000
Maximum Detect	63.000000	Maximum Non-Detect	10.000000
Variance Detects	335.77655	Percent Non-Detects	79.347826%
Mean Detects	11.989474	SD Detects	18.324207
Median Detects	5.8000000	CV Detects	1.5283579
Skewness Detects	2.0398656	Kurtosis Detects	3.0946561
Mean of Logged Detects	1.5666851	SD of Logged Detects	1.3552270

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.6286791	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.9010000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3418761	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1965000	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	3.2747662	KM Standard Error of Mean	0.9905475
KM SD	9.2461303	95% KM (BCA) UCL	4.9525848
95% KM (t) UCL	4.9208294	95% KM (Percentile Bootstrap) UCL	4.9707776
95% KM (z) UCL	4.9040719	95% KM Bootstrap t UCL	8.2808465
90% KM Chebyshev UCL	6.2464088	95% KM Chebyshev UCL	7.5924628
97.5% KM Chebyshev UCL	9.4607336	99% KM Chebyshev UCL	13.130590

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.3949652	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7870664	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.2125092	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.2074354	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.6637554	k star (bias corrected MLE)	0.5940397
Theta hat (MLE)	18.063090	Theta star (bias corrected MLE)	20.182952
nu hat (MLE)	25.222706	nu star (bias corrected)	22.573507
Mean (detects)	11.989474		

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000				Mean	2.4840217	
59					Maximum	63.000000				Median	0.0100000	
60					SD	9.4969711				CV	3.8232238	
61					k hat (MLE)	0.1768649				k star (bias corrected MLE)	0.1783440	
62					Theta hat (MLE)	14.044740				Theta star (bias corrected MLE)	13.928264	
63					nu hat (MLE)	32.543144				nu star (bias corrected)	32.815288	
64					Adjusted Level of Significance (β)	0.0473913						
65					Approximate Chi Square Value (32.82, α)	20.719633				Adjusted Chi Square Value (32.82, β)	20.566640	
66					95% Gamma Approximate UCL (use when n>=50)	3.9341376				95% Gamma Adjusted UCL (use when n<50)	3.9634033	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	3.2747662				SD (KM)	9.2461303	
70					Variance (KM)	85.490926				SE of Mean (KM)	0.9905475	
71					k hat (KM)	0.1254413				k star (KM)	0.1285972	
72					nu hat (KM)	23.081201				nu star (KM)	23.661886	
73					theta hat (KM)	26.105963				theta star (KM)	25.465298	
74					80% gamma percentile (KM)	3.0942551				90% gamma percentile (KM)	9.4414240	
75					95% gamma percentile (KM)	18.509206				99% gamma percentile (KM)	45.726540	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (23.66, α)	13.591811				Adjusted Chi Square Value (23.66, β)	13.470172	
79					95% Gamma Approximate KM-UCL (use when n>=50)	5.7010169				95% Gamma Adjusted KM-UCL (use when n<50)	5.7524987	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.8667435				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.9010000				Detected Data Not Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.1987648				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.1965000				Detected Data Not Lognormal at 5% Significance Level		
86	**Detected Data Not Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	2.5735410				Mean in Log Scale	-2.514324	
90					SD in Original Scale	9.4749215				SD in Log Scale	2.9100201	
91					95% t UCL (assumes normality of ROS data)	4.2150864				95% Percentile Bootstrap UCL	4.3535212	
92					95% BCA Bootstrap UCL	5.0573192				95% Bootstrap t UCL	5.7068069	
93					95% H-UCL (Log ROS)	22.737492						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	0.3256511				KM Geo Mean	1.3849321	
97					KM SD (logged)	0.8735834				95% Critical H Value (KM-Log)	2.1277674	
98					KM Standard Error of Mean (logged)	0.0937389				95% H-UCL (KM -Log)	2.4647204	
99					KM SD (logged)	0.8735834				95% Critical H Value (KM-Log)	2.1277674	
100					KM Standard Error of Mean (logged)	0.0937389						

101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	2.9434783				Mean in Log Scale	-0.183921	
105					SD in Original Scale	9.3920039				SD in Log Scale	1.1198756	
106					95% t UCL (Assumes normality)	4.5706581				95% H-Stat UCL	2.0560923	
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Data do not follow a Discernible Distribution at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					95% KM (Chebyshev) UCL	7.5924628						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.12/24/2021 7:28:26 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

CHROMIUM RTN GW

General Statistics

Total Number of Observations	21.000000	Number of Distinct Observations	8.0000000
Number of Detects	7.0000000	Number of Non-Detects	14.000000
Number of Distinct Detects	7.0000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	1.1000000	Minimum Non-Detect	1.0000000
Maximum Detect	800.00000	Maximum Non-Detect	1.0000000
Variance Detects	115350.48	Percent Non-Detects	66.666667%
Mean Detects	197.42857	SD Detects	339.63286
Median Detects	1.9000000	CV Detects	1.7202822
Skewness Detects	1.3901256	Kurtosis Detects	0.1534814
Mean of Logged Detects	2.3060720	SD of Logged Detects	2.9365148

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.6506533	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.8030000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.4273831	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.3041000	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	66.476190	KM Standard Error of Mean	48.034446
KM SD	203.79289	95% KM (BCA) UCL	142.66190
95% KM (t) UCL	149.32207	95% KM (Percentile Bootstrap) UCL	147.48571
95% KM (z) UCL	145.48582	95% KM Bootstrap t UCL	11334.918
90% KM Chebyshev UCL	210.57953	95% KM Chebyshev UCL	275.85349
97.5% KM Chebyshev UCL	366.45121	99% KM Chebyshev UCL	544.41289

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.0905680	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.8073036	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.3716158	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.3396629	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.2399819	k star (bias corrected MLE)	0.2323706
Theta hat (MLE)	822.68112	Theta star (bias corrected MLE)	849.62800
nu hat (MLE)	3.3597465	nu star (bias corrected)	3.2531885
Mean (detects)	197.42857		

51											
52	**Gamma ROS Statistics using Imputed Non-Detects**										
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs										
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)										
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs										
56	This is especially true when the sample size is small.										
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates										
58					Minimum	0.0100000				Mean	65.816190
59					Maximum	800.00000				Median	0.0100000
60					SD	209.04330				CV	3.1761683
61					k hat (MLE)	0.1219564				k star (bias corrected MLE)	0.1362800
62					Theta hat (MLE)	539.67005				Theta star (bias corrected MLE)	482.94810
63					nu hat (MLE)	5.1221668				nu star (bias corrected)	5.7237620
64					Adjusted Level of Significance (β)	0.0383000					
65					Approximate Chi Square Value (5.72, α)	1.5003645				Adjusted Chi Square Value (5.72, β)	1.3417819
66					95% Gamma Approximate UCL (use when n>=50)	251.08313				95% Gamma Adjusted UCL (use when n<50)	280.75815
67											
68	**Estimates of Gamma Parameters using KM Estimates**										
69					Mean (KM)	66.476190				SD (KM)	203.79289
70					Variance (KM)	41531.544				SE of Mean (KM)	48.034446
71					k hat (KM)	0.1064031				k star (KM)	0.1229487
72					nu hat (KM)	4.4689291				nu star (KM)	5.1638440
73					theta hat (KM)	624.75818				theta star (KM)	540.68249
74					80% gamma percentile (KM)	59.895849				90% gamma percentile (KM)	189.56787
75					95% gamma percentile (KM)	378.13471				99% gamma percentile (KM)	950.24147
76											
77	**Gamma Kaplan-Meier (KM) Statistics**										
78					Approximate Chi Square Value (5.16, α)	1.2286291				Adjusted Chi Square Value (5.16, β)	1.0895601
79					95% Gamma Approximate KM-UCL (use when n>=50)	279.39488				95% Gamma Adjusted KM-UCL (use when n<50)	315.05622
80											
81	**Lognormal GOF Test on Detected Observations Only**										
82					Shapiro Wilk Test Statistic	0.7401242				**Shapiro Wilk GOF Test**	
83					5% Shapiro Wilk Critical Value	0.8030000				Detected Data Not Lognormal at 5% Significance Level	
84					Lilliefors Test Statistic	0.2859806				**Lilliefors GOF Test**	
85					5% Lilliefors Critical Value	0.3041000				Detected Data appear Lognormal at 5% Significance Level	
86	**Detected Data appear Approximate Lognormal at 5% Significance Level**										
87											
88	**Lognormal ROS Statistics Using Imputed Non-Detects**										
89					Mean in Original Scale	65.817411				Mean in Log Scale	-4.443510
90					SD in Original Scale	209.04289				SD in Log Scale	6.0461476
91					95% t UCL (assumes normality of ROS data)	144.49371				95% Percentile Bootstrap UCL	147.57976
92					95% BCA Bootstrap UCL	179.72434				95% Bootstrap t UCL	9521.1156
93					95% H-UCL (Log ROS)	5.967E+12					
94											
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**										
96					KM Mean (logged)	0.7686907				KM Geo Mean	2.1569402
97					KM SD (logged)	1.9093242				95% Critical H Value (KM-Log)	3.9863213
98					KM Standard Error of Mean (logged)	0.4500320				95% H-UCL (KM -Log)	73.212175
99					KM SD (logged)	1.9093242				95% Critical H Value (KM-Log)	3.9863213
100					KM Standard Error of Mean (logged)	0.4500320					

101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	66.142857				Mean in Log Scale	0.3065925	
105					SD in Original Scale	208.93543				SD in Log Scale	2.1646808	
106					95% t UCL (Assumes normality)	144.77871				95% H-Stat UCL	120.41377	
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Approximate Lognormal Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					99% KM (Chebyshev) UCL	544.41289						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.12/24/2021 7:39:41 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

COPPER RTN GW

General Statistics

Total Number of Observations	21.000000	Number of Distinct Observations	15.000000
Number of Detects	16.000000	Number of Non-Detects	5.0000000
Number of Distinct Detects	14.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	1.4000000	Minimum Non-Detect	1.0000000
Maximum Detect	26000.000	Maximum Non-Detect	1.0000000
Variance Detects	51015821	Percent Non-Detects	23.809524%
Mean Detects	2601.3313	SD Detects	7142.5361
Median Detects	12.000000	CV Detects	2.7457234
Skewness Detects	2.9415859	Kurtosis Detects	8.4345997
Mean of Logged Detects	3.6016261	SD of Logged Detects	2.9941125

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.4286093	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.8870000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.4527713	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.2128000	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1982.2048	KM Standard Error of Mean	1383.1914
KM SD	6137.3030	95% KM (BCA) UCL	4505.2333
95% KM (t) UCL	4367.8202	95% KM (Percentile Bootstrap) UCL	4460.0190
95% KM (z) UCL	4257.3522	95% KM Bootstrap t UCL	47693.132
90% KM Chebyshev UCL	6131.7790	95% KM Chebyshev UCL	8011.3963
97.5% KM Chebyshev UCL	10620.232	99% KM Chebyshev UCL	15744.786

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.3779140	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.9058757	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.3413970	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.2403467	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.1760819	k star (bias corrected MLE)	0.1847332
Theta hat (MLE)	14773.416	Theta star (bias corrected MLE)	14081.556
nu hat (MLE)	5.6346211	nu star (bias corrected)	5.9114630
Mean (detects)	2601.3313		

