# **Risk Assessment Report**

828 Martin Luther King Jr. Blvd. Property Chapel Hill, North Carolina IHSB Site No. NONCD0001486 Brownfields Project No. 21061-17-060

> H&H Job No. TCH-009 October 7, 2021

> > C-1269 Engineering #C-245 Geology



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# Risk Assessment Report 828 Martin Luther King Jr. Blvd. Property Chapel Hill, North Carolina H&H Job No. TCH-009

#### 1.0 Introduction

This Risk Assessment Report has been prepared by Hart & Hickman, P.C. (H&H) to document the results of human health and ecological risk assessment activities completed for the property located at 828 Martin Luther King (MLK) Jr. Boulevard in Chapel Hill, Orange County, North Carolina (site).

The site is comprised of one land parcel that is approximately 10.24 acres in size and contains a two-story approximately 35,000 sq ft building located in the north-central portion. The building and associated parking areas are currently used for police department operations by the Town of Chapel Hill (Town). South of the police department operations area, the topography slopes downward along an embankment to a lower area where Bolin Creek and the Bolin Creek Trail (hereinafter also referred to as the greenway) are located. Prior to purchase of the site by the Town, the site was used by the previous owner as a borrow pit and fill site for coal combustion products (CCPs) and construction debris. The primary compounds of concern (COCs) associated with the site are metals associated with CCPs. A site location map is included as Figure 1, and a site map is included as Figure 2.

The purpose of this recent risk assessment is to evaluate the potential risk to human health or ecological receptors associated with the CCPs at the site, and whether additional remedial actions or other measures are warranted to address these risks. As discussed in Section 2.0 below, interim remedial measures were implemented by the Town in 2020 which included removal of exposed CCPs along the Bolin Creek Trail. The risk assessment activities were completed in general accordance with North Carolina Department of Environmental Quality (DEQ) and United States Environmental Protection Agency (EPA) risk assessment guidance (DEQ, 2020, DEQ, 2021a, EPA, 2018a, EPA, 2018b).



This Risk Assessment Report is organized into sections to include the following:

- Site Background Information (Section 2.0)
- Environmental Setting (Section 3.0)
- Summary of Environmental Conditions (Section 4.0)
- Human Health Risk Assessment (Section 5.0)
- Ecological Risk Assessment (Section 6.0)
- Conclusions and Recommendations (Section 7.0)
- References (Section 8.0)



# 2.0 Site Background Information

# 2.1 Site Location and Surrounding Land Use

The site is located at 828 MLK Jr. Blvd. in Chapel Hill, Orange County, North Carolina. The location of the site is shown in Figure 1, and a general layout of the site including the building, pavement, drainage features, vegetation, and greenway features is illustrated in Figure 2. The approximate geographical coordinates of the site are: 35°55'36.69"N latitude and 79°03'10.47"W longitude. The site parcel is zoned R-2 Residential 2 (4 units/acre) by the Town of Chapel Hill.

Adjacent properties are zoned as R-2, with the exception of southern adjacent properties. Southwest and southeast adjacent properties are zoned as R-4 Medium Density Residential Conditional (10 units/acre) and the south adjacent properties are zoned as NC Neighborhood Commercial.

The surrounding properties are occupied by the following:

- North and Northeast Bolinwood Drive with residential properties located beyond
- East Stratford Hills Apartments complex followed by vacant land
- South Bolin Creek followed by Lloyd Tire & Alignment and Mobil-branded gas station/Run-In-Jim's convenience store
- West MLK Jr. Blvd. followed by vacant land with residential properties located beyond

### 2.2 Site Description

The site is comprised of one land parcel that is approximately 10.24 acres in size and contains a two-story approximately 35,000 sq ft building located in the north-central portion of the site that is currently used for police department operations. Asphalt parking lots are located in the northwestern and central portions of the site, and wooded areas are located in the southern and



eastern portions of the site. Bolin Creek traverses the southern portion of the site, and a portion of the Bolin Creek Trail is located in the southern portion of the site just north of and parallel to Bolin Creek. The site topography consists of an elevated area where the police building and associated parking lots are located which slopes along an embankment to the south to a lower area along Bolin Creek where the Bolin Creek Trail is located. Chain-link fencing prevents access from the Bolin Creek Trail to the embankment along certain portions of the trail. Site topography is indicated in Figure 1.

## 2.3 Site History

#### 2.3.1 Site Ownership and Operational History

As indicated by Orange County Tax Records, the owner of the facility prior to the Town was Richard W. Sparrow, who initially operated the site as a borrow pit from the late 1950s to the early 1960s, and then as a fill site from the mid-1960s to the mid-1970s. The Town acquired the property in 1980 and constructed the site building in the early 1980s. The building has been used for police department operations by the Town since its construction. Additional municipal offices have also been located within the site building.

The Town is currently evaluating potential on and off-site locations for mixed-used redevelopment that may include the Municipal Services Center, residential housing, and retail. As part of the evaluation process, the Town applied for entry into the DEQ Brownfields Program, and received eligibility (Brownfields Project No. 23022-19-068) via a Letter of Eligibility dated October 1, 2019.

#### 2.3.2 Previous Environmental Investigations

Evidence of subsurface impacts associated with CCPs was first identified at the site during a *Phase I & Limited Phase II Environmental Site Assessment* completed by Falcon Engineering, Inc. in 2013. Investigation activities were then performed by Falcon and H&H under the direction of the DEQ Inactive Hazardous Sites Branch (IHSB) between 2013 and 2016, and



culminated in a *Phase II Remedial Investigation (RI) Report* dated August 14, 2017. The investigation activities included collection and laboratory analysis of CCPs, groundwater, soil, stream sediment, and surface water samples. In addition, an evaluation was performed to identify where the CCPs were potentially exposed at the ground surface.

In 2019, the Town contracted Duncklee & Dunham (D&D) and Dr. Ken Rudo of Rudo Toxicological Consultants (Rudo) to complete a preliminary human health and ecological risk assessment for the site. The risk assessment focused on the area of Bolin Creek and the Bolin Creek Trail, and included an evaluation of interim remedial measures (IRMs) to better control the risk profile of the site. Prior to performing the risk assessment, D&D and Rudo identified certain data gaps and requested that additional assessment be completed to support the risk assessment activities. In response, H&H performed additional drainage pathway soil assessment, fill material evaluation, and groundwater assessment, which is documented in a *Results of Post-Data Gap Assessment Report* dated December 1, 2020.

The initial risk assessment results concluded that interim measures, including removal of surficial coal ash in selected locations in the lower part of the site, would be protective of greenway trail users. In 2020, IRMs were implemented. IRMs included excavation and off-site disposal of soil and exposed CCPs along Bolin Creek Trail, stabilization and cover of exposed CCPs along the embankment between the upper and lower portions of the site, and temporary measures to address stormwater and erosion control in the area of the embankment. Specifically, approximately 1,004 tons of soil/CCPs at the base of the embankment and along Bolin Creek were excavated and transported off-site for disposal. In addition, super silt fencing and hydroseed were placed along the embankment, and a new storm water diversion channel was installed. The interim measures are documented in an *Interim Remedial Measures Report* dated April 19, 2021.

Following completion of the 2020 IRMs, D&D (now part of SynTerra Corporation) completed a *Human Health and Ecological Risk Assessment Report* dated May 6, 2021, which focused on potential risks in the area of Bolin Creek and the greenway trail. With regard to human health risk, the report concluded that the greenway trail is safe for users. With regard to ecological risk,



the report concluded that ecological risk was likely minimal, but recommended additional evaluation for certain constituents.

The Town requested that H&H perform additional risk assessment activities with the intent of defining the final measures recommended to address CCP impacts, both under the current land use scenario and possible future redevelopment scenarios. The results of the risk assessment performed by H&H are documented in this report. The risk assessment performed by H&H covered the site as a whole, including both the greenway trail area and the area of the current municipal operations.

As referenced in Section 2.3.1, the site has been accepted into the NC Brownfields Program, and mixed-used redevelopment that includes the Municipal Services Center, residential housing, and retail is being contemplated for the site. The Brownfields Program implements standard measures designed to address human-health risks for all projects, and did not request that the Town prepare this Risk Assessment Report. However, the Town voluntarily elected to contract H&H to complete the Risk Assessment in order to provide better explanation and transparency to the public regarding how risks will be addressed for the site. Should the Town Council decide to move forward with redevelopment of the site, future remediation, risk management, and/or redevelopment activities would be performed under the oversight of the Brownfields Program.

#### 3.0 Environmental Setting

### 3.1 Site Topography

The site property is located in the Piedmont Physiographic Province of North Carolina. The Piedmont province is a plateau that divides North Carolina's mountain and coastal plain regions. It has variable topography, with elevations ranging from approximately 300 feet above mean sea level (msl) in the eastern portion to approximately 1,500 feet msl in the western portion. The Piedmont is separated from the Coastal Plain region by a fall line, or the point in which rivers transition from rocky, shallow streams to smooth-flowing streams.

Overall, the site slopes to the south from an elevation of approximately 375 ft msl near Bolinwood Drive to an elevation of approximately 300 ft above msl near Bolin Creek, which transverses the southern boundary of the site. The site topography is segmented into two gently graded areas referred to as the "upper level" and the "lower level" that are separated by a steep embankment which generally runs east-west. The upper level includes the northern and central portion of the site where the building and asphalt parking lots are located. The lower level of the site gently slopes to the southeast toward Bolin Creek and includes the Bolin Creek Trail.

### 3.2 Surface Water Hydrology

The land surface across the site generally slopes to the south toward Bolin Creek. Stormwater infrastructure in the upper level was upgraded in October through November 2020 to minimize the potential for runoff from the upper level to the lower level. Super silt fencing was installed along the flanks of the embankment and in other areas in the vicinity of the trail to minimize the potential for stormwater to carry CCPs to the area of the trail and greenway. Portions of the embankment were also hydroseeded with grass seed and a biodegradable growth medium to provide erosion resistance to the slopes. In addition, stormwater upgrades were implemented in the police parking lot and an existing stormwater outfall channel so that stormwater is diverted from the embankment where CCPs are present at or below land surface which minimizes the potential for future erosion of soil/CCPs along the embankment. Note that these are considered



interim measures to address erosion along the embankment, and the Town is considering permanent measures to be implemented in conjunction with site redevelopment activities. Locations of site drainage features which discharge surface water to Bolin Creek are depicted in Figure 2.

Bolin Creek and its tributaries are classified by DEQ as Class WS-V, Nutrient Sensitive Waters (NSW) surface water bodies, and are part of the Cape Fear River basin. Class WS-V surface waters are protected as upstream water supplies draining to waters used as drinking water supplies. These waters are also protected for Class C uses, including secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival, and maintenance of biological integrity, and agriculture. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner. A NSW classification is a supplemental classification to identify waters needing additional nutrient management due to excessive microscopic or macroscopic vegetation growth.

Bolin Creek discharges into Little Creek, which feeds into Jordan Lake. Jordan Lake discharges to the Haw River, which joins with the Deep River to form the Cape Fear River.

#### 3.3 Geology

The site is located in the Piedmont Geologic Province of North Carolina, which consists of metamorphic and igneous crystalline bedrock overlain by a region of fractured and folded metamorphic and igneous crystalline bedrock. According to the Geologic Map of North Carolina (1985), the bedrock in site area is described as metamorphosed granitic rock. More detailed references (Cunningham and Daniel, 2001) describe the underlying bedrock as meta-igneous and meta-volcanic felsic rocks. Meta-igneous felsic rocks are light colored, massive to foliated metamorphosed igneous rock bodies, commonly with local shearing and jointing. Meta-volcanic felsic rocks are primarily dense, fine-grained, light colored felsic tuffs and felsic crystal tuffs, commonly with local shearing and phyllitic zones.



Based on previous assessment activities, the native shallow soil generally consists of silty clay saprolite which is approximately 5 to 15 ft thick. In areas where fill material is not present, the saprolite is underlain by a partially weathered rock (PWR) zone that is approximately 5 ft thick, and the PWR is underlain by bedrock. Depth to bedrock at the site generally ranges from approximately 10 to 15 ft bgs in the northern portion of the site near Bolinwood Road and in the southern portion of the site near Bolin Creek. Depth to bedrock in the central portion of the site where fill material has been placed is approximately 45 ft to 50 ft bgs. In areas where fill has been placed, the shallow cover soil generally consists of clayey silt fill which, in some locations, appears to be mixed with CCP. See Section 4.2 for a discussion of the extent and thickness of buried fill material across the site.

# 3.4 Hydrogeology

The occurrence and movement of groundwater in the Piedmont is within two separate yet interconnected water-bearing zones. A shallow water-bearing zone occurs within the saprolite (and may include alluvium near streams), and a deeper zone occurs within the underlying bedrock. Groundwater in the shallow saprolite zone occurs in the interstitial pore spaces between the grains comprising the unconsolidated saprolitic soils. Groundwater in this zone is typically under water table or unconfined conditions. Groundwater movement is generally lateral from recharge areas to small streams which serve as localized discharge points.

The occurrence and movement of groundwater in the underlying water-bearing zone within the crystalline bedrock is controlled by secondary joints, fractures, and faults within the bedrock. On a regional scale, the direction of groundwater flow is typically from highlands to major streams and groundwater sinks. The saprolite has a higher porosity than the bedrock and serves as a reservoir which supplies water to a network of fractures in the bedrock.

Based on the results of groundwater monitoring completed at the site, the direction of groundwater flow in the uppermost unconfined aquifer is south-southeast across the site towards Bolin Creek. The depth to groundwater is approximately 7 to 10 ft bgs in the most upgradient portion of the site near Bolinwood Road, and 1 to 6 ft bgs in the most downgradient portion of



the site near Bolin Creek. Groundwater is present at deeper depths in the central portion of the site where the natural ground surface elevation has been modified due to fill placement. Groundwater has been measured in the existing monitoring wells in the fill area at depths ranging from approximately 30 to 40 ft bgs. However, prior assessment activities also identified evidence of perched groundwater in the fill material, which is separated from the main underlying unconfined aquifer. As such, the groundwater depths measured in some monitoring wells (MW-1A, MW-1, MW-8, and MW-9) appear to reflect perched groundwater zones rather than the main underlying aquifer. Uncontrolled fill areas such as the site, in which layers with significantly different permeabilities are placed next to one another (i.e., debris with sand or a gravel zone immediately overlying a silt or clay layer) have a high potential for perched groundwater zones. Refer to the *Results of Post-Data Gap Assessment Report* prepared by H&H and dated December 1, 2020 for additional discussion of lines of evidence for perched groundwater conditions.

Historical tables and figures are included in Appendix A, including a summary of monitor well construction and historical groundwater elevation data, a geologic cross-section, and an unconfined aquifer potentiometric map.

# 4.0 Summary of Environmental Conditions

The primary COCs associated with the site are metals associated with CCPs. Naturally-occurring background levels of metals are also present at the site. An explanation of background concentrations, extent of CCPs, and brief summaries of the site-specific COCs in soil, groundwater, surface water, and sediment are presented in the sections below. Summaries of historical data for site soil, groundwater, surface water, and sediment are included in Appendix A.

### 4.1 Background Conditions

Metals, including the COCs for the site, are naturally occurring within North Carolina soils. These compounds are derived from the natural elemental composition of the source rock and compound concentrations are a reflection of the rock composition. Background samples collected from the site contained concentrations of certain metals exceeding DEQ Preliminary Soil Remediation Goals (PSRGs) in soil and stream sediment, which are attributed to naturally-occurring metals in the parent bedrock. EPA and DEQ do not require remediation of concentrations below naturally occurring background levels (EPA, 2002, DEQ, 2021). Therefore, evaluation of site-specific background levels is important in determining remedial goals. Note also that the DEQ PSRGs are initial screening levels based upon conservative exposure assumptions. DEQ allows that final remedial goals be based upon a risk evaluation using the DEQ risk calculator as discussed further in Section 5.0.

In order to determine whether metals detections at the site are related to fill materials or represent background levels, H&H calculated site-specific Background Screening Values (BSVs). Based on EPA guidance (EPA, 2015a, 2018a, 2018b), the BSVs for metals in soil consist of 95% upper tolerance limits (UTLs) with 95% coverage determined using EPA's ProUCL calculator (EPA, 2015a). Due to a more limited data set which introduces more uncertainty in output of the ProUCL calculator, the BSVs for stream sediment and surface water consist of the lower of the maximum detected background concentration or twice the mean of background concentrations. Appendix B contains details regarding the basis for the BSVs and documentation of the



calculations. The BSVs are referenced in subsequent sections of this report when evaluating whether concentrations detected in individual samples represent background conditions or evidence of contamination.

#### 4.2 Extent of CCPs

Based on prior assessment activities, fill materials placed at the site consist primarily of construction and demolition debris and fill soil intermixed with zones of CCPs. The thickness of the CCP zones primarily ranges from less than 1 ft to 3 ft, with some thicker zones up to 10 ft. Fill materials were identified to depths of approximately 40 ft, although the deepest that CCPs were observed was approximately 29 ft.

In the upper level of the site, CCPs are capped with clayey silt that ranges in thickness from less than 1 ft to approximately 10 ft thick, with most areas having greater than 2 ft of soil cover. CCP is exposed at the surface along the eastern and central portions of the embankment that separates the upper and lower levels of the site. CCPs in the western portion of the embankment are covered but with soil that is less than 2 ft thick. Erosion of CCPs along some portions of the embankment historically resulted in deposition of a layer of CCPs in the lower level of the site north and south of the Bolin Creek Trail. However, CCPs in the lower level were excavated as part of the 2020 IRMs, and no significant CCPs are currently present in the lower level.

#### 4.3 Soil and CCP Concentrations

Over 70 samples of soil and/or CCPs have been collected at the site over the course of historical assessment activities. Concentrations of COCs for samples that were not removed during the 2020 IRMs were compared to the current DEQ residential health-based PSRGs, industrial/commercial health-based PSRGs, and protection of groundwater PSRGs. Concentrations of metals were also compared to site-specific BSVs prior to comparison to PSRGs. The results of this comparison indicated concentrations of arsenic, barium, cobalt, manganese, mercury, and selenium above current PSRGs and BSVs, with arsenic being the most commonly detected constituent. Note that PSRGs are not intended as remediation goals and are



based on conservative risk assumptions. DEQ guidance recommends comparison of concentrations to PSRGs for initial screening purposes, but final remediation goals may be determined based on risk evaluation performed using the NC Risk Calculator, as discussed further in Section 5.0.

#### 4.4 Groundwater

Multiple groundwater monitoring events have been performed at the site over the course of historical assessment activities. Concentrations of COCs in groundwater samples were compared to 15A NCAC 02L .0202 Groundwater Standards (2L Standards). As previously mentioned, prior assessment data indicate that there are perched water zones in the fill material, and groundwater samples collected from shallow wells in the fill are monitoring these perched zones. Perched groundwater is likely present in some zones of CCPs or just below zones of CCPs. Concentrations of metals above 2L Standards in groundwater samples from these wells (MW-1A, MW-1, MW-8, and MW-9) are associated with the presence of CCPs within or near perched groundwater. Some impacted perched groundwater may eventually migrate through underlying unsaturated zones to groundwater in the main underlying unconfined aquifer; however, this migration is slow and of low volume. As such, there is limited or no groundwater impact in monitoring wells which are screened in non-fill zones in the unconfined aquifer, including well MW-11D located directly below the fill and shallow downgradient monitoring wells MW-3A and MW-4A which are located downgradient of the fill area.

#### 4.5 Surface Water

Surface water samples have been collected from Bolin Creek during four sampling events completed in 2013, 2014, 2016, and 2019 from three upstream locations, three locations adjacent to the site, and three downstream locations. A surface water sample was also collected from a drainage pathway at the site. No COCs were detected in surface water samples at concentrations above 15A NCAC 2B Section .0100 Surface Water Quality Standards (2B Standards). Based upon the surface water sample results, there is no evidence of surface water impact at the site which would warrant further assessment or remediation.



#### 4.6 Stream Sediment

Stream sediment samples have been collected from Bolin Creek during two sampling events completed in 2016 and 2019 from two upstream locations, two locations adjacent to the site, and three downstream locations. Concentrations of COCs were compared to the current DEQ residential health-based PSRGs, industrial/commercial health-based PSRGs, and protection of groundwater PSRGs. Concentrations of metals were also compared to site-specific BSVs prior to comparison to PSRGs. Manganese and/or hexavalent chromium were detected in two samples at concentrations above PSRGs and site-specific BSVs. As previously mentioned, note that PSRGs are not intended as remediation goals and are based on conservative risk assumptions. DEQ guidance recommends comparison to PSRGs for initial screening purposes, but remediation goals are determined based on risk evaluation performed using the NC Risk Calculator, as discussed further in Section 5.0.



#### 5.0 Human-Health Risk Assessment

H&H evaluated potential human-health risks associated with COCs detected in soil, groundwater, stream sediment, and surface water, and whether actions are warranted to address these risks. Actions could include remediation activities, implementation of land-use restrictions (LURs), or other measures to prevent exposures. Should the Town Council decide to move forward with redevelopment of the site, LURs are expected to be included in a Brownfields Agreement (BFA) with the DEQ Brownfields Program, which would be filed on the deed for the property and remain in perpetuity.

Risk assessment calculations were performed using the DEQ Risk Calculator (June 2021), which is an Excel-based calculator tool developed by DEQ that evaluates human-health risks using equations and inputs that have been approved by DEQ and are consistent with EPA risk assessment guidance. The methodology for the risk evaluation was in general accordance with the risk assessment procedures detailed in DEQ and EPA risk assessment guidance (DEQ, 2020, DEQ, 2021a, EPA, 2018b).

# **5.1 Exposure Pathways Evaluation**

An exposure pathway refers the mechanism by which people could potentially be exposed to COCs. A complete exposure pathway means that there is potential for human exposure to COCs, while an incomplete exposure pathway means that exposure is not possible due to absence of COCs, absence of receptors, or inaccessibility (i.e., surface cover such as pavement, no water supply well usage, etc). An exposure pathways evaluation was performed to identify current and potential future complete pathways for receptor exposure to site COCs. Below is a list of exposure pathways and a discussion of whether each pathway is complete for the site. For convenience, these pathways are addressed using the same naming conventions and order used in the DEQ Risk Calculator.



# Direct Contact Soil and Water Exposure Pathways

- Direct contact soil exposure pathway This pathway covers health-based soil exposure
  via ingestion, dermal contact, or outdoor inhalation of volatiles and particulates.
  Receptor scenarios considered for this exposure pathway are detailed below.
  - Resident Site use is currently non-residential; therefore, the direct contact soil
    exposure pathway is currently incomplete for the resident scenario. Under a future
    scenario, this exposure pathway could become complete in certain areas if the site is
    used for residential purposes.
  - Non-residential worker The direct contact soil exposure pathway is currently complete for non-residential workers in the area of the police department building where impacted soil is not covered by pavement, building floor slabs, or non-impacted soil cover. Under a future land use scenario, this exposure pathway could become complete in additional areas if building floor slabs, pavement, or non-impacted soil cover are removed.
  - Construction worker Per DEQ guidance (DEQ, 2021a), the Risk Calculator uses very conservative default inputs that represent worst-case situations and may result in overly restrictive risk values when evaluating the construction worker pathway. Therefore, the results of the construction worker evaluation performed using the Risk Calculator should not drive a cleanup level. Instead, the results are intended to be used to help guide safety concerns for imminent or potential future construction activities. An Environmental Management Plan (EMP) detailing methods to prevent construction worker exposure and manage impacted soil during construction activities is required by the Brownfields Program and will be specified in a LUR. Implementation of this EMP will result in the direct contact soil exposure pathway being incomplete for a construction worker. This pathway was evaluated as part of the risk assessment to help identify potential areas of concern to be addressed by the EMP, but does not drive proposed remediation goals.
  - Recreator The southern portion of the site is used as a public green space and contains the Bolin Creek Trail for recreational use; therefore, this pathway is currently complete for greenway users under both the current and future land use



- scenarios. For consistency, the recreator receptor is referred to as a greenway user throughout this report.
- Direct contact groundwater use exposure pathway This pathway covers health-based groundwater exposure via ingestion, dermal contact, or inhalation associated with use of groundwater from a water supply well. For the subject site, assessment data do not indicate groundwater impacts extending beyond the site property boundary, no water supply wells are currently present at the site, and a LUR preventing the future installation of water supply wells is proposed as part of the BFA. Implementation of this LUR will result in the groundwater use exposure pathway being incomplete. Therefore, this pathway was not evaluated as part of the risk assessment. However, possible direct contact with surface water and sediment from groundwater seepage to surface water is considered an exposure pathway as discussed below.
- Direct contact surface water exposure pathway This pathway covers health-based surface water exposure via ingestion or dermal contact during a recreational scenario.
   This pathway is considered complete for greenway users in the area of Bolin Creek under both the current and future land use scenarios.
- Direct contact sediment exposure pathway This pathway covers health-based stream sediment exposure via ingestion, dermal contact, or outdoor inhalation of volatiles and particulates. This pathway is not specifically covered in the DEQ Risk Calculator. Per DEQ guidance (DEQ, 2021a), this pathway was evaluated by entering sediment concentrations under the direct contact soil exposure pathway for a greenway user in the area of Bolin Creek. However, note that this approach overestimates risk since sediment will usually be covered by water, which limits human exposure and eliminates inhalation risk.

# Vapor Intrusion Exposure Pathway

Vapor intrusion exposure pathway – The vapor intrusion pathway covers indoor inhalation risk due to intrusion of volatile organic compound vapors from subsurface soil and/or groundwater into buildings. COCs for the site are non-volatile metals associated with CCPs; therefore, this pathway is not considered complete.



#### **Contaminant Migration Pathways**

• The contaminant migration pathways evaluate leaching of compounds from soil to groundwater, and migration of impacted groundwater towards either a downgradient water supply well or a downgradient surface water body. The Risk Calculator contains tools for predictive modeling of these pathways; however, per DEQ guidance (DEQ, 2021a), groundwater monitoring data that confirm the plume is stable and unlikely to impact a downgradient receptor are more reliable to support risk management decisions. As discussed in Section 4.3, groundwater monitoring data for the site indicate limited or no groundwater impact in monitoring wells which are screened in non-fill zones in the unconfined aquifer. Groundwater impacts, if any, will not migrate beyond the site property boundary due to the hydraulic barrier formed by Bolin Creek. In addition, as discussed in Section 4.4, surface water monitoring data indicate no significant impacts to Bolin Creek. Based on monitoring data, contaminant migration pathways are not considered a concern for the site.

# **5.2 Exposure Unit Designations**

For the purpose of risk characterization, the site was divided into exposure units (EUs) that represent areas of similar land use and potential receptors. Three EUs were defined for the site, and the EUs are depicted in Figure 3. A description of each EU and associated exposure pathways is provided below.

- EU #1 encompasses the upper level in the vicinity of the existing police department building and associated parking areas. EU #1 is currently non-residential. Future redevelopment may include residential use. Therefore, calculations were performed to evaluate the soil direct contact pathway for a resident, non-residential worker, and construction worker within EU #1. The direct contact groundwater use pathway will be managed via a LUR preventing the installation of water supply wells. No surface water or stream sediment are located within EU #1.
- EU #2 encompasses the area of Bolin Creek and the adjacent trail area, which is also referred to as the lower level of the site. EU #2 is currently used for recreational



purposes only. EU #2 is located within a flood zone; therefore, commercial or residential redevelopment is not viable. Calculations were performed to evaluate the soil, surface water, and stream sediment direct contact pathways for a greenway user, and the soil direct contact pathway for a construction worker within EU #2. The direct contact groundwater use pathway will be managed via a LUR preventing the installation of water supply wells.

- EU #3 encompasses the embankment between EU #1 and EU #2. The embankment is not currently in use and partially fenced off to prevent access from the adjacent EU #2 greenway area. Although occupancy and uses of EU #3 are inherently limited due to the steep slope, calculations were conservatively performed to evaluate the soil direct contact pathway for a resident, non-residential worker, construction worker, or greenway user within EU #3. The direct contact groundwater use pathway will be managed via a LUR preventing the installation of water supply wells. No surface water or stream sediment are located within EU #1.
- Note that the potential for erosion to transport impacts from the area of the embankment (EU #3) into the greenway area (EU #2) is an additional concern. The Town implemented temporary measures to minimize the potential for erosion as part of the IRMs implemented in 2020; however, H&H recommends implementation of permanent measures to prevent erosion in conjunction with site redevelopment activities.

### **5.3 Exposure Point Concentrations**

Exposure point concentrations were defined for the soil, sediment, and surface water direct contact exposure pathways. Analytes considered in the risk assessment conservatively included all detected constituents designated by DEQ as COCs requiring analysis for the site (see DEQ letter dated February 11, 2016). The data sets used for the risk assessment included the following:

• The soil EPC data set included the full set of historical soil sampling data, with several exceptions. First, soil samples that were excavated during the 2020 IRMs were removed from the data set. Secondly, at locations that were sampled more than once, only the



more recent samples were included in the data set. Lastly, based on EPA risk assessment guidance (EPA, 2018b), soil samples collected at depths 2 ft bgs or less were used for risk calculations for residents, non-residential workers, and greenway users, and samples collected at depths of 10 ft bgs or less were used for risk calculations for construction workers. Note that if impacted soil or CCPs at deeper depths are exposed during site redevelopment, additional risk evaluation should be performed to confirm surface soils do not exceed acceptable risk levels. If the site is redeveloped, the Brownfields Program will also likely require confirmatory sampling and risk evaluation in areas of potentially impacted soil or CCPs that are not covered by impervious surfaces (buildings, pavement, etc.) or at least 2 ft of clean fill.

- For surface water, more recent data is considered most representative of current conditions, but EPCs also need to account for possible variations in surface water concentrations over time. To account for potential variability over time, the surface water EPC data set included surface water samples collected within the past five years (2016 and 2019 sampling events).
- For stream sediment, two sampling events have been performed to date in 2016 and 2019. The locations sampled in 2016 were resampled in 2019, so the 2019 is considered most representative of current conditions and was used as the EPC data set.

Per DEQ guidance (DEQ, 2020), maximum concentrations for each constituent of concern detected in the referenced data sets were used as the EPCs. Following initial risk calculations, the EPC dataset was further refined to exclude metals detected at concentrations below site-specific BSVs. As previously discussed, the BSVs established for the site consisted of the 95% UTL with 95% coverage for background soil, and the lower of two times the mean or the maximum detected concentration for background surface water and sediment. EPC tables are included in Appendix C.

#### **5.4 Exposure Parameters**

The default exposure parameters incorporated in the DEQ Risk Calculator were used for the risk evaluation for a resident, non-residential worker, and construction worker. These exposure



parameters are consistent with EPA default exposure parameters (EPA, 2021), where established, and are intended to represent a reasonable maximum exposure (RME) scenario. RME is defined by EPA as the highest exposure that is reasonably expected to occur at a site, generally assumed to be in the range of the 90<sup>th</sup> and 99<sup>th</sup> percentiles (EPA, 2001). To calculate risks specific for greenway users, H&H calculated site-specific exposure factors based on greenway user polling data collected by the Town. Specifically, for adult and child exposure frequency, soil exposure time, and water exposure time, H&H used values equal to or more conservative than the 98th percentile of responses reported during the greenway user survey. This approach is consistent with RME as defined by EPA, and represents "worst-case" exposures. Following is a brief summary of the most pertinent exposure parameters, but please refer to the NC Risk Calculator documentation in Appendix C for a full list of exposure parameters used in the calculations:

- Residential exposure for 6 years (yrs) as a child and 20 yrs as an adult (26 yrs total), 350 days per year (d/yr), and 24 hours per day (hr/d).
- Non-residential exposure for 25 yrs (adult only), 250 d/yr, and 8 hr/d.
- Construction worker exposure for 1 yr (adult only), 250 d/yr, and 8 hr/day.
- Greenway user exposure for 6 yrs as a child and 20 yrs as an adult (26 yrs total), 364 d/yr and 1 hr/d as an adult, and 52 d/yr and 0.5 hr/d as a child.
- Dermal contact with soil parameters assumes exposure of head, hands, forearms, lower legs, and feet for a resident and greenway user, and exposure of head, hands, and forearms for a non-residential worker and construction worker.
- Soil ingestion parameters assume ingestion of 200 milligrams per day (mg/d) of soil by a
  child (greenway user or resident), and 100 mg/d of soil by an adult (greenway user,
  resident, or non-residential worker). Increased ingestion of 330 mg/d of soil is assumed
  for a construction worker.
- Significantly increased outdoor inhalation of particulates is assumed for a construction worker, with assumed particulates at levels greater than the National Ambient Air Quality
   Standard established under 40 Code of Federal Regulations Part 50 for particle pollution.

### **5.5 Toxicity Factors**



The conservative default toxicity factors incorporated in the DEQ Risk Calculator were used for the risk evaluation. Note that these toxicity factors account for possible development effects for pregnant women.

#### **5.6 Risk Assessment Results**

For the direct contact pathways, the DEQ Risk Calculator calculates values for potential cancer risk (CR) and potential non-cancer hazard quotient (HQ) or hazard index (HI) as described below:

- CR is defined as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. For example, a CR of one in 10,000 (1.0E-04) indicates one person in 10,000 may have an increased risk of cancer due to exposure to a chemical.
- HQ is defined as the ratio of the amount of a contaminant a person is exposed to versus the amount that may cause non-cancer harmful effects, while HI is defined the sum of HQs for individual contaminants for a given scenario. For example, a HI of less than 1 indicates the exposure is unlikely to cause non-cancer harmful effects.

For each receptor scenario, CR and HQ values for complete exposure pathways are summed to determine the cumulative risk for each receptor. The cumulative CR and HI values for each receptor are then compared to the DEQ acceptable risk values. DEQ considers a cumulative CR of 1.0E-4 and HI of 1.0 or less to be acceptable (DEQ, 2021a). Similarly, EPA considers exceedances of a CR of 1E-04 and HI of 1 to be triggers requiring remediation or other actions to reduce exposures (EPA, 2018b).

Note that calculated cumulative CR and HI values do not include risks associated with lead. Currently, there is no EPA reference dose or cancer potency factor to quantify risks associated with exposures to lead. Exposure risks to lead are characterized based on predicted blood lead levels. The DEQ Risk Calculator flags a lead concentration when the concentration exceeds the DEQ health-based residential or industrial/commercial PSRGs for lead (400 mg/kg and 800 mg/kg, respectively). Lead has not been detected at concentrations above DEQ health-based

PSRGs in samples collected at the site; therefore, lead is not considered to be a compound posing a significant risk for the site.

Cumulative CR and HI values calculated for each exposure unit and receptor scenario are summarized in Table 1. Risk calculator documentation is included in Appendix C. A discussion of the results is presented below.

# 5.6.1 Exposure Unit #1 – Upper Level

EU #1 covers the upper level in the area of the existing police department building. In the area of EU #1, calculated CR and HI values do not exceed DEQ acceptable risk limits for a non-residential worker. Therefore, the area of EU #1 is considered safe for non-residential workers, and no further evaluation of this exposure unit/receptor is considered warranted.

For a future resident in EU #1, the calculated cumulative CR value is acceptable; however, the calculated HI value exceeds the DEQ acceptable risk level of 1, both with and without background concentrations included. As previously referenced, background concentrations are excluded when determining remedial goals for the site. With background levels excluded, the COC driving the risk level above 1 is limited to manganese within the S-4 sample. This sample was collected at a depth of 1 ft bgs in the wooded area southwest of the police department building during the initial site assessment activities in April 2013, as reported in the Phase I & Limited Phase II Environmental Site Assessment prepared by Falcon Engineering and dated July 18, 2013. If the site is redeveloped for residential use, H&H recommends remediation (ex., excavation, cover to prevent exposure) or other actions (ex., resampling to verify concentrations) to address impacts in the area of sample S-4. Samples driving exceedances of residential risk levels are identified on Figure 4A.

For a construction worker, the calculated cumulative CR value was acceptable; however, calculated HI value exceeds the DEQ acceptable risk level of 1, both with and without background concentrations included. The COCs driving the risk level greater than 1 include manganese, arsenic, and mercury. Samples driving exceedances of construction worker risk



levels are identified on Figure 4B. As previously discussed, the Risk Calculator uses very conservative default inputs that represent worst-case situations and may result in overly restrictive risk values when evaluating the construction worker pathway. Construction worker risks will be managed via a LUR requiring preparation of an EMP, which will detail measures to prevent construction worker exposure, manage impacted soil during construction activities, and minimize the potential for off-site migration of impacted soil via surface water or windborne pathways.

## 5.6.2 Exposure Unit #2 – Lower Level

EU #2 covers the lower level in the area of the greenway trail and Bolin Creek. For a current and future greenway user, the calculated CR and HI values do not exceed DEQ acceptable risk limits. Therefore, the area of EU #2 is considered safe for greenway users, and no further evaluation of this exposure unit/receptor is considered warranted.

For a construction worker, the initial evaluation including background levels indicated the calculated cumulative CR value was acceptable, but the calculated HI value exceeds the DEQ acceptable risk level of 1. If background levels are excluded, the calculated CR and HI values do not exceed DEQ acceptable risk levels. Because risks associated with contamination do not exceed acceptable risk levels, no remediation or other measures are considered warranted to address construction worker risks in EU#2. However, the Brownfields Program will likely require an EMP for the site as a whole, including EU #2, which will detail measures to prevent construction worker exposure, manage impacted soil during construction activities, and minimize off-site migration pathways.

#### 5.6.3 Exposure Unit #3 - Embankment

EU #3 covers the area of the embankment between the upper and lower level. As previously noted, EU #3 is not currently used and occupancy is limited by fencing and a steep slope; however, H&H conservatively evaluated the same receptors designated for the upper and lower levels for this exposure unit.



For a potential current or future greenway user, the calculated CR and HI values do not exceed DEQ acceptable risk limits. Therefore, the area of EU #3 is considered safe for greenway users, and no further evaluation of this exposure unit/receptor is considered warranted.

For a potential current or future non-residential worker, the calculated CR and HI values do not exceed DEQ acceptable risk limits. Therefore, the area of EU#3 is considered safe for non-residential workers, and no further evaluation of this exposure unit/receptor is considered warranted.

For a potential future resident, the calculated cumulative CR value was acceptable; however, calculated HI value exceeds the DEQ acceptable risk limit, both with and without background levels included. With background levels excluded, the COC driving the exceedance is arsenic in samples S-7, HH-10, and HH-11. CCPs are exposed in areas of the embankment and the samples driving the risk exceedance were CCP samples. H&H recommends remediation or other measures (several examples given above) to address exposed CCPs in the area of the embankment. Samples driving exceedances of residential risk levels are identified on Figure 4A.

For a construction worker, the calculated cumulative CR value was acceptable; however, the calculated HI value exceeds the DEQ acceptable risk level, both with and without background levels included. The COCs driving the exceedance include manganese and arsenic. Samples driving exceedances of construction worker risk levels are identified on Figure 4B. Construction worker risks will be managed via a LUR requiring preparation of an EMP, which will detail measures to prevent construction worker exposure, manage impacted soil during construction activities, and minimize potential off-site migration.



#### 6.0 Ecological Risk Assessment

Due to the presence of potential ecological receptors in the area of Bolin Creek, H&H conducted initial screening activities related to ecological risk assessment. Based on DEQ guidance (DEQ, 2021b), the initial screening activities consisted of comparison of detected concentrations to the Ecological Screening Values (ESVs) established by EPA Region 4. The Guidelines for Performing Screening Level Ecological Risk Assessments within the Division of Waste Management (DENR, 2003) and EPA Region 4 Ecological Risk Assessment Supplemental Guidance (EPA, 2018a) were consulted during the initial screening; however, please note that H&H's evaluation did not constitute a full Screening Level Ecological Risk Assessment (SLERA).

Per DEQ and EPA guidance (DENR, 2003, EPA, 2018a), EPA ESVs are based on conservative endpoints and ecological effects data, and represent preliminary screening criteria to evaluate the potential for ecological risk (or lack thereof). ESVs are not intended to represent remediation goals. The purpose of the initial ESV screening activities performed by H&H was to evaluate whether additional actions are warranted to further evaluate or address ecological risks for the site. This section details the EPCs used for the screening, and the results of the ESV screening for surface water, sediment, and soil.

### **6.1 Exposure Units**

The ecological risk assessment included evaluation of data with respect to the same exposure units established in the human health risk assessment. The EUs were further evaluated with respect to the potential for significant ecological receptors to be present, as detailed below.

• EU #1 encompasses the upper level in the vicinity of the existing police department building. Ecological receptors are less likely to be present in the area of EU #1 due to the buildings and pavement associated with the police department building. However, some ecological receptors could potentially be present in the wooded areas surrounding the facility; therefore, this unit was conservatively screened for ecological risk. No stream



- sediment or surface water are located within this unit, so the only complete exposure pathway for ecological receptors is surface soil exposure.
- EU #2 encompasses the area of Bolin Creek and the adjacent trail area. EU #2 is considered the unit with the highest likelihood of potential ecological receptors. Complete exposure pathways for ecological receptors include surface soil exposure, sediment exposure, and surface water exposure.
- EU #3 encompasses the embankment between EU #1 and EU #2. The potential for ecological receptors in this area is considered moderate. No stream sediment or surface water are located within this unit, so the only complete exposure pathway for ecological receptors is surface soil exposure.
- As previously discussed, note that the potential for erosion to transport impacts from the area of the embankment (EU #3) into the greenway area (EU #2) is an additional concern. The Town implemented temporary measures to minimize the potential for erosion as part of the interim remediation measures implemented in 2020; however, H&H recommends implementation of permanent measures to prevent erosion in conjunction with site redevelopment activities.

### **6.2 Exposure Point Concentrations**

Analytes considered in the risk assessment conservatively included all detected constituents designated by DEQ as COCs requiring analysis for the site (see DEQ letter dated February 11, 2016). Similar to the human-health risk assessment, the data set used for the risk assessment included the following:

- The surface water EPC data set included surface water samples collected within the past five years (2016 and 2019 sampling events).
- The stream sediment EPC data set included the most recent samples collected in 2019.
- The soil EPC data set included the full set of historical soil sampling data with the exception of (1) soil samples that were excavated during the 2020 IRMs, (2) locations that were resampled, in which case only the latest data was included, and (3) samples collected at depths of more than 2 ft bgs. Samples collected from 0 to 2 ft bgs were used



based on prior guidance from DEQ personnel. This is consistent with or more conservative than EPA guidance, which recommends collection of samples for terrestrial ecological risk assessment at depths on the order of 25 to 30 cm, or 0.8 to 1 ft (EPA, 2015b).

Maximum concentrations for each constituent of concern detected in the referenced data sets were used as the EPCs. Concentrations were initially compared to ESVs directly without consideration of background concentrations. Where concentrations exceeded ESVs, concentrations were also compared to the established site-specific BSVs to evaluate exceedances potentially attributable to contamination rather than background conditions. As previously discussed, the BSVs established for the site consisted of the 95% UTL with 95% coverage for background soil, and the lower of two times the mean or the maximum detected concentration for background surface water and sediment.

#### **6.3 Ecological Screening Evaluation**

The results of the ecological risk evaluation for the soil, stream sediment, and surface water exposure pathways are detailed below. COCs identified at concentrations above BSVs and ESVs are shown on Figure 5.

#### 6.3.1 Soil Ecological Screening

The designated soil EPCs within the three exposure units were compared to the EPA Soil ESVs as summarized in Table 2. The results of the comparison for each exposure unit are discussed below.

# Exposure Unit #1

Within EU #1 (upper level), soil concentrations were identified above the EPA ESVs in multiple samples. However, the majority of the detections are below the site-specific BSVs and therefore considered representative of background conditions. Concentrations above both EPA ESVs and BSVs were identified only in soil samples S-4 and MW-7.



Sample S-4 contained cadmium, cobalt, copper, manganese, and nickel at concentrations above ESVs and BSVs. As previously discussed, this sample was collected at a depth of 1 ft bgs in the wooded area southwest of the police department building during the initial site assessment activities in April 2013. This sample was also identified as a driver for residential risk exceedances during the human health risk assessment.

Sample MW-7 is a soil sample collected from the boring for well MW-7 at a depth of 0-1 ft bgs in 2016. This sample contained copper at a concentration above both the ESV and BSV. This sample was collected in the eastern portion of the site approximately 120 ft cross-gradient of the area of CCPs. The detected concentration is higher than copper concentrations collected from CCPs in the source area. Based on review of the data, the copper detected in sample MW-7 is likely not associated with the CCP disposal area and is considered an outlier. Additional sampling may be beneficial to confirm concentrations in the area of well MW-7.

It should be noted that DEQ does not commonly require evaluation of ecological risks for soil (DEQ, 2021b). As such, DEQ may not require additional actions with regard to the exceedances of ESVs in S-4 and MW-7. If required by DEQ or if the Town wishes to take voluntary actions, H&H recommends remediation or other measure to address or further evaluate potential ecological risks in the area of samples S-4 and MW-7.

## Exposure Unit #2

Within EU #2 (lower level), soil concentrations were identified above the EPA ESVs in multiple samples. However, the majority of the detections are below the site-specific BSVs and therefore considered representative of background conditions. Concentrations above both EPA ESVs and BSVs were identified only in sample SED-13 which is a drainage pathway sample located near the bridge of the Bolin Creek Trail.

At the SED-13 location, samples were collected at both 0-2 and 2-6 inches bgs. Barium was detected at concentrations above the ESV and BSV in both sample depths. Selenium and strontium were also detected at concentrations above the ESVs and BSVs in the 0-2-inch bgs sample depth.



As previously referenced, DEQ does not commonly require evaluation of ecological risks for soil (DEQ, 2021b). As such, DEQ may not require additional actions with regard to the exceedances of ESVs in SED-13. If required by DEQ or if the Town wishes to take voluntary actions, H&H recommends remediation or other measure to address or further evaluate potential ecological risks in the area of sample SED-13.

# Exposure Unit #3

Within EU #3 (embankment), concentrations were identified above both EPA ESVs and BSVs in each sample collected (S-7, H-9, H-10, and H-11). Constituents detected above ESVs and BSVs include arsenic, barium, beryllium, mercury, selenium, and strontium. CCPs are exposed in areas of the embankment and the samples indicating exceedances were CCP samples. H&H recommends remediation or other measures to address exposed CCPs in the area of the embankment.

# 6.3.2 Stream Sediment Ecological Screening

The designated stream sediment EPCs in the area of Bolin Creek (EU #2) were compared to the EPA Sediment ESVs, as summarized in Table 3. The results of the comparison indicated barium in samples SED-4 (Adjacent to the site) and SED-5 (Downstream near the southeast property boundary) and total chromium in samples SED-4 (Adjacent) and SED-7 (Downstream and off-site) at concentrations above the EPA ESVs. For these exceedances, concentrations were then compared to the established BSVs. The concentrations were found to be below the BSVs, and are therefore considered representative of background conditions. The fact that these constituents represent background conditions is further confirmed by the detection of both barium and chromium at concentrations above EPA ESVs in the upgradient background sediment samples collected at the site.

Note that Table 3 also lists EPA Region 4 Refinement Screening Values (RSVs) for sediment. The RSVs are based on less conservative ecological effects data, and are intended to be used as a second-tier screening where ESVs are exceeded. Although sediment concentrations appear



indicative of background conditions and therefore do not warrant remediation, the concentrations (including those at background locations).do not exceed RSVs and therefore are not considered a significant ecological risk.

#### 6.3.3 Surface Water Ecological Screening

The designated surface water EPCs in the area of Bolin Creek (EU #2) were compared to the EPA Region 4 Acute and Chronic Surface Water ESVs, as well as the NC 2B Standards. The ESVs and 2B Standards for some constituents vary based on hardness. Based on historical sampling, the average hardness in Bolin Creek was calculated as 54.5 milligrams per liter (mg/L). Based on this value, the published ESVs based on a hardness of 50 mg/L were used. NC 2B Standards were derived using the DEQ Hardness-Dependent Metal Calculator dated July 26, 2021, and the average site-specific hardness of 54.5 mg/L. For constituents with no established 2B Standard, concentrations were compared to the NC In-Stream Target Values for Surface Water (July 26, 2021).

Table 4 provides a summary of surface water EPCs in comparison the referenced ecological screening criteria. As shown, no concentrations were found to exceed EPA Region 4 Acute and Chronic Surface Water ESVs, NC 2B Standards, or NC In-Stream Target Values for Surface Water.



#### 7.0 Conclusions and Recommendations

H&H has completed human-health and ecological risk assessment activities for the property located at 828 MLK Jr. Boulevard in Chapel Hill. The purpose of the risk assessment activities was to evaluate potential human health and ecological risks for CCPs at the site under the current land use scenario and possible future redevelopment scenarios. The risk assessment was performed in general accordance with DEQ and EPA risk assessment guidance (DEQ, 2020, DEQ, 2021a, EPA, 2018a, EPA 2018b), using conservative inputs intended to represent reasonable maximum exposure scenarios. A summary of the results is presented below.

### **Human-Health Risk Assessment Results**

The human-health risk assessment results indicated the following:

- Human-health risk was evaluated for possible future residents in the area of EU #1 (upper level) and EU #3 (embankment). The results of the risk evaluation indicated that acceptable risk levels were exceeded for a future resident in both units (with and without background concentrations included) with risks being driven by metals in the following locations:
  - o In the area of EU #1 (upper level), the driver for unacceptable risk levels for a resident is the manganese concentration in soil sample S-4.
  - o In the area of EU #3 (embankment), the drivers for unacceptable risk levels for a resident are arsenic concentrations in samples S-7, HH-10, and HH-11.
- Human-health risk was evaluated for possible current or future non-residential workers in the area of EU #1 (upper level) and EU #3 (embankment). The results of the risk evaluation indicated acceptable risk levels for a non-residential worker in both units. Therefore, the site is considered safe for non-residential workers under both current and future use scenarios.
- Human-health risk was evaluated for possible future construction workers in the area of all three exposure units (upper level, lower level, and embankment). The results of the risk evaluation indicated acceptable risk levels were exceeded for a construction worker in all three units. If background concentrations are removed, acceptable risk levels were exceeded for a construction worker in EU #1 (upper level) and EU #3 (embankment).



• Human-health risk was evaluated for possible current and future greenway users in the area of EU #2 (lower level) and EU #3 (embankment). The results of the risk evaluation indicated acceptable risk levels for greenway users in both units. Therefore, the site is considered safe for greenway users.

#### **Ecological Risk Assessment Results**

The results of the ecological risk screening indicated the following:

- The area of Bolin Creek (EU #2) is the area with the highest likelihood of potential ecological receptors. The results of the risk evaluation indicated no significant ecological risk for surface water and sediment in Bolin Creek.
- Exceedances of ESVs for multiple metals were identified in samples of exposed CCP collected along the embankment in EU #3 (S-7, HH-9, HH-10, and HH-11).
- Localized exceedances of ESVs were also identified at two soil sample locations within EU #1 (S-4 and MW-7) and one individual soil sample location within EU #2 (SED-13).

#### Recommendations

H&H's recommendations to address potential human-health and ecological risks identified as part of this risk assessment are detailed below. In addition to recommendations related to specific sample locations which are drivers for potential risks, in some cases LURs are recommended to confirm the assumptions made during the risk assessment activities remain valid. LURs are expected to be covered under a future BFA, which would be prepared under the jurisdiction of the DEQ Brownfields Program and filed on the deed for the property. The Brownfields Program requires annual certifications from the property owner that LURs are being complied with in perpetuity, which will confirm that potential risks addressed via LURs will be managed long-term.

• Exposed CCPs are present in the area of the embankment. The risk evaluation indicated exceedances of acceptable risk levels for a resident, construction worker, and/or ecological receptors based on metals concentrations in several samples of exposed CCPs collected in the embankment area (S-7, HH-9, HH-10, and HH-11). The potential for erosion to transport CCPs from the area of the embankment into the greenway area is considered an additional concern. The Town implemented temporary measures to



minimize the potential for erosion as part of the interim remediation measures implemented in 2020; however, H&H recommends implementation of permanent measures to address exposed CCPs and prevent erosion in the embankment area. These measures could effectively be performed in conjunction with site redevelopment activities.

- If the site is redeveloped for residential use, H&H recommends remediation or other actions (ex., excavation, impervious cover to prevent exposure, resampling to verify concentrations) to address impacts in the upper level in the area of sample S-4.
- Outside of the embankment area, the ecological risk screening indicated localized exceedances of ESVs at two soil sample locations within EU #1 (S-4 and MW-7) and one individual soil sample location within EU #2 (SED-13). DEQ does not commonly require evaluation of ecological risks for soil (DEQ, 2021b). As such, DEQ may not require additional actions with regard to the exceedances of ESVs in these samples. If required by DEQ or if the Town wishes to take voluntary actions, H&H recommends remediation or other measures to address or further evaluate potential ecological risks in the area of samples S-4, MW-7, and SED-13.
- To address construction worker risks, H&H recommends implementation of an anticipated LUR requiring preparation of an EMP, which will detail measures to prevent construction worker exposure, manage impacted soil and minimize the potential for off-site migration during construction (i.e., redevelopment) activities.
- The risk assessment calculations were based on soil samples collected at depths of 0 to 2 ft bgs for a resident, non-residential worker, and greenway user, and samples collected at depths of 0 to 10 ft bgs for a construction worker. If impacted soil or CCPs at deeper depths are exposed during site redevelopment, additional risk evaluation should be performed to confirm that potential exposure to these soils does not exceed acceptable risk levels. If the site is redeveloped, the Brownfields Program will also likely require confirmatory sampling and risk evaluation in areas of potentially impacted soil or CCPs that are not covered by impervious surfaces (buildings, pavement, etc.) or at least 2 ft of clean fill.
- H&H recommends a LUR preventing the future installation of water supply wells or other use or exposure of groundwater at the site.



#### 8.0 References

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# Table 1 (Page 1 of 1) Summary of Human Health Risk Assessment Results 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

		RISK ASSES	SMENT RESULTS INC	LUDING BACKGRO	OUND CONCENTRATION	DNS		
Evneques Bothway	Reside	ential	Non-Resider	ntial Worker	Construction	on Worker	Greenwa	y User
Exposure Pathway	Carcinogenic Risk	Hazard Index	Carcinogenic Risk	Hazard Index	Carcinogenic Risk	Hazard Index	Carcinogenic Risk	Hazard Index
			Exposure	Unit #1 - Upper Leve	el			
Soil Direct Contact	2.4E-05	3.6E+00	4.8E-06	2.4E-01	7.0E-06	1.1E+01	N/A	N/A
			Exposure	Unit #2 - Lower Lev	el			
Soil Direct Contact	N/A	N/A	N/A	N/A	1.4E-06	3.6E+00	8.4E-06	4.1E-01
Sediment Direct Contact	N/A	N/A	N/A	N/A	N/A	N/A	1.8E-06	9.1E-02
Surface Water Direct Contact	N/A	N/A	N/A	N/A	N/A	N/A	3.2E-07	1.7E-02
Cumulative Risk for Exposure Unit #2*	N/A	N/A	N/A	N/A	1.4E-06	3.6E+00	8.7E-06	4.2E-01
			Exposure U	Jnit #3 - Embankme	nt			
Soil Direct Contact	9.4E-05	3.1E+00	2.0E-05	2.2E-01	4.4E-06	8.8E+00	3.4E-05	4.6E-01

		RISK ASSES	SMENT RESULTS EXC	CLUDING BACKGRO	OUND CONCENTRATION	ONS		
Evacoure Bothway	Reside	ential	Non-Res	idential	Construction	on Worker	Greenwa	y User*
Exposure Pathway	Carcinogenic Risk	Hazard Index	Carcinogenic Risk	Hazard Index	Carcinogenic Risk	Hazard Index	Carcinogenic Risk	Hazard Index
			Exposure	Unit #1 - Upper Lev	el			
Soil Direct Contact	2.1E-05	1.3E+00	4.7E-06	9.1E-02	5.4E-06	1.1E+01	N/A	N/A
			Exposure	Unit #2 - Lower Lev	el			
Soil Direct Contact	N/A	N/A	N/A	N/A	8.1E-07	3.9E-01	8.0E-06	7.5E-02
Sediment Direct Contact	N/A	N/A	N/A	N/A	N/A	N/A	7.1E-13	2.1E-03
Surface Water Direct Contact	N/A	N/A	N/A	N/A	N/A	N/A	3.2E-07	1.7E-02
Cumulative Risk for Exposure Unit #2	N/A	N/A	N/A	N/A	8.1E-07	3.9E-01	8.3E-06	9.1E-02
			Exposure l	Jnit #3 - Embankme	ent			
Soil Direct Contact	8.9E-05	2.1E+00	2.0E-05	1.5E-01	3.4E-06	8.5E+00	3.3E-05	3.1E-01

#### Notes:

N/A = Not applicable

**Bold Red** indicates an exceedance of NCDEQ acceptable risk levels (Carcinogenic Risk <1.0E-04 and Hazard Index <1.0).

<sup>\*</sup> Cumulative risk calculated for EU #2 since more than one exposure pathway is complete. Cumulative risk indicates the higher of the sediment or soil risk, combined with the surface water risk. This is considered appropriate since a receptor could not be exposed to both soil and sediment at the same time and the same exposure pathways are covered by both risk calculations.

# Table 2 (Page 1 of 1) Soil Ecological Screening Table 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

Sample ID	Sample Date	Material Sampled (Soil or CCP)	Sample Depth (ft or in bgs)	arsenic	barium	beryllium	cadmium	hexavalent chromium	trivalent chromium	total chromium	cobalt	copper	lead	manganese	mercury	nickel	selenium	strontium	thallium	vanadium	zinc
	Site-Speci	(8)		3.015	87.86	0.929	0.313	5.725	70.2	70.2	36.31	77.3	59.11	1,149	0.256	19.49	2.503	43.19	0.981*	227	230
	EPA Region	4 Soil ESV <sup>(2)</sup>		18	330	2.5	0.36	0.34	26	23	13	28	11	220	0.013	38	0.52	96	0.05	7.8	46
	0.1/00/10			1				pper Level S	<del></del>							- 12					
S-4	04/29/13	CCP	1 ft	14	24	ND 4.00	1.5	NA 0.45	NA 20.55	22	30	65	20	1,500	0.011	43	ND 0.00	NA 24	ND	21	120
HH-1	11/03/16	Soil Soil	0-1 ft 0-1 ft	5.9	120	1.00 0.79	<0.29	0.45 0.54	20.55 19.46	21	7.9 8.4	25	27	350	0.052 0.067	8.8	0.69	31	< 0.58	48	50
HH-2	11/03/16 <sup>(5)</sup> 11/03/16	Soil	0-1 π 0-1 ft	3.4 4.9	110 140	0.79	<0.35 <0.29	0.54	13.57	20 14	12	17 21	18 30	360 BH 260	0.067	12 5.9	<0.71 <b>1.0</b>	30 25	<0.71 <0.58	41 48	35 43
HH-3	11/03/16	Soil	0-1 ft	9.9	200	1.30	<0.29	0.45 0.46 J	17.54	18	7.8	31	24	350	0.085	8.9	2.4	36	< 0.65	53	100
HH-4	11/03/16	Soil	0-1 ft	2.4	72	1.00	<0.33	0.46 3	44.5	45	16	37	2.3	630	<0.023	33	<0.56	42	0.60	73	70
HH-5	11/03/16	Soil	0-1 ft	2.4	73	0.75	<0.30	<0.14	23	23	8.4	19	9.3	410	<0.025	14	1.2	23	<0.60	39	51
HH-6	10/27/16	Soil	0-1 ft	NA	NA	NA	NA	<0.33	20	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HH-7	10/27/16	Soil	0-1 ft	NA	NA	NA	NA	<0.61	22	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-7	11/01/16	Soil	0-1 ft	2.6	67	0.87	< 0.30	0.89	9.11	10	3.9	180	7.6	100	0.030	2.9	<0.59	6.7	< 0.59	61	46
	· I				<u>l</u>	l	Er	nbankment	Samples (E	xposure Un	nit #3)						•		•		
S-7	01/31/14	CCP	0-4 ft	44	2,500	NA	ND	1.4	27.6	29	NA	NA	11	NA	0.44	NA	4.5	NA	NA	NA	NA
HH-9	04/03/19	CCP	0-1 ft	3.37	131	0.398 J	0.178 J	<1.29	12.7	12.7	5.97	14.5	NA	260	0.31	3.59	0.722	33.2	NA	NA	NA
HH-10	04/03/19	CCP	0-1 ft	60.3	2,970	5.14	0.162 J	<1.60	13.8	13.8	9.84	51.3	NA	73.3	0.22	17.1	5.04	269	NA	NA	NA
HH-11	04/03/19	CCP	0-1 ft	42.5	3,260	5.9	0.220 J	0.467 J	18.7	19.2	13.4	55.3	NA	113	0.43	23.5	9.05	234	NA	NA	NA
	T		1	I	ı	1		ower Level 9		1				1	1						
SS-7	02/18/16	Soil	2-12 in	3.1	84	0.60	ND	NA	NA	14	6.9	15	13	500	0.038	5.9	ND	31	ND	37	37
HH-8	10/27/16	Soil	0-1 ft	3.6	100	1.00	< 0.30	< 0.35	19	19	12	29	18	570	0.036	9.0	<0.60	28	<0.60	52	54
MW-6	11/02/16	Soil	0-1 ft	2.9	38	0.61	<0.26	0.21 J	9.79	10	9.5	23	12	570	0.082	8.2	1.0	22	0.81	31	77
SED-3A	04/05/19	Soil Soil	0-1 ft	3.45	33.9	0.418 J	< 0.582	<1.16	17.4	17.4	16.5	6.97	NA	560	<0.0054	5.82	0.237 J	9.6	NA	NA	NA
SED-5A SED-8	04/04/19 04/05/19		0-1 ft 2-6 in	1.25	13.5	0.156 J	<0.571 0.122 J	0.352 J	13.2 12.0	13.6	5.95	39.1	NA	243	0.0071	4.38	<0.571 <b>1.01</b>	10.9	NA	NA	NA
SED-6	04/05/19	Drainage Pathway Soil Drainage Pathway Soil	2-6 in	2.41 1.16	49.1 33.8	0.313 J 0.199 J	<0.660	<1.25 <b>0.461 J</b>	21.6	12 22.1	7.01 9.11	14.3 10.1	NA NA	423 431	0.063 0.013	4.66 6.68	<0.660	15.2 16.7	NA NA	NA NA	NA NA
SED-10	04/05/19	Drainage Pathway Soil	2-6 in	1.10	24.4	0.133 J	0.221 J	0.418 J	12.0	12.4	4.43	10.1	NA	195	0.013	4.03	0.273 J	8.1	NA	NA	NA
-	08/27/19	Drainage Pathway Soil	0-2 in	4.73	102	0.765 J	0.221 J	<1.68	27.6	27.6	6.17	23.1	NA	341	0.037	7.69	0.2733	25.4	NA	NA	NA
SED-12	04/05/19	Drainage Pathway Soil	2-6 in	3.97	122	0.499 J	0.204 J	<1.74	9.45	9.45 B	6.04	19.7	NA	319	0.077	4.95	1.36	32.8	NA	NA	NA
	08/27/19	Drainage Pathway Soil	0-2 in	12.4	958	1.56	0.284 J	<2.03	29.4	29.4	13.9	38.9	NA	538	0.12	19.2	3.07	125	NA	NA	NA
SED-13	04/05/19	Drainage Pathway Soil	2-6 in	14.5	724	1.1	0.171 J	<1.58	14.0	14	7.58	27.1	NA	563	0.075	8.73	1.69	70.5	NA	NA	NA
SED-18	04/05/19	Drainage Pathway Soil	2-6 in	4.53	137	0.534 J	<0.689	<1.38	18.7	18.7	11.1	28.2	NA	464	0.051	9.00	1.85	32.6	NA	NA	NA
SED-19	04/05/19	Drainage Pathway Soil	2-6 in	1.55	20.0	0.161 J	<0.588	0.435 J	21.7	22.1	7.98	8.38	NA	266	0.0073	4.94	0.334 J	15	NA	NA	NA
SED-20	04/05/19	Drainage Pathway Soil	2-6 in	0.792	31.4	0.152 J	<0.687	<1.37	5.76	5.76 B	4.5	9.1	NA	360	0.012	2.19	0.263 J	11.5	NA	NA	NA
SED-21	04/05/19	Drainage Pathway Soil	2-6 in	1.12	25.9	0.132 J	<0.591	<1.18	20.9	20.9	4.44	6.58	NA	221	0.012	2.70	0.286 J	12.8	NA	NA	NA
Excavation H-3	05/11/20	Soil	1-2 ft	2.41	71.0	<3.28	<1.31	0.410 J	40.2	40.6	14.1	43.4	NA	251	0.0485 J	12.5	1.46 J	58.1	NA	NA	NA
Excavation H-5	05/11/20	Soil	1-2 ft	1.10 J	74.5	<3.20	<1.22	0.497 J	21.1	21.6	8.25	16.9	NA	558	<0.0486	6.77	<3.04	32.2	NA	NA	NA
Excavation H-6	05/11/20	Soil	1-2 ft	1.02 J	96.0	<2.97	<1.19	<1.19	14.9	14.9	7.57	10.9	NA	557	0.0222 J	4.03	<2.97	20.5	NA	NA	NA
Excavation H-7	11/09/20	Soil	0-1 ft	1.10 J	73.7	0.767 J	<1.19	<1.19	8.04	8.04	3.68	15.0	NA	233	0.0222 3	4.63	0.479 J	9.6	NA	NA	NA
Excavation I-1	04/08/20	Soil	1-2 ft	2.91	67.2	<2.77	<1.11	0.457 J	26.2	26.7	13.0	18.3	NA	594	0.022	8.25	<2.77	26.3	NA	NA	NA
Excavation I-2	04/08/20	Soil	1-2 ft	3.65	74.1	<2.85	<1.11	0.457 J 0.313 J	23.3	23.6	12.0	21.4	NA	544	0.042	8.70	<2.77	17.2	NA NA	NA	NA NA
Excavation I-2  Excavation I-3	04/08/20	Soil	1-2 It 1-2 ft	2.18	61.5	<2.88	<1.14	0.313 J	13.1	13.5	9.23	19.5	NA NA	419	0.022	6.02	<2.88	13.3	NA NA	NA	NA NA
LACAVALIOIT I-3	04/00/20	3011	1 <b>-</b> 2 Il	2.10	01.0	~2.00	` I. IJ	0.507 5	13.1	13.3	3.23	13.5	1 4/4	713	0.013	0.02	~2.00	13.3	IAM	1 4/4/	I V/A

#### Notes:

Concentrations reported in milligrams per kilogram (mg/kg).

**Bold** denotes concentration above or equal to EPA Soil ESV.

**Bold**/Shaded denotes concentration above or equal to EPA Soil ESV and site-specific BSV.

NA = Not Analyzed

<sup>1)</sup> Site-Specific Background Screening Value (BSV) represents 95% upper threshold level (UTL) with 95% coverage calculated using EPA ProUCL 5.1.

<sup>\*</sup>Insufficient data to calculate 95% UTL; therefore, site-specific BSV indicates 2x mean concentration with non-detectable concentrations calculated as half the reporting limit

<sup>2)</sup> EPA Region 4 Soil Ecological Screening Value (ESV) (March 2018).

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.

Table shows constituents detected in soil samples collected between 0 and 2 ft bgs, excluding background samples, samples that have been excavated, and samples collected from locations resampled at a later date. Refer to Appendix A for a summary of additional sampling data.

# Table 3 (Page 1 of 1) Stream Sediment Ecological Screening Table 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

Sediment Sampling Point ID	Sample Date	arsenic	barium	beryllium	hexavalent chromium	trivalent chromium	total chromium	cobalt	copper	manganese	mercury	nickel	selenium	strontium
Site-Specific E	3SV <sup>(1)</sup>	2.74	38.4	0.48	0.79	69.5	70	16.388	13.8	759	0.0078	9.92	0.409	16.9
EPA Region 4 Sedin	nent ESV <sup>(2)</sup>	9.8	20	NS	NS	NS	43.4	50	31.6	460	0.17*	22.7	0.72*	NS
EPA Region 4 Sedin	nent RSV <sup>(3)</sup>	33	60	NS	NS	NS	111	NS	149	1,100	0.17*	48.6	1.2*	NS
SED-3 (Adjacent)	04/05/19	1.36	16.4	0.111 J	0.670 J	13.5	14.2	5.18	20.2	225	0.0054 J	4.81	< 0.607	9.2
SED-4 (Adjacent)	04/05/19	2.35	20.3	0.191 J	0.456 J	63.8	64.3	7.26	8.39	293	0.0080	10.5	0.344 J	30.7
SED-5 (Downstream)	04/04/19	1.82	24.3	0.233 J	0.595 J	16.8	17.4	5.9	8.86	399	< 0.0035	4.86	< 0.617	6.2
SED-6 (Downstream)	04/04/19	1.96	17.3	0.247 J	0.517 J	24.9	25.4	6.57	9.25	308	0.0058	7.15	< 0.643	8.4
SED-7 (Downstream)	04/04/19	1.35	16.4	0.179 J	0.995 J	59.4	60.4	6.47	6.77	262	0.0025 J	9.04	< 0.635	8.1

#### Notes

Concentrations reported in milligrams per kilogram (mg/kg).

- 1) Site-Specific Background Screening Value (BSV) indicates two times the mean detected background concentration or maximum detected background concentration, whichever is smaller
- 2) EPA Region 4 Sediment Ecological Screening Value (ESV) for freshwater (March 2018)
- 3) EPA Region 4 Sediment Refinement Screening Value (RSV) for freshwater (March 2018)

\*Indicates the lower of the aquatic versus wildlife based ESVs and RSVs.

**Bold** denotes concentration above EPA Sediment ESV.

Bold/Shaded denotes concentration above EPA Sediment ESV and site-specific BSV.

Red denotes concentration above EPA Sediment RSV.

Red/Shaded denotes concentration above EPA Sediment RSV and site-specific BSV.

NS = Not Specified

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.

Table shows constituents detected in the most recent set of surface water samples, excluding background samples. Refer to Appendix A for a summary of additional sampling data.