51											
52	**Gamma ROS Statistics using Imputed Non-Detects**										
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs										
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)										
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs										
56	This is especially true when the sample size is small.										
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates										
58					Minimum	0.0100000			Mean	1981.9690	
59					Maximum	26000.000			Median	5.8000000	
60					SD	6288.9422			CV	3.1730779	
61					k hat (MLE)	0.1317155			k star (bias corrected MLE)	0.1446450	
62					Theta hat (MLE)	15047.347			Theta star (bias corrected MLE)	13702.295	
63					nu hat (MLE)	5.5320516			nu star (bias corrected)	6.0750919	
64					Adjusted Level of Significance (β)	0.0383000					
65					Approximate Chi Square Value (6.08, α)	1.6783594			Adjusted Chi Square Value (6.08, β)	1.5078868	
66					95% Gamma Approximate UCL (use when n>=50)	7174.0557			95% Gamma Adjusted UCL (use when n<50)	7985.1111	
67											
68	**Estimates of Gamma Parameters using KM Estimates**										
69					Mean (KM)	1982.2048			SD (KM)	6137.3030	
70					Variance (KM)	37666489			SE of Mean (KM)	1383.1914	
71					k hat (KM)	0.1043138			k star (KM)	0.1211579	
72					nu hat (KM)	4.3811809			nu star (KM)	5.0886312	
73					theta hat (KM)	19002.320			theta star (KM)	16360.510	
74					80% gamma percentile (KM)	1757.3072			90% gamma percentile (KM)	5630.7511	
75					95% gamma percentile (KM)	11297.235			99% gamma percentile (KM)	28551.302	
76											
77	**Gamma Kaplan-Meier (KM) Statistics**										
78					Approximate Chi Square Value (5.09, α)	1.1933523			Adjusted Chi Square Value (5.09, β)	1.0569594	
79					95% Gamma Approximate KM-UCL (use when n>=50)	8452.4152			95% Gamma Adjusted KM-UCL (use when n<50)	9543.1373	
80											
81	**Lognormal GOF Test on Detected Observations Only**										
82					Shapiro Wilk Test Statistic	0.8441172			**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.8870000			Detected Data Not Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.2262721			**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.2128000			Detected Data Not Lognormal at 5% Significance Level		
86	**Detected Data Not Lognormal at 5% Significance Level**										
87											
88	**Lognormal ROS Statistics Using Imputed Non-Detects**										
89					Mean in Original Scale	1981.9830			Mean in Log Scale	1.9382763	
90					SD in Original Scale	6288.9376			SD in Log Scale	4.0615084	
91					95% t UCL (assumes normality of ROS data)	4348.9150			95% Percentile Bootstrap UCL	4483.1198	
92					95% BCA Bootstrap UCL	5228.6002			95% Bootstrap t UCL	47609.122	
93					95% H-UCL (Log ROS)	32933411					
94											
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**										
96					KM Mean (logged)	2.7440960			KM Geo Mean	15.550551	
97					KM SD (logged)	2.9591399			95% Critical H Value (KM-Log)	5.8331167	
98					KM Standard Error of Mean (logged)	0.6669146			95% H-UCL (KM -Log)	58807.769	
99					KM SD (logged)	2.9591399			95% Critical H Value (KM-Log)	5.8331167	
100					KM Standard Error of Mean (logged)	0.6669146					

	DL/2 Statistics	
	DL/2 Normal	**DL/2 Log-Transformed**
Mean in Original Scale	1982.0857	Mean in Log Scale 2.5790610
SD in Original Scale	6288.9036	SD in Log Scale 3.1995125
95% t UCL (Assumes normality)	4349.0049	95% H-Stat UCL 195159.68
DL/2 is not a recommended method, provided for comparisons and historical reasons		
	Nonparametric Distribution Free UCL Statistics	
	Data do not follow a Discernible Distribution at 5% Significance Level	
	Suggested UCL to Use	
99% KM (Chebyshev) UCL	15744.786	

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.12/25/2021 4:14:28 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

CUMENE RTN GW

General Statistics

Total Number of Observations	92.000000	Number of Distinct Observations	24.000000
Number of Detects	31.000000	Number of Non-Detects	61.000000
Number of Distinct Detects	23.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	1.2000000	Minimum Non-Detect	1.0000000
Maximum Detect	25.000000	Maximum Non-Detect	1.0000000
Variance Detects	50.854989	Percent Non-Detects	66.304348%
Mean Detects	8.6032258	SD Detects	7.1312684
Median Detects	7.9000000	CV Detects	0.8289063
Skewness Detects	0.6822306	Kurtosis Detects	-0.512499
Mean of Logged Detects	1.7030783	SD of Logged Detects	1.0495347

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.8786800	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.9290000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.1792090	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1559000	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	3.5619565	KM Standard Error of Mean	0.5756088
KM SD	5.4312670	95% KM (BCA) UCL	4.5173913
95% KM (t) UCL	4.5184867	95% KM (Percentile Bootstrap) UCL	4.4630435
95% KM (z) UCL	4.5087488	95% KM Bootstrap t UCL	4.7377678
90% KM Chebyshev UCL	5.2887831	95% KM Chebyshev UCL	6.0709773
97.5% KM Chebyshev UCL	7.1566326	99% KM Chebyshev UCL	9.2891922

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.1436363	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7695394	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.1575376	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.1614977	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.2538843	k star (bias corrected MLE)	1.1540461
Theta hat (MLE)	6.8612594	Theta star (bias corrected MLE)	7.4548374
nu hat (MLE)	77.740829	nu star (bias corrected)	71.550857
Mean (detects)	8.6032258		

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000				Mean	2.9133415	
59					Maximum	25.000000				Median	0.0100000	
60					SD	5.7794504				CV	1.9837875	
61					k hat (MLE)	0.2103033				k star (bias corrected MLE)	0.2106920	
62					Theta hat (MLE)	13.853045				Theta star (bias corrected MLE)	13.827490	
63					nu hat (MLE)	38.695813				nu star (bias corrected)	38.767327	
64					Adjusted Level of Significance (β)	0.0473913						
65					Approximate Chi Square Value (38.77, α)	25.506440				Adjusted Chi Square Value (38.77, β)	25.335345	
66					95% Gamma Approximate UCL (use when n>=50)	4.4279978				95% Gamma Adjusted UCL (use when n<50)	4.4579011	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	3.5619565				SD (KM)	5.4312670	
70					Variance (KM)	29.498661				SE of Mean (KM)	0.5756088	
71					k hat (KM)	0.4301054				k star (KM)	0.4233266	
72					nu hat (KM)	79.139398				nu star (KM)	77.892099	
73					theta hat (KM)	8.2815894				theta star (KM)	8.4142039	
74					80% gamma percentile (KM)	5.7834188				90% gamma percentile (KM)	9.9582346	
75					95% gamma percentile (KM)	14.511074				99% gamma percentile (KM)	25.892821	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (77.89, α)	58.560318				Adjusted Chi Square Value (77.89, β)	58.294512	
79					95% Gamma Approximate KM-UCL (use when n>=50)	4.7378204				95% Gamma Adjusted KM-UCL (use when n<50)	4.7594235	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.8796665				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.9290000				Detected Data Not Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.1676849				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.1559000				Detected Data Not Lognormal at 5% Significance Level		
86	**Detected Data Not Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	3.1755217				Mean in Log Scale	-0.407585	
90					SD in Original Scale	5.6571518				SD in Log Scale	1.9382770	
91					95% t UCL (assumes normality of ROS data)	4.1556323				95% Percentile Bootstrap UCL	4.1243598	
92					95% BCA Bootstrap UCL	4.3505902				95% Bootstrap t UCL	4.2668226	
93					95% H-UCL (Log ROS)	8.5390125						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	0.5738634				KM Geo Mean	1.7751117	
97					KM SD (logged)	1.0035972				95% Critical H Value (KM-Log)	2.2502864	
98					KM Standard Error of Mean (logged)	0.1063618				95% H-UCL (KM -Log)	3.7218086	
99					KM SD (logged)	1.0035972				95% Critical H Value (KM-Log)	2.2502864	
100					KM Standard Error of Mean (logged)	0.1063618						

	A	B	C	D	E	F	G	H	I	J	K	L
101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104	Mean in Original Scale					3.2304348	Mean in Log Scale					0.1142766
105	SD in Original Scale					5.6210894	SD in Log Scale					1.2884382
106	95% t UCL (Assumes normality)					4.2042976	95% H-Stat UCL					3.6253707
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113	95% KM Approximate Gamma UCL					4.7378204	95% GROS Approximate Gamma UCL					4.4279978
114												
115	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
116	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
117												
118	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
119	Recommendations are based upon data size, data distribution, and skewness.											
120	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
121	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
122												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.12/25/2021 3:48:33 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

CYCLOHEXANE RTN GW

General Statistics

Total Number of Observations	92.000000	Number of Distinct Observations	8.0000000
Number of Detects	8.0000000	Number of Non-Detects	84.000000
Number of Distinct Detects	8.0000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	10.000000	Minimum Non-Detect	10.000000
Maximum Detect	1600.0000	Maximum Non-Detect	10.000000
Variance Detects	312769.64	Percent Non-Detects	91.304348%
Mean Detects	816.25000	SD Detects	559.25812
Median Detects	635.00000	CV Detects	0.6851554
Skewness Detects	0.2564954	Kurtosis Detects	-1.142838
Mean of Logged Detects	6.1628094	SD of Logged Detects	1.6367187

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.9255235	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.8180000	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.2003391	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.2825000	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	80.108696	KM Standard Error of Mean	30.606214
KM SD	274.60444	95% KM (BCA) UCL	132.93478
95% KM (t) UCL	130.96922	95% KM (Percentile Bootstrap) UCL	130.54348
95% KM (z) UCL	130.45144	95% KM Bootstrap t UCL	142.05518
90% KM Chebyshev UCL	171.92734	95% KM Chebyshev UCL	213.51809
97.5% KM Chebyshev UCL	271.24444	99% KM Chebyshev UCL	384.63668

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.6517724	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7346757	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.2961421	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.3011619	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.0582142	k star (bias corrected MLE)	0.7447172
Theta hat (MLE)	771.34670	Theta star (bias corrected MLE)	1096.0537
nu hat (MLE)	16.931427	nu star (bias corrected)	11.915475
Mean (detects)	816.25000		

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000			Mean	71.721577		
59					Maximum	1600.0000			Median	0.0100000		
60					SD	278.35500			CV	3.8810496		
61					k hat (MLE)	0.1031095			k star (bias corrected MLE)	0.1069937		
62					Theta hat (MLE)	695.58620			Theta star (bias corrected MLE)	670.33486		
63					nu hat (MLE)	18.972157			nu star (bias corrected)	19.686833		
64					Adjusted Level of Significance (β)	0.0473913						
65					Approximate Chi Square Value (19.69, α)	10.620605			Adjusted Chi Square Value (19.69, β)	10.514426		
66					95% Gamma Approximate UCL (use when n>=50)	132.94635			95% Gamma Adjusted UCL (use when n<50)	134.28890		
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	80.108696			SD (KM)	274.60444		
70					Variance (KM)	75407.597			SE of Mean (KM)	30.606214		
71					k hat (KM)	0.0851029			k star (KM)	0.0895742		
72					nu hat (KM)	15.658929			nu star (KM)	16.481645		
73					theta hat (KM)	941.31600			theta star (KM)	894.32822		
74					80% gamma percentile (KM)	46.796753			90% gamma percentile (KM)	202.60151		
75					95% gamma percentile (KM)	466.74471			99% gamma percentile (KM)	1343.6894		
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (16.48, α)	8.3030446			Adjusted Chi Square Value (16.48, β)	8.2104719		
79					95% Gamma Approximate KM-UCL (use when n>=50)	159.01674			95% Gamma Adjusted KM-UCL (use when n<50)	160.80964		
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.6968644			**Shapiro Wilk GOF Test**			
83					5% Shapiro Wilk Critical Value	0.8180000			Detected Data Not Lognormal at 5% Significance Level			
84					Lilliefors Test Statistic	0.3673023			**Lilliefors GOF Test**			
85					5% Lilliefors Critical Value	0.2825000			Detected Data Not Lognormal at 5% Significance Level			
86	**Detected Data Not Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	76.685807			Mean in Log Scale	-0.330047		
90					SD in Original Scale	277.33300			SD in Log Scale	3.5660236		
91					95% t UCL (assumes normality of ROS data)	124.73419			95% Percentile Bootstrap UCL	128.65228		
92					95% BCA Bootstrap UCL	136.98280			95% Bootstrap t UCL	158.22870		
93					95% H-UCL (Log ROS)	3258.5040						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	2.6382568			KM Geo Mean	13.988797		
97					KM SD (logged)	1.1776748			95% Critical H Value (KM-Log)	2.4251810		
98					KM Standard Error of Mean (logged)	0.1312585			95% H-UCL (KM -Log)	37.754840		
99					KM SD (logged)	1.1776748			95% Critical H Value (KM-Log)	2.4251810		
100					KM Standard Error of Mean (logged)	0.1312585						

101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	75.543478				Mean in Log Scale	2.0053833	
105					SD in Original Scale	277.28220				SD in Log Scale	1.3675774	
106					95% t UCL (Assumes normality)	123.58307				95% H-Stat UCL	27.598684	
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Normal Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					95% KM (t) UCL	130.96922						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

1	**UCL Statistics for Data Sets with Non-Detects**										
2											
3	User Selected Options										
4	Date/Time of Computation	ProUCL 5.12/25/2021 3:51:38 PM									
5	From File	WorkSheet.xls									
6	Full Precision	ON									
7	Confidence Coefficient	95%									
8	Number of Bootstrap Operations	2000									
9											
10	**ETHYLBENZENE RTN GW**										
11											
12	**General Statistics**										
13	Total Number of Observations	92.000000				Number of Distinct Observations	33.000000				
14	Number of Detects	36.000000				Number of Non-Detects	56.000000				
15	Number of Distinct Detects	32.000000				Number of Distinct Non-Detects	1.0000000				
16	Minimum Detect	1.1000000				Minimum Non-Detect	1.0000000				
17	Maximum Detect	170.00000				Maximum Non-Detect	1.0000000				
18	Variance Detects	3416.0864				Percent Non-Detects	60.869565%				
19	Mean Detects	49.763889				SD Detects	58.447296				
20	Median Detects	15.000000				CV Detects	1.1744921				
21	Skewness Detects	0.9135865				Kurtosis Detects	-0.801413				
22	Mean of Logged Detects	2.8262569				SD of Logged Detects	1.7123923				
23											
24	**Normal GOF Test on Detects Only**										
25	Shapiro Wilk Test Statistic	0.7716997				**Shapiro Wilk GOF Test**					
26	5% Shapiro Wilk Critical Value	0.9350000				Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic	0.2460380				**Lilliefors GOF Test**					
28	5% Lilliefors Critical Value	0.1454000				Detected Data Not Normal at 5% Significance Level					
29	**Detected Data Not Normal at 5% Significance Level**										
30											
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**										
32	KM Mean	20.081522				KM Standard Error of Mean	4.5674850				
33	KM SD	43.197023				95% KM (BCA) UCL	28.430435				
34	95% KM (t) UCL	27.671636				95% KM (Percentile Bootstrap) UCL	27.518478				
35	95% KM (z) UCL	27.594366				95% KM Bootstrap t UCL	29.073925				
36	90% KM Chebyshev UCL	33.783977				95% KM Chebyshev UCL	39.990727				
37	97.5% KM Chebyshev UCL	48.605457				99% KM Chebyshev UCL	65.527424				
38											
39	**Gamma GOF Tests on Detected Observations Only**										
40	A-D Test Statistic	1.2767077				**Anderson-Darling GOF Test**					
41	5% A-D Critical Value	0.8050646				Detected Data Not Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic	0.1332189				**Kolmogorov-Smirnov GOF**					
43	5% K-S Critical Value	0.1544435				Detected data appear Gamma Distributed at 5% Significance Level					
44	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**										
45											
46	**Gamma Statistics on Detected Data Only**										
47	k hat (MLE)	0.5751613				k star (bias corrected MLE)	0.5457497				
48	Theta hat (MLE)	86.521621				Theta star (bias corrected MLE)	91.184451				
49	nu hat (MLE)	41.411615				nu star (bias corrected)	39.293980				
50	Mean (detects)	49.763889									

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000				Mean	19.478913	
59					Maximum	170.00000				Median	0.0100000	
60					SD	43.703252				CV	2.2436186	
61					k hat (MLE)	0.1627380				k star (bias corrected MLE)	0.1646777	
62					Theta hat (MLE)	119.69494				Theta star (bias corrected MLE)	118.28508	
63					nu hat (MLE)	29.943789				nu star (bias corrected)	30.300694	
64					Adjusted Level of Significance (β)	0.0473913						
65					Approximate Chi Square Value (30.30, α)	18.729345				Adjusted Chi Square Value (30.30, β)	18.584483	
66					95% Gamma Approximate UCL (use when n>=50)	31.513360				95% Gamma Adjusted UCL (use when n<50)	31.758999	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	20.081522				SD (KM)	43.197023	
70					Variance (KM)	1865.9828				SE of Mean (KM)	4.5674850	
71					k hat (KM)	0.2161153				k star (KM)	0.2163145	
72					nu hat (KM)	39.765223				nu star (KM)	39.801864	
73					theta hat (KM)	92.920389				theta star (KM)	92.834847	
74					80% gamma percentile (KM)	27.501680				90% gamma percentile (KM)	60.694166	
75					95% gamma percentile (KM)	101.32270				99% gamma percentile (KM)	211.79382	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (39.80, α)	26.347927				Adjusted Chi Square Value (39.80, β)	26.173829	
79					95% Gamma Approximate KM-UCL (use when n>=50)	30.335670				95% Gamma Adjusted KM-UCL (use when n<50)	30.537451	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.8979119				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.9350000				Detected Data Not Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.1224393				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.1454000				Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	19.708459				Mean in Log Scale	-0.176929	
90					SD in Original Scale	43.601734				SD in Log Scale	3.0441169	
91					95% t UCL (assumes normality of ROS data)	27.262529				95% Percentile Bootstrap UCL	27.821752	
92					95% BCA Bootstrap UCL	28.056142				95% Bootstrap t UCL	28.486709	
93					95% H-UCL (Log ROS)	397.10214						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	1.1059266				KM Geo Mean	3.0220234	
97					KM SD (logged)	1.7372689				95% Critical H Value (KM-Log)	3.0665257	
98					KM Standard Error of Mean (logged)	0.1836920				95% H-UCL (KM -Log)	23.889507	
99					KM SD (logged)	1.7372689				95% Critical H Value (KM-Log)	3.0665257	
100					KM Standard Error of Mean (logged)	0.1836920						

101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	19.777174				Mean in Log Scale	0.6840109	
105					SD in Original Scale	43.569379				SD in Log Scale	2.0274206	
106					95% t UCL (Assumes normality)	27.325639				95% H-Stat UCL	32.072717	
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					95% KM Approximate Gamma UCL	30.335670						
114												
115	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
116	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
117												
118	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
119	Recommendations are based upon data size, data distribution, and skewness.											
120	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
121	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
122												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.12/25/2021 4:00:40 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

m-XYLENE RTN GW

General Statistics

Total Number of Observations	92.000000	Number of Distinct Observations	25.000000
Number of Detects	27.000000	Number of Non-Detects	65.000000
Number of Distinct Detects	24.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	2.6000000	Minimum Non-Detect	2.0000000
Maximum Detect	250.00000	Maximum Non-Detect	2.0000000
Variance Detects	7411.9234	Percent Non-Detects	70.652174%
Mean Detects	71.103704	SD Detects	86.092528
Median Detects	27.000000	CV Detects	1.2108023
Skewness Detects	1.1481109	Kurtosis Detects	-0.258273
Mean of Logged Detects	3.3293741	SD of Logged Detects	1.5370261

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.7522276	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.9230000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.2750173	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1665000	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	22.280435	KM Standard Error of Mean	5.9008828
KM SD	55.541256	95% KM (BCA) UCL	33.313043
95% KM (t) UCL	32.086351	95% KM (Percentile Bootstrap) UCL	32.398913
95% KM (z) UCL	31.986523	95% KM Bootstrap t UCL	35.692668
90% KM Chebyshev UCL	39.983083	95% KM Chebyshev UCL	48.001787
97.5% KM Chebyshev UCL	59.131436	99% KM Chebyshev UCL	80.993478

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.8879928	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7930401	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.1464541	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.1761039	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.6529188	k star (bias corrected MLE)	0.6050637
Theta hat (MLE)	108.90129	Theta star (bias corrected MLE)	117.51442
nu hat (MLE)	35.257617	nu star (bias corrected)	32.673437
Mean (detects)	71.103704		

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000				Mean	20.874457	
59					Maximum	250.00000				Median	0.0100000	
60					SD	56.366789				CV	2.7002758	
61					k hat (MLE)	0.1452748				k star (bias corrected MLE)	0.1477840	
62					Theta hat (MLE)	143.68942				Theta star (bias corrected MLE)	141.24979	
63					nu hat (MLE)	26.730569				nu star (bias corrected)	27.192253	
64					Adjusted Level of Significance (β)	0.0473913						
65					Approximate Chi Square Value (27.19, α)	16.300526				Adjusted Chi Square Value (27.19, β)	16.166189	
66					95% Gamma Approximate UCL (use when n>=50)	34.822405				95% Gamma Adjusted UCL (use when n<50)	35.111770	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	22.280435				SD (KM)	55.541256	
70					Variance (KM)	3084.8311				SE of Mean (KM)	5.9008828	
71					k hat (KM)	0.1609222				k star (KM)	0.1629211	
72					nu hat (KM)	29.609682				nu star (KM)	29.977483	
73					theta hat (KM)	138.45471				theta star (KM)	136.75598	
74					80% gamma percentile (KM)	25.851193				90% gamma percentile (KM)	66.710650	
75					95% gamma percentile (KM)	120.56776				99% gamma percentile (KM)	274.31582	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (29.98, α)	18.475100				Adjusted Chi Square Value (29.98, β)	18.331307	
79					95% Gamma Approximate KM-UCL (use when n>=50)	36.151975				95% Gamma Adjusted KM-UCL (use when n<50)	36.435556	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.9199249				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.9230000				Detected Data Not Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.1273642				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.1665000				Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Approximate Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	21.340040				Mean in Log Scale	-0.285662	
90					SD in Original Scale	56.198499				SD in Log Scale	3.0573842	
91					95% t UCL (assumes normality of ROS data)	31.076520				95% Percentile Bootstrap UCL	31.242542	
92					95% BCA Bootstrap UCL	33.971567				95% Bootstrap t UCL	33.951459	
93					95% H-UCL (Log ROS)	375.56852						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	1.4668225				KM Geo Mean	4.3354373	
97					KM SD (logged)	1.4521222				95% Critical H Value (KM-Log)	2.7272784	
98					KM Standard Error of Mean (logged)	0.1542782				95% H-UCL (KM -Log)	18.846147	
99					KM SD (logged)	1.4521222				95% Critical H Value (KM-Log)	2.7272784	
100					KM Standard Error of Mean (logged)	0.1542782						

101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	21.573913				Mean in Log Scale	0.9770989	
105					SD in Original Scale	56.106257				SD in Log Scale	1.7316605	
106					95% t UCL (Assumes normality)	31.294412				95% H-Stat UCL	20.735077	
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					95% KM Approximate Gamma UCL	36.151975						
114												
115	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
116	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
117												
118	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
119	Recommendations are based upon data size, data distribution, and skewness.											
120	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
121	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
122												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.12/25/2021 3:53:41 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

NAPHTHALENE RTN GW

General Statistics

Total Number of Observations	92.000000	Number of Distinct Observations	44.000000
Number of Detects	52.000000	Number of Non-Detects	40.000000
Number of Distinct Detects	43.000000	Number of Distinct Non-Detects	2.0000000
Minimum Detect	1.0000000	Minimum Non-Detect	1.0000000
Maximum Detect	1900.0000	Maximum Non-Detect	10.000000
Variance Detects	169237.29	Percent Non-Detects	43.478261%
Mean Detects	195.64423	SD Detects	411.38461
Median Detects	38.000000	CV Detects	2.1027178
Skewness Detects	2.8100470	Kurtosis Detects	7.6555314
Mean of Logged Detects	3.2164036	SD of Logged Detects	2.2789115

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.5365787	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3649247	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1223312	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	111.02090	KM Standard Error of Mean	33.806975
KM SD	321.13203	95% KM (BCA) UCL	170.92717
95% KM (t) UCL	167.20035	95% KM (Percentile Bootstrap) UCL	171.15271
95% KM (z) UCL	166.62842	95% KM Bootstrap t UCL	202.85501
90% KM Chebyshev UCL	212.44182	95% KM Chebyshev UCL	258.38208
97.5% KM Chebyshev UCL	322.14539	99% KM Chebyshev UCL	447.39605

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.2166037	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.8554626	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.1842941	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.1332124	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.3296471	k star (bias corrected MLE)	0.3234495
Theta hat (MLE)	593.49592	Theta star (bias corrected MLE)	604.86785
nu hat (MLE)	34.283302	nu star (bias corrected)	33.638753
Mean (detects)	195.64423		