## Table 4 (page 1 of 1) Surface Water Ecological Screening Table 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

Surface Water Sampling Point ID	Sample Date	arsenic	barium	total chromium <sup>(4,5,6)</sup>	cobalt	copper <sup>(4,5)</sup>	manganese	nickel <sup>(4,5)</sup>	selenium	strontium
Site-Specific BSV	(1)	0.44	27	0.53	0.16	1.2	22.2	0.33	0.11	100
NC 2B Standard <sup>(</sup>	2)	10(t)	1,000(t)	11	1.6 <sup>(7)</sup>	5.33	NS	25(t)	5(t)	14,000 <sup>(7)</sup>
EPA Region 4 Surface Water	ESV (Acute) <sup>(3)</sup>	340	2,000	16	120	7.3	1,680	261	20	48,000
EPA Region 4 Surface Water E	SV (Chronic) <sup>(3)</sup>	150	220	11	19	5.16	93	29	5	5,300
	11/03/16	<10	27	<5.0	< 5.0	<10	34	<10	<20	100
SW-3 (Adjacent)	11/03/16 <sup>(8)</sup>	<10	27	<5.0	<5.0	<10	33	<10	<20	110
	04/05/19	0.45	25.7	0.62	0.26	2.8	37.4	0.50	0.11 J	88.8
	11/03/16	<10	27	<5.0	<5.0	<10	25	<10	<20	110
SW-4 (Adjacent)	04/05/19	0.42	23.6	< 0.50	0.14	1.0	24.6	0.26 J	0.10 J	89.1
	04/05/19 <sup>(8)</sup>	0.41	23.7	< 0.50	0.14	0.98	24.8	0.26 J	0.088 J	87.7
SM E (Downstroom)	11/03/16	<10	26	<5.0	<5.0	<10	24	<10	<20	100
SW-5 (Downstream)	04/04/19	0.40	16.9	< 0.50	0.14	0.88	19.5	0.21 J	0.12 J	81.8
SW-6 (Downstream)	04/04/19	0.40	16.9	< 0.50	0.14	0.84	18.7	0.21 J	0.11 J	81.3
SW-7 (Downstream)	04/04/19	0.42	18.4	< 0.50	0.16	1.1	23.1	0.23 J	0.10 J	86.7
SW-21 (Drainage Pathway)	04/05/19	0.40	32.1	0.73	0.36	3.2	29.5	0.62	0.11 J	69.9
511-21 (Diamage Faulway)	04/05/19 <sup>(9)</sup>	0.15	18.3	< 0.50	0.094 J	3.1	9.3	0.43 J	< 0.50	43.5

#### Notes:

Concentrations reported in micrograms per liter (µg/L).

- 1) Site-Specific Background Screening Value (BSV) indicates two times the mean detected background concentration or maximum detected background concentration, whichever is smaller.
- 2) North Carolina Surface Water Quality Standard (NC 2B Standard) adopted per 15A NCAC 2B Section .0100. Unless otherwise noted, values are the lowest of the Freshwater, Water Supply, and Human Health values because Bolin Creek is a WS V classification surface water
- 3) EPA Region 4 Surface Water Ecological Screening Value (ESV) for freshwater (March 2018).
- 4) 2B Standards derived using site-specific hardness data for surface water samples SW-1 through SW-7 and the DEQ Hardness-Dependent Metal Calculator dated July 26, 2021. Mean hardness for these samples was 54.5 mg/L. Value shown is the lower of the acute versus chronic values.
- 5) EPA ESVs based on estimated hardness of 50 mg/L, which is the value reported by EPA closest to the measured site-specific hardness 6) 2B Standard shown for total chromium indicates the lower of the hexavalent and trivalent chromium values.
- 7) No 2B Standard established, value shown is the NC In-Stream Target Values for Surface Water (July 26, 2021). Value shown is the lower of the acute versus chronic values.
- 8) Duplicate sample taken.
- 9) Sample was field filtered.

Bold denotes concentration above NC 2B Standard.

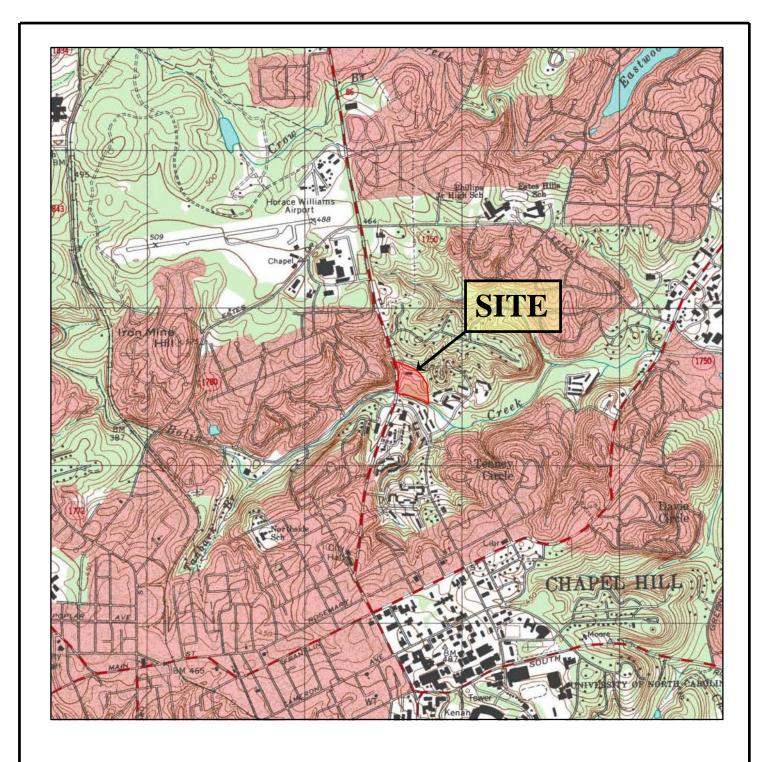
Bold/Shaded denotes concentration above NC 2B Standard and site-specific BSV.

Red denotes concentration above EPA Surface Water ESV (lower of acute or chronic).

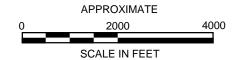
Red/Shaded denotes concentration above EPA Surface Water RSV and site-specific BSV.

NS = Not Specified

- J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.
- (t) = Based upon measurement of total recoverable metal. See 15A NCAC 02B .0211 for more information.
- Table shows constituents detected in surface water samples within the past five years, excluding background samples. Refer to Appendix A for a summary of additional sampling data.







U.S.G.S. QUADRANGLE MAP

**CHAPEL HILL, NORTH CAROLINA, 2002** 

QUADRANGLE 7.5 MINUTE SERIES (TOPOGRAPHIC)

TITLE

#### **SITE LOCATION MAP**

PROJECT TOWN OF CHAPEL HILL 828 MARTIN LUTHER KING JR. BOULEVARD CHAPEL HILL, NORTH CAROLINA



hickman 2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology

1

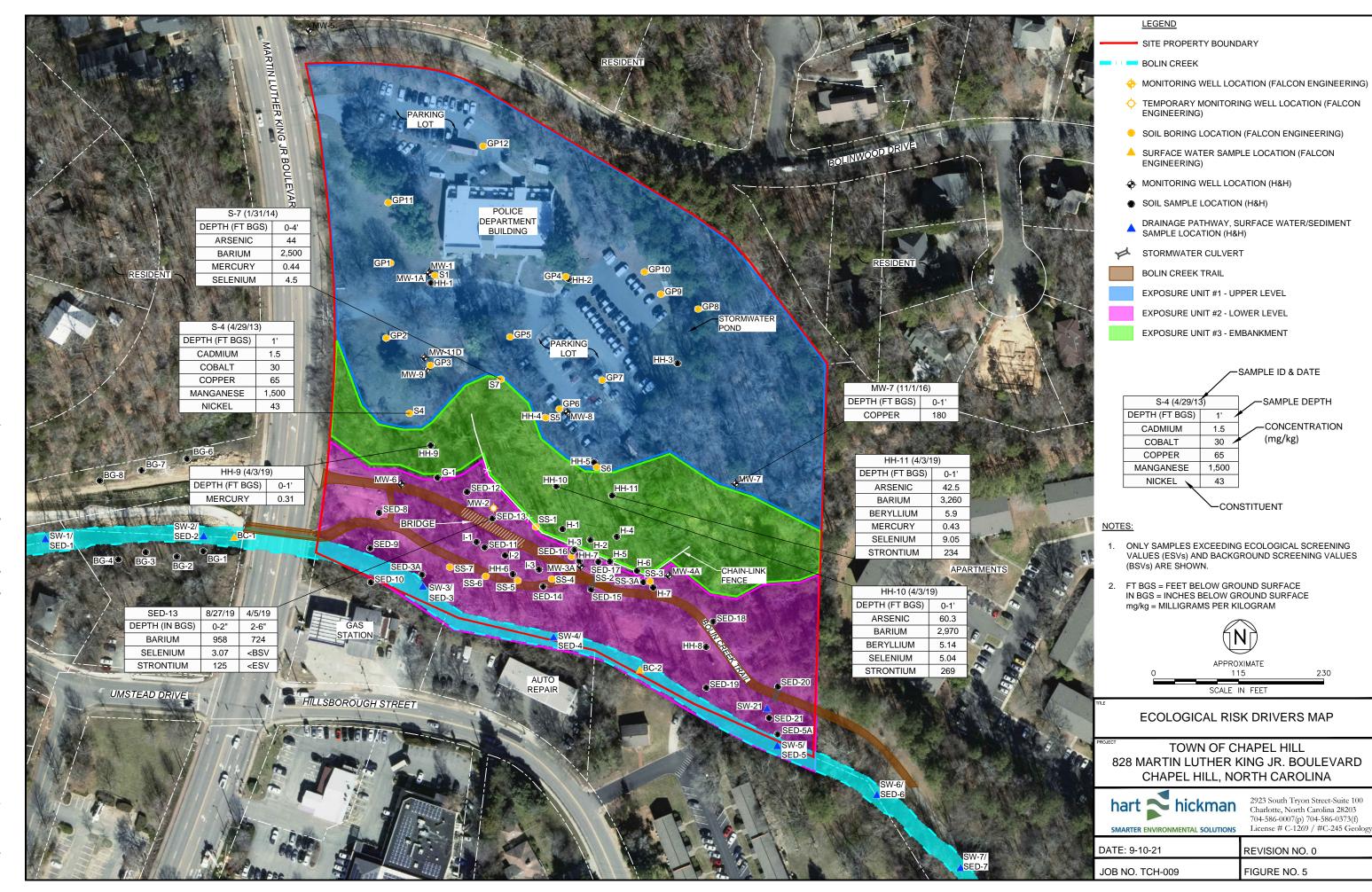
SMARTER ENVIRONMENTAL SOLUTIONS

DATE: 9-10-21 REVISION NO: 0

JOB NO: TCH-009 FIGURE NO:

**LEGEND** 

**LEGEND** 



### Appendix A

**Historical Data Tables and Figures** 

### Table A-1 (page 1 of 2) Summary of Post-IRM Soil Analytical Data 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

Sample ID	Sample Date	Material Sampled (Soil or CCP)	Sample Depth (ft or in bgs)	aluminum	antimony	arsenic	barium	beryllium	boron	cadmium	calcium	hexavalent chromium	trivalent chromium	total chromium	cobalt	copper	iron	lead	magnesium	manganese	mercury	molybdenum	nickel	potassium	selenium	silver	sodium	strontium	thallium	vanadium	zinc
	Site-Speci			NA	ND	3.015	87.86	0.929	NA	0.313	NA	5.725	70.2	70.2	36.31	77.3	NA	59.11	NA	1,149	0.256	NA	19.49	NA	2.503	NA	NA	43.19	0.981*	227	230
	SRG - Protection			110,000	0.90	5.8	580	63	45	3.0	NS	3.8	360,000	NS	0.90	700	150	270	NS	65	1.0	7.1	130	NS	2.1	3.4	NS	1,500	0.28	350	1,200
	SRG - Residenti			16,000 230,000	6.3 93	0.68 3.0	3,100 47.000	31 470	3,100 47,000	14 200	NS NS	0.31 6.5	23,000 350,000	NS NS	4.7 70	630 9.300	11,000	400 800	NS NS	380 5.600	2.3 9.7	78 1.200	310 4,700	NS NS	78 1.200	78 1,200	NS NS	9,400 140,000	0.16 2.3	78 1,200	4,700 70.000
PSRG	- industriai/Com	mercial Health-based <sup>2)</sup>		230,000	93	3.0	47,000	4/0	47,000	200	INO	0.5		per Level S		9,300	100,000	800	INO	5,000	9.1	1,200	4,700	INO	1,200	1,200	INO	140,000	2.3	1,200	70,000
S-4	04/29/13	CCP	1 ft	23,000	ND	14	24	ND	NA	1.5	9,900	NA	NA	22	30	65	59,000	20	9,000	1,500	0.011	NA	43	680	ND	ND	150	NA	ND	21	120
S-5	01/31/14	CCP	0-4 ft	NA	NA	37	2,800	NA	NA	ND	NA	1.3	19.7	21	NA	NA	NA	10	NA	NA	0.30	NA	NA	NA	3.2	ND	NA	NA	NA	NA	NA
S-6	01/31/14	CCP	0-4 ft	NA	NA	<u>43</u>	3,200	NA	NA	ND	NA	2.7	19.3	22	NA	NA	NA	12	NA	NA	0.42	NA	NA	NA	6.1	ND	NA	NA	NA	NA	NA
GP-1 GP-2	02/03/14	CCP	8-12 ft	NA NA	NA	3.5	86	NA NA	NA NA	ND ND	NA NA	ND ND	8.8 19	8.8	NA NA	NA NA	NA NA	26 11	NA NA	NA NA	0.083	NA NA	NA NA	NA	ND 4.0	ND ND	NA NA	NA NA	NA NA	NA NA	NA NA
GP-2 GP-3	02/03/14 02/03/14	CCP CCP	26-28 ft 10-12 ft	NA NA	NA NA	41 48	1,100 1,200	NA NA	NA NA	ND ND	NA NA	0.53	22.47	19 23	NA NA	NA NA	NA NA	39	NA NA	NA NA	0.24	NA NA	NA NA	NA NA	ND	ND	NA NA	NA NA	NA NA	NA NA	NA NA
GP-4	02/03/14	CCP	10-12 ft	NA	NA	<u>59</u>	2,900	NA	NA	ND	NA	ND	20	20	NA	NA	NA NA	11	NA	NA	0.42	NA	NA	NA NA	5.8	ND	NA	NA NA	NA	NA NA	NA
-	02/04/14	CCP	4-6 ft	NA	NA	72	2,800	NA	NA	ND	NA	ND	19	19	NA	NA	NA	9.5	NA	NA	0.33	NA	NA	NA	2.6	ND	NA	NA	NA	NA	NA
GP-5	04/03/19	CCP	4-6 ft	NA	NA	<u>95.9</u>	2,350	5.46	NA	<0.956	NA	0.836 J	12.3	13.1	7.05	50.9	NA	NA	NA	34.7	1.2	NA	11.1	NA	12	NA	NA	325	NA	NA	NA
	04/03/19 <sup>(3)</sup>	CCP	4-6 ft	NA	NA	<u>95.9</u>	2,630	6.99	NA	< 0.931	NA	0.712 J	16.2	16.9	10.3	62.5	NA	NA	NA	53.4	0.39	NA	17.1	NA	13	NA	NA	308	NA	NA	NA
GP-6	02/04/14 04/04/19	CCP CCP	9-11 ft 9-10 ft	NA NA	NA NA	65 6.73	<b>850</b> 178	NA 0.758	NA NA	ND 0.118 J	NA NA	ND <1.11	19 10.0	19 10	NA 5.18	NA 11	NA NA	27 NA	NA NA	NA 687	11 0.050	NA NA	NA 6.24	NA NA	<b>4.1</b> 0.88	ND NA	NA NA	NA 21.7	NA NA	NA NA	NA NA
GP-7	02/04/14	CCP	10-12 ft	NA	NA NA	55	1,700	0.736 NA	NA NA	0.116 J	NA NA	ND.	19.0	19	0.16 NA	NA.	NA NA	11	NA NA	NA	0.050	NA NA	NA NA	NA NA	4.3	ND	NA NA	NA NA	NA NA	NA NA	NA NA
GP-8	02/04/14	CCP	11-15 ft	NA	NA	54	4,100	NA	NA	ND	NA	ND	20	20	NA	NA	NA	9.2	NA	NA	0.29	NA	NA	NA	4.5	ND	NA	NA	NA	NA	NA
GP-11	02/04/14	CCP	4-6 ft	NA	NA	<u>16</u>	450	NA	NA	ND	NA	ND	16	16	NA	NA	NA	23	NA	NA	0.35	NA	NA	NA	ND	ND	NA	NA	NA	NA	NA
GP-12	02/04/14	CCP	2-4 ft	NA	NA	<u>52</u>	2,000	NA	NA	ND	NA	ND	19	19	NA	NA	NA	14	NA	NA	0.28	NA	NA	NA	2.1	ND	NA	NA	NA	NA	NA
HH-1	11/03/16	Soil	0-1 ft	NA	<0.29	5.9	120	1.00	NA	<0.29	NA	0.45	20.55	21	7.9	25	NA	27	NA	350	0.052	NA	8.8	NA	0.69	NA	NA	31	<0.58	48	50
HH-2	11/03/16 <sup>(3)</sup> 11/03/16	Soil Soil	0-1 ft 0-1 ft	NA NA	<0.35 <0.29	3.4 4.9	110 140	0.79	NA NA	< 0.35	NA NA	0.54	19.46 13.57	20 14	8.4 12	17 21	NA NA	18 30	NA NA	360 BH 260	0.067 0.085	NA NA	12 5.9	NA NA	<0.71 1.0	NA NA	NA NA	30 25	< 0.71	41 48	35 43
HH-3	11/03/16	Soil	0-1 ft	NA	< 0.23	9.9	200	1.30	NA	< 0.23	NA	0.46 J	17.54	18	7.8	31	NA	24	NA	350	0.003	NA	8.9	NA	2.4	NA	NA	36	< 0.65	53	100
HH-4	11/03/16	Soil	0-1 ft	NA	<0.28	2.4	72	1.00	NA	<0.28	NA	0.50	44.5	45	16	37	NA	2.3	NA	630	<0.023	NA	33	NA	<0.56	NA	NA	42	0.60	73	70
HH-5	11/03/16	Soil	0-1 ft	NA	< 0.30	2.4	73	0.75	NA	< 0.30	NA	< 0.14	23	23	8.4	19	NA	9.3	NA	410	<0.025	NA	14	NA	1.2	NA	NA	23	< 0.60	39	51
MW-7	11/01/16	Soil	0-1 ft	NA	< 0.30	2.6	67	0.87	NA	< 0.30	NA	0.89	9.11	10	3.9	180	NA	7.6	NA	100	0.030	NA	2.9	NA	<0.59	NA	NA	6.7	< 0.59	61	46
S-7	04/04/44	000	0.46				0.500	110	NA	ND	NA			bankment S		210				NA	0.44	114	110	212		ND	NA	NA	NA	NA	NA
S-7 HH-9	01/31/14	CCP CCP	0-4 ft 0-1 ft	NA NA	NA NA	44 3.37	2,500 131	0.398 J	NA NA	0.178 J	NA NA	1.4 <1.29	27.6 12.7	29 12.7	NA 5.97	NA 14.5	NA NA	11 NA	NA NA	260	0.44	NA NA	NA 3.59	NA NA	4.5 0.722	NA NA	NA NA	33.2	NA NA	NA NA	NA NA
HH-10	04/03/19	CCP	0-1 ft	NA	NA	60.3	2.970	5.14	NA	0.176 J	NA	<1.60	13.8	13.8	9.84	51.3	NA	NA	NA	73.3	0.22	NA	17.1	NA	5.04	NA	NA	269	NA	NA	NA
HH-11	04/03/19	CCP	0-1 ft	NA	NA	42.5	3,260	5.9	NA	0.220 J	NA	0.467 J	18.7	19.2	13.4	55.3	NA	NA	NA	113	0.43	NA	23.5	NA	9.05	NA	NA	234	NA	NA	NA
														wer Level S																	
SS-7	02/18/16	Soil	2-12 in	NA NA	ND <0.30	3.1	84	0.60	ND NA	ND <0.30	NA NA	NA <0.35	NA 40	14	6.9	15	NA NA	13	NA NA	500	0.038	ND	5.9	NA NA	ND <0.60	ND NA	NA NA	31	ND <0.60	37	37 54
HH-8 MW-6	10/27/16 11/02/16	Soil Soil	0-1 ft 0-1 ft	NA NA	< 0.30	3.6 2.9	100 38	1.00 0.61	NA NA	< 0.30	NA NA	<0.35 0.21 J	19 9.79	19 10	12 9.5	29 23	NA NA	18 12	NA NA	570 570	0.036	NA NA	9.0 8.2	NA NA	<0.60 1.0	NA NA	NA NA	28 22	0.81	52 31	77
SED-3A	04/05/19	Soil	0-1 ft	NA	NA.	3.45	33.9	0.418 J	NA	<0.582	NA	<1.16	17.4	17.4	16.5	6.97	NA	NA	NA	560	< 0.0054	NA	5.82	NA	0.237 J	NA	NA	9.6	NA	NA	NA
SED-5A	04/04/19	Soil	0-1 ft	NA	NA	1.25	13.5	0.156 J	NA	< 0.571	NA	0.352 J	13.2	13.6	5.95	39.1	NA	NA	NA	243	0.0071	NA	4.38	NA	< 0.571	NA	NA	10.9	NA	NA	NA
SED-8	04/05/19	Drainage Pathway Soil	2-6 in	NA	NA	2.41	49.1	0.313 J	NA	0.122 J	NA	<1.25	12.0	12	7.01	14.3	NA	NA	NA	423	0.063	NA	4.66	NA	1.01	NA	NA	15.2	NA	NA	NA
SED-9	04/05/19	Drainage Pathway Soil	2-6 in	NA	NA NA	1.16	33.8	0.199 J	NA	< 0.660	NA	0.461 J	21.6	22.1	9.11	10.1	NA NA	NA NA	NA	431	0.013	NA	6.68	NA NA	<0.660	NA	NA	16.7	NA NA	NA NA	NA NA
SED-10	04/05/19 08/27/19	Drainage Pathway Soil Drainage Pathway Soil	2-6 in 0-2 in	NA NA	NA NA	1.29 <u>4.73</u>	24.4 102	0.118 J 0.765 J	NA NA	0.221 J 0.214 J	NA NA	0.418 J <1.68	12.0 27.6	12.4 27.6	4.43 6.17	10.8 23.1	NA NA	NA NA	NA NA	195 341	0.037	NA NA	4.03 7.69	NA NA	0.273 J 0.961	NA NA	NA NA	8.1 25.4	NA NA	NA NA	NA NA
SED-12	04/05/19	Drainage Pathway Soil	2-6 in	NA	NA	3.97	122	0.765 J	NA	0.214 J	NA	<1.74	9.45	9.45 B	6.04	19.7	NA NA	NA	NA	319	0.042	NA	4.95	NA NA	1.36	NA	NA	32.8	NA	NA NA	NA
SED-13	08/27/19	Drainage Pathway Soil	0-2 in	NA	NA	12.4	958	1.56	NA	0.284 J	NA	<2.03	29.4	29.4	13.9	38.9	NA	NA	NA	538	0.12	NA	19.2	NA	3.07	NA	NA	125	NA	NA	NA
	04/05/19	Drainage Pathway Soil	2-6 in	NA	NA	<u>14.5</u>	724	1.1	NA	0.171 J	NA	<1.58	14.0	14	7.58	27.1	NA	NA	NA	563	0.075	NA	8.73	NA	1.69	NA	NA	70.5	NA	NA	NA
SED-18	04/05/19	Drainage Pathway Soil	2-6 in	NA	NA	4.53	137	0.534 J	NA NA	<0.689	NA	<1.38	18.7	18.7	11.1	28.2	NA	NA	NA	464	0.051	NA	9	NA	1.85	NA NA	NA	32.6	NA	NA	NA
SED-19 SED-20	04/05/19 04/05/19	Drainage Pathway Soil Drainage Pathway Soil	2-6 in 2-6 in	NA NA	NA NA	1.55 0.792	20.0 31.4	0.161 J 0.152 J	NA NA	<0.588	NA NA	0.435 J <1.37	21.7 5.76	22.1 5.76 B	7.98 4.5	8.38 9.1	NA NA	NA NA	NA NA	266 360	0.0073	NA NA	4.94 2.19	NA NA	0.334 J 0.263 J	NA NA	NA NA	15 11.5	NA NA	NA NA	NA NA
SED-21	04/05/19	Drainage Pathway Soil	2-6 in	NA	NA	1.12	25.9	0.132 J	NA	<0.591	NA	<1.18	20.9	20.9	4.44	6.58	NA	NA	NA	221	0.012	NA	2.19	NA	0.286 J	NA	NA	12.8	NA	NA	NA
Excavation G-1	04/16/20	Soil	2-3 ft	NA	NA	3.68	58.8	<3.08	NA	<1.23	NA	0.478 J	20.0	20.5	5.73	14.5	NA	NA	NA	193	0.052	NA	6.94	NA	<3.08	NA	NA	6.2	NA	NA	NA
Excavation H-1	05/11/20	Soil	1-2 ft	NA	NA	1.16	37.2	<2.76	NA	<1.10	NA	<1.10	20.1	20.1	10.7	15.3	NA	NA	NA	412	< 0.0442	NA	5.80	NA	<2.76	NA	NA	29.3	NA	NA	NA
Excavation H-2	05/11/20	Soil	1-2 ft	NA	NA	1.93	100	<3.25	NA	<1.30	NA	0.578 J	43.8	44.4	19.1	59.2	NA	NA	NA	265	0.0494 J	NA	16.2	NA	1.58 J	NA	NA	56.8	NA	NA	NA
Excavation H-3 Excavation H-4	05/11/20 05/11/20	Soil Soil	1-2 ft 2-3 ft	NA NA	NA NA	2.41	71.0 67.1	<3.28	NA NA	<1.31	NA NA	0.410 J 0.388 J	40.2 25.8	40.6 26.2	14.1 20.8	43.4 24.0	NA NA	NA NA	NA NA	251 1,480	0.0485 J 0.0237 J	NA NA	12.5 7.81	NA NA	1.46 J	NA NA	NA NA	58.1 38.1	NA NA	NA NA	NA NA
Excavation H-5	05/11/20	Soil	1-2 ft	NA	NA NA	1.10 J	74.5	<3.04	NA	<1.22	NA	0.366 J	21.1	21.6	8.25	16.9	NA NA	NA NA	NA	558	< 0.0237 3	NA NA	6.77	NA NA	<3.04	NA	NA NA	32.2	NA	NA NA	NA NA
Excavation H-6	05/11/20	Soil	1-2 ft	NA	NA	1.02 J	96.0	<2.97	NA	<1.19	NA	<1.19	14.9	14.9	7.57	10.7	NA	NA	NA	557	0.0222 J	NA	4.03	NA	<2.97	NA	NA	20.5	NA	NA	NA
Excavation H-7	11/09/20	Soil	0-1 ft	NA	NA	1.10 J	73.7	0.767 J	NA	<1.22	NA	<1.22	8.04	8.04	3.68	15.0	NA	NA	NA	233	0.022	NA	4.63	NA	0.479 J	NA	NA	9.6	NA	NA	NA
Excavation I-1	04/08/20	Soil	1-2 ft	NA	NA	2.91	67.2	<2.77	NA	<1.11	NA	0.457 J	26.2	26.7	13.0	18.3	NA	NA	NA	594	0.042	NA	8.25	NA	<2.77	NA	NA	26.3	NA	NA	NA
Excavation I-2 Excavation I-3	04/08/20 04/08/20	Soil Soil	1-2 ft 1-2 ft	NA NA	NA NA	3.65 2.18	74.1 61.5	<2.85	NA NA	<1.14	NA NA	0.313 J 0.387 J	23.3 13.1	23.6 13.5	12.0 9.23	21.4 19.5	NA NA	NA NA	NA NA	544 419	0.022	NA NA	8.70 6.02	NA NA	<2.85	NA NA	NA NA	17.2 13.3	NA NA	NA NA	NA NA
Excavation 1-3	04/08/20	2011	I-Z II	INA	INA	2.18	01.0	<2.88	INA	51.15	NA	0.387 J	13.1	13.5	9.23	19.5	NA	INA	INA	419	0.019	IVA	0.02	NA	SZ.00	INA	NA	13.3	IVA	INA	INA

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#### Table A-1 (page 2 of 2) Summary of Post-IRM Soil Analytical Data 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

Sample ID	Sample Date	Material Sampled (Soil or CCP)	Sample Depth (ft or in bgs)	aluminum	antimony	arsenic	barium	beryllium	boron	cadmium	calcium	hexavalent chromium	trivalent chromium	total chromium	cobalt	copper	iron	lead	magnesium	manganese	mercury	molybdenum	nickel	potassium	selenium	silver	sodium	strontium	thallium	vanadium	zinc
	Site-Specif			NA	ND	3.015	87.86	0.929	NA	0.313	NA	5.725	70.2	70.2	36.31	77.3	NA	59.11	NA	1,149	0.256	NA	19.49	NA	2.503	NA	NA	43.19	0.981*	227	230
	RG - Protection			110,000	0.90	5.8	580	63	45	3.0	NS	3.8	360,000	NS	0.90	700	150	270	NS	65	1.0	7.1	130	NS	2.1	3.4	NS	1,500	0.28	350	1,200
	SRG - Residentia			16,000	6.3	0.68	3,100	31	3,100	14	NS	0.31	23,000	NS	4.7	630	11,000	400	NS	380	2.3	78	310	NS	78	78	NS	9,400	0.16	78	4,700
PSRG	Industrial/Comn	nercial Health-based <sup>2)</sup>		230,000	93	3.0	47,000	470	47,000	200	NS	6.5	350,000	NS	70	9,300	160,000	800	NS	5,600	9.7	1,200	4,700	NS	1,200	1,200	NS	140,000	2.3	1,200	70,000
														kground Sa																	
MW-5 (background)	11/02/16	Soil	0-1 ft	NA	< 0.30	2.1	76	0.99	NA	< 0.30	NA	0.43 J	17.57	18	27	49	NA	4.0	NA	710	<0.023	NA	5.0	NA	< 0.59	NA	NA	25	< 0.59	190	47
. ( 5,	11/02/16	Soil	6-7 ft	NA	< 0.27	1.4	61	0.60	NA	<0.27	NA	0.81	38.19	39	19	18	NA	0.55	NA	940	<0.020	NA	20	NA	< 0.53	NA	NA	29	<u>2.3</u>	67	75
BG-1 (background)	11/03/16	Soil	0-1 ft	NA	<0.28	1.9	36	0.39	NA	<0.28	NA	0.87	17.13	18	6.3	16	NA	25	NA	310	0.033	NA	5.4	NA	1.6	NA	NA	15	<0.57	34	43
,	11/03/16	Soil	2-3 ft	NA	<0.29	2.3	45	0.48	NA	<0.29	NA	<0.12	19	19	7.3	18	NA	43	NA	440	0.280	NA	6.2	NA	1.6	NA	NA	15	< 0.57	35	49
BG-2 (background)	11/03/16	Soil	0-1 ft	NA	<0.28	1.9	45	0.50	NA	<0.28	NA	0.84	16.16	17	7.4	18	NA	32	NA	410	0.045	NA	4.9	NA	1.1	NA	NA	14	<0.56	35	44
	11/03/16 11/03/16	Soil	2-3 ft	NA	< 0.27	1.9	52 44	0.53	NA	< 0.27	NA	0.70 0.21 J	23.3	24 16	7.5 7.5	20	NA	26	NA	450 410	0.038	NA	7.9	NA	1.7	NA NA	NA	19 46	< 0.55	37 37	45 40
BG-3 (background)	11/03/16	Soil Soil	0-1 ft 2-3 ft	NA	<0.30	2.2	56	0.43	NA NA	<0.30	NA	0.213	23.3	22	7.5	15 18	NA NA	25 29	NA NA	410	0.024	NA NA	5.1 5.2	NA NA	1.4	NA NA	NA NA	19	< 0.53	40	46
	11/03/16	Soil	2-3 II 0-1 ft	NA NA	<0.27	1.7	50	0.54	NA NA	< 0.27	NA NA	<0.88	19	10	9.5	16	NA NA	29	NA NA	450 BH	0.040	NA NA	6.0	NA NA	< 0.59	NA NA	NA NA	16 A	<0.53 <0.59	53	50
BG-4 (background)	11/03/16	Soil	2-3 ft	NA	< 0.29	2.0	53	0.52	NA NA	0.38	NA	0.50 J	22.5	23	9.5	23	NA NA	21	NA NA	460 BH	0.026	NA NA	8.5	NA	< 0.59	NA	NA	10 A	< 0.65	51	230
	04/03/19	Soil	2-3 II 0-1 ft	NΑ	<0.33 NA	2.05 O1	64.4	0.625	NA NA	0.38 0.177 J	NΑ	5.34	39.4	44.7	14.4	26.4	NA NA	NA NA	NA NA	460 BH 448 J6	0.054	NA NA	12.8	NA NA	0.562 J	NA NA	NA NA	19	<0.05 NA	NA NA	NA NA
BG-6 (background)	04/04/19	Soil	2-3 ft	NΔ	NA	2.29	66.3	0.507 J	NA	0.177 J	NΔ	<1.19	22.9	22.9	14.7	32.3	NA	NA	NA NA	467	0.022	NA	7.78	NA	0.828	NA	NA	16.8	NA	NA	NA
	04/03/19	Soil	0-1 ft	NA	NA	1.97	52.7	0.410 J	NA	0.136 J	NA	<1.16	70.2	70.2	18.9	36.4	NA	NA	NA NA	813	0.032	NA	12.8	NA	0.543 J	NA	NA	22.6	NA	NA	NA
BG-7 (background)	04/04/19	Soil	2-3 ft	NA	NA	3.08	77.9	0.410 J	NA	0.108 J	NA	<1.16	27	27	16.3	32.5	NA	NA	NA	548	0.023	NA	6.2	NA	0.502 J	NA	NA	24.3	NA	NA	NA
	04/03/19	Soil	0-1 ft	NA	NA	1.8	52.4	0.370 J	NA	0.0951 J	NA	<1.10	24.5	24.5	21.8	62.8	NA	NA	NA	759	0.0072	NA	9.04	NA	0.485 J	NA	NA	24.4	NA	NA	NA
BG-8 (background)	04/04/19	Soil	2-3 ft	NA	NA	1.66	47.6	0.293 J	NA	0.0918 J	NA	<1.14	21.7	21.7	23.5	60.2	NA	NA	NA	732	< 0.0067	NA	7.86	NA	0.306 J	NA	NA	25.1	NA	NA	NA

Notes:

Concentrations reported in milligrams per kilogram (mg/kg).

1) Site-Specific Background Screening Value (BSV) represents 95% upper threshold level (UTL) with 95% coverage calculated using EPA ProUCL 5.1.

\*Insufficient data to calculate 95% UTL; therefore, site-specific BSV indicates 2x mean concentration with non-detect concentrations calculated as half the reporting limit.

2) North Carolina Department of Environmental Quality (DEQ) Preliminary Soil Remediation Goals (PSRGs) (June 2021)

3) Duplicate sample taken

Bold denotes concentration above or equal to Protection of Groundwater PSRG and site-specific BSV

Shading indicates concentration above or equal to Industrial/Commercial PSRG and site-specific BSV

Underlining indicates concentration above or equal to Industrial/Commercial PSRG and site-specific BSV

Underlining indicates concentration above or equal to Industrial/Commercial PSRG and site-specific BSV

Underlining indicates concentration above or equal to Not Calculated

J = Detected; N = Not Analyzet, N S = Not Specified; N C = Not Calculated

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.

O1 = Analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.

J6 = The sample matrix interfered with the ability to make any accurate determination; spike value is low.

BH = Method blank greater than one-half laboratory reporting limit, but sample concentration greater than 10x the method blank.

A = Continuing Calibration Verification standard recovery (82%) is less than the lower control limit (90%). Result has possible low bias.

Excavated sample locations are not shown in table.

Analytical Methods

Metals by EPA Method 6010C or 6020B

Hexavalent Chromium by EPA Method 7196 or 7199 (Phase II RI and April 2019 Data Gap Samples)

Mercury by EPA Method 7471B

Hart & Hickman, PC

# Table A-2 (page 1 of 1) Summary of Stream Sediment Analytical Data 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

Sediment Sampling Point ID	Sample Date	antimony	arsenic	barium	beryllium	cadmium	hexavalent chromium	trivalent chromium	total chromium	cobalt	copper	lead	manganese	mercury	nickel	selenium	strontium	thallium	vanadium	zinc
Site-Specific BS	<b>V</b> <sup>(1)</sup>	ND	2.74	38.4	0.48	ND	0.79	69.5	70	16.388	13.8	7.1	759	0.0078	9.92	0.409	16.9	ND	37	34
PSRG - Protection of Gro	oundwater <sup>(2)</sup>	0.90	5.8	580	63	3.0	3.8	360,000	NS	0.90	700	270	65	1.0	130	2.1	1,500	0.28	350	1,200
PSRG - Resident	ial <sup>(2)</sup>	6.3	0.68	3,100	31	14	0.31	23,000	NS	4.7	630	400	380	2.3	310	78	9,400	0.16	78	4,700
PSRG - Industrial/Com	ımercial <sup>(2)</sup>	93	3.0	47,000	470	200	6.5	350,000	NS	70	9,300	800	5,600	9.7	4,700	1,200	140,000	2.3	1,200	70,000
SED-1 (Upstream)	10/27/16	< 0.32	1.2	12	< 0.32	< 0.32	0.24 J	22.76	23	3.9	4.2	4.0	180	<0.026	3.8	< 0.64	6.9	< 0.64	19	19
OLD-1 (Opstream)	04/05/19	NA	1.95 O1	38.4 J6	0.249 J	< 0.636	0.428 J	65.0	65.4 J3, J6	7.63	8.42	NA	449 J6	0.0078	7.1	0.409 J	8.4	NA	NA	NA
	10/27/16	< 0.33	2.1	20	0.48	< 0.33	< 0.40	36	36	7.8	8.0	7.1	330	< 0.025	7.2	< 0.65	11	< 0.65	37	34
SED-2 (Upstream)	10/27/16 <sup>(3)</sup>	< 0.32	2.5	17	0.45	< 0.32	< 0.40	49	49	6.5	9.1	6.7	290	<0.026	6.0	< 0.63	12	< 0.63	35	31
OLD-2 (Opstream)	04/05/19	NA	2.74	29.6	0.305 J	< 0.619	0.796 J	56.3	57.1	20.9	13.8	NA	811	0.0053 J	9.16	0.306 J	16.9	NA	NA	NA
	04/05/19 <sup>(3)</sup>	NA	2.02	17.4	0.222 J	< 0.617	0.546 J	69.5	70	7.29	6.79	NA	347	0.0051	9.92	0.237 J	8.8	NA	NA	NA
SED-3 (Adjacent)	10/27/16	< 0.32	1.6	21	0.37	< 0.32	< 0.39	30	30	6.2	7.4	6.9	220	< 0.026	6.8	< 0.64	12	< 0.64	29	35
OLD-0 (Adjustit)	04/05/19	NA	1.36	16.4	0.111 J	< 0.607	0.670 J	13.5	14.2	5.18	20.2	NA	225	0.0054 J	4.81	< 0.607	9.2	NA	NA	NA
SED-4 (Adjacent)	10/27/16	< 0.33	1.2	8.4	< 0.33	< 0.33	<0.38	34	34	3.5	5.2	3.5	130	< 0.027	5.0	< 0.65	6.4	< 0.65	16	20
OLD-4 (Aujacent)	04/05/19	NA	2.35	20.3	0.191 J	<0.586	0.456 J	63.8	64.3	7.26	8.39	NA	293	0.0080	10.5	0.344 J	30.7	NA	NA	NA
SED-5 (Downstream)	10/27/16	< 0.31	1.4	44	0.41	< 0.31	< 0.37	51	51	9.5	8.6	22	860	<0.025	5.3	< 0.62	13	< 0.62	35	32
OLD-0 (DOWNSHEAM)	04/04/19	NA	1.82	24.3	0.233 J	< 0.617	0.595 J	16.8	17.4	5.9	8.86	NA	399	<0.0035	4.86	< 0.617	6.2	NA	NA	NA
SED-6 (Downstream)	04/04/19	NA	1.96	17.3	0.247 J	< 0.643	0.517 J	24.9	25.4	6.57	9.25	NA	308	0.0058	7.15	< 0.643	8.4	NA	NA	NA
SED-7 (Downstream)	04/04/19	NA	1.35	16.4	0.179 J	< 0.635	0.995 J	59.4	60.4	6.47	6.77	NA	262	0.0025 J	9.04	< 0.635	8.1	NA	NA	NA

#### **Notes**

Concentrations reported in milligrams per kilogram (mg/kg).

- 1) Site-Specific Background Screening Value (BSV) indicates two times the mean detected background concentration or maximum detected background concentration, whichever is smaller.
- 2) North Carolina Department of Environmental Quality (DEQ) Preliminary Soil Remediation Goals (PSRGs) (July 2021)
- 3) Duplicate sample taken.

Bold denotes concentration above or equal to Protection of Groundwater PSRG and site-specific BSVs.

Shading indicates concentration above or equal to Residential PSRG and site-specific BSVs.

<u>Underlining</u> indicates concentration above or equal to Industrial/Commercial PSRG and site-specific BSVs.

- ND Not Detected; NA Not Analyzed; NS Not Specified
- J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.
- O1 = Analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.
- J3 = The associated batch QC was outside the established quality control range for precision.
- J6 = The sample matrix interfered with the ability to make any accurate determination; spike value is low.

#### **Analytical Methods:**

Metals by EPA Method 6010C, 6020A, or 6020B

Mercury by EPA Method 7470A

Hexavalent Chromium by EPA Method 7199A

### Table A-3 (page 1 of 1) Summary of Surface Water Analytical Data 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

Surface Water Sampling Point ID	Sample Date	aluminum	antimony	arsenic	barium	beryllium	cadmium <sup>(3)</sup>	calcium	hexavalent chromium	trivalent chromium <sup>(3)</sup>	total chromium	cobalt	copper <sup>(3)</sup>	iron	lead <sup>(3)</sup>	magnesium	manganese	mercury	nicke( <sup>(3)</sup>	potassium	selenium	strontium	silver <sup>(3)</sup>	sodium	thallium	vanadium	zinc <sup>(3)</sup>	Hardness
Site-Specific BSV		NA	ND	0.44	27	ND	ND	NA	ND	ND	0.53	0.16	1.2	ND	ND	NA	22.2	ND	0.33	NA	0.11	100	ND	NA	ND	ND	ND	54,000
NC 2B Standard <sup>(2)</sup>		NS	NS	10(t)	1,000(t)	6.5	0.27	NS	11	45.08	NS	NS	5.33	NS	1.29	NS	NS	0.012(t)	25(t)	NS	5(t)	NS	0.06	NS	NS	NS	70.07	NS
BC-1 (Upstream)	2/5/2014	NA	NA	ND	24	NA	ND	NA	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA	NA	NA
0114414	11/3/2016	NA	<5.0	<10	27	<2.0	<1.0	NA	< 0.74	NA	<5.0	<5.0	<10	< 0.2	<5.0	NA	<10	< 0.2	<10	NA	<20	100	NA	NA	<10	<5.0	<30	NA
SW-1 (Upstream)	4/5/2019	NA	NA	0.44	23.1	< 0.10	<0.080	NA	NA	NA	0.53	0.16	1.2	NA	NA	NA	22.2	<0.20	0.29 J	NA	0.096 J	85.3	NA	NA	NA	NA	NA	54,000
OW 0 (Un-through)	11/3/2016	NA	<5.0	<10	27	<2.0	<1.0	NA	< 0.74	NA	<5.0	<5.0	<10	< 0.2	<5.0	NA	11	<0.2	<10	NA	<20	100	NA	NA	<10	< 5.0	<30	NA
SW-2 (Upstream)	4/5/2019	NA	NA	0.42	23.2	< 0.10	<0.080	NA	NA	NA	0.45 J	0.16	1.1	NA	NA	NA	21.2	< 0.20	0.33 J	NA	0.11 J	85.5	NA	NA	NA	NA	NA	53,600
BC-2 (Bolin Creek at Site)	6/20/2013	290	ND	0.90	27	ND	ND	16,000	NA	ND	ND	0.37	2.6	860	0.50	5,300	100	ND	1.2	2,300	ND	NA	ND	7,800	ND	ND	45	NA
BC-2 (Boilli Creek at Site)	2/5/2014	NA	NA	ND	24	NA	ND	NA	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA	NA	NA
	11/3/2016	NA	<5.0	<10	27	<2.0	<1.0	NA	< 0.74	NA	<5.0	<5.0	<10	< 0.2	<5.0	NA	34	< 0.2	<10	NA	<20	100	NA	NA	<10	<5.0	<30	NA
SW-3 (Adjacent)	11/3/2016 <sup>4</sup>	NA	<5.0	<10	27	<2.0	<1.0	NA	< 0.74	NA	<5.0	<5.0	<10	< 0.2	<5.0	NA	33	< 0.2	<10	NA	<20	110	NA	NA	<10	<5.0	<30	NA
	4/5/2019	NA	NA	0.45	25.7	<0.10	<0.080	NA	NA	NA	0.62	0.26	2.8	NA	NA	NA	37.4	<0.20	0.50	NA	0.11 J	88.88	NA	NA	NA	NA	NA	55,900
	11/3/2016	NA	<5.0	<10	27	<2.0	<1.0	NA	< 0.74	NA	<5.0	<5.0	<10	< 0.2	<5.0	NA	25	<0.2	<10	NA	<20	110	NA	NA	<10	<5.0	<30	NA
SW-4 (Adjacent)	4/5/2019	NA	NA	0.42	23.6	< 0.10	<0.080	NA	NA	NA	< 0.50	0.14	1.0	NA	NA	NA	24.6	<0.20	0.26 J	NA	0.10 J	89.1	NA	NA	NA	NA	NA	57,100
	4/5/2019 <sup>4</sup>	NA	NA	0.41	23.7	< 0.10	<0.080	NA	NA	NA	< 0.50	0.14	0.98	NA	NA	NA	24.8	<0.20	0.26 J	NA	0.088 J	87.7	NA	NA	NA	NA	NA	54,300
SW-5 (Downstream)	11/3/2016	NA	<5.0	<10	26	<2.0	<1.0	NA	<0.74U	NA	<5.0	<5.0	<10	< 0.2	<5.0	NA	24	< 0.2	<10	NA	<20	100	NA	NA	<10	<5.0	<30	NA
	4/4/2019	NA	NA	0.40	16.9	<0.10	<0.080	NA	NA	NA	< 0.50	0.14	0.88	NA	NA	NA	19.5	<0.20	0.21 J	NA	0.12 J	81.8	NA	NA	NA	NA	NA	53,400
SW-6 (Downstream)	4/4/2019	NA	NA	0.40	16.9	<0.10	<0.080	NA	NA	NA	< 0.50	0.14	0.84	NA	NA	NA	18.7	<0.20	0.21 J	NA	0.11 J	81.3	NA	NA	NA	NA	NA	53,400
SW-7 (Downstream)	4/4/2019	NA	NA	0.42	18.4	<0.10	<0.080	NA	NA	NA	< 0.50	0.16	1.1	NA	NA	NA	23.1	<0.20	0.23 J	NA	0.10 J	86.7	NA	NA	NA	NA	NA	54,400
SW-21 (Drainage Pathway)	4/5/2019	NA	NA	0.40	32.1	<0.10	<0.080	NA	NA	NA	0.73	0.36	3.2	NA	NA	NA	29.5	<0.20	0.62	NA	0.11 J	69.9	NA	NA	NA	NA	NA	31,400
. 5	4/5/2019 <sup>5</sup>	NA	NA	0.15	18.3	< 0.10	<0.080	NA	NA	NA	< 0.50	0.094 J	3.1	NA	NA	NA	9.3	< 0.20	0.43 J	NA	< 0.50	43.5	NA	NA	NA	NA	NA	22,200

#### Notes:

- Concentrations reported in micrograms per liter (µg/L).

  1) Site-Specific Background Screening Value (BSV) indicates two times the mean detected background concentration or maximum detected background concentration, whichever is smaller.

  2) North Carolina Surface Water Quality Standard (NC 2B Standard) adopted per 15A NCAC 2B Section .0100. Unless otherwise noted, values are the lowest of the Freshwater, Water Supply, and Human Health values because Boli Creek is a WS V classification surface water. Value shown is the lower of the acute versus chronic, where applicable.
- 3) 2B Standards derived using site-specific hardness data for surface water samples SW-1 through SW-7 and the DEQ Hardness-Dependent Metal Calculator dated July 26, 2021. Mean hardness for these samples was 54.5 mg/L.
- 4) Duplicate sample taken.
- 5) Sample was field filtered.

**Bold** denotes concentration above NC 2B Standard and site-specific BSV.

ND = Not Detected; NA = Not Analyzed; NS = Not Specified

- J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration
- (t) = Based upon measurement of total recoverable metal. See 15A NCAC 02B .0211 for more information.

Analytical Methods:

Metals by 6010C, 6020A, or 6020B Mercury by 7470A

Hexavalent chromium by 7199A Total hardness by Standard Method 2340B

## Table A-4 (page 1 of 1) Summary of Well Construction and Groundwater Elevation Data 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

	Dormonent or		Doto		Well	Screen	Total	Caroonad	TOC	Novemb	er 9, 2016	April 3	3, 2019	Sepembe	er 26, 2019	February	12, 2020
Well ID	Permanent or Temporary	Date Installed	Date Abandoned	Drilling Method	Material	Slot Size (in)	Depth (ft bls)	Screened Interval	Elevation (ft)	Depth to Water (ft bls)	Groundwater Elevation (ft)						
MW-1	Permanent	4/29/2013	N/A	DPT	2" PVC	0.01	40	30-40	346.12	35.48	310.64	30.90	315.22	35.67	310.45	35.22	310.90
MW-1A	Permanent	9/24/2019	N/A	Sonic	2" PVC	0.01	40	25-40	345.96					31.43	314.53	30.27	315.69
MW-2	Temporary	6/20/2013	6/20/2013	HA	Unknown	Unknown	8	Unknown									
MW-3	Permanent	1/27/2014	1/7/2015	Auger	2" PVC	0.01	11	6-11									
MW-4	Permanent	1/27/2014	1/6/2015	Auger	2" PVC	0.01	9.2	4.2-9.2									
MW-3A	Permanent	5/12/2015	N/A	Air Rotary	2" PVC	0.01	16	1-16	298.10	5.91	292.19	2.79	295.31	7.14	290.96	1.34	296.76
MW-4A	Permanent	5/14/2015	N/A	Air Rotary	2" PVC	0.01	19	4-19	298.00	6.72	291.28	3.20	294.80	7.83	290.17	2.22	295.78
MW-5	Permanent	11/2/2016	N/A	Air Rotary	2" PVC	0.01	27.5	17.5 - 27.5	369.33	9.27	360.06	7.03	362.30	10.24	359.09	9.67	359.66
MW-6	Permanent	11/2/2016	N/A	HSA	2" PVC	0.01	17.5	7.5 - 17.5	315.39	9.92	305.47	7.42	307.97	10.54	304.85	6.87	308.52
MW-7	Permanent	11/2/2016	N/A	Air Rotary	2" PVC	0.01	69.5	59.5 - 69.5	339.54	46.97	292.57	43.58	295.96	47.05	292.49	45.09	294.45
MW-8	Permanent	9/24/2019	N/A	Sonic	2" PVC	0.01	44.5	29.5-44.5	343.89					40.16	303.73	38.21	305.68
MW-9	Permanent	9/24/2019	N/A	Sonic	2" PVC	0.01	45.0	30-45	339.04					26.92	312.12	25.47	313.57
TMW-10	Temporary	9/24/2019	9/24/2019	Sonic	2" PVC	0.01	40.0	25-40	349.35					27.23*	322.12*		
MW-11D	Permanent	2/11/2020	N/A	HSA / Air Rotary	2" PVC	0.01	56.0	46-56	339.29							31.85	307.44

#### Notes

MW-1, MW-3A, MW-4A, MW-5, MW-6, and MW-7 were surveyed by CE Group on December 8, 2016.

MW-1A, MW-8, MW-9, and TMW-10 were surveyed by H&H on September 26, 2019.

MW-11D was surveyed by H&H on March 3, 2020.

ft = feet; bls = below land surface; in = inches

DPT = Direct Push Technology; HA = Hand Auger; HSA = Hollow Stem Auger

TOC = Top of Casing; -- = Not Specified; N/A = Not Applicable

<sup>\* =</sup> Depth to water gauged on September 24, 2019.

### Table A-5 (page 1 of 1) Summary of Groundwater Analytical Data 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

11892016    12			1 1		1		I					I	<u> </u>	ı	I			I		1		ı	1	1		I	I		I	l		
March   192996   148   188   189		Sample Date	urbidity	ılkalinity	ıluminum	intimony*	ırsenic	arium	eryllium	oron	admium	alcium	exavalent chromiun	rivalent chromium	otal chromium	obalt*	opper	uo.	peq	nagnesium	nanganese	nercury	nolybdenum	iickel	otassium	elenium	ilver	odium	trontium	hallium*	anadium*	inc
Marcian   Marc	2L Standard	d or IMAC	NS	NS	NS	1	10	700	4	700	2	NS	NS	NS	10	1	1,000	300	15	NS	50	1	NS	100	NS	20	20	NS	NS	0.2	0.3	1,000
## 1500015   16   16   16   16   16   16   16	_	11/9/2016	3.8	NA	NA	<0.5	<10	51	<2.0	NA	<1.0	NA	NA	NA	<5.0	0.27 J	<10	NA	<5.0	NA	580	<0.2	NA	<10	NA	23	NA	NA	190	<2.5	0.39 J	<30
## 1999   Mile	(Background)	4/3/2017	8.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4.8	NA	<10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
March   10   10   10   10   10   10   10   1			NA		5,600	ļ		· ·	1.6		ł					15				25,000	· '				· ·			34,000		1.0	38	52
March   1000			NS		1471				<b>.</b>							ļ														.,,	260	330
March   Marc	MW-1		NS		<del> </del>			· ·	<del>                                     </del>		<b>-</b>										· -								<del> </del>		200	260
Maria   Mari	_		475.0		1																										92	99
MW-14   900000000   MS   NA   NA   NA   NA   NA   NA   NA   N	-		NA 7.70		<del> </del>				1											<u> </u>	· ·										1.2 J	<30
## 2000 1   No.   16,000   O.91	100/44				+		-	· '	<del>                                     </del>		ł				+	<b> </b>					· '								· ·	-	NA NA	NA NA
220014 No. NA. NA. NA. NA. NA. NA. NA. NA. NA. NA			6.63		147 (		_	1																						1471	71	2,200
## 1   19   19   19   19   19   19   19	IVIVV-2		NA		1		1	<u> </u>			ł				1					· ·	<u> </u>							-			NA NA	2,200 NA
## 8150016   1.50   1.5	-		NΔ		1471										.,,,,	1471										.,,				1471	NA	NA
	MW-3		1.500		+			1	ł – – – – – – – – – – – – – – – – – – –		-										<b>!</b>										NA	NA
17212015   5.7	-		-		<del> </del>			ł	<b>.</b>																						NA	NA
March   Part			5.7	NA	NA	NA	ND	ļ	NA	520	ND	NA		NA	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	ND	ND	NA	NA	NA	NA	NA
11/9/2016   1.2   NA   NA   40.5   410   53   420   NA   410   NA   410   NA   410   NA   410   NA   410   NA   420   NA   410   NA   420   NA   410   NA   420   AA   410   NA   420   AA   AA   AA   AA   AA   AA   AA		2/17/2016	1.3	NA	NA	ND	ND	89	ND		ND	NA	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND	ND	ND	NA	23	ND	NA	2,400	ND	ND	ND
11992016   12   NA NA		2/17/2016²	1.3	NA	NA	ND	ND	80	ND	ND	ND	NA	NA	NA	ND	ND	ND	NA	ND	NA	23	ND	ND	ND	NA	26	ND	NA	2,100	ND	ND	ND
### 4#2019 0.00 NA NA NA NA 0.15 68.2 < 0.10 NA 0.080 NA NA NA 0.080 NA NA NA 0.050 NA NA NA 0.050 NA	MW-3A	11/9/2016	1.2	NA	NA	<0.5	<10	53	<2.0	NA	<1.0	NA	NA	NA	<5.0	<0.11	<10	NA	<5.0	NA	14	<0.2	NA	<10	NA	50	NA	NA	2,400	5.4 J	0.94 J	12 J
MW-4   252014   NA   NA   NA   NA   NA   NA   NA   N		11/9/2016 <sup>2</sup>	1.2	NA	NA	<0.5	<10	53	<2.0	NA	<1.0	NA	NA	NA	<5.0	<0.11	<10	NA	<5.0	NA	15	<0.2	NA	<10	NA	52	NA	NA	2,400	5.3 J	0.95 J	<30
##4-46   ##4-2019   ##		4/4/2019	0.00	NA	NA	NA	0.15	68.2	<0.10	NA	<0.080	NA	NA	NA	<0.50	0.21	0.55	NA	NA	NA	5.8	<0.20	NA	0.50 J	NA	34.2	NA	NA	2,950	NA	NA	NA
S20/2014***  410 NA	MW-4	2/5/2014	NA	NA	NA	NA	140	6,500	NA	NA	1.7	NA	ND	NA	930	NA	NA	NA	250	NA	NA	1.4	NA	NA	NA	99	ND	NA	NA	NA	NA	NA
MW-8   Pick			<10	NA	NA	NA	ND	75	NA	NA	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA	NA	NA	NA
Marcha   M		7/21/2015	24.7	NA	NA		ND	64	NA						ND	NA				NA				NA		ND				NA	NA	NA
MW-4A   189,0   NA   NA   ND   ND   33   ND   ND   ND   ND   ND			_					1	<u> </u>											<u> </u>											NA	NA
119/2016 4.8 NA NA < 0.5 < 0.0 36 < 0.0 NA < 0.0 NA < 0.0 NA NA NA < 0.0 NA	MW-4A		_		<del> </del>	ļ		ł			<b>-</b>					ļ															ND	34
44/2019         9.43         NA         NA         NA         C.10         22.5         0.070 J         NA	_		_		<u> </u>	<u> </u>			<del>                                     </del>		-									<u> </u>									-		ND	48
MW-6         2.5         NA         NA         < 0.5	-				<del> </del>			ł	<b>.</b>											<u> </u>	ł										<0.15	17 J
MW-6         4/3/2017         7.6         NA			+-+		+			ļ	1		ł				_					+	-										NA 4.2.1	NA 120
MW-6         4/4/2019         4.48         NA         NA         NA         0.14         283         <0.10	-		+												1																1.2 J NA	<30 NA
4/4/2019 <sup>2</sup> 4.48         NA         NA         NA         0.14         279         <0.10	MW-6							ł			<b>-</b>					ļ															NA NA	NA NA
MW-7 11/14/2016 8.9 NA NA < 0.5 < 10 10 < 2.0 NA < 1.0 NA NA < 1.0 NA	-		_		<u> </u>	<u> </u>		<b>!</b>	<del>                                     </del>											<u> </u>	<u> </u>								-		NA	NA NA
MW-7 4/3/2019 8.95 NA NA NA NA 0.13 4.5 <0.10 NA <0.080 NA					-			-								_				ļ	· ·										1.1 J	26 J
MW-8 9/26/2019 7.95 NA NA NA 6.1 219 <0.10 NA <0.080 NA	MW-7		+ -		+				ł – – – – – – – – – – – – – – – – – – –						+						<b>!</b>								-		NA	NA
	MW-8			NA												4.0				NA											NA	NA
		9/26/2019	1.74	NA	NA	NA	0.75	394	<0.20	NA	< 0.16	NA	NA	NA	<1.0	1.5	2.1	NA	NA	NA	5,060	<0.20	NA	0.41 J	NA	<1.0	NA	NA	2,160	NA	NA	NA
MW-9 2/12/2020 1.10 377,000 NA NA 0.78J 369 <0.10 NA <0.10 118,000 NA NA <1.0 2.3 1.0 NA NA 26,100 5,430 <0.20 NA <1.0 12,400 <1.0 NA 24,900 2,380 NA	MW-9	2/12/2020	1.10	377,000	NA	NA	0.78J	369	<0.10	NA	<0.10	118,000	NA	NA	<1.0	2.3	1.0	NA	NA	26,100	5,430	<0.20	NA	<1.0	12,400	<1.0	NA	24,900	2,380	NA	NA	NA
2/12/2020 <sup>2</sup> 1.10 377,000 NA NA 0.74J 338 <0.10 NA <0.10 113,000 NA NA <1.0 2.5 1.1 NA NA 25,600 5,170 <0.20 NA <1.0 12,100 <1.0 NA 24,100 2,310 NA	F	2/12/2020 <sup>2</sup>	1.10	377,000	NA	NA	0.74J	338	<0.10	NA	<0.10	113,000	NA	NA	<1.0	2.5	1.1	NA	NA	25,600	5,170	<0.20	NA	<1.0	12,100	<1.0	NA	24,100	2,310	NA	NA	NA
MW-11D 2/13/2020 8.59 413,000 NA NA 1.5 24.1 <0.10 NA <0.10 45,100 NA NA 1.7 <1.0 2.2 NA NA 30,300 14.7 <0.20 NA 5.5 145,000 0.74J NA 65,400 604 NA	MW-11D	2/13/2020	8.59	413,000	NA	NA	1.5	24.1	<0.10	NA	< 0.10	45,100	NA	NA	1.7	<1.0	2.2	NA	NA	30,300	14.7	<0.20	NA	5.5	145,000	0.74J	NA	65,400	604	NA	NA	NA

Notes:

Concentrations reported in micrograms per liter (µg/L), except turbidity which is reported in Nephelometric Turbidity Units (NTUs).

2L Standard = North Carolina Department of Environmental Quality (DEQ) 15A NCAC 02L.0202 Groundwater Standards (April 2013).

IMAC = Interim Maximum Allowable Concentration

Bold denotes concentration above or equal to the 2L Standard or IMAC and background levels

ND = Not Detected; NA = Not Analyzed; NS = Not Specified

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.

\*Reported to the method detection limit instead of laboratory reporting limit;

1) Denotes sample labeled as "Well #1" in the lab report associated with the Limited Phase II ESA prepared by Falcon.

2) Denotes duplicate sample taken.

3) Denotes sample labeled as "Well 1" in the lab report associated with the October 3, 2014 letter prepared by Falcon.

4) Denotes simple labeled as "Well 1" in the lab report associated with the October 3, 2014 letter prepared by Falcon.

4) Denotes filtered sample was also collected from MW-4 on August 20, 2014 and the results were reported in mg/kg-wet, presumably because of the high sediment load. These data are not included in this table.

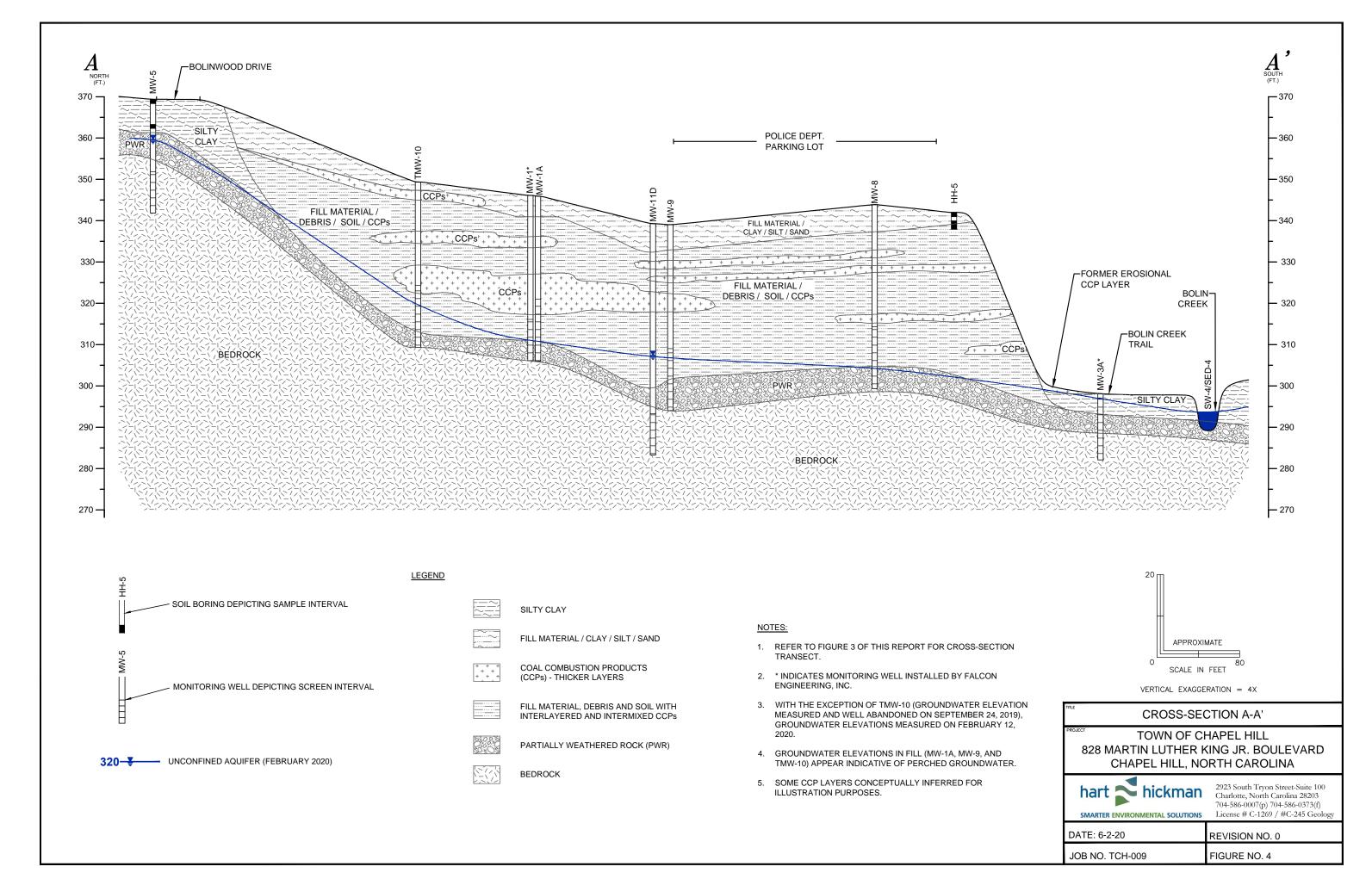
Analytical Methods:

Metals by EPA Method 6010C, 6020A, or 6020B

Hexavalent Chromium by EPA Method 7196A / SM3500

Mercury by 7470A/245.1

S:\AAA-Master Projects\Town of Chapel Hill (TCH\)TCH-002 - Police Station\Ph II RI Work\Figures\Figures\_3.26.20.dwg, FIG 3, 4/22/2020 3:00:11 PM, SVIncent



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DATE: 6-3-20

JOB NO. TCH-009

REVISION NO. 0

FIGURE NO. 5

S:AAA-Master Projects/Town of Chapel Hill (TCH)/TCH-002 - Police Station/Ph II RI Work/Figures/Cross-Section\_3.26.20.dwg, FIG 5, 6/3/2020 2:41:19 PM, SVir

### Appendix B

**Summary of Background Screening Values Calculations** 

#### Appendix B

#### **Calculation of Background Screening Values (BSVs)**

In order to determine whether metals detections are related to source materials or represent naturally-occurring background levels, site-specific Background Screening Values (BSVs) were established for the site. This appendix documents the methodology used for the BSV calculations. The ProUCL software version 5.1 (ProUCL) published by the United States Environmental Protection Agency (EPA) was used to calculate statistics on the background metals sets, as described further below. A table summarizing the calculation results and the ProUCL output sheets are included in this appendix.

#### Soil BSVs

During historical assessment activities, a total of 16 background soil samples were collected at locations upgradient of the site and outside the area of fill material. Prior reports documented calculation of 95% upper confidence limits (UCLs) for soil, which represent the upper boundary of the mean of background concentrations. UCLs are appropriate for background metals evaluations when comparing mean concentrations in the source area to mean background concentrations. However, the risk assessment for the subject site is based on maximum source area concentrations rather mean concentrations. For maximum point source concentration comparisons, EPA guidance indicates that use of the 95% Upper Tolerance Limit (UTL) with 95% coverage is more appropriate (EPA, 2015). This UTL represents the value below which 95% of the population values are expected to fall with 95% confidence.

The calculated BSVs for soil represent the 95% UTLs for the background soil data set, which were calculated using the following steps:

- A 95% UTL was calculated for multiple potential data distributions, including normal, gamma, lognormal, and nonparametric.
- A Goodness of Fit (GoF) test was run on each dataset to determine which distribution fit the background dataset.
- A 95% UTL was selected based on which distribution best fit the dataset:
  - For datasets that potentially fit both the normal and gamma distributions, the 95%
     UTL for the distribution with the highest coefficient of correlation (R) was used.

- For datasets that only fit either the normal or gamma distribution, the 95% UTL for the distribution which the dataset fit (normal or gamma) was used.
- For datasets that did not fit normal or gamma distributions, but fit the lognormal distribution, the lognormal 95% UTL was used.
- For datasets which did not fit any distribution, the nonparametric 95% UTL was used.

Non-detects were incorporated into the calculations using the Kaplan-Meier (KM) method. For thallium, Pro-UCL was unable to calculate either a 95% UTL or a mean concentration because thallium was detected in only one of the background samples. As referenced below, EPA guidance also references use of two times the mean background concentration as an appropriate method of calculating BSVs. For thallium, a value of two times the mean concentration was calculated using half of the reporting limit as the concentration for non-detect values. Note that this value is less than the maximum concentration detected in site background samples and considered conservative.

#### Sediment and Surface Water Background Screening Values

During historical assessment activities, a total of four background sediment samples and five background surface water samples were collected at locations upstream of the site and outside the area of fill material. The number of samples is insufficient to calculate a 95% UTL. EPA guidance alternately recommends use of twice the site-specific background mean concentrations as BSVs (EPA, 2018a and 2018b). These values were calculated for the subject site. In some cases, two times the mean concentrations derived values that were higher than the maximum concentrations detected in the background samples. In order to provide for additional conservatism, the BSVs used for sediment and surface water represent the lower of the maximum background concentration or twice the site-specific background mean concentration.

For the purposes of calculating the site-specific background mean concentrations, duplicate sample results were averaged with their parent sample results prior to calculating the background mean concentrations. Additionally, for datasets with non-detect values, the ProUCL software was utilized to calculate the background mean concentrations following the KM method.