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000				Mean	110.58587	
59					Maximum	1900.0000				Median	1.3000000	
60					SD	323.04184				CV	2.9211855	
61					k hat (MLE)	0.1562382				k star (bias corrected MLE)	0.1583899	
62					Theta hat (MLE)	707.80280				Theta star (bias corrected MLE)	698.18764	
63					nu hat (MLE)	28.747838				nu star (bias corrected)	29.143741	
64					Adjusted Level of Significance (β)	0.0473913						
65					Approximate Chi Square Value (29.14, α)	17.821020				Adjusted Chi Square Value (29.14, β)	17.680011	
66					95% Gamma Approximate UCL (use when n>=50)	180.84745				95% Gamma Adjusted UCL (use when n<50)	182.28982	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	111.02090				SD (KM)	321.13203	
70					Variance (KM)	103125.78				SE of Mean (KM)	33.806975	
71					k hat (KM)	0.1195204				k star (KM)	0.1228694	
72					nu hat (KM)	21.991762				nu star (KM)	22.607973	
73					theta hat (KM)	928.88621				theta star (KM)	903.56817	
74					80% gamma percentile (KM)	99.960718				90% gamma percentile (KM)	316.54160	
75					95% gamma percentile (KM)	631.57199				99% gamma percentile (KM)	1587.5163	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (22.61, α)	12.795102				Adjusted Chi Square Value (22.61, β)	12.677430	
79					95% Gamma Approximate KM-UCL (use when n>=50)	196.16548				95% Gamma Adjusted KM-UCL (use when n<50)	197.98629	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Approximate Test Statistic	0.9217753				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk P Value	0.0021698				Detected Data Not Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.1551974				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.1223312				Detected Data Not Lognormal at 5% Significance Level		
86	**Detected Data Not Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	110.68366				Mean in Log Scale	0.7109666	
90					SD in Original Scale	323.00807				SD in Log Scale	3.5760077	
91					95% t UCL (assumes normality of ROS data)	166.64533				95% Percentile Bootstrap UCL	168.13225	
92					95% BCA Bootstrap UCL	186.43866				95% Bootstrap t UCL	195.19185	
93					95% H-UCL (Log ROS)	9669.1616						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	1.8204029				KM Geo Mean	6.1743458	
97					KM SD (logged)	2.3270316				95% Critical H Value (KM-Log)	3.8176435	
98					KM Standard Error of Mean (logged)	0.2450253				95% H-UCL (KM -Log)	234.91269	
99					KM SD (logged)	2.3270316				95% Critical H Value (KM-Log)	3.8176435	
100					KM Standard Error of Mean (logged)	0.2450253						

	A	B	C	D	E	F	G	H	I	J	K	L
101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104	Mean in Original Scale					110.84783	Mean in Log Scale					1.5416270
105	SD in Original Scale					322.95165	SD in Log Scale					2.5795006
106	95% t UCL (Assumes normality)					166.79972	95% H-Stat UCL					400.23434
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Data do not follow a Discernible Distribution at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113	95% KM (Chebyshev) UCL					258.38208						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation	ProUCL 5.13/1/2021 4:37:56 PM										
5	From File	WorkSheet.xls										
6	Full Precision	ON										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10	**2-METHYLNAPHTHALENE RTN GW**											
11												
12	**General Statistics**											
13	Total Number of Observations	91.000000			Number of Distinct Observations	32.000000						
14	Number of Detects	28.000000			Number of Non-Detects	63.000000						
15	Number of Distinct Detects	26.000000			Number of Distinct Non-Detects	6.0000000						
16	Minimum Detect	0.3200000			Minimum Non-Detect	0.2500000						
17	Maximum Detect	270.00000			Maximum Non-Detect	5.3000000						
18	Variance Detects	3684.2589			Percent Non-Detects	69.230769%						
19	Mean Detects	25.189286			SD Detects	60.698096						
20	Median Detects	1.9000000			CV Detects	2.4096791						
21	Skewness Detects	3.3735443			Kurtosis Detects	11.417148						
22	Mean of Logged Detects	1.2734665			SD of Logged Detects	1.9449578						
23												
24	**Normal GOF Test on Detects Only**											
25	Shapiro Wilk Test Statistic	0.4612439			**Shapiro Wilk GOF Test**							
26	5% Shapiro Wilk Critical Value	0.9240000			Detected Data Not Normal at 5% Significance Level							
27	Lilliefors Test Statistic	0.3410053			**Lilliefors GOF Test**							
28	5% Lilliefors Critical Value	0.1641000			Detected Data Not Normal at 5% Significance Level							
29	**Detected Data Not Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32	KM Mean	7.9543056			KM Standard Error of Mean	3.7367335						
33	KM SD	35.003008			95% KM (BCA) UCL	14.616396						
34	95% KM (t) UCL	14.164612			95% KM (Percentile Bootstrap) UCL	15.075408						
35	95% KM (z) UCL	14.100685			95% KM Bootstrap t UCL	28.954233						
36	90% KM Chebyshev UCL	19.164506			95% KM Chebyshev UCL	24.242349						
37	97.5% KM Chebyshev UCL	31.290199			99% KM Chebyshev UCL	45.134335						
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40	A-D Test Statistic	2.4751541			**Anderson-Darling GOF Test**							
41	5% A-D Critical Value	0.8443384			Detected Data Not Gamma Distributed at 5% Significance Level							
42	K-S Test Statistic	0.2648931			**Kolmogorov-Smirnov GOF**							
43	5% K-S Critical Value	0.1784793			Detected Data Not Gamma Distributed at 5% Significance Level							
44	**Detected Data Not Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47	k hat (MLE)	0.3451086			k star (bias corrected MLE)	0.3319422						
48	Theta hat (MLE)	72.989438			Theta star (bias corrected MLE)	75.884545						
49	nu hat (MLE)	19.326084			nu star (bias corrected)	18.588765						
50	Mean (detects)	25.189286										

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000				Mean	7.7574725	
59					Maximum	270.00000				Median	0.0100000	
60					SD	35.239619				CV	4.5426676	
61					k hat (MLE)	0.1575040				k star (bias corrected MLE)	0.1596376	
62					Theta hat (MLE)	49.252533				Theta star (bias corrected MLE)	48.594270	
63					nu hat (MLE)	28.665734				nu star (bias corrected)	29.054043	
64					Adjusted Level of Significance (β)	0.0473626						
65					Approximate Chi Square Value (29.05, α)	17.750805				Adjusted Chi Square Value (29.05, β)	17.608522	
66					95% Gamma Approximate UCL (use when n>=50)	12.697223				95% Gamma Adjusted UCL (use when n<50)	12.799822	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	7.9543056				SD (KM)	35.003008	
70					Variance (KM)	1225.2106				SE of Mean (KM)	3.7367335	
71					k hat (KM)	0.0516409				k star (KM)	0.0572645	
72					nu hat (KM)	9.3986438				nu star (KM)	10.422132	
73					theta hat (KM)	154.03112				theta star (KM)	138.90475	
74					80% gamma percentile (KM)	1.6771136				90% gamma percentile (KM)	14.258540	
75					95% gamma percentile (KM)	44.092995				99% gamma percentile (KM)	163.69199	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (10.42, α)	4.2072928				Adjusted Chi Square Value (10.42, β)	4.1437762	
79					95% Gamma Approximate KM-UCL (use when n>=50)	19.704077				95% Gamma Adjusted KM-UCL (use when n<50)	20.006105	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.8919363				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.9240000				Detected Data Not Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.1882125				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.1641000				Detected Data Not Lognormal at 5% Significance Level		
86	**Detected Data Not Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	7.7943295				Mean in Log Scale	-2.816561	
90					SD in Original Scale	35.231679				SD in Log Scale	3.5388827	
91					95% t UCL (assumes normality of ROS data)	13.932423				95% Percentile Bootstrap UCL	14.657508	
92					95% BCA Bootstrap UCL	17.715001				95% Bootstrap t UCL	31.509623	
93					95% H-UCL (Log ROS)	241.12070						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	-0.521208				KM Geo Mean	0.5938026	
97					KM SD (logged)	1.6174803				95% Critical H Value (KM-Log)	2.9185778	
98					KM Standard Error of Mean (logged)	0.1747906				95% H-UCL (KM -Log)	3.6129433	
99					KM SD (logged)	1.6174803				95% Critical H Value (KM-Log)	2.9185778	
100					KM Standard Error of Mean (logged)	0.1747906						

101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104	Mean in Original Scale					8.0988462	Mean in Log Scale					-0.500061
105	SD in Original Scale					35.170312	SD in Log Scale					1.7641414
106	95% t UCL (Assumes normality)					14.226249	95% H-Stat UCL					5.1136048
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Data do not follow a Discernible Distribution at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113	95% KM (Chebyshev) UCL					24.242349						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.13/1/2021 4:59:40 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

o-XYLENE RTN GW

General Statistics

Total Number of Observations	92.000000	Number of Distinct Observations	35.000000
Number of Detects	36.000000	Number of Non-Detects	56.000000
Number of Distinct Detects	34.000000	Number of Distinct Non-Detects	1.0000000
Minimum Detect	1.1000000	Minimum Non-Detect	1.0000000
Maximum Detect	77.000000	Maximum Non-Detect	1.0000000
Variance Detects	472.75371	Percent Non-Detects	60.869565%
Mean Detects	19.700000	SD Detects	21.742900
Median Detects	8.8000000	CV Detects	1.1037005
Skewness Detects	1.2417285	Kurtosis Detects	0.4386396
Mean of Logged Detects	2.2972733	SD of Logged Detects	1.2640164

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.7887489	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.9350000	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.2943587	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.1454000	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	8.3173913	KM Standard Error of Mean	1.7152175
KM SD	16.221682	95% KM (BCA) UCL	11.115217
95% KM (t) UCL	11.167690	95% KM (Percentile Bootstrap) UCL	11.221739
95% KM (z) UCL	11.138673	95% KM Bootstrap t UCL	11.963513
90% KM Chebyshev UCL	13.463044	95% KM Chebyshev UCL	15.793851
97.5% KM Chebyshev UCL	19.028921	99% KM Chebyshev UCL	25.383590

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.0437002	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7828173	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.1852371	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.1519764	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.8603688	k star (bias corrected MLE)	0.8071899
Theta hat (MLE)	22.897159	Theta star (bias corrected MLE)	24.405658
nu hat (MLE)	61.946551	nu star (bias corrected)	58.117671
Mean (detects)	19.700000		

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000				Mean	7.7147826	
59					Maximum	77.000000				Median	0.0100000	
60					SD	16.588749				CV	2.1502550	
61					k hat (MLE)	0.1881997				k star (bias corrected MLE)	0.1893091	
62					Theta hat (MLE)	40.992535				Theta star (bias corrected MLE)	40.752302	
63					nu hat (MLE)	34.628744				nu star (bias corrected)	34.832879	
64					Adjusted Level of Significance (β)	0.0473913						
65					Approximate Chi Square Value (34.83, α)	22.331095				Adjusted Chi Square Value (34.83, β)	22.171797	
66					95% Gamma Approximate UCL (use when n>=50)	12.033807				95% Gamma Adjusted UCL (use when n<50)	12.120267	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	8.3173913				SD (KM)	16.221682	
70					Variance (KM)	263.14296				SE of Mean (KM)	1.7152175	
71					k hat (KM)	0.2628951				k star (KM)	0.2615688	
72					nu hat (KM)	48.372701				nu star (KM)	48.128664	
73					theta hat (KM)	31.637679				theta star (KM)	31.798099	
74					80% gamma percentile (KM)	12.266994				90% gamma percentile (KM)	24.877920	
75					95% gamma percentile (KM)	39.715397				99% gamma percentile (KM)	78.967593	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (48.13, α)	33.205108				Adjusted Chi Square Value (48.13, β)	33.008128	
79					95% Gamma Approximate KM-UCL (use when n>=50)	12.055522				95% Gamma Adjusted KM-UCL (use when n<50)	12.127465	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.9366913				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.9350000				Detected Data appear Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.1284364				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.1454000				Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	8.0145811				Mean in Log Scale	0.0338753	
90					SD in Original Scale	16.453901				SD in Log Scale	2.2885533	
91					95% t UCL (assumes normality of ROS data)	10.865246				95% Percentile Bootstrap UCL	10.765582	
92					95% BCA Bootstrap UCL	11.451672				95% Bootstrap t UCL	11.603009	
93					95% H-UCL (Log ROS)	35.033960						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	0.8989330				KM Geo Mean	2.4569802	
97					KM SD (logged)	1.3655948				95% Critical H Value (KM-Log)	2.6292600	
98					KM Standard Error of Mean (logged)	0.1443927				95% H-UCL (KM -Log)	9.0951803	
99					KM SD (logged)	1.3655948				95% Critical H Value (KM-Log)	2.6292600	
100					KM Standard Error of Mean (logged)	0.1443927						

101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	8.0130435				Mean in Log Scale	0.4770173	
105					SD in Original Scale	16.449859				SD in Log Scale	1.6637067	
106					95% t UCL (Assumes normality)	10.863008				95% H-Stat UCL	10.806183	
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Lognormal Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					KM H-UCL	9.0951803						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.12/25/2021 3:55:31 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