#### Table B-1 (page 1 of 1) Summary of Background Screening Values (BSVs) for Soil 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

Sample ID	aluminum	antimony	arsenic	barium	beryllium	boron	cadmium	calcium	hexavalent chromium	trivalent chromium	total chromium	cobalt	соррег	iron	lead	magnesium	manganese	mercury	molybdenum	nickel	potassium	selenium	silver	sodium	strontium	thallium	vanadium	zinc
Site Background Data																											1	,
MW-5 (0-1)	NA	< 0.30	2.1	76	0.99	NA	< 0.30	NA	0.43 J	17.57	18	27	49	NA	4.0	NA	710	< 0.023	NA	5.0	NA	< 0.59	NA	NA	25	< 0.59	190	47
MW-5 (6-7)	NA	< 0.27	1.4	61	0.60	NA	< 0.27	NA	0.81	38.19	39	19	18	NA	0.55	NA	940	< 0.020	NA	20	NA	< 0.53	NA	NA	29	2.3	67	75
BG-1 (0-1)	NA	<0.28	1.9	36	0.39	NA	<0.28	NA	0.87	17.13	18	6.3	16	NA	25	NA	310	0.033	NA	5.4	NA	1.6	NA	NA	15	< 0.57	34	43
BG-1 (2-3)	NA	< 0.29	2.3	45	0.48	NA	< 0.29	NA	< 0.12	19	19	7.3	18	NA	43	NA	440	0.280	NA	6.2	NA	1.6	NA	NA	15	< 0.57	35	49
BG-2 (0-1)	NA	< 0.28	1.9	45	0.50	NA	<0.28	NA	0.84	16.16	17	7.4	18	NA	32	NA	410	0.045	NA	4.9	NA	1.1	NA	NA	14	< 0.56	35	44
BG-2 (2-3)	NA	< 0.27	1.9	52	0.53	NA	< 0.27	NA	0.70	23.3	24	7.5	20	NA	26	NA	450	0.038	NA	7.9	NA	1.7	NA	NA	19	< 0.55	37	45
BG-3 (0-1)	NA	< 0.30	1.7	44	0.43	NA	< 0.30	NA	0.21 J	23.3	16	7.5	15	NA	25	NA	410	0.024	NA	5.1	NA	1.4	NA	NA	46	< 0.60	37	40
BG-3 (2-3)	NA	< 0.27	2.2	56	0.54	NA	< 0.27	NA	0.88	21.12	22	7.5	18	NA	29	NA	410	0.040	NA	5.2	NA	1.2	NA	NA	19	< 0.53	40	46
BG-4 (0-1)	NA	< 0.29	1.7	50	0.50	NA	< 0.29	NA	< 0.13	19	19	9.5	16	NA	22	NA	450 BH	0.026	NA	6.0	NA	< 0.59	NA	NA	16 A	< 0.59	53	50
BG-4 (2-3)	NA	< 0.33	2.0	53	0.52	NA	0.38	NA	0.50 J	22.5	23	11	23	NA	21	NA	460 BH	0.054	NA	8.5	NA	< 0.65	NA	NA	19	< 0.65	51	230
BG-6 (0-1)	NA	NA	2.05 O1	64.4	0.625	NA	0.177 J	NA	5.34	39.4	44.7	14.4	26.4	NA	NA	NA	448 J6	0.022	NA	12.8	NA	0.562 J	NA	NA	17	NA	NA	NA
BG-6 (2-3)	NA	NA	2.29	66.3	0.507 J	NA	0.139 J	NA	<1.19	22.9	22.9	14.7	32.3	NA	NA	NA	467	0.032	NA	7.78	NA	0.828	NA	NA	16.8	NA	NA	NA
BG-7 (0-1)	NA	NA	1.97	52.7	0.410 J	NA	0.136 J	NA	<1.16	70.2	70.2	18.9	36.4	NA	NA	NA	813	0.025	NA	12.8	NA	0.543 J	NA	NA	22.6	NA	NA	NA
BG-7 (2-3)	NA	NA	3.08	77.9	0.430 J	NA	0.108 J	NA	<1.16	27	27	16.3	32.5	NA	NA	NA	548	0.023	NA	6.2	NA	0.502 J	NA	NA	24.3	NA	NA	NA
BG-8 (0-1)	NA	NA	1.8	52.4	0.370 J	NA	0.0951 J	NA	<1.14	24.5	24.5	21.8	62.8	NA	NA	NA	759	0.0072	NA	9.04	NA	0.485 J	NA	NA	24.4	NA	NA	NA
BG-8 (2-3)	NA	NA	1.66	47.6	0.293 J	NA	0.0918 J	NA	<1.14	21.7	21.7	23.5	60.2	NA	NA	NA	732	< 0.0067	NA	7.86	NA	0.306 J	NA	NA	25.1	NA	NA	NA
Background Statistics	7000 - 400 000	-4.0.0.0	4.40	50-1,000	ND-1.0	ND 400	4.0.40	400 000 000+	NC	NS	7-300	ND 50	2.0-20	400 - 400 000+	ND 50	FO FO 000*	*0 0 7000*	0.03-0.52	<3-15*	ND	50-37.000*	<0.1-0.8	ND-5.0	*500 50 000*	ND-300	NC	15-300	44.50
North Carolina Background Range <sup>(1)</sup>	7000 - >100,000	<1.0-8.8	1-18			ND-100	1.0-10	100-280,000*	10 40 . F 04			ND-50		100 - >100,000*			<2.0-7000*			ND 4.000	,			<500-50,000*		NS 10 FO OO		11-59
Site Specific Background Range	NA NA	ND	1.4 - 3.08	36 - 77.9	0.293 - 0.99		<0.27 - 0.38	NA	<0.12 - 5.34	16.16 - 70.2	16 - 70.2	6.3 - 27	15 - 62.8	NA	0.55 - 43	NA	310 - 940	<0.0067 - 0.28	NA	4.9 - 20	NA	<0.53 - 1.7	NA	NA	14 - 46	<0.53 - 2.3	34 - 190	40 - 230
2x Mean Background	NA NA	ND	3.994	109.92	1.014	NA	0.28	NA	1.696	52.86	53.26	27.46	57.7	NA NA	45.52	NA	1094.6	0.0842	NA	16.336	NA	1.708	NA NA	NA NA	43.4	NC	115.8	133.8
Selected 95% UTL with 95% Coverage	NA	NC	3.015	87.86	0.929	NA NA	0.313	NA	5.725	70.2	70.2	36.31	77.3	1473	59.11	NA	1149	0.256	NA	19.49	NA NA	2.503	NA	NA	43.19	NC 0.004	227	230
Recommended Site-Specific BSV <sup>(2,3)</sup>	NA	ND	3.015	87.86	0.929	NA	0.313	NA	5.725	70.2	70.2	36.31	77.3	NA	59.11	NA	1149	0.256	NA	19.49	NA	2.503	NA	NA	43.19	0.981	227	230

Hart & Hickman, PC

<sup>1)</sup> North Carolina Soil Background Range taken from Elements in North American Soils, 2nd Edition by James Dragun and Khaled Chekiri

2) Recommended Site-Specific Background Screening Value (BSV) based on 95% UTL with 95% coverage for all constituents except thallium.

3) Thallium did not have enough detects to run ProUCL statistics. Site-specific BSV was calculated as 2x the mean using 1/2 of the reporting limits as the values for non-detects.

NA = Not Analyzed; ND = Not Detected; -- = Not Calculated; UTL = Upper Tolerance Limit

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration

O1 = Analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.

J6 = The sample matrix interfered with the ability to make any accurate determination; spike value is low.

BH = Method blank greater than one-half laboratory reporting limit, but sample concentration greater than 10x the method blank.

A = Continuing Calibration Verification standard recovery (82%) is less than the lower control limit (90%). Result has possible low bias.

## Table B-2 (page 1 of 1) Summary of Background Screening Values (BSVs) for Sediment 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

Sediment Sampling Point ID	Sample Date	antimony	arsenic	barium	beryllium	cadmium	hexavalent chromium	trivalent chromium	total chromium	cobalt	copper	lead	manganese	mercury	nickel	selenium	strontium	thallium	vanadium	zinc
SED-1 (Upstream)	10/27/2016	< 0.32	1.2	12	< 0.32	< 0.32	0.24 J	22.76	23	3.9	4.2	4.0	180	<0.026	3.8	<0.64	6.9	<0.64	19	19
SED-1 (Opstream)	4/5/2019	NA	1.95 O1	38.4 J6	0.249 J	< 0.636	0.428 J	65.0	65.4 J3, J6	7.63	8.42	NA	449 J6	0.0078	7.1	0.409 J	8.4	NA	NA	NA
	10/27/2016	< 0.33	2.1	20	0.48	< 0.33	<0.40	36	36	7.8	8.0	7.1	330	<0.025	7.2	< 0.65	11	< 0.65	37	34
SED-2 (Upstream)	10/27/2016 <sup>(1)</sup>	< 0.32	2.5	17	0.45	< 0.32	< 0.40	49	49	6.5	9.1	6.7	290	< 0.026	6.0	< 0.63	12	< 0.63	35	31
SED-2 (Opstream)	4/5/2019	NA	2.74	29.6	0.305 J	< 0.619	0.796 J	56.3	57.1	20.9	13.8	NA	811	0.0053 J	9.16	0.306 J	16.9	NA	NA	NA
	4/5/2019 <sup>(1)</sup>	NA	2.02	17.4	0.222 J	< 0.617	0.546 J	69.5	70	7.29	6.79	NA	347	0.0051	9.92	0.237 J	8.8	NA	NA	NA
Background Site-Specific Background Range Site-Specific Mean <sup>(2)</sup>		ND ND	1.2-2.74 1.958	12-38.4 23.1	<0.32-0.48 0.308	<0.32-<0.636 ND	0.24 J-0.796 J 0.395	22.76-69.5 48.28	23-70 48.61	3.9-20.9 8.194	4.2-13.8 7.866	4.0-7.1 5.45	180-811 379.5	<0.026 - 0.0078 0.0065	3.8-9.92 6.76	0.237 J-<0.65 0.34	6.9-16.9 9.913	<0.63-<0.65 ND	19-37 27.5	19-34 25.75
2X Site-Specific Mean  Recommended Sit	e-Specific BSV <sup>(3)</sup>	ND ND	3.916 2.74	46.2 38.4	0.616 0.48	ND ND	0.79 0.79	96.56 69.5	97.22 70	16.388 16.388	15.732 13.8	10.9 7.1	759 759	0.013 0.0078	13.52 9.92	0.68 0.409	19.826 16.9	ND ND	55 37	51.5 34

#### Notes

- 1) Duplicate sample data, average of parent sample and duplicate used in calculations.
- 2) Site-specific mean for datasets with non-detects calculated using Kaplan-Meier Method via ProUCL version 5.1.
- 3) Recommended Site-Specific Background Screening Value (BSV) indicates 2x mean background concentration or maximum detected concentration, whichever is lower.
- NA = Not Analyzed; ND = Not Detected
- J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.
- O1 = Analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.
- J3 = The associated batch QC was outside the established quality control range for precision.
- J6 = The sample matrix interfered with the ability to make any accurate determination; spike value is low.

## Table B-3 (page 1 of 1) Summary of Background Screening Values (BSVs) for Surface Water 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job No. TCH-009

Surface Water Background Sample Location	Sample Date	aluminum	antimony	arsenic	barium	beryllium	cadmium	calcium	hexavalent chromium	trivalent chromium	total chromium	cobalt	copper	iron	lead	magnesium	manganese	mercury	nickel	potassium	selenium	strontium	silver	sodium	thallium	vanadium	zinc	Hardness
BC-1 (Upstream)	2/5/2014	NA	NA	ND	24	NA	ND	NA	ND	ND	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA	NA	NA
SW-1 (Upstream)	11/3/2016	NA	< 5.0	<10	27	<2.0	<1.0	NA	< 0.74	NA	< 5.0	<5.0	<10	< 0.2	<5.0	NA	<10	< 0.2	<10	NA	<20	100	NA	NA	<10	< 5.0	<30	NA
SW-1 (Opstream)	4/5/2019	NA	NA	0.44	23.1	< 0.10	< 0.080	NA	NA	NA	0.53	0.16	1.2	NA	NA	NA	22.2	< 0.20	0.29 J	NA	0.096 J	85.3	NA	NA	NA	NA	NA	54,000
014 0 (114	11/3/2016	NA	< 5.0	<10	27	<2.0	<1.0	NA	< 0.74	NA	< 5.0	< 5.0	<10	< 0.2	< 5.0	NA	11	< 0.2	<10	NA	<20	100	NA	NA	<10	< 5.0	<30	NA
SW-2 (Upstream)	4/5/2019	NA	NA	0.42	23.2	< 0.10	< 0.080	NA	NA	NA	0.45 J	0.16	1.1	NA	NA	NA	21.2	< 0.20	0.33 J	NA	0.11 J	85.5	NA	NA	NA	NA	NA	53,600
Background Stati Site Specific Background Ran Site Specific Mean <sup>(1)</sup>		NA	ND	<10 - 0.44	23.1 - 27 24.86	ND	ND	NA	ND	ND			<10 - 1.2	ND	ND	NA	<10 - 22.2	ND	<10 - 0.33 J	NA	<20 - 0.11 J	85.3 - 100 92.7	ND ND	NA	ND ND	ND	ND	53,600 - 54,000
2X Site Specific Mean		NA NA	ND ND	0.43 0.86	24.86 49.72	ND ND	ND ND	NA NA	ND	ND ND	0.49 0.98	1.33 <sup>(3)</sup> 2.66	1.15 2.3	ND ND	ND ND	NA NA	16.1 32.2	ND ND	0.31 0.62	NA NA	0.103 0.206	92.7 185.4	ND ND	NA NA	ND ND	ND ND	ND ND	53,800 107,600
Recommended Site-Spe	ecific BSV <sup>(2)</sup>	NA	ND	0.44	27	ND	ND	NA	ND	ND	0.53	0.16	1.2	ND	ND	NA	22.2	ND	0.33	NA	0.11	100	ND	NA	ND	ND	ND	54,000

Notes:

1) Site specific mean for datasets with non-detects calculated using Kaplan-Meier Method via ProUCL version 5.1

2) Recommended Site-Specific Background Screening Value (BSV) indicates 2x mean background concentration or maximum detected concentration, whichever is lower.

3) The Kaplan-Meier mean could not be calculated for Cobalt, as there was only one unique detection. Therefore, the site-specific mean was calculated using 1/2 of the reporting limits as the values for non-detects.

NA = Not Analyzed; ND = Not Detected; NC = Not Calculated

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration

	Background Statistics for	or Data Sets	with Non-Detects	
User Selected Options				
Date/Time of Computation	ProUCL 5.18/17/2021 4:	10:55 PM		
·	ProUCL Background Inpo			
Full Precision	OFF			
	95%			
	95%			
Different or Future K Observations	1			
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ramber of Bostonap operanone				
antimony				
		General S	Statistics	
Total	Number of Observations	10	Number of Missing Observations	6
Number	of Distinct Observations	5	J	
	Number of Detects	0	Number of Non-Detects	10
NL	umber of Distinct Detects	0	Number of Distinct Non-Detects	5
	Minimum Detect	N/A	Minimum Non-Detect	0.27
	Maximum Detect	N/A	Maximum Non-Detect	0.33
	Variance Detected	N/A	Percent Non-Detects	100%
	Mean Detected	N/A	SD Detected	N/A
Mean	of Detected Logged Data	N/A	SD of Detected Logged Data	N/A
ı ıvıdan c	or Dottottoa Loggod Data	1477	05 01 50100104 E09904 5414	1071
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Warning: All obse	ervations are Non-Detects	s (NDs), ther	refore all statistics and estimates should also be NDsI	
=			refore all statistics and estimates should also be NDs!	
Specifically, sample	e mean, UCLs, UPLs, and	d other statis	tics are also NDs lying below the largest detection limit!	n
Specifically, sample	e mean, UCLs, UPLs, and	d other statis		).
Specifically, sample	e mean, UCLs, UPLs, and cide to use alternative si	l other statis te specific va	tics are also NDs lying below the largest detection limit! alues to estimate environmental parameters (e.g., EPC, BTV	').
Specifically, sample	e mean, UCLs, UPLs, and cide to use alternative si	l other statis te specific va	tics are also NDs lying below the largest detection limit!	').
Specifically, sample	e mean, UCLs, UPLs, and cide to use alternative si	l other statis te specific va	tics are also NDs lying below the largest detection limit! alues to estimate environmental parameters (e.g., EPC, BTV	).
Specifically, sample The Project Team may de	e mean, UCLs, UPLs, and cide to use alternative si	l other statis te specific va	tics are also NDs lying below the largest detection limit! alues to estimate environmental parameters (e.g., EPC, BTV	<b>')</b> .
Specifically, sample	e mean, UCLs, UPLs, and cide to use alternative si	l other statis te specific va	tics are also NDs lying below the largest detection limit! alues to estimate environmental parameters (e.g., EPC, BTV	).
Specifically, sample The Project Team may de	e mean, UCLs, UPLs, and cide to use alternative si	l other statis te specific va	tics are also NDs lying below the largest detection limit! alues to estimate environmental parameters (e.g., EPC, BTV	).
Specifically, sample The Project Team may de	e mean, UCLs, UPLs, and cide to use alternative si	d other statis te specific va r variable an	tics are also NDs lying below the largest detection limit! alues to estimate environmental parameters (e.g., EPC, BTV timony was not processed!	
Specifically, sample The Project Team may de	mean, UCLs, UPLs, and cide to use alternative side to	d other statis te specific va r variable an	tics are also NDs lying below the largest detection limit! alues to estimate environmental parameters (e.g., EPC, BTV timony was not processed!  Number of Distinct Observations	13
Specifically, sample The Project Team may de	mean, UCLs, UPLs, and cide to use alternative side to	d other statis te specific va r variable an	Number of Distinct Observations  First Quartile	13 1.775
Specifically, sample The Project Team may de	mean, UCLs, UPLs, and cide to use alternative side to	to ther statiste specific variable and the specific variable variabl	Number of Distinct Observations  First Quartile  Median	13 1.775 1.935
Specifically, sample The Project Team may de	mean, UCLs, UPLs, and cide to use alternative side to	te specific variable and the specific variab	Number of Distinct Observations  First Quartile	13 1.775 1.935 2.125
Specifically, sample The Project Team may de	The data set for Number of Observations  Minimum  Second Largest	to ther statiste specific variable and the specific variable variabl	Number of Distinct Observations  First Quartile  Median	13 1.775 1.935
Specifically, sample The Project Team may de	nean, UCLs, UPLs, and cide to use alternative side to	te specific variable and the specific variab	tics are also NDs lying below the largest detection limit! alues to estimate environmental parameters (e.g., EPC, BTV timony was not processed!  Number of Distinct Observations First Quartile Median Third Quartile	13 1.775 1.935 2.125
Specifically, sample The Project Team may de	Number of Observations  Minimum  Second Largest  Mean	te specific variable and the specific variab	Number of Distinct Observations First Quartile Median Third Quartile SD	13 1.775 1.935 2.125 0.376
Specifically, sample The Project Team may de	Number of Observations  Minimum  Second Largest  Maximum  Mean  Coefficient of Variation  Mean of logged Data	16 1.4 2.3 3.08 1.997 0.188 0.676	Number of Distinct Observations First Quartile Median Third Quartile SD Skewness SD of logged Data	13 1.775 1.935 2.125 0.376 1.463
Specifically, sample The Project Team may de	Number of Observations  Minimum  Second Largest  Maximum  Mean  Coefficient of Variation  Mean of logged Data	16 1.4 2.3 3.08 1.997 0.188 0.676	Number of Distinct Observations First Quartile Median Third Quartile SD Skewness	13 1.775 1.935 2.125 0.376 1.463
Specifically, sample The Project Team may de  arsenic  General Statistics  Total	Number of Observations  Minimum  Second Largest  Maximum  Mean  Coefficient of Variation  Mean of logged Data	16 1.4 2.3 3.08 1.997 0.188 0.676	Number of Distinct Observations First Quartile Median Third Quartile SD Skewness SD of logged Data	13 1.775 1.935 2.125 0.376 1.463
Specifically, sample The Project Team may de  arsenic  General Statistics  Total	Number of Observations Minimum Second Largest Maximum Mean Coefficient of Variation Mean of logged Data Critical Values for	16 1.4 2.3 3.08 1.997 0.188 0.676	Number of Distinct Observations First Quartile Median Third Quartile SD Skewness SD of logged Data	13 1.775 1.935 2.125 0.376 1.463 0.176
Specifically, sample The Project Team may de  arsenic  General Statistics  Total	Number of Observations Minimum Second Largest Maximum Mean Coefficient of Variation Mean of logged Data Critical Values for	16 1.4 2.3 3.08 1.997 0.188 0.676	Number of Distinct Observations First Quartile Median Third Quartile SD Skewness SD of logged Data	13 1.775 1.935 2.125 0.376 1.463 0.176
Specifically, sample The Project Team may de  arsenic  General Statistics  Total	Number of Observations Minimum Second Largest Maximum Mean Coefficient of Variation Mean of logged Data Critical Values for	16 1.4 2.3 3.08 1.997 0.188 0.676	Number of Distinct Observations First Quartile Median Third Quartile SD Skewness SD of logged Data	13 1.775 1.935 2.125 0.376 1.463 0.176
Specifically, sample The Project Team may decomposite of the Proje	Number of Observations Minimum Second Largest Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values for	16 1.4 2.3 3.08 1.997 0.188 0.676  Normal G	Number of Distinct Observations First Quartile Median Third Quartile SD Skewness SD of logged Data  Md Threshold Values (BTVs)  Males to estimate environmental parameters (e.g., EPC, BTV)  Number of Distinct Observations First Quartile Median Third Quartile SD Skewness SD of logged Data	13 1.775 1.935 2.125 0.376 1.463 0.176
Specifically, sample The Project Team may decomposite of the Proje	Number of Observations Minimum Second Largest Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values for ance Factor K (For UTL)	16 1.4 2.3 3.08 1.997 0.188 0.676  Dr Backgrour 2.524  Normal G 0.887	Number of Distinct Observations First Quartile Median Third Quartile SD Skewness SD of logged Data  Md Threshold Values (BTVs)  GOF Test  Shapiro Wilk GOF Test	13 1.775 1.935 2.125 0.376 1.463 0.176
Specifically, sample The Project Team may de  arsenic  General Statistics  Total  Toler  SI  5% St	Number of Observations Minimum Second Largest Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values for ance Factor K (For UTL)  hapiro Wilk Test Statistic hapiro Wilk Critical Value	16 1.4 2.3 3.08 1.997 0.188 0.676  Normal G 0.887 0.887	Number of Distinct Observations First Quartile Median Third Quartile SD Skewness SD of logged Data  Md Threshold Values (BTVs)  GOF Test  Shapiro Wilk GOF Test Data appear Normal at 5% Significance Level	13 1.775 1.935 2.125 0.376 1.463 0.176

	tatistics Ass	suming Normal Distribution	
95% UTL with 95% Coverage	2.946	90% Percentile (z)	2.47
95% UPL (t)	2.676	95% Percentile (z)	2.61
95% USL	2.915	99% Percentile (z)	2.87
	Gamma	GOF Test	
A-D Test Statistic	0.399	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance	e Leve
K-S Test Statistic	0.124	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significance	e Leve
Detected data appear	Gamma Di	stributed at 5% Significance Level	
		<del>`</del>	
	Gamma	Statistics	
k hat (MLE)	33.27	k star (bias corrected MLE)	27.0
Theta hat (MLE)	0.06	Theta star (bias corrected MLE)	0.07
nu hat (MLE)	1065	nu star (bias corrected)	866.4
MLE Mean (bias corrected)	1.997	MLE Sd (bias corrected)	0.38
Background St	atistics Ass	uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	2.69	90% Percentile	2.50
95% Hawkins Wixley (HW) Approx. Gamma UPL	2.693	95% Percentile	2.66
95% WH Approx. Gamma UTL with 95% Coverage	3.015	99% Percentile	2.99
95% HW Approx. Gamma UTL with 95% Coverage	3.027		
95% WH USL	2.977	95% HW USL	2.98
	Lognorma	I GOF Test	
Shapiro Wilk Test Statistic	0.948	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.125	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear	Lognormal	at 5% Significance Level	
Background Sta	tistics assu	ming Lognormal Distribution	
95% UTL with 95% Coverage	3.069	90% Percentile (z)	2.46
95% UPL (t)	2.705	95% Percentile (z)	2.62
95% USL	3.026	99% Percentile (z)	2.96
Nonnerometria	Dietribution	Free Background Statistics	
nonparametric i		: 5% Significance Level	
Data annea			
Data appea	ii Nomara		
Nonparametric Upp	er Limits fo	r Background Threshold Values	
Nonparametric Upp Order of Statistic, r	er Limits fo	r Background Threshold Values  95% UTL with 95% Coverage	3.08
Nonparametric Upp	er Limits fo	r Background Threshold Values  95% UTL with 95% Coverage  Approximate Actual Confidence Coefficient achieved by UTL	0.56
Nonparametric Upp Order of Statistic, r Approx, f used to compute achieved CC	er Limits fo 16 0.842	r Background Threshold Values  95% UTL with 95% Coverage  Approximate Actual Confidence Coefficient achieved by UTL  Approximate Sample Size needed to achieve specified CC	0.56 59
Nonparametric Upp Order of Statistic, r Approx, f used to compute achieved CC 95% Percentile Bootstrap UTL with 95% Coverage	er Limits fo 16 0.842 3.08	Packground Threshold Values  95% UTL with 95% Coverage  Approximate Actual Confidence Coefficient achieved by UTL  Approximate Sample Size needed to achieve specified CC  95% BCA Bootstrap UTL with 95% Coverage	0.56 59 3.08
Nonparametric Upp Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL	er Limits fo 16 0.842 3.08 3.08	r Background Threshold Values  95% UTL with 95% Coverage  Approximate Actual Confidence Coefficient achieved by UTL  Approximate Sample Size needed to achieve specified CC  95% BCA Bootstrap UTL with 95% Coverage  90% Percentile	0.56 59 3.08 2.29
Nonparametric Upp Order of Statistic, r Approx, f used to compute achieved CC 95% Percentile Bootstrap UTL with 95% Coverage	er Limits fo 16 0.842 3.08	Packground Threshold Values  95% UTL with 95% Coverage  Approximate Actual Confidence Coefficient achieved by UTL  Approximate Sample Size needed to achieve specified CC  95% BCA Bootstrap UTL with 95% Coverage	0.56

Note: The use of USL tends to yield a conservative	e estimate	of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV of	only when th	ne data set represents a background data set free of outliers	
and consists of observa	tions collect	ed from clean unimpacted locations.	
The use of USL tends to provide a balan-	ce between	false positives and false negatives provided the data	
represents a background data set and wh	en many or	site observations need to be compared with the BTV.	
barium			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	15
Minimum	36	First Quartile	46.95
Second Largest	76	Median	52.55
Maximum	77.9	Third Quartile	61.85
Mean	54.96	SD	11.56
Coefficient of Variation	0.21	Skewness	0.653
Mean of logged Data	3.986	SD of logged Data	0.206
		nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.524	d2max (for USL)	2.443
	N	2057	
Chaning Will, Took Chatishin		GOF Test	
Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value	0.942	Shapiro Wilk GOF Test  Data appear Normal at 5% Significance Level	
5% Shapiro Wilk Childar Value  Lilliefors Test Statistic	0.887	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level	
		: 5% Significance Level	
Data appea	ii Nomiai ai	. 070 Oignineance cever	
Background St	atistics Ass	suming Normal Distribution	
95% UTL with 95% Coverage	84.14	90% Percentile (z)	69.77
95% UPL (t)	75.85	95% Percentile (z)	73.97
95% USL	83.21	99% Percentile (z)	81.85
		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
	Gamma	GOF Test	
A-D Test Statistic	0.321	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significan	ce Level
K-S Test Statistic	0.17	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significan	ce Level
Detected data appear	Gamma Dis	stributed at 5% Significance Level	
	Gamma	Statistics	
k hat (MLE)	25.01	k star (bias corrected MLE)	20.36
Theta hat (MLE)	2.197	Theta star (bias corrected MLE)	2.699
nu hat (MLE)	800.4	nu star (bias corrected)	651.7
MLE Mean (bias corrected)	54.96	MLE Sd (bias corrected)	12.18
=		uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	77.19	90% Percentile	71.03
95% Hawkins Wixley (HW) Approx. Gamma UPL	77.42	95% Percentile	76.4
95% WH Approx. Gamma UTL with 95% Coverage	87.86	99% Percentile	87.18

95% HW Approx. Gamma UTL with 95% Coverage	88.48		
95% WH USL	86.61	95% HW USL	87.18
	Lognorma	I GOF Test	
Shapiro Wilk Test Statistic	0.968	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.156	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear	Lognormal	at 5% Significance Level	
		ming Lognormal Distribution	
95% UTL with 95% Coverage	90.65	90% Percentile (z)	70.16
95% UPL (t)	78.19	95% Percentile (z)	75.62
95% USL	89.16	99% Percentile (z)	87.03
Namananakia	Distrik - dis -	Face Declaration of Obstitution	
		Free Background Statistics t 5% Significance Level	
Data appea	ir ivormai a	t 5% Significance Level	
Nama and a state of the	au liualka fa	r Background Threshold Values	
• • • • • • • • • • • • • • • • • • • •			77.0
Order of Statistic, r	16	95% UTL with 95% Coverage	77.9
Approx, f used to compute achieved CC	0.842	Approximate Actual Confidence Coefficient achieved by UTL	0.56
050/ 5	77.0	Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	77.9	95% BCA Bootstrap UTL with 95% Coverage	77.9
95% UPL	77.9	90% Percentile	71.15
90% Chebyshev UPL	90.71	95% Percentile	76.48
95% Chebyshev UPL	106.9	99% Percentile	77.62
95% USL	77.9		
		of BTV, especially when the sample size starts exceeding 20.	
		ne data set represents a background data set free of outliers	
		ted from clean unimpacted locations.	
		false positives and false negatives provided the data	
represents a background data set and wh	en many o	nsite observations need to be compared with the BTV.	
eryllium			
eneral Statistics			
Total Number of Observations	16	Number of Distinct Observations	14
Minimum	0.293	First Quartile	0.42
Second Largest	0.625	Median	0.5
Maximum	0.99	Third Quartile	0.53
Mean	0.507	SD	0.15
Coefficient of Variation	0.305	Skewness	2.049
Mean of logged Data	-0.715	SD of logged Data	0.26
Critical Values for	r Backgrou	ind Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.524	d2max (for USL)	2.443
	NI -	005 7	
Charles Wills Task Contact		GOF Test	
Shapiro Wilk Test Statistic	0.813	Shapiro Wilk GOF Test	

5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.228	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level	
Data Not	Normal at 5	% Significance Level	
B		No. 10 to 10	
		ruming Normal Distribution	0.705
95% UTL with 95% Coverage	0.897	90% Percentile (z)	0.705
95% UPL (t)	0.786	95% Percentile (z)	0.761
95% USL	0.885	99% Percentile (z)	0.867
	Gamma (	GOF Test	
A-D Test Statistic	0.558	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance	ce Level
K-S Test Statistic	0.185	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.215	Detected data appear Gamma Distributed at 5% Significand	ce Level
Detected data appear	r Gamma Dis	stributed at 5% Significance Level	
	Gamma		
k hat (MLE)	14.04	k star (bias corrected MLE)	11.45
Theta hat (MLE)	0.0361	Theta star (bias corrected MLE)	0.0443
nu hat (MLE)	449.4	nu star (bias corrected)	366.5
MLE Mean (bias corrected)	0.507	MLE Sd (bias corrected)	0.15
Background S	tatistics Assi	uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	0.787	90% Percentile	0.706
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.788	95% Percentile	0.776
95% WH Approx. Gamma UTL with 95% Coverage	0.929	99% Percentile	0.919
95% HW Approx. Gamma UTL with 95% Coverage	0.936	oo % 1 oreentale	0.010
95% WH USL	0.912	95% HW USL	0.918
55% 552	0.0.2	557 552	
	Lognormal	GOF Test	
_ · · · · · · · · · · · · · · · · · · ·	0.933	Shapiro Wilk Lognormal GOF Test	
Shapiro Wilk Test Statistic			
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
5% Shapiro Wilk Critical Value Lilliefors Test Statistic	0.887 0.169	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test	
5% Shapiro Wilk Critical Value  Lilliefors Test Statistic  5% Lilliefors Critical Value	0.887 0.169 0.213	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level	
5% Shapiro Wilk Critical Value  Lilliefors Test Statistic  5% Lilliefors Critical Value	0.887 0.169 0.213	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test	
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear	0.887 0.169 0.213	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level	
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear	0.887 0.169 0.213	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level  at 5% Significance Level	0.69
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear  Background Sta	0.887 0.169 0.213 • Lognormal a	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level  at 5% Significance Level  ming Lognormal Distribution	0.69
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear  Background Sta  95% UTL with 95% Coverage	0.887 0.169 0.213 Lognormal attistics assur 0.962	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level  at 5% Significance Level  ming Lognormal Distribution  90% Percentile (z)	0.76
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear  Background Sta  95% UTL with 95% Coverage 95% UPL (t)	0.887 0.169 0.213 • Lognormal a atistics assur 0.962 0.794	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level  at 5% Significance Level  ming Lognormal Distribution  90% Percentile (z)  95% Percentile (z)	0.76
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear  Background Sta  95% UTL with 95% Coverage 95% UPL (t) 95% USL	0.887 0.169 0.213 Lognormal and the state of the state	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level  at 5% Significance Level  ming Lognormal Distribution  90% Percentile (z)  95% Percentile (z)	0.76
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear  Background Sta 95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric	0.887 0.169 0.213 • Lognormal and tistics assured tistics assured to 1.962 0.794 0.942 • Distribution	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level at 5% Significance Level  ming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z)	0.76
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear  Background Sta  95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric Data appear Gar	0.887 0.169 0.213 Lognormal attistics assur 0.962 0.794 0.942  Distribution	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level at 5% Significance Level  ming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z)  99% Percentile (z)  free Background Statistics uted at 5% Significance Level	0.76
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear  Background Sta  95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric Data appear Gar	0.887 0.169 0.213 Lognormal and Section 1	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level at 5% Significance Level  ming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)  Free Background Statistics atted at 5% Significance Level	0.76
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear  Background Sta 95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric Data appear Gar  Nonparametric Upp Order of Statistic, r	0.887 0.169 0.213 Lognormal and istics assur 0.962 0.794 0.942  Distribution mma Distribution mma Distribution 16	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level  at 5% Significance Level  ming Lognormal Distribution  90% Percentile (z)  95% Percentile (z)  99% Percentile (z)  Free Background Statistics  atted at 5% Significance Level  Background Threshold Values  95% UTL with 95% Coverage	0.76 0.913
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear  Background Sta 95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric Data appear Gar	0.887 0.169 0.213 Lognormal and Section 1	Data appear Lognormal at 5% Significance Level  Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level at 5% Significance Level  ming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)  Free Background Statistics atted at 5% Significance Level	0.76 0.913

Gamma GOF	Tests on De	tected Observations Only	
DL/2 is not a recommended method	od. DL/2 pro	vided for comparisons and historical reasons	
99% Percentile (z)	0.301	95% USL	0.309
90% Percentile (z)	0.233	95% Percentile (z)	0.257
95% UTL95% Coverage	0.314	95% UPL (t)	0.267
Mean	0.15	SD SD	0.0648
DI /2 Substitution Reads	round Static	stics Assuming Normal Distribution	
99% KM Percentile (z)	0.299	95% KM USL	0.307
90% KM Percentile (z)	0.228	95% KM Percentile (z)	0.253
95% UTL95% Coverage	0.313	95% KM UPL (t)	0.264
KM Mean	0.14	KM SD	0.0682
Kaplan Meier (KM) Back	ground Stat	istics Assuming Normal Distribution	
Detected Data appear	~hh.oximate	5 Normal at 376 Significatice Level	
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level  Normal at 5% Significance Level	el
Lilliefors Test Statistic	0.3	Lilliefors GOF Test	<u>-1</u>
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level	
Shapiro Wilk Test Statistic	0.712	Shapiro Wilk GOF Test	
		on Detects Only	
		, ,	
Tolerance Factor K (For UTL)	2.524	d2max (for USL)	2.443
Critical Values fo	r Backgrou	nd Threshold Values (BTVs)	
Mean of Detected Logged Data	-1.948	SD of Detected Logged Data	0.491
Mean of Detected Learned Date	0.161	SD Detected	0.101
Variance Detected	0.0102	Percent Non-Detects	56.25%
Maximum Detect	0.38	Maximum Non-Detect	0.3
Minimum Detect	0.0918	Minimum Non-Detect	0.27
Number of Distinct Detects	7	Number of Distinct Non-Detects	4
Number of Detects	7	Number of Non-Detects	9
Number of Distinct Observations	11		
Total Number of Observations	16	Number of Missing Observations	0
	General S	Statistics	
cadmium			
represents a background data set and wh	en many on	site observations need to be compared with the BTV.	
The use of USL tends to provide a balance	ce between t	false positives and false negatives provided the data	
and consists of observation	tions collecte	ed from clean unimpacted locations.	
Therefore, one may use USL to estimate a BTV of	only when the	e data set represents a background data set free of outliers	
Note: The use of USL tends to yield a conservative	ve estimate o	of BTV, especially when the sample size starts exceeding 20.	
95% USL	0.99		
95% Chebyshev UPL	1.201	99% Percentile	0.935
90% Chebyshev UPL	0.985	95% Percentile	0.716

K O T		0.007	K-I 0 005	
	est Statistic	0.267	Kolmogorov-Smirnov GOF	
	critical Value		Detected data appear Gamma Distributed at 5% Signific stributed at 5% Significance Level	ance Level
Detected	uata appeai	Gaillilla Di	subuted at 5% Significance Level	
	Gamma	Statistics on	Detected Data Only	
	k hat (MLE)	4.282	k star (bias corrected MLE	2.542
	a hat (MLE)	0.0376	Theta star (bias corrected MLE	′
	u hat (MLE)	59.94	nu star (bias correcte	·
MLE Mean (bia	` '	0.161	(5.25 65.163.5	.,
MLE Sd (bia	,	0.101	95% Percentile of Chisquare (2ksta	r) 11.2
	,			7
G	amma ROS	Statistics us	sing Imputed Non-Detects	
			NDs with many tied observations at multiple DLs	
GROS may not be used when kstar of	of detects is s	mall such as	s <1.0, especially when the sample size is small (e.g., <15-2	0)
For such situation	ons, GROS r	nethod may	yield incorrect values of UCLs and BTVs	
Т	his is especia	ally true whe	n the sample size is small.	
For gamma distributed detected of	data, BTVs a	nd UCLs ma	y be computed using gamma distribution on KM estimates	
	Minimum	0.0789	Mea	n 0.143
	Maximum	0.38	Media	n 0.131
	SD	0.0718	C	V 0.503
	k hat (MLE)	6.178	k star (bias corrected MLI	5.062
Thet	a hat (MLE)	0.0231	Theta star (bias corrected MLE	0.0282
n	u hat (MLE)	197.7	nu star (bias corrected	1) 162
MLE Mean (bia	s corrected)	0.143	MLE Sd (bias corrected	0.0634
95% Percentile of Chisqu	are (2kstar)	18.48	90% Percenti	e 0.228
959	% Percentile	0.26	99% Percentil	0.33
The following stati	stics are cor	nputed usin	g Gamma ROS Statistics on Imputed Data	
Upper Limits (	using Wilson	Hilferty (WI	H) and Hawkins Wixley (HW) Methods	
	WH	HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.335	0.339	95% Approx. Gamma UPL 0.266	0.266
95% Gamma USL	0.327	0.33		
				'
Est	timates of G	amma Parai	meters using KM Estimates	
	Mean (KM)	0.14	SD (KN	0.0682
Va	riance (KM)	0.00465	SE of Mean (KN	0.0207
	k hat (KM)	4.238	k star (KN	3.485
	nu hat (KM)	135.6	nu star (KN	l) 111.5
the	eta hat (KM)	0.0331	theta star (KN	0.0403
80% gamma per	centile (KM)	0.197	90% gamma percentile (KN	
95% gamma per	centile (KM)	0.283	99% gamma percentile (KN	0.371
		· -	ng gamma distribution and KM estimates	
Upper Limits			H) and Hawkins Wixley (HW) Methods	
	WH	HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.313	0.314	95% Approx. Gamma UPL 0.252	0.25
95% KM Gamma Percentile	0.239	0.237	95% Gamma USL 0.306	0.307
			etected Observations Only	
Shapiro Wilk T		0.851	Shapiro Wilk GOF Test	
5% Shapiro Wilk C	ritical Value	0.803	Detected Data appear Lognormal at 5% Significance	Level

		T	
Lilliefors Test Statistic	0.235	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Le	evel
Detected Data ap	pear Logno	rmal at 5% Significance Level	
Rackground Lognormal ROS Statistics	Assuming	Lognormal Distribution Using Imputed Non-Detects	
Mean in Original Scale	0.143	Mean in Log Scale	-2.02
SD in Original Scale	0.0693	SD in Log Scale	0.358
95% UTL95% Coverage	0.327	95% BCA UTL95% Coverage	0.38
95% Bootstrap (%) UTL95% Coverage	0.327	95% UPL (t)	0.253
90% Percentile (z)	0.38	95% Percentile (z)	0.239
99% Percentile (z)	0.305	95% USL	0.239
3370 1 313311113 (2)	0.000	307, 302	0.010
Statistics using KM estimates	on Logged	Data and Assuming Lognormal Distribution	
KM Mean of Logged Data	-2.04	95% KM UTL (Lognormal)95% Coverage	0.32
KM SD of Logged Data	0.357	95% KM UPL (Lognormal)	0.248
95% KM Percentile Lognormal (z)	0.234	95% KM USL (Lognormal)	0.311
Parlament PL 0	N-41-41- A	Distribution	
Mean in Original Scale	0.15	ssuming Lognormal Distribution  Mean in Log Scale	-1.952
SD in Original Scale	0.0648	SD in Log Scale	0.312
95% UTL95% Coverage	0.312	95% UPL (t)	0.312
90% Percentile (z)	0.312	95% Percentile (z)	0.237
99% Percentile (z)	0.212	95% Percentile (2)	0.237
` '		ovided for comparisons and historical reasons.	0.304
Data appear to follow a t	)iocei ilibie	Distribution at 5% Significance Level	
Nonparametric Upper Limits for B	Vs(no disti	nction made between detects and nondetects)	
Order of Statistic.	16	95% UTL with95% Coverage	0.38
Approx, f used to compute achieved CC	0.842	Approximate Actual Confidence Coefficient achieved by UTL	0.56
Approximate Sample Size needed to achieve specified CC	59	95% UPL	
95% USL	0.38	95% KM Chebyshev UPL	0.38
			0.38
		of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV of	only when th	ne data set represents a background data set free of outliers	
Therefore, one may use USL to estimate a BTV of and consists of observa	only when th	ne data set represents a background data set free of outliers led from clean unimpacted locations.	
Therefore, one may use USL to estimate a BTV of and consists of observa  The use of USL tends to provide a balan	only when the tions collect ce between	ne data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data	
Therefore, one may use USL to estimate a BTV of and consists of observa  The use of USL tends to provide a balan	only when the tions collect ce between	ne data set represents a background data set free of outliers led from clean unimpacted locations.	
Therefore, one may use USL to estimate a BTV of and consists of observa  The use of USL tends to provide a balan represents a background data set and when the	only when the tions collect ce between	ne data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data	
Therefore, one may use USL to estimate a BTV of and consists of observa  The use of USL tends to provide a balan represents a background data set and when the	only when the tions collections collections collections collections between the many or the time of t	ne data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.	
Therefore, one may use USL to estimate a BTV of and consists of observa  The use of USL tends to provide a balan represents a background data set and whenexavalent chromium	conly when the tions collections collections collections collections between the many or the collections of	ne data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics	0.447
Therefore, one may use USL to estimate a BTV of and consists of observa  The use of USL tends to provide a balan represents a background data set and whenexavalent chromium  Total Number of Observations	ce between many or General	ne data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.	
Therefore, one may use USL to estimate a BTV of and consists of observa  The use of USL tends to provide a balan represents a background data set and where the chromium  Total Number of Observations  Number of Distinct Observations	General 16 14	ne data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations	0.447
Therefore, one may use USL to estimate a BTV of and consists of observa The use of USL tends to provide a balan represents a background data set and whenexavalent chromium  Total Number of Observations Number of Detects	General 16 14	ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects	0.447
Therefore, one may use USL to estimate a BTV of and consists of observa The use of USL tends to provide a balan represents a background data set and whenexavalent chromium  Total Number of Observations Number of Distinct Observations Number of Detects Number of Distinct Detects	General 16 14 9	seed from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects	0.447
Therefore, one may use USL to estimate a BTV of and consists of observa.  The use of USL tends to provide a balan represents a background data set and whenexavalent chromium  Total Number of Observations Number of Distinct Observations Number of Distinct Detects  Number of Distinct Detects  Minimum Detect	General 16 14 9 9 0.21	statistics  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detectt	0.447 0 7 5 0.12
Therefore, one may use USL to estimate a BTV of and consists of observa The use of USL tends to provide a balan represents a background data set and whenexavalent chromium  Total Number of Observations Number of Distinct Observations Number of Detects Number of Distinct Detects	General 16 14 9	seed from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects	0.447

Mean Detected	1.176	SD Detected	1.579
Mean of Detected Logged Data	-0.27	SD of Detected Logged Data	0.867
		nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.524	d2max (for USL)	2.443
		t on Detects Only	
Shapiro Wilk Test Statistic	0.531	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.463	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level	
Data Not	Normai at 5	% Significance Level	
Vorton Major (VM) Dool	d Ot-	sieties Accounting Name of Distribution	
Kapian Meler (KM) Baci		tistics Assuming Normal Distribution	1 105
	0.848	KM SD	1.195
95% UTL95% Coverage	3.864	95% KM UPL (t)	3.007
90% KM Percentile (z)	2.379	95% KM Percentile (z)	2.814
99% KM Percentile (z)	3.628	95% KM USL	3.768
DI /O Out attention Beat		lation Assurate a Normal Distribution	
		istics Assuming Normal Distribution	1 005
Mean	0.85 3.941	SD OF(V, HDL, W)	1.225
95% UTL95% Coverage	2.42	95% UPL (t)	3.063 2.865
90% Percentile (z)	3.699	95% Percentile (z)	
99% Percentile (z)		95% USL pvided for comparisons and historical reasons	3.843
DEZ 13 Not a recommended metal	ou. DEZ pic	Truck for compansons and historical reasons	
Commo COE	Tooto on Do	etected Observations Only	
A-D Test Statistic	1.129	Anderson-Darling GOF Test	
5% A-D Critical Value	0.738	Data Not Gamma Distributed at 5% Significance Leve	1
K-S Test Statistic	0.738	Kolmogorov-Smirnov GOF	ı
5% K-S Critical Value	0.394	Data Not Gamma Distributed at 5% Significance Leve	ı
		ed at 5% Significance Level	!
Data Not Gaille	iia Distribute	ed at 5 % Significance Level	
Gamma	Statistics on	n Detected Data Only	
k hat (MLE)	1.299	k star (bias corrected MLE)	0.94
Theta hat (MLE)	0.905	Theta star (bias corrected MLE)	1.25
nu hat (MLE)	23.38	nu star (bias corrected)	16.92
MLE Mean (bias corrected)	1.176	nu star (bias correcteu)	10.92
MLE Sd (bias corrected)	1.170	95% Percentile of Chisquare (2kstar)	5.757
MILE Su (bias corrected)	1.212	35% Percentile of Chisquare (2kstar)	5.757
Commo BOS	Ctatiaties	sing Imputed Non-Detects	
		5 NDs with many tied observations at multiple DLs	
-			
		s <1.0, especially when the sample size is small (e.g., <15-20)	
		yield incorrect values of UCLs and BTVs	
		n the sample size is small.  by be computed using gamma distribution on KM estimates	
			0.701
Minimum	0.01	Mean	0.791
Maximum	5.34	Median CV	0.6
SD k hat (MLE)	1.263 0.541	k star (bias corrected MLE)	1.598 0.482
	11.5/11	k star (hias corrected MLE)	ロカメン

Thet	a hat (MLE)	1.46	Theta star (bias corrected MLE	<b>'</b>
	u hat (MLE)	17.33	nu star (bias corrected	<b>'</b>
MLE Mean (bia	s corrected)	0.791	MLE Sd (bias corrected	1.139
95% Percentile of Chisqu	ıare (2kstar)	3.75	90% Percentile	
95%	% Percentile	3.078	99% Percentile	5.354
The following stati	stics are cor	nputed using	g Gamma ROS Statistics on Imputed Data	
Upper Limits (	using Wilson	Hilferty (Wh	H) and Hawkins Wixley (HW) Methods	
	WH	HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage	5.5	6.852	95% Approx. Gamma UPL 3.222	3.638
95% Gamma USL	5.202	6.412		
Es	timates of G	amma Parar	neters using KM Estimates	
	Mean (KM)	0.848	SD (KM	1.195
Va	riance (KM)	1.429	SE of Mean (KM	0.322
	k hat (KM)	0.503	k star (KM	0.45
	nu hat (KM)	16.09	nu star (KM	) 14.4
the	eta hat (KM)	1.686	theta star (KM	1.883
80% gamma per	centile (KM)	1.383	90% gamma percentile (KM	2.342
95% gamma per	centile (KM)	3.379	99% gamma percentile (KM	5.956
	` '		<u> </u>	<u> </u>
The following sta	tistics are co	omputed usi	ng gamma distribution and KM estimates	
_		-	H) and Hawkins Wixley (HW) Methods	
	WH	HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage	3.926	4.122	95% Approx. Gamma UPL 2.562	2.577
95% KM Gamma Percentile	2.305	2.299	95% Gamma USL 3.753	3.92
5070 1 411	2.000	2.200	3373 3311111 332	0.02
I o	anormal GO	F Test on Do	etected Observations Only	
Shapiro Wilk T		0.852	Shapiro Wilk GOF Test	
5% Shapiro Wilk C		0.829	Detected Data appear Lognormal at 5% Significance	l evel
·	est Statistic	0.324	Lilliefors GOF Test	
5% Lilliefors C		0.274	Data Not Lognormal at 5% Significance Level	
			Lognormal at 5% Significance Level	
Dottoctou De	ata appear A	pproximate	Lognormal at 0 % Oignineance Level	
Background Lognormal RC	n Statistics	Assuming I	ognormal Distribution Using Imputed Non-Detects	
<u> </u>	riginal Scale	0.836	Mean in Log Scale	-0.641
	riginal Scale	1.23	SD in Log Scale	
95% UTL95°		5.021	95% BCA UTL95% Coverage	
95% Bootstrap (%) UTL95°	ŭ	5.34	95% BEA 01295% Coverage 95% UPL (1	
	ercentile (z)	1.655	95% OPL (I	
	ercentile (z)		95% Percentule (2	
99% P	erceriule (Z)	4.208	95% US!	4.072
Chatlatian value 1/8	A actimeter	on Logged 5	Oota and Assuming Lagrarmal Distribution	
KM Mean of L			Oata and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% Coverage	E 705
		-0.678		
95% KM Percentile Lo	ogged Data	0.96	95% KM UPL (Lognormal	
95% KIVI Percentile Lo	ognormal (z)	2.462	95% KM USL (Lognormal	5.298
		Danalnai A	anning Lagranus Distribution	
Backo	でいのの ロログき	otatistics As	suming Lognormal Distribution	
		0.05	Manual O. I	0.000
Mean in O	riginal Scale	0.85	Mean in Log Scale	
Mean in O	riginal Scale	0.85 1.225 7.159	Mean in Log Scalı SD in Log Scalı 95% UPL (t	1.045

90% Percentile (z)	1.954	95% Percentile (z)	2.857
99% Percentile (z)	5.823	95% Percentile (2) 95% USL	6.58
` '		povided for comparisons and historical reasons.	0.50
DD2 is not a recommended mean	од. ББ2 річ	orace for companions and motorical reasons.	
Nonparametric	Distribution	Free Background Statistics	
-		Distribution at 5% Significance Level	
Nonparametric Upper Limits for B	ΓVs(no disti	nction made between detects and nondetects)	
Order of Statistic, r	16	95% UTL with95% Coverage	5.34
Approx, f used to compute achieved CC	0.842	Approximate Actual Confidence Coefficient achieved by UTL	0.56
Approximate Sample Size needed to achieve specified CC	59	95% UPL	5.34
95% USL	5.34	95% KM Chebyshev UPL	6.218
Note: The use of USL tends to yield a conservative	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV	only when th	ne data set represents a background data set free of outliers	
and consists of observa	tions collect	ed from clean unimpacted locations.	
The use of USL tends to provide a balan	ce between	false positives and false negatives provided the data	
represents a background data set and wh	nen many or	nsite observations need to be compared with the BTV.	
rivalent chromium			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	14
Minimum	16.16	First Quartile	19
Second Largest	39.36	Median	22.7
Maximum	70.2	Third Quartile	25.13
Mean	26.43	SD	13.43
Coefficient of Variation	0.508	Skewness	2.637
Mean of logged Data	3.194	SD of logged Data	0.377
Critical Values for	or Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.524	d2max (for USL)	2.443
	Normal (	GOF Test	
Shapiro Wilk Test Statistic	0.668	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.307	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level	
Data Not	Normal at 5	5% Significance Level	
-		suming Normal Distribution	
95% UTL with 95% Coverage	60.32	90% Percentile (z)	43.64
95% UPL (t)	50.7	95% Percentile (z)	48.52
95% USL	59.24	99% Percentile (z)	57.67
		GOF Test	
A-D Test Statistic	1.306	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.741	Data Not Gamma Distributed at 5% Significance Leve	el
K-S Test Statistic	0.272	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.216	Data Not Gamma Distributed at 5% Significance Leve	el

Data Not Gamr	na Distribut	ed at 5% Significance Level	
	Commo	Statistics	
k hat (MLE)	6.387	k star (bias corrected MLE)	5.231
Theta hat (MLE)	4.139	Theta star (bias corrected MLE)	5.053
nu hat (MLE)	204.4	nu star (bias corrected)	167.4
MLE Mean (bias corrected)	26.43	MLE Sd (bias corrected)	11.56
WEEL Wealt (bias corrected)	20.40	MLE od (blas corrected)	11.50
Background St	tatistics Ass	suming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	48.8	90% Percentile	41.9
95% Hawkins Wixley (HW) Approx. Gamma UPL	48.63	95% Percentile	47.86
95% WH Approx. Gamma UTL with 95% Coverage	61.37	99% Percentile	60.42
95% HW Approx. Gamma UTL with 95% Coverage	61.72		
95% WH USL	59.86	95% HW USL	60.12
		LOOFT	
Shapiro Wilk Test Statistic	Lognorma 0.831	I GOF Test Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.245	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.243	Data Not Lognormal at 5% Significance Level	
		t 5% Significance Level	
95% UTL with 95% Coverage 95% UPL (t) 95% USL	63.2 48.22 61.3	ming Lognormal Distribution  90% Percentile (z)  95% Percentile (z)  99% Percentile (z)	39.55 45.36 58.66
<u> </u>		Free Background Statistics ternible Distribution (0.05)	
Nonparametric Upp	er Limits fo	r Background Threshold Values	
Order of Statistic, r	16	95% UTL with 95% Coverage	70.2
Approx, f used to compute achieved CC	0.842	Approximate Actual Confidence Coefficient achieved by UTL	0.56
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	70.2	95% BCA Bootstrap UTL with 95% Coverage	70.2
95% UPL	70.2	90% Percentile	38.78
90% Chebyshev UPL	67.95	95% Percentile	47.07
95% Chebyshev UPL	86.76	99% Percentile	65.57
95% USL	70.2		
Therefore, one may use USL to estimate a BTV and consists of observa  The use of USL tends to provide a balance.	only when the tions collections between	of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers are from clean unimpacted locations.  false positives and false negatives provided the data	
represents a background data set and wi	hen many or	nsite observations need to be compared with the BTV.	
eneral Statistics			

Minimum	16	First Quartile	18.75
Second Largest	44.7	Median	22.45
Maximum	70.2	Third Quartile	25.13
Mean	26.63	SD	13.98
Coefficient of Variation	0.525	Skewness	2.394
Mean of logged Data	3.194	SD of logged Data	0.397
Critical Values for	or Backgrou	ind Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.524	d2max (for USL)	2.443
	Normal (	GOF Test	
Shapiro Wilk Test Statistic	0.689	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.31	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level	
		∫ 5% Significance Level	
Background S	tatistics Ass	suming Normal Distribution	
95% UTL with 95% Coverage	61.92	90% Percentile (z)	44.55
95% UPL (t)	51.89	95% Percentile (z)	49.63
95% USL	60.79	99% Percentile (z)	59.16
30 % 602	00.70	33 75 T CICOTUDE (Z)	
	Gamma	GOF Test	
A-D Test Statistic	1.323	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.741	Data Not Gamma Distributed at 5% Significance Leve	اد
K-S Test Statistic	0.273	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.216	Data Not Gamma Distributed at 5% Significance Leve	اد
		ed at 5% Significance Level	
Data Not Gaini	na Distribut	ed at 5% digrillicance Level	
	Gamma	Statistics	
k hat (MLE)	5.828	k star (bias corrected MLE)	4.777
Theta hat (MLE)	4.568	Theta star (bias corrected MLE)	5.573
nu hat (MLE)	186.5	nu star (bias corrected)	152.9
MLE Mean (bias corrected)	26.63	MLE Sd (bias corrected)	12.18
MLE Mean (bias corrected)	20.03	MLE Su (bias corrected)	12.10
Dookseyand C	estication Ann	versing Commo Distribution	
	50.36	suming Gamma Distribution	42.04
95% Wilson Hilferty (WH) Approx. Gamma UPL		90% Percentile	42.94
95% Hawkins Wixley (HW) Approx. Gamma UPL	50.22	95% Percentile	49.3
95% WH Approx. Gamma UTL with 95% Coverage	63.88	99% Percentile	62.77
95% HW Approx. Gamma UTL with 95% Coverage	64.37	050/ 104/101	00.04
95% WH USL	62.25	95% HW USL	62.64
	•	LOOF Total	
		I GOF Test	
Shapiro Wilk Test Statistic	0.833	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.245	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.213	Data Not Lognormal at 5% Significance Level	
Data Not L	ognormal a	t 5% Significance Level	
Background Sta	tistics assu	ming Lognormal Distribution	

95% UTL with 95% Coverage			
	66.4	90% Percentile (z)	40.55
95% UPL (t)	49.95	95% Percentile (z)	46.84
95% USL	64.31	99% Percentile (z)	61.39
		Free Background Statistics	
Data do not to	ollow a Disc	ernible Distribution (0.05)	
Nonnarametria Una	or Limite fo	r Background Threshold Values	
Order of Statistic, r	16	95% UTL with 95% Coverage	70.2
Approx, f used to compute achieved CC	0.842	Approximate Actual Confidence Coefficient achieved by UTL	0.56
Approx, I asea to compate defineved os	0.042	Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	70.2	95% BCA Bootstrap UTL with 95% Coverage	70.2
95% UPL	70.2	90% Percentile	41.85
90% Chebyshev UPL	69.87	95% Percentile	51.08
95% Chebyshev UPL	89.46	99% Percentile	66.38
95% USL	70.2	3370 Tercertuie	00.00
33 / 000	70.2		
Note: The use of USL tends to yield a conservative	e estimate	of BTV, especially when the sample size starts exceeding 20.	
		ne data set represents a background data set free of outliers	
		ed from clean unimpacted locations.	
		false positives and false negatives provided the data	
		nsite observations need to be compared with the BTV.	
represents a background data set and wit	ich many of	isite observations need to be compared with the BTV.	
General Statistics  Total Number of Observations	16	Number of Distinct Observations	14
Minimum	6.3	First Quartile	
Casand Lawreck			7.5
Second Largest	23.5	Median	12.7
Second Largest  Maximum	27	Median Third Quartile	12.7 18.93
Maximum Mean	27 13.73		12.7
Maximum  Mean  Coefficient of Variation	27 13.73 0.49	Third Quartile SD Skewness	12.7 18.93 6.721 0.591
Maximum Mean	27 13.73	Third Quartile SD	12.7 18.93 6.721 0.591
Maximum  Mean  Coefficient of Variation  Mean of logged Data	27 13.73 0.49 2.506	Third Quartile SD Skewness SD of logged Data	12.7 18.93 6.721
Maximum  Mean  Coefficient of Variation  Mean of logged Data	27 13.73 0.49 2.506	Third Quartile SD Skewness	12.7 18.93 6.721 0.591
Maximum  Mean  Coefficient of Variation  Mean of logged Data  Critical Values fo	27 13.73 0.49 2.506 or Backgrou 2.524	Third Quartile SD Skewness SD of logged Data  nd Threshold Values (BTVs)  d2max (for USL)	12.7 18.93 6.721 0.591 0.494
Maximum  Mean  Coefficient of Variation  Mean of logged Data  Critical Values for  Tolerance Factor K (For UTL)	27 13.73 0.49 2.506 or Backgrou 2.524	Third Quartile SD Skewness SD of logged Data  and Threshold Values (BTVs)  d2max (for USL)	12.7 18.93 6.721 0.591 0.494
Maximum  Mean  Coefficient of Variation  Mean of logged Data  Critical Values fo  Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic	27 13.73 0.49 2.506 or Backgrou 2.524 Normal (	Third Quartile SD Skewness SD of logged Data  Ind Threshold Values (BTVs)  d2max (for USL)  GOF Test Shapiro Wilk GOF Test	12.7 18.93 6.721 0.591 0.494
Maximum  Mean  Coefficient of Variation  Mean of logged Data  Critical Values for  Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value	27 13.73 0.49 2.506 or Backgrou 2.524 Normal ( 0.891 0.887	Third Quartile  SD  Skewness  SD of logged Data  and Threshold Values (BTVs)  d2max (for USL)  GOF Test  Shapiro Wilk GOF Test  Data appear Normal at 5% Significance Level	12.7 18.93 6.721 0.591 0.494
Maximum  Mean  Coefficient of Variation  Mean of logged Data  Critical Values for  Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  Lilliefors Test Statistic	27 13.73 0.49 2.506 or Backgrou 2.524 Normal 0 0.891 0.887 0.198	Third Quartile SD Skewness SD of logged Data  Ind Threshold Values (BTVs)  d2max (for USL)  GOF Test Shapiro Wilk GOF Test Data appear Normal at 5% Significance Level Lilliefors GOF Test	12.7 18.93 6.721 0.591 0.494
Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values fo Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value	27 13.73 0.49 2.506 or Backgrou 2.524 Normal 0 0.891 0.887 0.198 0.213	Third Quartile SD Skewness SD of logged Data  Ind Threshold Values (BTVs)  d2max (for USL)  GOF Test  Shapiro Wilk GOF Test Data appear Normal at 5% Significance Level Lilliefors GOF Test  Data appear Normal at 5% Significance Level	12.7 18.93 6.721 0.591 0.494
Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values fo Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value	27 13.73 0.49 2.506 or Backgrou 2.524 Normal 0 0.891 0.887 0.198 0.213	Third Quartile SD Skewness SD of logged Data  Ind Threshold Values (BTVs)  d2max (for USL)  GOF Test Shapiro Wilk GOF Test Data appear Normal at 5% Significance Level Lilliefors GOF Test	12.7 18.93 6.721 0.591 0.494
Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values for Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appea	27 13.73 0.49 2.506  Pr Backgrout 2.524  Normal 0 0.891 0.887 0.198 0.213  Pr Normal at	Third Quartile SD Skewness SD of logged Data  Ind Threshold Values (BTVs)  d2max (for USL)  GOF Test  Shapiro Wilk GOF Test Data appear Normal at 5% Significance Level Lilliefors GOF Test  Data appear Normal at 5% Significance Level	12.7 18.93 6.721 0.591 0.494
Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values for Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appea	27 13.73 0.49 2.506  Pr Backgrout 2.524  Normal 0 0.891 0.887 0.198 0.213  Pr Normal at	Third Quartile  SD  Skewness SD of logged Data  and Threshold Values (BTVs)  d2max (for USL)  GOF Test  Shapiro Wilk GOF Test  Data appear Normal at 5% Significance Level Lilliefors GOF Test  Data appear Normal at 5% Significance Level 15% Significance Level 25% Significance Level	12.7 18.93 6.721 0.591 0.494
Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values for Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value  Data appear  Background St 95% UTL with 95% Coverage	27 13.73 0.49 2.506  Property Background 2.524  Normal Control 0.891 0.887 0.198 0.213 Property Sar Normal at Catistics Assets	Third Quartile SD Skewness SD of logged Data  Ind Threshold Values (BTVs)  GOF Test Shapiro Wilk GOF Test Data appear Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level style="color: blue;">Est Significance Level Significance Level Significance Level Suming Normal Distribution	12.7 18.93 6.721 0.591 0.494
Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values for Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appea	27 13.73 0.49 2.506  Pr Backgrou 2.524  Normal (  0.891 0.887 0.198 0.213  Pr Normal at Satistics Assess 30.69	Third Quartile SD Skewness SD of logged Data  Ind Threshold Values (BTVs)  GOF Test Shapiro Wilk GOF Test Data appear Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level swiming Normal Distribution  90% Percentile (z)	12.7 18.93 6.721 0.591 0.494 2.443
Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values for Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value  Data appea  Background St 95% UTL with 95% Coverage 95% UPL (t)	27 13.73 0.49 2.506  Pr Backgrou 2.524  Normal 0 0.891 0.887 0.198 0.213 Pr Normal at 30.69 25.87	Third Quartile  SD  Skewness  SD of logged Data  and Threshold Values (BTVs)  d2max (for USL)  GOF Test  Shapiro Wilk GOF Test  Data appear Normal at 5% Significance Level  Lilliefors GOF Test  Data appear Normal at 5% Significance Level  25% Significance Level  suming Normal Distribution  90% Percentile (z)  95% Percentile (z)	12.7 18.93 6.721 0.591 0.494 2.443

A-D Test Statistic		Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	-	Detected data appear Gamma Distributed at 5% Significance	۽L
K-S Test Statistic		Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value		Data Not Gamma Distributed at 5% Significance Level	<u> </u>
Detected data follow App	pr. Gamma	Distribution at 5% Significance Level	_
	Gamma	Statistics	
k hat (MLE)		k star (bias corrected MLE)	3
Theta hat (MLE)	3.011	Theta star (bias corrected MLE)	3
nu hat (MLE)	145.8	nu star (bias corrected)	11
MLE Mean (bias corrected)	13.73	MLE Sd (bias corrected)	-
Background S	tatistics Ass	suming Gamma Distribution	_
95% Wilson Hilferty (WH) Approx. Gamma UPL	27.93	90% Percentile	2
95% Hawkins Wixley (HW) Approx. Gamma UPL	28.34	95% Percentile	2
95% WH Approx. Gamma UTL with 95% Coverage	36.31	99% Percentile	3
95% HW Approx. Gamma UTL with 95% Coverage	37.53	3370 I GIOGIANO	_
95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL	35.29	95% HW USL	3
53 /0 WILL OOL	30.20	33 /0 FTW USL	_
		I GOF Test	_
Shapiro Wilk Test Statistic		Shapiro Wilk Lognormal GOF Test	_
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	_
Lilliefors Test Statistic		Lilliefors Lognormal GOF Test	_
5% Lilliefors Critical Value	0.213	Data Not Lognormal at 5% Significance Level	
95% UTL with 95% Coverage		ıming Lognormal Distribution 90% Percentile (z)	2
95% UPL (t)	29.93	95% Percentile (z)	2
95% USL	40.99	99% Percentile (z)	3
			_
<u> </u>		ree Background Statistics	
Data appe	ar invillial a	t 5% Significance Level	_
Nonparametric Upp	per Limits fo	or Background Threshold Values	
Order of Statistic, r	16	95% UTL with 95% Coverage	2
Approx, f used to compute achieved CC	0.842	Approximate Actual Confidence Coefficient achieved by UTL	
		Approximate Sample Size needed to achieve specified CC	į
95% Percentile Bootstrap UTL with 95% Coverage	27	95% BCA Bootstrap UTL with 95% Coverage	2
95% UPL	27	90% Percentile	2
90% Chebyshev UPL	34.51	95% Percentile	
95% Chebyshev UPL	43.92	99% Percentile	
95% USL	27		
Note: The use of USL tends to yield a conservati	ve estimate	of BTV, especially when the sample size starts exceeding 20.	_
· · · · · · · · · · · · · · · · · · ·		he data set represents a background data set free of outliers	_
			_
	ations collect	ted from clean unimpacted locations.	
The use of USL tends to provide a balan		•	_
	nce between	ted from clean unimpacted locations. If alse positives and false negatives provided the data insite observations need to be compared with the BTV.	_

ppper			
eneral Statistics			
Total Number of Observations	16	Number of Distinct Observations	12
Minimum	15	First Quartile	18
Second Largest	60.2	Median	21.5
Maximum	62.8	Third Quartile	33.48
Mean	28.85	SD	15.78
Coefficient of Variation	0.547	Skewness	1.27
Mean of logged Data	3.244	SD of logged Data	0.48
Critical Values fo	or Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.524	d2max (for USL)	2.443
	Normal G	GOF Test	
Shapiro Wilk Test Statistic	0.801	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.213	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
Data appear Appro	oximate No	rmal at 5% Significance Level	
Background St	tatistics Ass	uming Normal Distribution	
95% UTL with 95% Coverage	68.68	90% Percentile (z)	49.07
95% UPL (t)	57.36	95% Percentile (z)	54.81
95% USL	67.41	99% Percentile (z)	65.56
	Gamma (	GOF Test	
A-D Test Statistic	0.943	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.742	Data Not Gamma Distributed at 5% Significance Leve	el
K-S Test Statistic	0.212	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance	ce Level
Detected data follow App	or. Gamma I	Distribution at 5% Significance Level	
	Gamma	Statistics	
k hat (MLE)	4.383	k star (bias corrected MLE)	3.603
Theta hat (MLE)	6.582	Theta star (bias corrected MLE)	8.00
nu hat (MLE)	140.3	nu star (bias corrected)	115.3
MLE Mean (bias corrected)	28.85	MLE Sd (bias corrected)	15.2
Rackground St.	atietice Aee	uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	59.22	90% Percentile	49.23
95% Hawkins Wixley (HW) Approx. Gamma UPL	59.64	95% Percentile	57.52
95% WH Approx. Gamma UTL with 95% Coverage	77.3	99% Percentile	75.31
95% HW Approx. Gamma UTL with 95% Coverage	79.13	3378 i Giceriule	, 0.0
95% WH USL	75.13	95% HW USL	76.72
	Lognormal	GOF Test	
Shanira Wilk Tast Statistia	Lognormal		
Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value	0.876 0.887	GOF Test  Shapiro Wilk Lognormal GOF Test  Data Not Lognormal at 5% Significance Level	