TETRACHLOROETHENE RTN GW

General Statistics

Total Number of Observations	92.000000	Number of Distinct Observations	9.0000000
Number of Detects	7.0000000	Number of Non-Detects	85.000000
Number of Distinct Detects	7.0000000	Number of Distinct Non-Detects	2.0000000
Minimum Detect	26.000000	Minimum Non-Detect	1.0000000
Maximum Detect	76.000000	Maximum Non-Detect	5.0000000
Variance Detects	292.61905	Percent Non-Detects	92.391304%
Mean Detects	55.571429	SD Detects	17.106111
Median Detects	60.000000	CV Detects	0.3078221
Skewness Detects	-0.706264	Kurtosis Detects	0.0578062
Mean of Logged Detects	3.9670488	SD of Logged Detects	0.3651299

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.9491078	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.8030000	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.1735678	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.3041000	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	5.1521739	KM Standard Error of Mean	1.7019988
KM SD	15.114012	95% KM (BCA) UCL	8.0543478
95% KM (t) UCL	7.9805063	95% KM (Percentile Bootstrap) UCL	7.7065217
95% KM (z) UCL	7.9517128	95% KM Bootstrap t UCL	7.4936858
90% KM Chebyshev UCL	10.258170	95% KM Chebyshev UCL	12.571015
97.5% KM Chebyshev UCL	15.781153	99% KM Chebyshev UCL	22.086848

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.3646576	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7084726	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.2085862	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.3119281	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	10.041233	k star (bias corrected MLE)	5.8330853
Theta hat (MLE)	5.5343234	Theta star (bias corrected MLE)	9.5269357
nu hat (MLE)	140.57726	nu star (bias corrected)	81.663194
Mean (detects)	55.571429		

51											
52	**Gamma ROS Statistics using Imputed Non-Detects**										
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs										
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)										
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs										
56	This is especially true when the sample size is small.										
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates										
58					Minimum	0.0100000			Mean	6.6623405	
59					Maximum	76.000000			Median	0.0100000	
60					SD	16.130815			CV	2.4211934	
61					k hat (MLE)	0.1633692			k star (bias corrected MLE)	0.1652883	
62					Theta hat (MLE)	40.780878			Theta star (bias corrected MLE)	40.307382	
63					nu hat (MLE)	30.059937			nu star (bias corrected)	30.413055	
64					Adjusted Level of Significance (β)	0.0473913					
65					Approximate Chi Square Value (30.41, α)	18.817818			Adjusted Chi Square Value (30.41, β)	18.672586	
66					95% Gamma Approximate UCL (use when n>=50)	10.767568			95% Gamma Adjusted UCL (use when n<50)	10.851316	
67											
68	**Estimates of Gamma Parameters using KM Estimates**										
69					Mean (KM)	5.1521739			SD (KM)	15.114012	
70					Variance (KM)	228.43336			SE of Mean (KM)	1.7019988	
71					k hat (KM)	0.1162041			k star (KM)	0.1196612	
72					nu hat (KM)	21.381556			nu star (KM)	22.017665	
73					theta hat (KM)	44.337278			theta star (KM)	43.056337	
74					80% gamma percentile (KM)	4.5042122			90% gamma percentile (KM)	14.585940	
75					95% gamma percentile (KM)	29.410594			99% gamma percentile (KM)	74.690514	
76											
77	**Gamma Kaplan-Meier (KM) Statistics**										
78					Approximate Chi Square Value (22.02, α)	12.351526			Adjusted Chi Square Value (22.02, β)	12.236116	
79					95% Gamma Approximate KM-UCL (use when n>=50)	9.1841961			95% Gamma Adjusted KM-UCL (use when n<50)	9.2708211	
80											
81	**Lognormal GOF Test on Detected Observations Only**										
82					Shapiro Wilk Test Statistic	0.8801709			**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.8030000			Detected Data appear Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.2094632			**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.3041000			Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Lognormal at 5% Significance Level**										
87											
88	**Lognormal ROS Statistics Using Imputed Non-Detects**										
89					Mean in Original Scale	12.882499			Mean in Log Scale	2.0703804	
90					SD in Original Scale	14.853112			SD in Log Scale	0.9920484	
91					95% t UCL (assumes normality of ROS data)	15.455825			95% Percentile Bootstrap UCL	15.580377	
92					95% BCA Bootstrap UCL	16.219919			95% Bootstrap t UCL	16.060822	
93					95% H-UCL (Log ROS)	16.368069					
94											
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**										
96					KM Mean (logged)	0.3018407			KM Geo Mean	1.3523457	
97					KM SD (logged)	1.0559373			95% Critical H Value (KM-Log)	2.3011009	
98					KM Standard Error of Mean (logged)	0.1189098			95% H-UCL (KM -Log)	3.0466928	
99					KM SD (logged)	1.0559373			95% Critical H Value (KM-Log)	2.3011009	
100					KM Standard Error of Mean (logged)	0.1189098					

	A	B	C	D	E	F	G	H	I	J	K	L
101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104	Mean in Original Scale					4.9728261	Mean in Log Scale					-0.111146
105	SD in Original Scale					15.262243	SD in Log Scale					1.3065053
106	95% t UCL (Assumes normality)					7.6170343	95% H-Stat UCL					2.9846753
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Normal Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113	95% KM (t) UCL					7.9805063						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.13/1/2021 4:47:46 PM
From File	WorkSheet.xls
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

PENTACHLOROPHENOL RTN GW

General Statistics

Total Number of Observations	91.000000	Number of Distinct Observations	9.0000000
Number of Detects	5.0000000	Number of Non-Detects	86.000000
Number of Distinct Detects	5.0000000	Number of Distinct Non-Detects	4.0000000
Minimum Detect	6.8000000	Minimum Non-Detect	2.0000000
Maximum Detect	22.000000	Maximum Non-Detect	5.6000000
Variance Detects	37.612000	Percent Non-Detects	94.505495%
Mean Detects	12.920000	SD Detects	6.1328623
Median Detects	13.000000	CV Detects	0.4746797
Skewness Detects	0.7120118	Kurtosis Detects	-0.130496
Mean of Logged Detects	2.4670177	SD of Logged Detects	0.4822293

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.9316744	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.7620000	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.1980980	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.3427000	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.6000000	KM Standard Error of Mean	0.3282754
KM SD	2.8009418	95% KM (BCA) UCL	3.1626374
95% KM (t) UCL	3.1455810	95% KM (Percentile Bootstrap) UCL	3.1472527
95% KM (z) UCL	3.1399650	95% KM Bootstrap t UCL	2.9464993
90% KM Chebyshev UCL	3.5848263	95% KM Chebyshev UCL	4.0309195
97.5% KM Chebyshev UCL	4.6500794	99% KM Chebyshev UCL	5.8662994

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.2681927	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.6804866	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.2305211	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.3582221	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	5.6104334	k star (bias corrected MLE)	2.3775067
Theta hat (MLE)	2.3028524	Theta star (bias corrected MLE)	5.4342644
nu hat (MLE)	56.104334	nu star (bias corrected)	23.775067
Mean (detects)	12.920000		

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000				Mean	0.7407823	
59					Maximum	22.000000				Median	0.0100000	
60					SD	3.2300632				CV	4.3603408	
61					k hat (MLE)	0.1919469				k star (bias corrected MLE)	0.1929450	
62					Theta hat (MLE)	3.8593083				Theta star (bias corrected MLE)	3.8393444	
63					nu hat (MLE)	34.934336				nu star (bias corrected)	35.115988	
64					Adjusted Level of Significance (β)	0.0473626						
65					Approximate Chi Square Value (35.12, α)	22.558178				Adjusted Chi Square Value (35.12, β)	22.396216	
66					95% Gamma Approximate UCL (use when n>=50)	1.1531650				95% Gamma Adjusted UCL (use when n<50)	1.1615043	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	2.6000000				SD (KM)	2.8009418	
70					Variance (KM)	7.8452747				SE of Mean (KM)	0.3282754	
71					k hat (KM)	0.8616652				k star (KM)	0.8405846	
72					nu hat (KM)	156.82306				nu star (KM)	152.98640	
73					theta hat (KM)	3.0174134				theta star (KM)	3.0930853	
74					80% gamma percentile (KM)	4.2368719				90% gamma percentile (KM)	6.2468291	
75					95% gamma percentile (KM)	8.2857740				99% gamma percentile (KM)	13.082280	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (152.99, α)	125.39555				Adjusted Chi Square Value (152.99, β)	124.99599	
79					95% Gamma Approximate KM-UCL (use when n>=50)	3.1720795				95% Gamma Adjusted KM-UCL (use when n<50)	3.1822192	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.9461124				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.7620000				Detected Data appear Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.2040617				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.3427000				Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	1.3956205				Mean in Log Scale	-1.003632	
90					SD in Original Scale	3.2244528				SD in Log Scale	1.6598241	
91					95% t UCL (assumes normality of ROS data)	1.9573875				95% Percentile Bootstrap UCL	1.9749496	
92					95% BCA Bootstrap UCL	2.1898693				95% Bootstrap t UCL	2.2808553	
93					95% H-UCL (Log ROS)	2.4434351						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	0.7906126				KM Geo Mean	2.2047466	
97					KM SD (logged)	0.4166693				95% Critical H Value (KM-Log)	1.8008139	
98					KM Standard Error of Mean (logged)	0.0488344				95% H-UCL (KM -Log)	2.6026038	
99					KM SD (logged)	0.4166693				95% Critical H Value (KM-Log)	1.8008139	
100					KM Standard Error of Mean (logged)	0.0488344						

101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104					Mean in Original Scale	2.6521978				Mean in Log Scale	0.7428645	
105					SD in Original Scale	2.8865196				SD in Log Scale	0.5969302	
106					95% t UCL (Assumes normality)	3.1550898				95% H-Stat UCL	2.8328778	
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Normal Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113					95% KM (t) UCL	3.1455810						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3			User Selected Options									
4			Date/Time of Computation	ProUCL 5.12/25/2021 3:57:10 PM								
5			From File	WorkSheet.xls								
6			Full Precision	ON								
7			Confidence Coefficient	95%								
8			Number of Bootstrap Operations	2000								
9												
10	**TRICHLOROETHENE RTN GW**											
11												
12	**General Statistics**											
13					Total Number of Observations	92.000000			Number of Distinct Observations	7.0000000		
14					Number of Detects	7.0000000			Number of Non-Detects	85.000000		
15					Number of Distinct Detects	6.0000000			Number of Distinct Non-Detects	1.0000000		
16					Minimum Detect	10.000000			Minimum Non-Detect	1.0000000		
17					Maximum Detect	27.000000			Maximum Non-Detect	1.0000000		
18					Variance Detects	61.952381			Percent Non-Detects	92.391304%		
19					Mean Detects	17.428571			SD Detects	7.8709835		
20					Median Detects	14.000000			CV Detects	0.4516138		
21					Skewness Detects	0.3179836			Kurtosis Detects	-2.531505		
22					Mean of Logged Detects	2.7677300			SD of Logged Detects	0.4607559		
23												
24	**Normal GOF Test on Detects Only**											
25					Shapiro Wilk Test Statistic	0.8020926			**Shapiro Wilk GOF Test**			
26					5% Shapiro Wilk Critical Value	0.8030000			Detected Data Not Normal at 5% Significance Level			
27					Lilliefors Test Statistic	0.2398638			**Lilliefors GOF Test**			
28					5% Lilliefors Critical Value	0.3041000			Detected Data appear Normal at 5% Significance Level			
29	**Detected Data appear Approximate Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32					KM Mean	2.2500000			KM Standard Error of Mean	0.5402212		
33					KM SD	4.7972479			95% KM (BCA) UCL	3.1739130		
34					95% KM (t) UCL	3.1477240			95% KM (Percentile Bootstrap) UCL	3.0869565		
35					95% KM (z) UCL	3.1385848			95% KM Bootstrap t UCL	3.1590951		
36					90% KM Chebyshev UCL	3.8706637			95% KM Chebyshev UCL	4.6047697		
37					97.5% KM Chebyshev UCL	5.6236804			99% KM Chebyshev UCL	7.6251333		
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40					A-D Test Statistic	0.6935345			**Anderson-Darling GOF Test**			
41					5% A-D Critical Value	0.7096686			Detected data appear Gamma Distributed at 5% Significance Level			
42					K-S Test Statistic	0.2556691			**Kolmogorov-Smirnov GOF**			
43					5% K-S Critical Value	0.3128602			Detected data appear Gamma Distributed at 5% Significance Level			
44	**Detected data appear Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47					k hat (MLE)	5.6935910			k star (bias corrected MLE)	3.3487187		
48					Theta hat (MLE)	3.0610860			Theta star (bias corrected MLE)	5.2045493		
49					nu hat (MLE)	79.710274			nu star (bias corrected)	46.882061		
50					Mean (detects)	17.428571						