5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Approx	ximate Logi	normal at 5% Significance Level	
		ming Lognormal Distribution	
95% UTL with 95% Coverage	86.59	90% Percentile (z)	47.55
95% UPL (t)	61.27	95% Percentile (z)	56.66
95% USL	83.28	99% Percentile (z)	78.72
Nonparametric	Distribution	Free Background Statistics	
Data appear Appr	oximate No	ormal at 5% Significance Level	
Nonnarametric I Inn	er Limits fo	r Background Threshold Values	
Order of Statistic, r	16	95% UTL with 95% Coverage	62.8
Approx, f used to compute achieved CC	0.842	Approximate Actual Confidence Coefficient achieved by UTL	0.56
PP - 7		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	62.8	95% BCA Bootstrap UTL with 95% Coverage	62.8
95% UPL	62.8	90% Percentile	54.6
90% Chebyshev UPL	77.65	95% Percentile	60.85
95% Chebyshev UPL	99.75	99% Percentile	62.41
95% USL	62.8		
Note: The use of USL tends to yield a conservative	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV	only when t	he data set represents a background data set free of outliers	
		ted from clean unimpacted locations.	
		false positives and false negatives provided the data	
ead General Statistics			
Total Number of Observations	10	Number of Distinct Observations	9
		Number of Missing Observations	6
Minimum	0.55	First Quartile	21.25
Second Largest	32	Median	25
Maximum	43	Third Quartile	28.25
Mean	22.76	SD	12.49
Coefficient of Variation	0.549	Skewness	-0.582
Mean of logged Data	2.721	SD of logged Data	1.328
Critical Values fo	or Backgrou	and Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176
		GOF Test	
Shapiro Wilk Test Statistic	0.912	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.244	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	
Data appea	ar Normal a	t 5% Significance Level	
Background S			

95% UTL with 95% Coverage	59.11	90% Percentile (z)	38
95% UPL (t)	46.76	95% Percentile (z)	43
95% USL	49.93	99% Percentile (z)	51
A D T I O I I I		GOF Test	
A-D Test Statistic	1.256	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.741	Data Not Gamma Distributed at 5% Significance Leve	el
K-S Test Statistic	0.377	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.272	Data Not Gamma Distributed at 5% Significance Leve	el
Data Not Gamr	na Distribut	ed at 5% Significance Level	
	Gamma	Statistics	
k hat (MLE)	1.383	k star (bias corrected MLE)	1.
Theta hat (MLE)	16.46	Theta star (bias corrected MLE)	22
nu hat (MLE)	27.65	nu star (bias corrected)	20
MLE Mean (bias corrected)	22.76	MLE Sd (bias corrected)	22
WILL Weart (bias corrected)	22.70	WEE Ou (bias corrected)	
Background S	tatistics Ass	suming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	74.91	90% Percentile	51
95% Hawkins Wixley (HW) Approx. Gamma UPL	86.38	95% Percentile	67
95% WH Approx. Gamma UTL with 95% Coverage	126.4	99% Percentile	103
95% HW Approx. Gamma UTL with 95% Coverage	160.3		
95% WH USL	86.44	95% HW USL	102
		1	
		Il GOF Test	
Shapiro Wilk Test Statistic	0.676	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level	
	0.396	Lilliefors Lognormal GOF Test	
Lilliefors Test Statistic			
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level	
5% Lilliefors Critical Value		Data Not Lognormal at 5% Significance Level t 5% Significance Level	
5% Lilliefors Critical Value  Data Not L	ognormal a	t 5% Significance Level	
5% Lilliefors Critical Value  Data Not L  Background Sta	ognormal a	ŭ ŭ	83
5% Lilliefors Critical Value  Data Not L	ognormal a	t 5% Significance Level	
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage	ognormal a	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z)	135
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage  95% UPL (t)	ognormal and attistics assumed to 195.4	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z)  95% Percentile (z)	135
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage  95% UPL (t)  95% USL	726.1 195.4 273.6	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z)  95% Percentile (z)	135
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage  95% UPL (t)  95% USL  Nonparametric	atistics assu 726.1 195.4 273.6	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z)	135
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage  95% UPL (t)  95% USL  Nonparametric  Data appea	atistics assu 726.1 195.4 273.6 Distribution	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z)  99% Percentile (z)  1 Free Background Statistics 1 5% Significance Level	135
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric Data appea	atistics assu 726.1 195.4 273.6 Distribution ar Normal a	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)  Free Background Statistics t 5% Significance Level  or Background Threshold Values	135
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric Data appea	ognormal a atistics assu 726.1 195.4 273.6  Distribution ar Normal a per Limits fo	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)  In Free Background Statistics It 5% Significance Level  In Background Threshold Values  95% UTL with 95% Coverage	135
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric Data appea	atistics assu 726.1 195.4 273.6 Distribution ar Normal a	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)  Free Background Statistics t 5% Significance Level  Free Background Threshold Values  95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL	135 334 43 0.
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage  95% UPL (t)  95% USL  Nonparametric  Data appea  Nonparametric Upp  Order of Statistic, r  Approx, f used to compute achieved CC	atistics assumption of the composition of the compo	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)  1 Free Background Statistics 1 5% Significance Level  1 Background Threshold Values 95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC	135 334 43 0 59
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric Data appear  Nonparametric Upp Order of Statistic, r Approx, f used to compute achieved CC	atistics assumption of the control o	t 5% Significance Level    Significance Level	138 334 43 0 59
Background Sta  95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric Data appea  Nonparametric Upp Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL	atistics assurations of the second of the se	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)  1 Free Background Statistics 1 5% Significance Level  1 Packground Threshold Values  95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile	138 334 43 0 59 43
5% Lilliefors Critical Value  Data Not L  Background Sta  95% UTL with 95% Coverage  95% UPL (t)  95% USL  Nonparametric  Data appea  Nonparametric Upp  Order of Statistic, r  Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage  95% UPL  90% Chebyshev UPL	atistics assurated in the second of the seco	t 5% Significance Level    Iming Lognormal Distribution	138 334 43 0 59 43 38
Background Sta  95% UTL with 95% Coverage 95% UPL (t) 95% USL  Nonparametric Data appea  Nonparametric Upp Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL	atistics assurations of the second of the se	t 5% Significance Level  Iming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)  1 Free Background Statistics 1 5% Significance Level  1 Packground Threshold Values  95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile	43 0. 59 43 38 42

Therefore, one may use USL to estimate a BTV	only when th	ne data set represents a background data set free of outliers	
and consists of observa	tions collect	ed from clean unimpacted locations.	
The use of USL tends to provide a balar	ice between	false positives and false negatives provided the data	
represents a background data set and w	hen many or	nsite observations need to be compared with the BTV.	
manganese			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	13
Minimum	310	First Quartile	432.5
Second Largest	813 940	Median Third Quartile	455 715.5
Maximum Mean	547.3	Third Quartile SD	182.1
Coefficient of Variation	0.333	Skewness	0.921
Mean of logged Data	6.257	SD of logged Data	0.321
Mean of logged Data	0.237	SD 01 logged Data	0.313
Critical Values for	or Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.524	d2max (for USL)	2.443
	Name al 4	205 7	
Ohanina Milla Taak Ohatistia		GOF Test	
Shapiro Wilk Critical Value	0.854	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.295 0.213	Lilliefors GOF Test	
5% Lilliefors Critical Value		Data Not Normal at 5% Significance Level  Significance Level	
Data Not	Normal at t	ow Significance Level	
Background S	tatistics Ass	suming Normal Distribution	
95% UTL with 95% Coverage	1007	90% Percentile (z)	780.7
95% UPL (t)	876.4	95% Percentile (z)	846.9
95% USL	992.3	99% Percentile (z)	971
		GOF Test	
A-D Test Statistic		Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.739	Data Not Gamma Distributed at 5% Significance Lev	el
K-S Test Statistic	0.281	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.215	Data Not Gamma Distributed at 5% Significance Level	el
Data Not Gaini	iia Distribut	ed at 5% Significance Level	
	Gamma	Statistics	
k hat (MLE)	10.67	k star (bias corrected MLE)	8.708
Theta hat (MLE)	51.31	Theta star (bias corrected MLE)	62.85
nu hat (MLE)	341.3	nu star (bias corrected)	278.7
MLE Mean (bias corrected)	547.3	MLE Sd (bias corrected)	185.5
		uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	899.2	90% Percentile	794.4
95% Hawkins Wixley (HW) Approx. Gamma UPL	903.3	95% Percentile	883.7
95% WH Approx. Gamma UTL with 95% Coverage	1083	99% Percentile	1068
95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL	1097 1061	95% HW USL	1074
95% WH USL	1001	95% HW USL	1074

	11 0 0	
	-	
ximate Logr	normal at 5% Significance Level	
-4 -4	ming Lagrange Distribution	
		770
	( )	779
	` '	872.6
1120	99% Percentile (z)	1080
Distribution	Free Background Statistics	
	-	
per Limits fo	r Background Threshold Values	
16	95% UTL with 95% Coverage	940
0.842	Approximate Actual Confidence Coefficient achieved by UTL	0.56
	Approximate Sample Size needed to achieve specified CC	59
940	95% BCA Bootstrap UTL with 95% Coverage	940
940	90% Percentile	786
1110	95% Percentile	844.8
1366	99% Percentile	921
940		
only when thations collect	ne data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data	
General	Statistics	
16		0
15	, and the second	
13	Number of Non-Detects	3
13		3
	Minimum Non-Detect	0.0067
	Maximum Non-Detect	0.023
0.00492	Percent Non-Detects	18.759
0.0499	SD Detected	0.0701
0.0.00		
-3.402	SD of Detected Logged Data	
-3.402	SD of Detected Logged Data	
	and Threshold Values (BTVs)	0.807
or Backgrou 2.524	and Threshold Values (BTVs)	0.807
	0.896   0.887   0.264   0.213	Data appear Lognormal at 5% Significance Level  0.264  Lilliefors Lognormal GOF Test  0.213  Data Not Lognormal at 5% Significance Level  oximate Lognormal at 5% Significance Level  oximate Lognormal at 5% Significance Level  oximate Lognormal Distribution  1149  90% Percentile (z)  918  95% Percentile (z)  1120  99% Percentile (z)  1120  99% Percentile (z)  per Limits for Background Statistics  oximate Lognormal at 5% Significance Level  per Limits for Background Threshold Values  16  95% UTL with 95% Coverage  0.842  Approximate Actual Confidence Coefficient achieved by UTL  Approximate Sample Size needed to achieve specified CC  940  95% BCA Bootstrap UTL with 95% Coverage  940  90% Percentile  1110  95% Percentile  1110  95% Percentile  1366  99% Percentile  940  ive estimate of BTV, especially when the sample size starts exceeding 20.  only when the data set represents a background data set free of outliers ations collected from clean unimpacted locations.  noe between false positives and false negatives provided the data then many onsite observations need to be compared with the BTV.  General Statistics  16  Number of Missing Observations  15  Number of Distinct Non-Detects  13  Number of Distinct Non-Detects  13  Number of Distinct Non-Detect  Maximum Non-Detect

5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.4	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level	
		i% Significance Level	
Kaplan Meier (KM) Back	around Sta	tistics Assuming Normal Distribution	
KM Mean	0.0421	KM SD	0.0629
95% UTL95% Coverage	0.201	95% KM UPL (t)	0.156
90% KM Percentile (z)	0.123	95% KM Percentile (z)	0.146
99% KM Percentile (z)	0.188	95% KM USL	0.196
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			
DL/2 Substitution Back	ground Stat	istics Assuming Normal Distribution	
Mean	0.0421	SD	0.065
95% UTL95% Coverage	0.206	95% UPL (t)	0.16
90% Percentile (z)	0.125	95% Percentile (z)	0.149
99% Percentile (z)	0.193	95% USL	0.201
,		ovided for comparisons and historical reasons	
Gamma GOF	Tests on De	etected Observations Only	
A-D Test Statistic	1.525	Anderson-Darling GOF Test	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Leve	اد
K-S Test Statistic	0.279	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.241	Data Not Gamma Distributed at 5% Significance Leve	اد
		ed at 5% Significance Level	<u></u>
		Detected Data Only	
k hat (MLE)	1.377	k star (bias corrected MLE)	1.111
Theta hat (MLE)	0.0363	Theta star (bias corrected MLE)	0.045
nu hat (MLE)	35.81	nu star (bias corrected)	28.88
MLE Mean (bias corrected)	0.0499	050/ D 11/ (01/ (01/ )	0.444
MLE Sd (bias corrected)	0.0474	95% Percentile of Chisquare (2kstar)	6.414
O P00	Otatiatias	aing Inspected New Datasta	
		sing Imputed Non-Detects	
<u> </u>		6 NDs with many tied observations at multiple DLs	
•		s <1.0, especially when the sample size is small (e.g., <15-20)	
		yield incorrect values of UCLs and BTVs	
		en the sample size is small.	
		y be computed using gamma distribution on KM estimates	0.0405
Minimum	0.0072	Mean	0.0425
Maximum		Median	0.0255
SD	0.0648	CV	1.526
k hat (MLE)	1.207	k star (bias corrected MLE)	1.023
Theta hat (MLE)	0.0352	Theta star (bias corrected MLE)	0.0415
nu hat (MLE)	38.64	nu star (bias corrected)	32.73
MLE Mean (bias corrected)	0.0425	MLE Sd (bias corrected)	0.042
95% Percentile of Chisquare (2kstar)	6.079	90% Percentile	0.0972
95% Percentile	0.126	99% Percentile	0.193
		g Gamma ROS Statistics on Imputed Data	
		H) and Hawkins Wixley (HW) Methods	LI\^/
WH	HW	WH	HW

95% Approx. Gamma UTL with 95% Coverage	0.195	0.2	95% Approx. Gamma UPL	0.128	0.126
95% Gamma USL	0.187	0.19			
Est	imates of G	amma Parar	meters using KM Estimates		
	Mean (KM)	0.0421		SD (KM)	0.0629
Vai	riance (KM)	0.00396	SE of I	Mean (KM)	0.0164
	k hat (KM)	0.448		k star (KM)	0.405
<u> </u>	nu hat (KM)	14.33		u star (KM)	12.97
	ta hat (KM)	0.094	theta	a star (KM)	0.104
80% gamma pero	` '	0.068	90% gamma perce	entile (KM)	0.119
95% gamma pero	, ,	0.174	99% gamma perce	` '	0.313
	` /		<u> </u>	, ,	
The following state	tistics are co	omputed usi	ng gamma distribution and KM estimates		
_		-	H) and Hawkins Wixley (HW) Methods		
	WH	HW	,,,	WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.193	0.2	95% Approx. Gamma UPL	0.126	0.125
95% KM Gamma Percentile	0.113	0.112	95% Gamma USL	0.185	0.19
	31111				
Loc	normal GO	F Test on D	etected Observations Only		
Shapiro Wilk To	=	0.844	Shapiro Wilk GOF Test		
5% Shapiro Wilk Ci		0.866	Data Not Lognormal at 5% Significar	nce Level	
·	est Statistic	0.227	Lilliefors GOF Test		
	5% Lilliefors Critical Value 0.234 Detected Data appear Lognormal at 5% Significance Le		evel		
			Lognormal at 5% Significance Level	goaoo _	
Dottotted Da	ita appeai A	pproximate	Logiorna at 0 % olgimounoc Lovei		
Rackground Lognormal PC	S Statistics	Accuming I	ognormal Distribution Using Imputed Non-Detect	·e	
Mean in Ori		0.0419		Log Scale	-3.691
	iginal Scale	0.065		Log Scale	0.958
95% UTL95%	-	0.003	95% BCA UTL95%	-	0.938
95% Bootstrap (%) UTL95%		0.28		5% UPL (t)	0.23
, ,	ercentile (z)	0.0852		rcentile (z)	0.141
	ercentile (z)	0.032	93 % F e	95% USL	0.121
99% P6	ercennie (z)	0.232		95% USL	0.259
Statistics using VA	1 aatimataa	on Loggod F	Data and Assuming Lognormal Distribution		
KM Mean of Lo		-3.68	95% KM UTL (Lognormal)95%	Coverage	0.256
KM SD of Lo		0.918	95% KW UTE (E091011111)95% 95% KM UPL (L		0.230
			·		
95% KM Percentile Lo	gnormai (z)	0.114	95% KM USL (L	_ognormai)	0.238
<u> </u>		Nantal 6	anning Lagrange District		
			suming Lognormal Distribution	10 1	2.007
Mean in Ori	-	0.0421		Log Scale	-3.687
	iginal Scale	0.065		Log Scale	0.979
95% UTL95%	_	0.296		5% UPL (t)	0.147
	ercentile (z)	0.0878	95% Pe	rcentile (z)	0.125
	ercentile (z)	0.244		95% USL	0.274
DL/2 is not a Recomme	ended Meth	od. DL/2 pro	ovided for comparisons and historical reasons.		
			Free Background Statistics		
Data appear	to follow a l	Discernible I	Distribution at 5% Significance Level		
Nonparametric Upper	Limits for B	ΓVs(no distiı	nction made between detects and nondetects)		

Ouden of Ototickie ul	10	050/ LITE with 050/ Occasion	0.00
Order of Statistic, r	16 0.842	95% UTL with95% Coverage	0.28
Approx, f used to compute achieved CC		Approximate Actual Confidence Coefficient achieved by UTL	0.56
Approximate Sample Size needed to achieve specified CC	59	95% UPL	0.28
95% USL	0.28	95% KM Chebyshev UPL	0.325
Note: The use of USL tends to yield a conservative	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
		ne data set represents a background data set free of outliers	
		ted from clean unimpacted locations.	
The use of USL tends to provide a balan	ce between	false positives and false negatives provided the data	
		nsite observations need to be compared with the BTV.	
nickel			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	14
Minimum	4.9	First Quartile	5.35
Second Largest	12.8	Median	6.99
Maximum	20	Third Quartile	8.635
Mean	8.168	SD	4.026
Coefficient of Variation	0.493	Skewness	1.97
Mean of logged Data	2.014	SD of logged Data	0.404
Critical Values fo	or Backgrou	and Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.524	d2max (for USL)	2.443
		<u> </u>	
		GOF Test	
Shapiro Wilk Test Statistic	0.767	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.227	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.213	Data Not Normal at 5% Significance Level	
Data Not	Normal at t	5% Significance Level	
Background St	tatistics Ass	suming Normal Distribution	
95% UTL with 95% Coverage	18.33	90% Percentile (z)	13.33
95% UPL (t)	15.44	95% Percentile (z)	14.79
95% USL	18	99% Percentile (z)	17.53
	Gamma	GOF Test	
A-D Test Statistic	0.845	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.741	Data Not Gamma Distributed at 5% Significance Level	l
K-S Test Statistic	0.192	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance	e Level
Detected data follow App		Distribution at 5% Significance Level	
		Statistics	
k hat (MLE)	5.949	k star (bias corrected MLE)	4.876
, , ,	4 070	Theta star (bias corrected MLE)	1.675
Theta hat (MLE)	1.373	` ` '	
Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)	1.373	` ` '	156

Background St	atistics Ass	suming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	15.39	90% Percentile	13.12
95% Hawkins Wixley (HW) Approx. Gamma UPL	15.41	95% Percentile	15.05
95% WH Approx. Gamma UTL with 95% Coverage	19.49	99% Percentile	19.12
95% HW Approx. Gamma UTL with 95% Coverage	19.74		
95% WH USL	18.99	95% HW USL	19.22
	Lognorma	I GOF Test	
Shapiro Wilk Test Statistic	0.884	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.18	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear Approx	ximate Logi	normal at 5% Significance Level	
Background Sta	tistics assu	ming Lognormal Distribution	
95% UTL with 95% Coverage	20.77	90% Percentile (z)	12.57
95% UPL (t)	15.55	95% Percentile (z)	14.56
95% USL	20.11	99% Percentile (z)	19.18
Nonparametric	Distribution	Free Background Statistics	
Data appear Approxima	te Gamma	Distribution at 5% Significance Level	
Nonparametric Upp	er Limits fo	r Background Threshold Values	
Order of Statistic, r	16	95% UTL with 95% Coverage	20
Approx, f used to compute achieved CC	0.842	Approximate Actual Confidence Coefficient achieved by UTL	0.56
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	20	95% BCA Bootstrap UTL with 95% Coverage	20
95% UPL	20	90% Percentile	12.8
90% Chebyshev UPL	20.62	95% Percentile	14.6
95% Chebyshev UPL	26.26	99% Percentile	18.92
95% USL	20		
Note: The use of USL tends to yield a conservation	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
·		he data set represents a background data set free of outliers	
		ted from clean unimpacted locations.	
		false positives and false negatives provided the data	
		nsite observations need to be compared with the BTV.	
Toprosonie a sasignama data coi ana wi	- Ion many o	isino observatione need to be compared with the BTV.	
elenium			
	General	Statistics	
Total Number of Observations	16	Number of Missing Observations	0
Number of Distinct Observations	14	,	
Number of Detects	12	Number of Non-Detects	4
Number of Distinct Detects	11	Number of Distinct Non-Detects	3
Minimum Detect	0.306	Minimum Non-Detect	0.53
Maximum Detect	1.7	Maximum Non-Detect	0.65
Variance Detected	0.258	Percent Non-Detects	25%
Mean Detected	0.986	SD Detected	0.508
Mean of Detected Logged Data	-0.157	SD of Detected Logged Data	0.582
Mican of Detected Logged Data	J. 107	OD OF Detected Logged Data	J.JUZ

Normal GOF Test on Detects Only  Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  0.859  Detected Data appear Normal at 5% Sig  Lilliefors Test Statistic  0.214  Lilliefors GOF Test  5% Lilliefors Critical Value  0.243  Detected Data appear Normal at 5% Significance Level  Kaplan Meier (KM) Background Statistics Assuming Normal Distribution  KM Mean  0.854  95% UTL95% Coverage  2.068  90% KM Percentile (z)  1.471  95% KM P  99% KM Percentile (z)  1.973  9  DL/2 Substitution Background Statistics Assuming Normal Distribution  Mean  0.813  95% UTL95% Coverage  2.16	KM SD KM UPL (t) ercentile (z) 95% UPL (t) ercentile (z) 95% USL	
Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  Lilliefors Test Statistic  Lilliefors Critical Value  0.859  Detected Data appear Normal at 5% Significance Level  Skapian Meier (KM) Background Statistics Assuming Normal Distribution  KM Mean  95% UTL95% Coverage  90% KM Percentile (z)  1.471  95% KM P  99% KM Percentile (z)  1.973  90% FP  DL/2 Substitution Background Statistics Assuming Normal Distribution  Mean  0.813  95% UTL95% Coverage  2.16  90% Percentile (z)  1.497  95% FP  99% Percentile (z)  2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only  A-D Test Statistic  Kolmogorov-Smirnov GO  5% K-S Critical Value  Detected data appear Gamma Distributed at 5% Significance Level	KM SD KM UPL (t) ercentile (z) 95% UPL (t) ercentile (z) 95% USL	0.48 1.72 1.64 2.03 0.53 1.77
Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  0.859  Detected Data appear Normal at 5% Sig  Lilliefors Test Statistic  0.214  Lilliefors GOF Test  5% Lilliefors Critical Value  0.243  Detected Data appear Normal at 5% Sig  Rifficance Level  Kapian Meier (KM) Background Statistics Assuming Normal Distribution  KM Mean  95% UTL95% Coverage  2.068  90% KM Percentile (z)  1.471  95% KM P  99% KM Percentile (z)  1.973  9  DL/2 Substitution Background Statistics Assuming Normal Distribution  Mean  0.813  95% UTL95% Coverage  2.16  90% Percentile (z)  1.497  95% P  99% Percentile (z)  2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only  A-D Test Statistic  5% A-D Critical Value  0.737  Detected data appear Gamma Distributed at 5% Kolmogorov-Smirnov GO  5% K-S Critical Value  0.247  Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only  k hat (MLE)  K star (bias cor	KM SD KM UPL (t) ercentile (z) 95% UPL (t) ercentile (z) 95% USL	0.48 1.72 1.64 2.03 0.53 1.77
5% Shapiro Wilk Critical Value Lilliefors Test Statistic Lilliefors Test Statistic Detected Data appear Normal at 5% Sig  Detected Data appear Normal at 5% Sig  Detected Data appear Normal at 5% Significance Level  Kaplan Meier (KM) Background Statistics Assuming Normal Distribution  KM Mean 0.854 95% UTL95% Coverage 2.068 95% KM Percentile (z) 1.471 95% KM Percentile (z) 1.973 99  DL/2 Substitution Background Statistics Assuming Normal Distribution  Mean 0.813 95% UTL95% Coverage 2.16 90% Percentile (z) 1.497 95% F 99% Percentile (z) 2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only A-D Test Statistic 5% A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only k hat (MLE) 3.662 k star (bias cor	KM SD KM UPL (t) ercentile (z) 95% UPL (t) ercentile (z) 95% USL	0.48 1.72 1.64 2.03 0.53 1.77
Lilliefors Test Statistic  5% Lilliefors Critical Value  Detected Data appear Normal at 5% Significance Level  Kaplan Meier (KM) Background Statistics Assuming Normal Distribution  KM Mean  0.854  95% UTL95% Coverage 2.068 90% KM Percentile (z) 1.471 95% KM Percentile (z) 1.973 99% KM Percentile (z) 1.973 99% UTL95% Coverage 2.16 99% UTL95% Coverage 2.16 99% Percentile (z) 1.497 95% F  99% Percentile (z) 2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only A-D Test Statistic 5% A-D Critical Value 1.645  Camma Copt Tests on Detected data appear Gamma Distributed at 5% K-S Critical Value 1.645  Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor	KM SD KM UPL (t) ercentile (z) 95% UPL (t) ercentile (z) 95% USL	0.48 1.72 1.64 2.03 0.53 1.77
Detected Data appear Normal at 5% Significance Level  Kaplan Meier (KM) Background Statistics Assuming Normal Distribution  KM Mean 0.854 95% UTL95% Coverage 2.068 95% 90% KM Percentile (z) 1.471 95% KM Percentile (z) 1.973 99% KM Percentile (z) 1.973 95% KM Percentile (z) 1.497 95% Fercentile (z) 2.055 DL/2 substitution Background Statistics Assuming Normal Distribution  Mean 0.813 95% UTL95% Coverage 2.16 90% Percentile (z) 1.497 95% Fercentile (z) 2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only A-D Test Statistic 0.53 Anderson-Darling GOF Tests on Detected data appear Gamma Distributed at 5% K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5% Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only k hat (MLE) 3.662 k star (bias cor	KM SD KM UPL (t) ercentile (z) 5% KM USL  SD 95% UPL (t) ercentile (z) 95% USL	0.48 1.72 1.64 2.03 0.53 1.77
Name	KM SD KM UPL (t) ercentile (z) 5% KM USL  SD 95% UPL (t) ercentile (z) 95% USL	0.48 1.72 1.64 2.03 0.53 1.77
Kaplan Meier (KM) Background Statistics Assuming Normal Distribution  KM Mean 0.854 95% UTL95% Coverage 2.068 95% 90% KM Percentile (z) 1.471 95% KM P 99% KM Percentile (z) 1.973 9  DL/2 Substitution Background Statistics Assuming Normal Distribution  Mean 0.813 95% UTL95% Coverage 2.16 90% Percentile (z) 1.497 95% P 99% Percentile (z) 2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only  A-D Test Statistic 0.53 Anderson-Darling GOF Te 5% A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5 K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5 Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only k hat (MLE) 3.662 k star (bias cor	SD 95% UPL (t) ercentile (z) 95% UPL (t) ercentile (z) 95% USL	1.72 1.64 2.03 0.53 1.77 1.69
KM Mean   0.854   95% UTL95% Coverage   2.068   95%   95% UTL95% Coverage   2.068   95%   90% KM Percentile (z)   1.471   95% KM P   99% KM Percentile (z)   1.973   9   9   9   9   9   9   9   9   9	SD 95% UPL (t) ercentile (z) 95% UPL (t) ercentile (z) 95% USL	1.72 1.64 2.03 0.53 1.77 1.69
95% UTL95% Coverage 2.068 95% 90% KM Percentile (z) 1.471 95% KM Percentile (z) 1.973 99% Coverage 2.16 90% Percentile (z) 1.497 95% Percentile (z) 2.055 DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons Gamma GOF Tests on Detected Observations Only A-D Test Statistic 0.53 Anderson-Darling GOF Tests On Detected data appear Gamma Distributed at 5% A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5% K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5% Detected data appear Gamma Distributed at 5% Detected data appear Gamma Distributed at 5% Gamma Statistics on Detected Data Only k hat (MLE) 3.662 k star (bias cor	SD 95% UPL (t) ercentile (z) 95% UPL (t) ercentile (z) 95% USL	1.72 1.64 2.03 0.53 1.77 1.69
90% KM Percentile (z) 1.471 95% KM P 99% KM Percentile (z) 1.973 9  DL/2 Substitution Background Statistics Assuming Normal Distribution  Mean 0.813 95% UTL95% Coverage 2.16 90% Percentile (z) 1.497 95% P 99% Percentile (z) 2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only A-D Test Statistic 0.53 Anderson-Darling GOF Te 5% A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5 K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5 Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only k hat (MLE) 3.662 k star (bias cor	sp s	1.64 2.03 0.53 1.77 1.69
DL/2 Substitution Background Statistics Assuming Normal Distribution    Mean   0.813     95% UTL95% Coverage   2.16     90% Percentile (z)   1.497   95% Percentile (z)   2.055     DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons    Gamma GOF Tests on Detected Observations Only     A-D Test Statistic   0.53   Anderson-Darling GOF Tests A-D Critical Value   0.737   Detected data appear Gamma Distributed at 5     K-S Test Statistic   0.205   Kolmogorov-Smirnov GO     5% K-S Critical Value   0.247   Detected data appear Gamma Distributed at 5     Detected data appear Gamma Distributed at 5% Significance Level     Gamma Statistics on Detected Data Only   k hat (MLE)   3.662   k star (bias cor	SD 95% UPL (t) ercentile (z) 95% USL	0.53 1.77 1.69
DL/2 Substitution Background Statistics Assuming Normal Distribution    Mean   0.813     95% UTL95% Coverage   2.16     90% Percentile (z)   1.497   95% Pictorial (z)     99% Percentile (z)   2.055     DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons    Gamma GOF Tests on Detected Observations Only     A-D Test Statistic   0.53   Anderson-Darling GOF Tests     5% A-D Critical Value   0.737   Detected data appear Gamma Distributed at Statistic     K-S Test Statistic   0.205   Kolmogorov-Smirnov GOS     5% K-S Critical Value   0.247   Detected data appear Gamma Distributed at Statistic     Detected data appear Gamma Distributed at 5% Significance Level     Gamma Statistics on Detected Data Only     k hat (MLE)   3.662   k star (bias cor	SD 95% UPL (t) ercentile (z) 95% USL	0.53 1.77 1.69
Mean 0.813 95% UTL95% Coverage 2.16 90% Percentile (z) 1.497 95% P 99% Percentile (z) 2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only  A-D Test Statistic 0.53 Anderson-Darling GOF Tests A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5 K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5 Detected data appear Gamma Distributed at 5 Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor	95% UPL (t) ercentile (z) 95% USL	1.77
Mean 0.813  95% UTL95% Coverage 2.16  90% Percentile (z) 1.497 95% P  99% Percentile (z) 2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only  A-D Test Statistic 0.53 Anderson-Darling GOF Tests A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5 K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5 Detected data appear Gamma Distributed at 5 Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor	95% UPL (t) ercentile (z) 95% USL	1.77
95% UTL95% Coverage 2.16  90% Percentile (z) 1.497 95% P  99% Percentile (z) 2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only  A-D Test Statistic 0.53 Anderson-Darling GOF Te  5% A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5  K-S Test Statistic 0.205 Kolmogorov-Smirnov GO  5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5  Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor	95% UPL (t) ercentile (z) 95% USL	1.77
90% Percentile (z) 1.497 95% P 99% Percentile (z) 2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only  A-D Test Statistic 0.53 Anderson-Darling GOF Tests On Detected data appear Gamma Distributed at 5 K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5 Detected data appear Gamma Distributed at 5 Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor	ercentile (z) 95% USL	1.69
99% Percentile (z) 2.055  DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons  Gamma GOF Tests on Detected Observations Only  A-D Test Statistic 0.53 Anderson-Darling GOF Tests A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5 K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5 Detected data appear Gamma Distributed at 5 Significance Level  Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor	95% USL	
Gamma GOF Tests on Detected Observations Only  A-D Test Statistic 0.53 Anderson-Darling GOF Tests On Detected data appear Gamma Distributed at 5 K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5 Detected data appear Gamma Distributed at 5 Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor	est	2.11
Gamma GOF Tests on Detected Observations Only  A-D Test Statistic 0.53 Anderson-Darling GOF Tests A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5 K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5 Detected data appear Gamma Distributed at 5 Significance Level  Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor		
A-D Test Statistic 0.53 Anderson-Darling GOF Te 5% A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5 K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5 Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only k hat (MLE) 3.662 k star (bias cor		
A-D Test Statistic 0.53 Anderson-Darling GOF Te 5% A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5 K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5 Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only k hat (MLE) 3.662 k star (bias cor		
5% A-D Critical Value 0.737 Detected data appear Gamma Distributed at 5  K-S Test Statistic 0.205 Kolmogorov-Smirnov GO  5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5  Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor		
K-S Test Statistic 0.205 Kolmogorov-Smirnov GO 5% K-S Critical Value 0.247 Detected data appear Gamma Distributed at 5  Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor	% Significance	e Leve
Detected data appear Gamma Distributed at 5% Significance Level  Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor		
Gamma Statistics on Detected Data Only  k hat (MLE) 3.662 k star (bias cor	5% Significance	e Leve
k hat (MLE) 3.662 k star (bias cor		
k hat (MLE) 3.662 k star (bias cor		
	rooted MLE)	2.80
Theta hat (MLE) 0.209 Theta star (blas cor		
1 (415) 27.00		0.35
	s corrected)	67.2
MLE Mean (bias corrected) 0.986  MLE Sd (bias corrected) 0.589 95% Percentile of Chisqu	Jare (2kstar)	12
WEE Ou (Didd Coffeeted) 0.000	lare (ZKStar)	12
Gamma ROS Statistics using Imputed Non-Detects		
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs		
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e	e.g., <15-20)	
For such situations, GROS method may yield incorrect values of UCLs and BTVs		
This is especially true when the sample size is small.	-tit	
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM e		0.05
Minimum 0.306	Mean	0.85
Maximum 1.7	Median	0.59
SD 0.493		0.57
k hat (MLE) 3.391 k star (bias cor	CV	
Theta hat (MLE) 0.253 Theta star (bias cornu hat (MLE) 108.5 nu star (bias	rected MLE)	2.79 0.30