51												
52	**Gamma ROS Statistics using Imputed Non-Detects**											
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0100000				Mean	1.5486458	
59					Maximum	27.000000				Median	0.0100000	
60					SD	5.0994539				CV	3.2928471	
61					k hat (MLE)	0.1812461				k star (bias corrected MLE)	0.1825823	
62					Theta hat (MLE)	8.5444345				Theta star (bias corrected MLE)	8.4819045	
63					nu hat (MLE)	33.349291				nu star (bias corrected)	33.595147	
64					Adjusted Level of Significance (β)	0.0473913						
65					Approximate Chi Square Value (33.60, α)	21.341053				Adjusted Chi Square Value (33.60, β)	21.185600	
66					95% Gamma Approximate UCL (use when n>=50)	2.4378827				95% Gamma Adjusted UCL (use when n<50)	2.4557711	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	2.2500000				SD (KM)	4.7972479	
70					Variance (KM)	23.013587				SE of Mean (KM)	0.5402212	
71					k hat (KM)	0.2199787				k star (KM)	0.2200519	
72					nu hat (KM)	40.476089				nu star (KM)	40.489550	
73					theta hat (KM)	10.228261				theta star (KM)	10.224860	
74					80% gamma percentile (KM)	3.1053826				90% gamma percentile (KM)	6.7973005	
75					95% gamma percentile (KM)	11.298918				99% gamma percentile (KM)	23.506967	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (40.49, α)	26.908685				Adjusted Chi Square Value (40.49, β)	26.732613	
79					95% Gamma Approximate KM-UCL (use when n>=50)	3.3855793				95% Gamma Adjusted KM-UCL (use when n<50)	3.4078782	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.8135996				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.8030000				Detected Data appear Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.2419848				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.3041000				Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	2.9025882				Mean in Log Scale	0.1464975	
90					SD in Original Scale	4.9737886				SD in Log Scale	1.3893525	
91					95% t UCL (assumes normality of ROS data)	3.7643051				95% Percentile Bootstrap UCL	3.8530140	
92					95% BCA Bootstrap UCL	3.9871952				95% Bootstrap t UCL	4.1398929	
93					95% H-UCL (Log ROS)	4.4747969						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	0.2105882				KM Geo Mean	1.2344039	
97					KM SD (logged)	0.7432020				95% Critical H Value (KM-Log)	2.0455277	
98					KM Standard Error of Mean (logged)	0.0836925				95% H-UCL (KM -Log)	1.9081367	
99					KM SD (logged)	0.7432020				95% Critical H Value (KM-Log)	2.0455277	
100					KM Standard Error of Mean (logged)	0.0836925						

	DL/2 Statistics	
	DL/2 Normal	**DL/2 Log-Transformed**
Mean in Original Scale	1.7880435	Mean in Log Scale -0.429820
SD in Original Scale	4.9448795	SD in Log Scale 0.9301900
95% t UCL (Assumes normality)	2.6447518	95% H-Stat UCL 1.2405190
DL/2 is not a recommended method, provided for comparisons and historical reasons		
	Nonparametric Distribution Free UCL Statistics	
	Detected Data appear Approximate Normal Distributed at 5% Significance Level	
	Suggested UCL to Use	
95% KM (t) UCL	3.1477240	

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ATTACHMENT 6

VURAM INDUSTRIAL/COMMERCIAL RISK OUTPUT

Virginia Department of Environmental Quality

VURAM

Virginia Unified Risk Assessment Model

VERSION: 3.1

Industrial/Commercial Worker Quantitative Risk Assessment Report

Program: Voluntary Remediation Program (VRP)

Site Name:RTN500501UNIONST

Total Hazard Index/Risk for All Media

Non-Cancer Adult
Total: 1.14E+01
Exceeds Hazard Index!

Cancer
Total: 1.24E-03
Exceeds Cumulative Risk!

Risk Based Performance Criteria

Default Hazard Index	Default Cumulative Risk-All Chemicals
1	1.00E-04

Groundwater Declaration Restricted Use

Restricted use of groundwater is for onsite use ONLY. Potential offsite risks and receptors are evaluated separately. The nature and extent of the groundwater plume is sufficiently characterized. Concentrations along the vertical and horizontal migration of the plume are stable.

All Report Pages are Required for Risk Assessment Submission
DETAILED REPORT FOLLOWS

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Soil

Analyte: Arsenic, Inorganic

CAS: 7440-38-2

Concentration mg/kg:	2.50E+03
RfDo (mg/kg-day):	3.00E-04
RfCi (mg/m3):	1.50E-05
SFO (mg/kg-day)-1:	1.50E+00
IUR (µg/m3)-1:	4.30E-03
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	4.28E+00	Ingestion:	6.88E-04
Dermal:	9.06E-01	Dermal:	1.46E-04
Inhalation:	2.80E-02	Inhalation:	6.45E-07
Total:	**5.21E+00**	**Total:**	**8.34E-04**
% Contribution to Media Risk	45.72%		67.36%

Exceeds Hazard! Exceeds Risk!	mg/kg	*Non-Cancer Adult*	*Cancer*
Recommended Acceptable Concentration		*4.79E+02*	*3.00E+00*

Analyte: Benz[a]anthracene

CAS: 56-55-3

Concentration mg/kg:	6.80E+02
RfDo (mg/kg-day):	
RfCi (mg/m3):	
SFO (mg/kg-day)-1:	1.00E-01
IUR (µg/m3)-1:	6.00E-05
Mutagen:	Y
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:		Ingestion:	2.08E-05
Dermal:		Dermal:	1.14E-05
Inhalation:		Inhalation:	7.57E-07
Total:	**0.00E+00**	**Total:**	**3.30E-05**
% Contribution to Media Risk	0.00%		2.66%

Exceeds Risk!	mg/kg	*Non-Cancer Adult*	*Cancer*
Recommended Acceptable Concentration		*N/A*	*2.06E+01*

Analyte: Benzo[a]pyrene

CAS: 50-32-8

Concentration mg/kg:	5.70E+02
RfDo (mg/kg-day):	3.00E-04
RfCi (mg/m3):	2.00E-06
SFO (mg/kg-day)-1:	1.00E+00
IUR (µg/m3)-1:	6.00E-04
Mutagen:	Y
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	1.63E+00	Ingestion:	1.74E-04
Dermal:	8.95E-01	Dermal:	9.59E-05
Inhalation:	4.78E-02	Inhalation:	2.05E-08
Total:	**2.57E+00**	**Total:**	**2.70E-04**
% Contribution to Media Risk	22.53%		21.82%

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Soil

Exceeds Hazard! Exceeds Risk!	mg/kg	*Non-Cancer Adult*	*Cancer*
Recommended Acceptable Concentration		*2.22E+02*	*2.11E+00*

Analyte: Benzo[b]fluoranthene

CAS: 205-99-2

Concentration mg/kg:	3.90E+02
RfDo (mg/kg-day):	
RfCi (mg/m3):	
SFO (mg/kg-day)-1:	1.00E-01
IUR (µg/m3)-1:	6.00E-05
Mutagen:	Y
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		**Cancer**	
Ingestion:		Ingestion:	1.19E-05
Dermal:		Dermal:	6.56E-06
Inhalation:		Inhalation:	1.40E-09
Total:	**0.00E+00**	**Total:**	**1.85E-05**

% Contribution to Media Risk	0.00%	1.49%

Exceeds Risk!	mg/kg	*Non-Cancer Adult*	*Cancer*
Recommended Acceptable Concentration		*N/A*	*2.11E+01*

Analyte: Biphenyl, 1,1'-

CAS: 92-52-4

Concentration mg/kg:	1.60E+02
RfDo (mg/kg-day):	5.00E-01
RfCi (mg/m3):	4.00E-04
SFO (mg/kg-day)-1:	8.00E-03
IUR (µg/m3)-1:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		**Cancer**	
Ingestion:	2.74E-04	Ingestion:	3.91E-07
Dermal:		Dermal:	
Inhalation:	8.01E-01	Inhalation:	
Total:	**8.01E-01**	**Total:**	**3.91E-07**

% Contribution to Media Risk	7.03%	0.03%

	mg/kg	*Non-Cancer Adult*	*Cancer*
Recommended Acceptable Concentration		*N/A*	*N/A*

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Soil

Analyte: Dibenz[a,h]anthracene

CAS: 53-70-3

Concentration mg/kg:	1.30E+02
RfDo (mg/kg-day):	
RfCi (mg/m3):	
SFO (mg/kg-day)-1:	1.00E+00
IUR (µg/m3)-1:	6.00E-04
Mutagen:	Y
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:		Ingestion:	3.98E-05
Dermal:		Dermal:	2.19E-05
Inhalation:		Inhalation:	4.68E-09
Total:	**0.00E+00**	**Total:**	**6.16E-05**
% Contribution to Media Risk	0.00%		4.98%

	mg/kg	*Non-Cancer Adult*	*Cancer*
Exceeds Risk!			
Recommended Acceptable Concentration		*N/A*	*2.11E+00*

Analyte: Dibenzofuran

CAS: 132-64-9

Concentration mg/kg:	6.00E+02
RfDo (mg/kg-day):	1.00E-03
RfCi (mg/m3):	
SFO (mg/kg-day)-1:	
IUR (µg/m3)-1:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	5.14E-01	Ingestion:	
Dermal:		Dermal:	
Inhalation:		Inhalation:	
Total:	**5.14E-01**	**Total:**	**0.00E+00**
% Contribution to Media Risk	4.50%		0.00%

	mg/kg	*Non-Cancer Adult*	*Cancer*
Recommended Acceptable Concentration		*N/A*	*N/A*

Analyte: Indeno[1,2,3-cd]pyrene

CAS: 193-39-5

Concentration mg/kg:	2.80E+02
RfDo (mg/kg-day):	
RfCi (mg/m3):	
SFO (mg/kg-day)-1:	1.00E-01
IUR (µg/m3)-1:	6.00E-05
Mutagen:	Y
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:		Ingestion:	8.56E-06
Dermal:		Dermal:	4.71E-06
Inhalation:		Inhalation:	1.01E-09
Total:	**0.00E+00**	**Total:**	**1.33E-05**
% Contribution to Media Risk	0.00%		1.07%

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Soil

Exceeds Risk!	mg/kg	*Non-Cancer Adult*	*Cancer*
Recommended Acceptable Concentration		*N/A*	*2.11E+01*

Analyte: Lead and Compounds

CAS: 7439-92-1

Concentration mg/kg:	2.20E+03
RfDo (mg/kg-day):	
RfCi (mg/m3):	
SFO (mg/kg-day)-1:	
IUR (µg/m3)-1:	
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		**Cancer**	
Ingestion:		Ingestion:	
Dermal:		Dermal:	
Inhalation:		Inhalation:	
Total:	**0.00E+00**	**Total:**	**0.00E+00**

% Contribution to Media Risk 0.00% 0.00%

	mg/kg	*Non-Cancer Adult*	*Cancer*
Recommended Acceptable Concentration		*N/A*	*N/A*

Analyte: Mercury (elemental)

CAS: 7439-97-6

Concentration mg/kg:	7.50E+01
RfDo (mg/kg-day):	
RfCi (mg/m3):	3.00E-04
SFO (mg/kg-day)-1:	
IUR (µg/m3)-1:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		**Cancer**	
Ingestion:		Ingestion:	
Dermal:		Dermal:	
Inhalation:	1.64E+00	Inhalation:	
Total:	**1.64E+00**	**Total:**	**0.00E+00**

% Contribution to Media Risk 14.42% 0.00%

Exceeds Hazard!	mg/kg	*Non-Cancer Adult*	*Cancer*
Recommended Acceptable Concentration		*4.56E+01*	*N/A*

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Soil

Analyte: Naphthalene

CAS: 91-20-3

Concentration mg/kg:	6.20E+01
RfDo (mg/kg-day):	2.00E-02
RfCi (mg/m3):	3.00E-03
SFO (mg/kg-day)-1:	1.20E-01
IUR (µg/m3)-1:	3.40E-05
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	2.65E-03	Ingestion:	2.27E-06
Dermal:	1.46E-03	Dermal:	1.25E-06
Inhalation:	1.02E-01	Inhalation:	3.71E-06
Total:	**1.06E-01**	**Total:**	**7.24E-06**
% Contribution to Media Risk	0.93%		0.58%

	mg/kg	*Non-Cancer Adult*	*Cancer*
Exceeds Risk!			
Recommended Acceptable Concentration		*N/A*	*8.56E+00*

Analyte: Thallium (Soluble Salts)

CAS: 7440-28-0

Concentration mg/kg:	6.50E+00
RfDo (mg/kg-day):	1.00E-05
RfCi (mg/m3):	
SFO (mg/kg-day)-1:	
IUR (µg/m3)-1:	
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	5.57E-01	Ingestion:	
Dermal:		Dermal:	
Inhalation:		Inhalation:	
Total:	**5.57E-01**	**Total:**	**0.00E+00**
% Contribution to Media Risk	4.88%		0.00%

	mg/kg	*Non-Cancer Adult*	*Cancer*
Recommended Acceptable Concentration		*N/A*	*N/A*

Total Calculated Hazard Index/Risk For Media: Soil

Non-Cancer Adult		Cancer	
Ingestion:	6.98E+00	Ingestion:	9.46E-04
Dermal:	1.80E+00	Dermal:	2.87E-04
Inhalation:	2.62E+00	Inhalation:	5.14E-06
Total:	**1.14E+01**	**Total:**	**1.24E-03**

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Total Hazard Index/Risk for All Media

Non-Cancer Adult

Ingestion:	6.98E+00
Dermal:	1.80E+00
Inhalation:	2.62E+00
Total:	**1.14E+01**

Exceeds Hazard Index!

Cancer

Ingestion:	9.46E-04
Dermal:	2.87E-04
Inhalation:	5.14E-06
Total:	**1.24E-03**

Exceeds Cumulative Risk!

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Industrial Exposure Default Values

Symbol	Description	Value	Units
AFw	Composite Worker Soil Adherence Factor	0.12	(mg/cm2)
ATw	Composite Worker Averaging Time	365	(days/yr)
ATw	Composite Worker Averaging Time: 365 x LT	25550	(days)
ATw-a	Composite Worker Averaging Time: 365 x EDw	9125	(days)
BWw	Composite Worker Body Weight	80	(kg)
EDw	Composite Worker Total Exposure Duration	25	(yrs)
EFw	Composite Worker Exposure Frequency	250	(days/yr)
ETw	Composite Worker Exposure Time	8	(hrs/day)
ETw-ai	Composite Worker Air Inhalation Exposure Time	8	(hrs/day)
ETw-si	Composite Worker Soil Inhalation Exposure Time	8	(hrs/day)
IRw	Composite Worker Soil Ingestion Rate	100	(mg/day)
SAw	Composite Worker Soil Surface Area	3527	(cm2/day)

END OF REPORT

Groundwater Declaration Restricted Use

Restricted use of groundwater is for onsite use ONLY. Potential offsite risks and receptors are evaluated separately. The nature and extent of the groundwater plume is sufficiently characterized. Concentrations along the vertical and horizontal migration of the plume are stable.

ATTACHMENT 7

VURAM CONSTRUCTION RISK OUTPUT

Virginia Department of Environmental Quality

VURAM

Virginia Unified Risk Assessment Model

VERSION: 3.1

Construction Worker Quantitative Risk Assessment Report

Site Name: RTN500501UNIONST

Program: Voluntary Remediation Program

Total Hazard Index/Risk for All Media

Non-Cancer Adult	Cancer
Total: 5.19E+01	**Total: 1.80E-04**
Exceeds Hazard Index!	***Exceeds Cumulative Risk!***

Risk Based Performance Criteria

Default Hazard Index	Default Cumulative Risk-All Chemicals
1	**1.00E-04**

Contact Depth to Groundwater: Direct Less than 15ft

All Report Pages are Required for Risk Assessment Submission
DETAILED REPORT FOLLOWS

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Soil

Analyte: Arsenic, Inorganic
CAS: 7440-38-2

Concentration mg/kg:	2.50E+03
RfDo:	3.00E-04
RfCi:	1.50E-05
SFO:	1.50E+00
IUR:	4.30E-03
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	7.37E+00	Ingestion:	7.57E-05
Dermal:	1.18E+00	Dermal:	7.28E-06
Inhalation:	1.57E-02	Inhalation:	1.38E-08
Total:	**8.56E+00**	**Total:**	**8.30E-05**
% Contribution to Media Risk	54.72%		77.43%

Exceeds Hazard! ***Exceeds Risk!***

Analyte: Benz[a]anthracene
CAS: 56-55-3

Concentration mg/kg:	6.80E+02
RfDo:	
RfCi:	
SFO:	1.00E-01
IUR:	6.00E-05
Mutagen:	Y
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:		Ingestion:	1.37E-06
Dermal:		Dermal:	5.72E-07
Inhalation:		Inhalation:	9.35E-09
Total:	**0.00E+00**	**Total:**	**1.95E-06**
% Contribution to Media Risk	0.00%		1.82%

Exceeds Risk!

Analyte: Benzo[a]pyrene
CAS: 50-32-8

Concentration mg/kg:	5.70E+02
RfDo:	3.00E-04
RfCi:	2.00E-06
SFO:	1.00E+00
IUR:	6.00E-04
Mutagen:	Y
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	2.80E+00	Ingestion:	1.15E-05
Dermal:	1.17E+00	Dermal:	4.79E-06
Inhalation:	2.45E+00	Inhalation:	4.03E-08
Total:	**6.42E+00**	**Total:**	**1.63E-05**
% Contribution to Media Risk	41.00%		15.25%

Exceeds Hazard! ***Exceeds Risk!***

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Soil

Analyte: Benzo[b]fluoranthene
CAS: 205-99-2

Concentration mg/kg:	3.90E+02
RfDo:	
RfCi:	
SFO:	1.00E-01
IUR:	6.00E-05
Mutagen:	Y
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:		Ingestion:	7.87E-07
Dermal:		Dermal:	3.28E-07
Inhalation:		Inhalation:	2.70E-09
Total:	**0.00E+00**	**Total:**	**1.12E-06**

% Contribution to Media Risk 0.00% 1.04%

Exceeds Risk!

Analyte: Biphenyl, 1,1'-
CAS: 92-52-4

Concentration mg/kg:	1.60E+02
RfDo:	1.00E-01
RfCi:	4.00E-03
SFO:	8.00E-03
IUR:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	2.36E-03	Ingestion:	2.58E-08
Dermal:		Dermal:	
Inhalation:	9.76E-03	Inhalation:	
Total:	**1.21E-02**	**Total:**	**2.58E-08**

% Contribution to Media Risk 0.08% 0.02%

Analyte: Dibenz[a,h]anthracene
CAS: 53-70-3

Concentration mg/kg:	1.30E+02
RfDo:	
RfCi:	
SFO:	1.00E+00
IUR:	6.00E-04
Mutagen:	Y
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:		Ingestion:	2.62E-06
Dermal:		Dermal:	1.09E-06
Inhalation:		Inhalation:	4.91E-09
Total:	**0.00E+00**	**Total:**	**3.72E-06**

% Contribution to Media Risk 0.00% 3.47%

Exceeds Risk!

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Soil

Analyte: Dibenzofuran
CAS: 132-64-9

Concentration mg/kg:	6.00E+02
RfDo:	4.00E-03
RfCi:	
SFO:	
IUR:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	2.21E-01	Ingestion:	
Dermal:		Dermal:	
Inhalation:		Inhalation:	
Total:	**2.21E-01**	**Total:**	**0.00E+00**

% Contribution to Media Risk 1.41% 0.00%

Analyte: Indeno[1,2,3-cd]pyrene
CAS: 193-39-5

Concentration mg/kg:	2.80E+02
RfDo:	
RfCi:	
SFO:	1.00E-01
IUR:	6.00E-05
Mutagen:	Y
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:		Ingestion:	5.65E-07
Dermal:		Dermal:	2.36E-07
Inhalation:		Inhalation:	1.08E-09
Total:	**0.00E+00**	**Total:**	**8.02E-07**

% Contribution to Media Risk 0.00% 0.75%

Analyte: Lead and Compounds
CAS: 7439-92-1

Concentration mg/kg:	2.20E+03
RfDo:	
RfCi:	
SFO:	
IUR:	
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:		Ingestion:	
Dermal:		Dermal:	
Inhalation:		Inhalation:	
Total:	**0.00E+00**	**Total:**	**0.00E+00**

% Contribution to Media Risk 0.00% 0.00%

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Soil

Analyte: Mercury (elemental)
CAS: 7439-97-6

Concentration mg/kg:	7.50E+01
RfDo:	
RfCi:	3.00E-04
SFO:	
IUR:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:		Ingestion:	
Dermal:		Dermal:	
Inhalation:	1.85E-01	Inhalation:	
Total:	**1.85E-01**	**Total:**	**0.00E+00**

% Contribution to Media Risk 1.18% 0.00%

Analyte: Naphthalene
CAS: 91-20-3

Concentration mg/kg:	6.20E+01
RfDo:	6.00E-01
RfCi:	3.00E-03
SFO:	1.20E-01
IUR:	3.40E-05
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	1.52E-04	Ingestion:	1.50E-07
Dermal:	6.35E-05	Dermal:	6.26E-08
Inhalation:	1.20E-02	Inhalation:	1.67E-08
Total:	**1.22E-02**	**Total:**	**2.29E-07**

% Contribution to Media Risk 0.08% 0.21%

Analyte: Thallium (Soluble Salts)
CAS: 7440-28-0

Concentration mg/kg:	6.50E+00
RfDo:	4.00E-05
RfCi:	
SFO:	
IUR:	
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	2.39E-01	Ingestion:	
Dermal:		Dermal:	
Inhalation:		Inhalation:	
Total:	**2.39E-01**	**Total:**	**0.00E+00**

% Contribution to Media Risk 1.53% 0.00%

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Soil

Total Calculated Hazard Index/Risk For Media: Soil

Non-Cancer Adult		Cancer	
Ingestion:	1.06E+01	Ingestion:	9.27E-05
Dermal:	2.35E+00	Dermal:	1.44E-05
Inhalation:	2.67E+00	Inhalation:	8.89E-08
Total:	**1.56E+01**	**Total:**	**1.07E-04**

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Groundwater

Analyte: Arsenic, Inorganic
CAS: 7440-38-2

Concentration ug/L :	6.10E+01
RfDo:	3.00E-04
RfCi:	1.50E-05
SFO:	1.50E+00
IUR:	4.30E-03
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	1.82E-02	Ingestion:	1.12E-07
Dermal:	1.28E-02	Dermal:	7.89E-08
Inhalation:		Inhalation:	
Total:	**3.10E-02**	**Total:**	**1.91E-07**

% Contribution to Media Risk 0.09% 0.26%

Analyte: Benzene
CAS: 71-43-2

Concentration ug/L :	5.47E+01
RfDo:	1.00E-02
RfCi:	8.00E-02
SFO:	5.50E-02
IUR:	7.80E-06
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	4.88E-04	Ingestion:	3.68E-09
Dermal:	5.66E-03	Dermal:	4.26E-08
Inhalation:	3.80E-01	Inhalation:	3.25E-06
Total:	**3.86E-01**	**Total:**	**3.29E-06**

% Contribution to Media Risk 1.07% 4.55%

Exceeds Risk!

Analyte: Beryllium and compounds
CAS: 7440-41-7

Concentration ug/L :	8.90E+01
RfDo:	5.00E-03
RfCi:	2.00E-05
SFO:	
IUR:	2.40E-03
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	1.59E-03	Ingestion:	
Dermal:	1.60E-01	Dermal:	
Inhalation:		Inhalation:	
Total:	**1.62E-01**	**Total:**	**0.00E+00**

% Contribution to Media Risk 0.45% 0.00%

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Groundwater

Analyte: Biphenyl, 1,1'-
CAS: 92-52-4

Concentration ug/L :	2.43E+00
RfDo:	1.00E-01
RfCi:	4.00E-03
SFO:	8.00E-03
IUR:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	2.17E-06	Ingestion:	2.38E-11
Dermal:	1.77E-04	Dermal:	1.95E-09
Inhalation:	2.06E-01	Inhalation:	
Total:	**2.06E-01**	**Total:**	**1.97E-09**

% Contribution to Media Risk 0.57% 0.00%

Analyte: Cadmium (Water)
CAS: 7440-43-9-Water

Concentration ug/L :	2.74E+01
RfDo:	5.00E-04
RfCi:	1.00E-05
SFO:	
IUR:	1.80E-03
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	4.89E-03	Ingestion:	
Dermal:	6.90E-02	Dermal:	
Inhalation:		Inhalation:	
Total:	**7.39E-02**	**Total:**	**0.00E+00**

% Contribution to Media Risk 0.20% 0.00%

Analyte: Chloroform
CAS: 67-66-3

Concentration ug/L :	7.59E+00
RfDo:	1.00E-01
RfCi:	2.44E-01
SFO:	3.10E-02
IUR:	2.30E-05
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	6.78E-06	Ingestion:	2.88E-10
Dermal:	4.00E-05	Dermal:	1.70E-09
Inhalation:	1.39E-02	Inhalation:	1.07E-06
Total:	**1.40E-02**	**Total:**	**1.07E-06**

% Contribution to Media Risk 0.04% 1.48%

Exceeds Risk!

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Groundwater

Analyte: Chromium(VI)
CAS: 18540-29-9

Concentration ug/L :	5.44E+02
RfDo:	5.00E-03
RfCi:	3.00E-04
SFO:	5.00E-01
IUR:	8.40E-02
Mutagen:	Y
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	9.72E-03	Ingestion:	3.33E-07
Dermal:	5.49E-01	Dermal:	1.88E-05
Inhalation:		Inhalation:	
Total:	**5.58E-01**	**Total:**	**1.91E-05**

% Contribution to Media Risk 1.54% 26.43%

Exceeds Risk!

Analyte: Copper
CAS: 7440-50-8

Concentration ug/L :	1.57E+04
RfDo:	1.00E-02
RfCi:	
SFO:	
IUR:	
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	1.41E-01	Ingestion:	
Dermal:	9.92E-02	Dermal:	
Inhalation:		Inhalation:	
Total:	**2.40E-01**	**Total:**	**0.00E+00**

% Contribution to Media Risk 0.66% 0.00%

Analyte: Cumene
CAS: 98-82-8

Concentration ug/L :	4.74E+00
RfDo:	4.00E-01
RfCi:	9.00E-02
SFO:	
IUR:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	1.06E-06	Ingestion:	
Dermal:	7.10E-05	Dermal:	
Inhalation:	2.37E-02	Inhalation:	
Total:	**2.38E-02**	**Total:**	**0.00E+00**

% Contribution to Media Risk 0.07% 0.00%

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Groundwater

Analyte: Methylnaphthalene, 2-
CAS: 91-57-6

Concentration ug/L :	2.42E+01
RfDo:	4.00E-03
RfCi:	
SFO:	
IUR:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	5.41E-04	Ingestion:	
Dermal:	4.06E-02	Dermal:	
Inhalation:		Inhalation:	
Total:	**4.11E-02**	**Total:**	**0.00E+00**

% Contribution to Media Risk 0.11% 0.00%

Analyte: Naphthalene
CAS: 91-20-3

Concentration ug/L :	2.58E+02
RfDo:	6.00E-01
RfCi:	3.00E-03
SFO:	1.20E-01
IUR:	3.40E-05
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	3.84E-05	Ingestion:	3.79E-08
Dermal:	1.47E-03	Dermal:	1.45E-06
Inhalation:	3.35E+01	Inhalation:	4.68E-05
Total:	**3.35E+01**	**Total:**	**4.83E-05**

% Contribution to Media Risk 92.47% 66.72%

Exceeds Hazard! Exceeds Risk!

Analyte: Pentachlorophenol
CAS: 87-86-5

Concentration ug/L :	3.15E+00
RfDo:	1.00E-03
RfCi:	
SFO:	4.00E-01
IUR:	5.10E-06
Mutagen:	
VOC:	

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	2.81E-04	Ingestion:	1.54E-09
Dermal:	5.66E-02	Dermal:	3.10E-07
Inhalation:		Inhalation:	
Total:	**5.69E-02**	**Total:**	**3.12E-07**

% Contribution to Media Risk 0.16% 0.43%

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Groundwater

Analyte: Tetrachloroethylene
CAS: 127-18-4

Concentration ug/L :	7.98E+00
RfDo:	8.00E-03
RfCi:	4.07E-02
SFO:	2.10E-03
IUR:	2.60E-07
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	8.91E-05	Ingestion:	2.05E-11
Dermal:	2.89E-03	Dermal:	6.65E-10
Inhalation:	7.54E-02	Inhalation:	1.09E-08
Total:	**7.84E-02**	**Total:**	**1.16E-08**

% Contribution to Media Risk 0.22% 0.02%

Analyte: Trichloroethylene
CAS: 79-01-6

Concentration ug/L :	3.15E+00
RfDo:	5.00E-04
RfCi:	2.15E-03
SFO:	4.60E-02
IUR:	4.10E-06
Mutagen:	Y
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	5.62E-04	Ingestion:	1.77E-10
Dermal:	5.76E-03	Dermal:	1.82E-09
Inhalation:	6.31E-01	Inhalation:	7.62E-08
Total:	**6.38E-01**	**Total:**	**7.82E-08**

% Contribution to Media Risk 1.76% 0.11%

Analyte: Xylene, m-
CAS: 108-38-3

Concentration ug/L :	3.61E+01
RfDo:	2.00E-01
RfCi:	1.00E-01
SFO:	
IUR:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	1.61E-05	Ingestion:	
Dermal:	6.51E-04	Dermal:	
Inhalation:	1.73E-01	Inhalation:	
Total:	**1.74E-01**	**Total:**	**0.00E+00**

% Contribution to Media Risk 0.48% 0.00%

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Groundwater

Analyte: Xylene, o-

CAS: 95-47-6

Concentration ug/L :	9.10E+00
RfDo:	2.00E-01
RfCi:	1.00E-01
SFO:	
IUR:	
Mutagen:	
VOC:	Y

Calculated Hazard Quotient/Risk

Non-Cancer Adult		Cancer	
Ingestion:	4.06E-06	Ingestion:	
Dermal:	1.47E-04	Dermal:	
Inhalation:	4.34E-02	Inhalation:	
Total:	**4.35E-02**	**Total:**	**0.00E+00**

% Contribution to Media Risk 0.12% 0.00%

Total Calculated Hazard Index/Risk For Media: Groundwater

Non-Cancer Adult		Cancer	
Ingestion:	1.77E-01	Ingestion:	4.88E-07
Dermal:	1.00E+00	Dermal:	2.07E-05
Inhalation:	3.50E+01	Inhalation:	5.12E-05
Total:	**3.62E+01**	**Total:**	**7.24E-05**

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Total Hazard Index/Risk for All Media

Non-Cancer Adult

Ingestion:	1.08E+01
Dermal:	3.35E+00
Inhalation:	3.77E+01
Total:	**5.19E+01**

Exceeds Hazard Index!

Cancer

Ingestion:	9.32E-05
Dermal:	3.50E-05
Inhalation:	5.13E-05
Total:	**1.80E-04**

Exceeds Cumulative Risk!

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Construction Exposure Default Values

Symbol	Description	Value	Units
A	Construction Worker Soil Inhalation Dispersion Constant - Philadelphia	14.0111	(unitless)
AFcw	Construction Worker Soil Adherence Factor	0.3	(mg/cm2)
As	Areal extent of the site or contamination	0.5	(acres)
ATcw	Construction Worker Averaging Time: 365 x LT	25550	(days)
ATcw	Construction Worker Averaging Time	365	(days/yr)
ATcw-a	Construction Worker Averaging Time: EWcw x 7 x EDcw	350	(days)
B	Construction Worker Soil Inhalation Dispersion Constant - Philadelphia	19.6154	(unitless)
BWcw	Construction Worker Body Weight	80	(kg)
C	Construction Worker Soil Inhalation Dispersion Constant - Philadelphia	225.3397	(unitless)
DWcw	Construction Worker Days Worked	5	(days/week)
EDcw	Construction Worker Exposure Duration	1	(yrs)
EFcw	Construction Worker Exposure Frequency	250	(days/yrs)
EFcw-a	Construction Worker Air Exposure Frequency	250	(days/yr)
EFcw-s	Construction Worker Soil Exposure Frequency	250	(days/yr)
EFcw-vrp	Construction Worker Soil Exposure Frequency - VRP ONLY - Virginia DEQ	125	(days/yr)
ETcw	Construction Worker Exposure Time	8	(hrs/day)
ETcw-s	Construction Worker Soil Exposure Time	8	(hrs/day)
EWcw	Construction Worker Weeks Worked	50	(weeks/yr)
F(x)	Function Dependent on 0.886 × (Ut/Um)	0.194	(unitless)
Fd	Dispersion Correction Factor	0.185	(unitless)
IRcw	Construction Worker Soil Ingestion Rate	330	(mg/day)
n	Total soil porosity: 1-(ρb/ρs)	0.433962264150943	(unitless)
PEFsc	Particulate Emission Factor Subchronic - Virginia DEQ calculated	1266503136.97919	(m3/kg)

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

Q/C	Inverse of the ratio of the 1-h geometric mean concentration to the emission flux along a straight road segment bisecting a square site - Virginia DEQ	87.3689772162309	(g/m2-s per kg/m)
SAcw	Construction Worker Surface Area	3527	(cm2/day)
Tc	Total time over which construction occurs: EDcw*EWcw*7days/wk*24hrs/day*3600s/hr	30240000	(s)
TR-ACH	Trench Air Changes per Hour - Virginia DEQ	2	(h)-1
TR-ACvad	Trench Advection Coefficient Groundwater greater than 15ft - Virginia DEQ	0.25	(cm3/cm3)
TR-CF1	Trench Conversion Factor-1	0.001	(L/cm3)
TR-CF2	Trench Conversion Factor-2	10000	(cm2/m2)
TR-CF3	Trench Conversion Factor-3	3600	(s/hr)
TR-CF4	Trench Conversion Factor-4	1000000	(cm3/m3)
TR-D-dir	Trench Depth - groundwater less Than 15ft - Virginia DEQ	2.44	(m)
TR-D-ind	Trench Depth - groundwater greater than 15ft - Virginia DEQ	4.57	(m)
TR-Dsg	Trench - Depth to soil gas vapor source - Virginia DEQ	1	(cm)
TR-EFcw	Trench Construction Worker Exposure Frequency - Virginia DEQ	125	(days/yr)
TR-ETcw	Trench Construction Worker Exposure Time - Virginia DEQ	4	(hrs/day)
TR-EVcw	Trench Construction Worker Events - Virginia DEQ	1	(events/day)
TR-F	Trench Fraction of floor through which contaminant can enter - Virginia DEQ	1	(unitless)
TR-HV	Trench Thickness of Vadose Zone - groundwater greater than 15 ft - Virginia DEQ	30	(cm)
TR-IRcw	Trench Construction Worker Groundwater Ingestion Rate - Virginia DEQ	0.02	(L/day)
TR-KGH2O	Trench Gas-phase mass transfer coefficient of water vapor at 25deg C - Virginia DEQ	0.833	(cm/s)
TR-KLO2	Trench Liquid-phase mass transfer coefficient of oxygen at 25deg C - Virginia DEQ	0.002	(cm/s)
TR-L	Trench Length - Virginia DEQ	2.44	(m)
TR-Lgw	Trench Depth to groundwater - Virginia DEQ	488	(cm)
TR-MWH2O	Trench Molecular Weight of Water - Virginia DEQ	18	(unitless)
TR-MWO2	Trench Molecular Weight of Oxygen - Virginia DEQ	32	(unitless)
TR-Porvad	Trench Porosity in Vadose Zone - groundwater greater than 15ft - Virginia DEQ	0.44	(cm3/cm3)
TR-R	Trench Ideal Gas Constant - Virginia DEQ	0.000082	(atm-m3/mol-K)

Risk Based Performance Criteria

Default Hazard Index	Default Risk Individual Chemical	Default Cumulative Risk-All Chemicals
1	1.00E-06	1.00E-04

Contact Depth to Groundwater: Direct Less than 15ft

TR-Temp-F	Trench Temperature Fahrenheit - Virginia DEQ	77	(F)
TR-Temp-K	Trench Temperature - Virginia DEQ	298	(K)
TR-W	Trench Width - Virginia DEQ	0.91	(m)
TR-W/D	Trench Width to Depth Ratio - Virginia DEQ	0.38	(unitless)
Um	Mean Annual Wind Speed	4.69	(m/s)
Ut	Equivalent Threshold Value of Wind Speed at 7m	11.32	(m/s)
V	V Fraction of Vegetative Cover	0.5	(unitless)
Θa	Air filled soil porosity: n-Θw	0.133962264150943	(unitless)
Θw	Water filled soil porosity	0.3	(unitless)
ρb	Dry soil bulk density	1.5	(kg/L)
ρs	Soil particle density	2.65	(kg/L)

END OF REPORT