MLE Moon (bio	o corrected)	0.859	MLE Cd /bigg gorrooteg	) 0.514
MLE Mean (bia	, i		MLE Sd (bias corrected 90% Percentil	′
95% Percentile of Chisqu	` ′	11.98		
	6 Percentile	1.84	99% Percentile  Gamma ROS Statistics on Imputed Data	2.476
<del>-</del>			) and Hawkins Wixley (HW) Methods	
Оррег Ентис	WH	HW HW	) and nawkins wixiey (nw) Methods  WH	HW
95% Approx. Gamma UTL with 95% Coverage	2.562	2.667	95% Approx. Gamma UPL 1.909	1.943
95% Gamma USL	2.482	2.577	3370 Approx. Gainina of E	1.545
33% Gamma GGE	2.402	2.077		
Es	timates of G	amma Param	eters using KM Estimates	
	Mean (KM)	0.854	SD (KN	0.481
Va	riance (KM)	0.231	SE of Mean (KN	
	k hat (KM)	3.156	k star (KN	′
	nu hat (KM)	101	nu star (KN	′
	eta hat (KM)	0.271	theta star (KN	′
80% gamma per	` ′	1.24	90% gamma percentile (KN	<b>'</b>
95% gamma pen	` '	1.869	99% gamma percentile (KN	*
<u> </u>	` /			<u> </u>
The following sta	tistics are co	omputed usin	g gamma distribution and KM estimates	
Upper Limits (	using Wilson	Hilferty (WH	) and Hawkins Wixley (HW) Methods	
	WH	HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage	2.503	2.604	95% Approx. Gamma UPL 1.871	1.903
95% KM Gamma Percentile	1.745	1.766	95% Gamma USL 2.426	2.516
Lo	gnormal GO	F Test on De	tected Observations Only	
Shapiro Wilk T	est Statistic	0.906	Shapiro Wilk GOF Test	
5% Shapiro Wilk C	ritical Value	0.859	Detected Data appear Lognormal at 5% Significance	Level
Lilliefors T	est Statistic	0.181	Lilliefors GOF Test	
5% Lilliefors C	ritical Value	0.243	Detected Data appear Lognormal at 5% Significance	Level
Detec	ted Data ap	pear Lognorn	nal at 5% Significance Level	
Background Lognormal R0	OS Statistics	Assuming Lo	ognormal Distribution Using Imputed Non-Detects	
Mean in Or	iginal Scale	0.859	Mean in Log Scal	
SD in Oi	iginal Scale	0.492	SD in Log Scal	0.569
95% UTL95°	% Coverage	3.101	95% BCA UTL95% Coverag	e 1.7
95% Bootstrap (%) UTL959	ŭ	1.7	95% UPL (	2.062
90% P	ercentile (z)	1.529	95% Percentile (2	) 1.88
99% P	ercentile (z)	2.771	95% US	2.962
<u>-</u>			ata and Assuming Lognormal Distribution	
KM Mean of L		-0.317	95% KM UTL (Lognormal)95% Coverag	
	ogged Data	0.568	95% KM UPL (Lognorma	•
95% KM Percentile Lo	gnormal (z)	1.853	95% KM USL (Lognorma	) 2.916
<u> </u>			uming Lognormal Distribution	0.151
	iginal Scale	0.813	Mean in Log Scal	
SD in Or	iginal Scale	0.534	SD in Log Scal	
	v 0	0 7 4		
95% UTL959	-	3.74	95% UPL (	•
90% P	% Coverage ercentile (z) ercentile (z)	3.74 1.586 3.263	95% UPL ( 95% Percentile (z 95% US	) 2.038

DL/2 is not a Recommended Meth	od. DL/2 pr	ovided for comparisons and historical reasons.	
Nonnarametric	Dietribution	Free Background Statistics	
		Distribution at 5% Significance Level	
· · · · · · · · · · · · · · · · · · ·		<u> </u>	
Nonparametric Upper Limits for B	√S(no disti	nction made between detects and nondetects)	
Order of Statistic, r	16	95% UTL with95% Coverage	1.7
Approx, f used to compute achieved CC	0.842	Approximate Actual Confidence Coefficient achieved by UTL	0.56
Approximate Sample Size needed to achieve specified CC	59	95% UPL	1.7
95% USL	1.7	95% KM Chebyshev UPL	3.016
Note: The use of USL tends to yield a conservative	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV	only when th	ne data set represents a background data set free of outliers	
and consists of observa	tions collect	ed from clean unimpacted locations.	
The use of USL tends to provide a balan	ce between	false positives and false negatives provided the data	
represents a background data set and wh	nen many or	site observations need to be compared with the BTV.	
strontium			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	13
Minimum	14	First Quartile	16.6
Second Largest	29	Median	19
Maximum	46	Third Quartile	24.55
Mean	21.7	SD	7.877
Coefficient of Variation	0.363	Skewness	2.078
Mean of logged Data	3.029	SD of logged Data	0.307
Critical Values for	or Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.524	d2max (for USL)	2.443
	Normal (	GOF Test	
Shapiro Wilk Test Statistic	0.791	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.208	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.213	Data appear Normal at 5% Significance Level	
O /o Elillototo Officar Valuo	0.2.0	Bata appear Horman at 676 eighniodrico Ecver	
		rmal at 5% Significance Level	
Data appear Appr	oximate No	rmal at 5% Significance Level	
Data appear Appr  Background St	oximate No	rmal at 5% Significance Level	31.79
Data appear Appr  Background St  95% UTL with 95% Coverage	oximate Notatistics Ass	rmal at 5% Significance Level suming Normal Distribution  90% Percentile (z)	31.79
Data appear Appr  Background St  95% UTL with 95% Coverage  95% UPL (t)	tatistics Ass 41.58 35.93	rmal at 5% Significance Level  suming Normal Distribution  90% Percentile (z)  95% Percentile (z)	34.66
Data appear Appr  Background St  95% UTL with 95% Coverage	oximate Notatistics Ass	rmal at 5% Significance Level suming Normal Distribution  90% Percentile (z)	
Data appear Appr  Background St  95% UTL with 95% Coverage  95% UPL (t)	41.58 35.93 40.94	suming Normal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z)	34.66
Data appear Appr  Background St  95% UTL with 95% Coverage  95% UPL (t)  95% USL	tatistics Ass 41.58 35.93 40.94	rmal at 5% Significance Level  suming Normal Distribution  90% Percentile (z)  95% Percentile (z)  99% Percentile (z)	34.66
Data appear Appr  Background St 95% UTL with 95% Coverage 95% UPL (t) 95% USL  A-D Test Statistic	41.58 35.93 40.94	suming Normal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z) Anderson-Darling Gamma GOF Test	34.66 40.02
Data appear Appr  Background St  95% UTL with 95% Coverage  95% UPL (t)  95% USL	41.58 35.93 40.94 Gamma 0.604	suming Normal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)  GOF Test  Anderson-Darling Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance	34.66 40.02
Background St 95% UTL with 95% Coverage 95% UPL (t) 95% USL  A-D Test Statistic 5% A-D Critical Value	41.58 35.93 40.94 Gamma 0.604 0.739	suming Normal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z) Anderson-Darling Gamma GOF Test	34.66 40.02

	Gamma	Statistics	
k hat (MLE)	10.41	k star (bias corrected MLE)	8.501
Theta hat (MLE)	2.084	Theta star (bias corrected MLE)	2.553
nu hat (MLE)	333.2	nu star (bias corrected)	272
MLE Mean (bias corrected)	21.7	MLE Sd (bias corrected)	7.443
Background St	atistics Ass	suming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	35.79	90% Percentile	31.62
95% Hawkins Wixley (HW) Approx. Gamma UPL	35.82	95% Percentile	35.21
95% WH Approx. Gamma UTL with 95% Coverage	43.19	99% Percentile	42.64
95% HW Approx. Gamma UTL with 95% Coverage	43.54		
95% WH USL	42.31	95% HW USL	42.61
	Lognorma	I GOF Test	
Shapiro Wilk Test Statistic	0.91	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.17	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
Data appear	Lognormal	at 5% Significance Level	
Background State	tistics assu	ming Lognormal Distribution	
95% UTL with 95% Coverage	44.88	90% Percentile (z)	30.64
95% UPL (t)	36	95% Percentile (z)	34.25
95% USL	43.78	99% Percentile (z)	42.23
Nonparametric I	Distribution	Free Background Statistics	
Data appear Appro	oximate No	rmal at 5% Significance Level	
Nonparametric Upp	er Limits fo	r Background Threshold Values	
Order of Statistic, r	16	95% UTL with 95% Coverage	46
Approx, f used to compute achieved CC	0.842	Approximate Actual Confidence Coefficient achieved by UTL	0.56
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	46	95% BCA Bootstrap UTL with 95% Coverage	46
95% UPL	46	90% Percentile	27.05
90% Chebyshev UPL	46.06	95% Percentile	33.25
95% Chebyshev UPL	57.09	99% Percentile	43.45
95% Chebyshev UPL 95% USL	57.09 46	99% Percentile	43.45
95% USL	46		43.45
95% USL  Note: The use of USL tends to yield a conservative	46 ve estimate	of BTV, especially when the sample size starts exceeding 20.	43.45
Note: The use of USL tends to yield a conservative.  Therefore, one may use USL to estimate a BTV of	46 ve estimate only when th	of BTV, especially when the sample size starts exceeding 20. ne data set represents a background data set free of outliers	43.45
Note: The use of USL tends to yield a conservative.  Therefore, one may use USL to estimate a BTV of and consists of observations.	46  ve estimate only when the tions collect	of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers led from clean unimpacted locations.	43.45
Note: The use of USL tends to yield a conservative Therefore, one may use USL to estimate a BTV of and consists of observation The use of USL tends to provide a balance.	46  ve estimate only when the tions collections collections between	of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers led from clean unimpacted locations.  false positives and false negatives provided the data	43.45
Note: The use of USL tends to yield a conservative Therefore, one may use USL to estimate a BTV of and consists of observation The use of USL tends to provide a balance.	46  ve estimate only when the tions collections collections between	of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers led from clean unimpacted locations.	43.45
Note: The use of USL tends to yield a conservative Therefore, one may use USL to estimate a BTV of and consists of observation The use of USL tends to provide a balance.	46  ve estimate only when the tions collections collections between	of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers led from clean unimpacted locations.  false positives and false negatives provided the data	43.45
Note: The use of USL tends to yield a conservative Therefore, one may use USL to estimate a BTV of and consists of observation The use of USL tends to provide a balance represents a background data set and when the use of USL tends to provide a balance represents a background data set and when the use of USL tends to provide a balance represents a background data set and when the use of USL tends to provide a balance represents a background data set and when the use of USL tends to yield a conservative to the use of USL tends to yield a conservative tends to yield a con	46  ve estimate only when the tions collections collections between	of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers led from clean unimpacted locations.  false positives and false negatives provided the data	43.45
Note: The use of USL tends to yield a conservative Therefore, one may use USL to estimate a BTV of and consists of observation The use of USL tends to provide a balance represents a background data set and when the use of USL tends to provide a balance represents a background data set and when the use of USL tends to provide a balance represents a background data set and when the use of USL tends to provide a balance represents a background data set and when the use of USL tends to yield a conservative to the use of USL tends to yield a conservative tends to yield a con	46  ve estimate only when the tions collections collections many or ma	of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers led from clean unimpacted locations.  false positives and false negatives provided the data	43.45
Note: The use of USL tends to yield a conservative.  Therefore, one may use USL to estimate a BTV of and consists of observation.  The use of USL tends to provide a balance represents a background data set and when	46  ve estimate only when the tions collections collections many or ma	of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers and from clean unimpacted locations.  false positives and false negatives provided the data ansite observations need to be compared with the BTV.	43.45
Note: The use of USL tends to yield a conservative.  Therefore, one may use USL to estimate a BTV of and consists of observation.  The use of USL tends to provide a balance represents a background data set and whe	46  ve estimate only when the tions collect ce between many or General	of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers sed from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics	

Number of Distinct Detects	1	Number of Distinct Non-Detects	7
Minimum Detect	2.3	Minimum Non-Detect	0.53
Maximum Detect	2.3	Maximum Non-Detect	0.65
Variance Detected	N/A	Percent Non-Detects	90%
Mean Detected	2.3	SD Detected	N/A
Mean of Detected Logged Data	0.833	SD of Detected Logged Data	N/A
Warning: Only one distinct data value was detected	ed! ProUCL	(or any other software) should not be used on such a data set	t!
It is suggested to use alternative site specific values determ	nined by the	Project Team to estimate environmental parameters (e.g., E	PC, BTV).
The data set for	or variable ti	nallium was not processed!	
vanadium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	8
		Number of Missing Observations	6
Minimum	34	First Quartile	35.5
Second Largest	67	Median	38.5
Maximum	190	Third Quartile	52.5
Mean	57.9	SD	47.63
Coefficient of Variation	0.823	Skewness	2.884
Mean of logged Data	3.89	SD of logged Data	0.527
Critical Values for	or Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176
	Normal (	GOF Test	
Shapiro Wilk Test Statistic	0.548	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.341	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	
Data Not	Normal at 5	% Significance Level	
Background S	tatistics Ass	suming Normal Distribution	
95% UTL with 95% Coverage	196.6	90% Percentile (z)	118.9
95% UPL (t)	149.5	95% Percentile (z)	136.2
95% USL	161.5	99% Percentile (z)	168.7
		1	
	Gamma	GOF Test	
A-D Test Statistic	1.459	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.732	Data Not Gamma Distributed at 5% Significance Lev	el
K-S Test Statistic	0.285	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.268	Data Not Gamma Distributed at 5% Significance Levi	el
Data Not Gamr	na Distribut	ed at 5% Significance Level	
	Gamma	Statistics	
k hat (MLE)	3.123	k star (bias corrected MLE)	2.253
Theta hat (MLE)	18.54	Theta star (bias corrected MLE)	25.7

nu hat (MLE)	62.46	nu star (bias corrected)	45.06
MLE Mean (bias corrected)	57.9	MLE Sd (bias corrected)	38.58
MEE Mean (blue confected)	07.0	INIEE OU (DIAS CONCOCCU)	00.00
Background S	tatistics Ass	suming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	139.3	90% Percentile	109.5
95% Hawkins Wixley (HW) Approx. Gamma UPL	138.1	95% Percentile	132.3
95% WH Approx. Gamma UTL with 95% Coverage	209.5	99% Percentile	182.5
95% HW Approx. Gamma UTL with 95% Coverage	212.7		
95% WH USL	155.5	95% HW USL	155
	Lognorma	I GOF Test	
Shapiro Wilk Test Statistic	0.71	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.249	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	
		normal at 5% Significance Level	
<u></u>			
Background St	atistics assu	ming Lognormal Distribution	
95% UTL with 95% Coverage	227	90% Percentile (z)	96.14
95% UPL (t)	134.8	95% Percentile (z)	116.4
95% USL	154.1	99% Percentile (z)	166.8
		1	
Nonparametric	Distribution	Free Background Statistics	
Data appear Appro	ximate Logi	normal at 5% Significance Level	
Nonparametric Up	per Limits fo	r Background Threshold Values	
Order of Statistic, r	10	95% UTL with 95% Coverage	190
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	190	95% BCA Bootstrap UTL with 95% Coverage	190
95% UPL	190	90% Percentile	79.3
90% Chebyshev UPL	207.8	95% Percentile	134.7
95% Chebyshev UPL	275.7	99% Percentile	178.9
95% USL	190	3370 Forestitute	170.5
	.00		
Note: The use of USL tends to yield a conservat	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
<u> </u>		ne data set represents a background data set free of outliers	
<u> </u>		ted from clean unimpacted locations.	
		false positives and false negatives provided the data	
		raise pecial de ana raise riegant de providea ane aara	
p. oooo a baonground data oot diid W		nsite observations need to be compared with the BTV	
		nsite observations need to be compared with the BTV.	
inc		nsite observations need to be compared with the BTV.	
zinc		nsite observations need to be compared with the BTV.	
		nsite observations need to be compared with the BTV.	
General Statistics	hen many or		10
		Number of Distinct Observations	10
General Statistics  Total Number of Observations	hen many or	Number of Distinct Observations Number of Missing Observations	6
General Statistics  Total Number of Observations  Minimum	10	Number of Distinct Observations Number of Missing Observations First Quartile	6 44.25
General Statistics  Total Number of Observations  Minimum  Second Largest	10 40 75	Number of Distinct Observations Number of Missing Observations First Quartile Median	6 44.25 46.5
General Statistics  Total Number of Observations  Minimum	10	Number of Distinct Observations Number of Missing Observations First Quartile	6 44.25

Coefficient of Variation		Skewness	3.01
Mean of logged Date	a 4.028	SD of logged Data	0.524
		und Threshold Values (BTVs)	
Tolerance Factor K (For UTI	2.911	d2max (for USL)	2.176
		GOF Test	
Shapiro Wilk Test Statist		Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Valu		Data Not Normal at 5% Significance Level	
Lilliefors Test Statist		Lilliefors GOF Test	
5% Lilliefors Critical Valu		Data Not Normal at 5% Significance Level	
Data N	ot Normal at	5% Significance Level	
<del>-</del>		suming Normal Distribution	
95% UTL with 95% Coverag		90% Percentile (z)	141.4
95% UPL (	t) 178.6	95% Percentile (z)	162.5
95% US	193.4	99% Percentile (z)	202.1
	Gamma	GOF Test	
A-D Test Statist	c 2.033	Anderson-Darling Gamma GOF Test	
5% A-D Critical Valu	e 0.732	Data Not Gamma Distributed at 5% Significance Leve	el
K-S Test Statist	c 0.412	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Valu	e 0.268	Data Not Gamma Distributed at 5% Significance Leve	el
Data Not Gar	nma Distribut	ed at 5% Significance Level	
	Gamma	Statistics	
k hat (MLE	3.009	k star (bias corrected MLE)	2.173
Theta hat (MLE	22.23	Theta star (bias corrected MLE)	30.79
nu hat (MLE	60.18	nu star (bias corrected)	43.46
nu nat (witt	,		
MLE Mean (bias corrected	′	MLE Sd (bias corrected)	45.38
<u> </u>	′	MLE Sd (bias corrected)	45.38
MLE Mean (bias corrected	66.9	MLE Sd (bias corrected)	45.38
MLE Mean (bias corrected	66.9  Statistics Ass		45.38 127.6
MLE Mean (bias corrected	66.9  Statistics Ass L 162.6	suming Gamma Distribution	
MLE Mean (bias corrected  Background  95% Wilson Hilferty (WH) Approx. Gamma UP	Statistics As: L 162.6 L 160.4	suming Gamma Distribution 90% Percentile	127.6
MLE Mean (bias corrected  Background  95% Wilson Hilferty (WH) Approx. Gamma UP  95% Hawkins Wixley (HW) Approx. Gamma UP	Statistics Ass L 162.6 L 160.4 e 245.8	suming Gamma Distribution  90% Percentile  95% Percentile	127.6 154.6
MLE Mean (bias corrected  Background  95% Wilson Hilferty (WH) Approx. Gamma UP  95% Hawkins Wixley (HW) Approx. Gamma UP  95% WH Approx. Gamma UTL with 95% Coverage	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1	suming Gamma Distribution  90% Percentile  95% Percentile	127.6 154.6
MLE Mean (bias corrected  Background  95% Wilson Hilferty (WH) Approx. Gamma UP  95% Hawkins Wixley (HW) Approx. Gamma UP  95% WH Approx. Gamma UTL with 95% Coverage  95% HW Approx. Gamma UTL with 95% Coverage	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1	suming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile	127.6 154.6 214.2
MLE Mean (bias corrected  Background  95% Wilson Hilferty (WH) Approx. Gamma UP  95% Hawkins Wixley (HW) Approx. Gamma UP  95% WH Approx. Gamma UTL with 95% Coverage  95% HW Approx. Gamma UTL with 95% Coverage	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1 L 181.7	suming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile	127.6 154.6 214.2
MLE Mean (bias corrected  Background  95% Wilson Hilferty (WH) Approx. Gamma UP  95% Hawkins Wixley (HW) Approx. Gamma UP  95% WH Approx. Gamma UTL with 95% Coverage  95% HW Approx. Gamma UTL with 95% Coverage	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1 L 181.7	90% Percentile 95% Percentile 99% Percentile 99% Percentile	127.6 154.6 214.2
MLE Mean (bias corrected  Background  95% Wilson Hilferty (WH) Approx. Gamma UP  95% Hawkins Wixley (HW) Approx. Gamma UP  95% WH Approx. Gamma UTL with 95% Coverag  95% HW Approx. Gamma UTL with 95% Coverag  95% WH US	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1 L 181.7	suming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% HW USL	127.6 154.6 214.2
MLE Mean (bias corrected  Background  95% Wilson Hilferty (WH) Approx. Gamma UP  95% Hawkins Wixley (HW) Approx. Gamma UP  95% WH Approx. Gamma UTL with 95% Coverage  95% HW Approx. Gamma UTL with 95% Coverage  95% WH US  Shapiro Wilk Test Statist	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1 L 181.7 Lognorma c 0.608 e 0.842	Suming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 95% HW USL  II GOF Test  Shapiro Wilk Lognormal GOF Test	127.6 154.6 214.2
Background  95% Wilson Hilferty (WH) Approx. Gamma UP  95% Hawkins Wixley (HW) Approx. Gamma UP  95% WH Approx. Gamma UTL with 95% Coverag  95% HW Approx. Gamma UTL with 95% Coverag  95% WH US  Shapiro Wilk Test Statist  5% Shapiro Wilk Critical Value	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1 L 181.7 Lognorma c 0.608 e 0.842 c 0.388	90% Percentile 95% Percentile 95% Percentile 99% Percentile 95% HW USL  Il GOF Test Shapiro Wilk Lognormal GOF Test Data Not Lognormal at 5% Significance Level	127.6 154.6 214.2
Background  95% Wilson Hilferty (WH) Approx. Gamma UP 95% Hawkins Wixley (HW) Approx. Gamma UP 95% WH Approx. Gamma UTL with 95% Coverag 95% HW Approx. Gamma UTL with 95% Coverag 95% WH US  Shapiro Wilk Test Statist 5% Shapiro Wilk Critical Valu Lilliefors Test Statist	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1 L 181.7 Lognorma c 0.608 e 0.842 c 0.388 e 0.262	Suming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile 95% HW USL  II GOF Test  Shapiro Wilk Lognormal GOF Test Data Not Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test	127.6 154.6 214.2
Background  95% Wilson Hilferty (WH) Approx. Gamma UP 95% Hawkins Wixley (HW) Approx. Gamma UP 95% WH Approx. Gamma UTL with 95% Coverag 95% HW Approx. Gamma UTL with 95% Coverag 95% WH US  Shapiro Wilk Test Statist 5% Shapiro Wilk Critical Valu Lilliefors Test Statist	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1 L 181.7 Lognorma c 0.608 e 0.842 c 0.388 e 0.262	Suming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile  95% HW USL  II GOF Test  Shapiro Wilk Lognormal GOF Test Data Not Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test  Data Not Lognormal at 5% Significance Level	127.6 154.6 214.2
Background  95% Wilson Hilferty (WH) Approx. Gamma UP 95% Hawkins Wixley (HW) Approx. Gamma UP 95% WH Approx. Gamma UTL with 95% Coverag 95% HW Approx. Gamma UTL with 95% Coverag 95% WH US  Shapiro Wilk Test Statist 5% Shapiro Wilk Critical Valu Lilliefors Test Statist 5% Lilliefors Critical Valu  Data Not	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1 L 181.7 Lognorma c 0.608 e 0.842 c 0.388 e 0.262 Lognormal a	Suming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile  95% HW USL  II GOF Test  Shapiro Wilk Lognormal GOF Test Data Not Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test  Data Not Lognormal at 5% Significance Level	127.6 154.6 214.2
Background  95% Wilson Hilferty (WH) Approx. Gamma UP 95% Hawkins Wixley (HW) Approx. Gamma UP 95% WH Approx. Gamma UTL with 95% Coverag 95% HW Approx. Gamma UTL with 95% Coverag 95% WH US  Shapiro Wilk Test Statist 5% Shapiro Wilk Critical Valu Lilliefors Test Statist 5% Lilliefors Critical Valu  Data Not	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1 L 181.7 Lognorma c 0.608 e 0.842 c 0.388 e 0.262 Lognormal a	Suming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile 95% HW USL  II GOF Test  Shapiro Wilk Lognormal GOF Test Data Not Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test Data Not Lognormal at 5% Significance Level t 5% Significance Level	127.6 154.6 214.2
Background  95% Wilson Hilferty (WH) Approx. Gamma UP 95% Hawkins Wixley (HW) Approx. Gamma UP 95% WH Approx. Gamma UTL with 95% Coverag 95% HW Approx. Gamma UTL with 95% Coverag 95% WH US  Shapiro Wilk Test Statist 5% Shapiro Wilk Critical Valu Lilliefors Test Statist 5% Lilliefors Critical Valu  Data Not	Statistics Ass L 162.6 L 160.4 e 245.8 e 248.1 L 181.7  Lognorma c 0.608 e 0.842 c 0.388 e 0.262  Lognormal a	Suming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 95% HW USL  II GOF Test  Shapiro Wilk Lognormal GOF Test Data Not Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test Data Not Lognormal at 5% Significance Level t 5% Significance Level	127.6 154.6 214.2 180.2

Nonparametric	Nonparametric Distribution Free Background Statistics									
Data do not fo	ollow a Disc	ernible Distribution (0.05)								
Nonparametric Upp	er Limits fo	r Background Threshold Values								
Order of Statistic, r	10	95% UTL with 95% Coverage	230							
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401							
		Approximate Sample Size needed to achieve specified CC	59							
95% Percentile Bootstrap UTL with 95% Coverage	230	95% BCA Bootstrap UTL with 95% Coverage	230							
95% UPL	230	90% Percentile	90.5							
90% Chebyshev UPL	249.8	95% Percentile	160.3							
95% Chebyshev UPL	332.6	99% Percentile	216.1							
95% USL	230									

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.

Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.

The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

	ioodness-of-Fit Te	st St	tatistics for l	Data Sets wi	th Non-Dete	ects			
User Selected Options		14.4.	14.F2 DM						
·	roUCL 5.18/17/202								
	roUCL Background	ınp	uts.xis						
	)FF								
Confidence Coefficient 0	.95								
								T	1
antimony									
							0/ 1/5		
	Num C	bs	Num Miss	Num Valid	Detects	NDs	% NDs		
Raw	Statistics 16		6	10	0	10	100.00%		
Warning: All observ									
Specifically, sample n									
The Project Team may decid	de to use alternati	ve si	te specific v	alues to esti	imate enviro	nmental par	ameters (e.	g., EPC, BT	V).
	The data s	et fo	r variable ar	ntimony was	not process	sed!			
arsenic									
Raw Stat									
Number	r of Valid Observati	ons	16						
Number of	f Distinct Observati		13						
	Minin	num	1.4						
	Maxin		3.08						
	Mean of Raw D	)ata	1.997						
Standard	Deviation of Raw D	)ata	0.376						
	k	(hat	33.27						
	Theta	hat	0.06						
	K	star	27.08						
	Theta	star	0.0737						
	Log Transformed D		0.676						
Standard Deviation of	Log Transformed D	)ata	0.176						
Normal GOF T	est Results								
Co	orrelation Coefficie	nt R	0.929						
Sha	piro Wilk Test Stat	istic	0.887						
Shapiro W	ilk Critical (0.05) Va	alue	0.887						
Approximate	e Shapiro Wilk P Va	alue	0.039						
	Lilliefors Test Stat	istic	0.147						
Lilliefo	ors Critical (0.05) Va	alue	0.213						
Data appear Normal at (0.05) Signific	ance Level								
Gamma GOF T	est Results								
Co	orrelation Coefficie	nt R	0.948						

A-D Test Statistic	0.399	1		T	1
A-D Test Statistic  A-D Critical (0.05) Value	0.399				
K-S Test Statistic	0.124				
K-S Critical(0.05) Value	0.215				
Data appear Gamma Distributed at (0.05) Significance Leve	)I				
Lognormal GOF Test Results					
Correlation Coefficient R	0.963				
Shapiro Wilk Test Statistic	0.948				
Shapiro Wilk Critical (0.05) Value	0.887				
Approximate Shapiro Wilk P Value	0.368				
Lilliefors Test Statistic	0.125				
Lilliefors Critical (0.05) Value	0.213				
Data appear Lognormal at (0.05) Significance Level					
barium					
Raw Statistics					
Number of Valid Observations	16				
Number of Distinct Observations	15				
Minimum	36				
Maximum	77.9				
Mean of Raw Data	54.96				
Standard Deviation of Raw Data	11.56				
Khat	25.01				
Theta hat	2.197				
Kstar	20.36				
Theta star	2.699				
Mean of Log Transformed Data	3.986				
Standard Deviation of Log Transformed Data	0.206				
Clairadia Dorration of Log Handlomou Data	0.200				
Normal GOF Test Results					
Normal GOT Test Nesults					
Correlation Coefficient R	0.971				
Shapiro Wilk Test Statistic	0.942				
Shapiro Wilk Critical (0.05) Value					
	0.887				
Approximate Shapiro Wilk P Value  Lilliefors Test Statistic					
	0.192				
Lilliefors Critical (0.05) Value	0.213				
Data appear Normal at (0.05) Significance Level					
2 225 : 5					
Gamma GOF Test Results					
_					
Correlation Coefficient R	0.981				
A-D Test Statistic	0.321				
A-D Critical (0.05) Value	0.736				
K-S Test Statistic	0.17				
K-S Critical(0.05) Value	0.215				
Data appear Gamma Distributed at (0.05) Significance Leve	ı				

Lagrange COF Took Bossika					
Lognormal GOF Test Results					
	2 22 4				
Correlation Coefficient R	0.984				
Shapiro Wilk Test Statistic	0.968				
Shapiro Wilk Critical (0.05) Value	0.887				
Approximate Shapiro Wilk P Value	0.779				
Lilliefors Test Statistic	0.156				
Lilliefors Critical (0.05) Value	0.213				
Data appear Lognormal at (0.05) Significance Level					
beryllium					
Raw Statistics					
Number of Valid Observations	16				
Number of Distinct Observations	14				
Minimum	0.293				
Maximum	0.99				
Mean of Raw Data	0.507				
Standard Deviation of Raw Data	0.154				
Khat	14.04				
Theta hat	0.0361				
Kstar	11.45				
Theta star	0.0443				
Mean of Log Transformed Data	-0.715				
Standard Deviation of Log Transformed Data	0.268				
Standard Deviation of Log Transformed Data	0.200				
Normal GOF Test Results					
Normal GOL Test Results					
Correlation Coefficient R	0.886				
Shapiro Wilk Test Statistic	0.813				
Shapiro Wilk Critical (0.05) Value	0.887				
Approximate Shapiro Wilk P Value	0.00264				
Lilliefors Test Statistic	0.228				
Lilliefors Critical (0.05) Value	0.213				
Data not Normal at (0.05) Significance Level					
Gamma GOF Test Results					
Correlation Coefficient R	0.92				
A-D Test Statistic	0.558				
A-D Critical (0.05) Value	0.738				
K-S Test Statistic	0.185				
K-S Critical(0.05) Value	0.215				
Data appear Gamma Distributed at (0.05) Significance Leve	I				
Lognormal GOF Test Results					
Correlation Coefficient R	0.953				
Shapiro Wilk Test Statistic	0.933				
r · · · · · · · · · · · · · · · · · · ·				<u> </u>	İ.

OL LANGUE OF STATE	(0.05) ) ( 1	0.007	1			1	1	1
Shapiro Wilk Critical	` '							
Approximate Shapiro								
	Test Statistic							
Lilliefors Critical	* *	0.213						
Data appear Lognormal at (0.05) Significance L	.evel							
cadmium								
	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs		
Raw Statistics	16	0	16	7	9	56.25%		
	Number	Minimum	Maximum	Mean	Median	SD		
Statistics (Non-Detects Only)	9	0.27	0.3	0.283	0.28	0.0122		
Statistics (Non-Detects Only)	7	0.0918	0.38	0.161	0.136	0.101		
Statistics (All: NDs treated as DL value)	16	0.0918	0.38	0.23	0.27	0.09		
Statistics (All: NDs treated as DL/2 value)	16	0.0918	0.38	0.15	0.14	0.0648		
Statistics (Normal ROS Imputed Data)	16	0.0772	0.38	0.147	0.136	0.0725		
Statistics (Gamma ROS Imputed Data)	16	0.0789	0.38	0.143	0.131	0.0718		
Statistics (Lognormal ROS Imputed Data)	16	0.0918	0.38	0.143	0.131	0.0693		
		1	l .	1		I.		
	K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV		
Statistics (Non-Detects Only)	4.282	2.542	0.0376	-1.948	0.491	-0.252		
Statistics (NDs = DL)	5.628	4.614	0.0408	-1.562	0.47	-0.301		
Statistics (NDs = DL/2)	9.164	7.487	0.0164	-1.952	0.312	-0.16		
Statistics (Gamma ROS Estimates)	6.178	5.062	0.0231	-2.03	0.392	-0.193		
Statistics (Lognormal ROS Estimates)				-2.02	0.358	-0.177		
		1	l			l		
!	Normal GOF	Test Result	s					
	No NDs	NDs = DL	NDs = DL/2	Normal ROS	i			
Correlation Coefficient R	0.832	0.936	0.729	0.849				
		Crit. (0.05)	C	Conclusion wit	th Alpha(0.0	5)		
Shapiro-Wilk (Detects Only)		0.803	Data Not No					
Shapiro-Wilk (NDs = DL)		0.887	Data Not No	ormal				
Shapiro-Wilk (NDs = DL/2)		0.887	Data Not No					
Shapiro-Wilk (Normal ROS Estimates)		0.887	Data Not No					
Lilliefors (Detects Only)		0.304	Data Appea	ır Normal				
Lilliefors (NDs = DL)	0.297	0.213	Data Not No	ormal				
Lilliefors (NDs = DL/2)		0.213	Data Not No	ormal				
Lilliefors (Normal ROS Estimates)	0.215	0.213	Data Not No	ormal				
	Gamma GOF	Test Resul	ts					
	No NDs			Gamma ROS				
Correlation Coefficient R	0.919	0.901	0.791	0.893				
	Test value	Crit. (0.05)	C	Conclusion wit	th Alpha(0.0	5)		
Anderson-Darling (Detects Only)	0.646	0.71						
Kolmogorov-Smirnov (Detects Only)		0.71						

Anderson Darling (NIDs = DL)	1.302	0.741	<u> </u>				1
Anderson-Darling (NDs = DL)  Kolmogorov-Smirnov (NDs = DL)	0.328	0.741	Data Not Co	amma Distrib	utod		
Anderson-Darling (NDs = DL/2)		0.216	Data Not Ga	amma Distrib	utea		
• , ,	1.888	0.739	Data Nat C	amana Diatrib			
Kolmogorov-Smirnov (NDs = DL/2)  Anderson-Darling (Gamma ROS Estimates)	0.332	0.215	Data Not Ga	amma Distrib			
• ,	0.81		D-44-D	-t A	D Di-t-		
Kolmogorov-Smirnov (Gamma ROS Est.)	0.165	0.216	Detected Da	ata appear A	pproximate (	Gamma Distr	
			-14-				
Lo	gnormal GO	F Test Resu	JITS				
	No NDs	NDo = DI	NDs = DL/2	Log ROS			
Correlation Coefficient R	0.918	0.916	0.846	0.905			
Correlation Coefficient N	0.916	0.910	0.040	0.903			
	Test value	Crit. (0.05)		Conclusion wi	th Alpha/0.0	5)	
Shapiro-Wilk (Detects Only)	0.851	0.803		r Lognormal	tii Aipiia(0.0	3)	
Shapiro-Wilk (NDs = DL)	0.831	0.887	Data Not Lo				
Shapiro-Wilk (NDs = DL/2)	0.827	0.887	Data Not Lo				
Shapiro-Wilk (Lognormal ROS Estimates)	0.746	0.887	Data Not Lo	-			
Lilliefors (Detects Only)		0.887		r Lognormal			
Lilliefors (NDs = DL)		0.304	Data Not Lo				
Lilliefors (NDs = DL/2)	0.305	0.213	Data Not Lo				
Lilliefors (Lognormal ROS Estimates)	0.303	0.213		r Lognormal			
Lillielors (Lognormal NOS Estimates)							
Note: Substitution methods such as DL or DL/2	oro not room	mmondod					
Note: Substitution methods such as DE of DEZ	are not rect	minenaea.					
hexavalent chromium							
nexavalent cinomium							
	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs	
Raw Statistics	16	0	16	9	7	43.75%	
Traw Statistics	10	U	10	3	,	45.7570	
	Number	Minimum	Maximum	Mean	Median	SD	
Statistics (Non-Detects Only)	7	0.12	1.19	0.863	1.14	0.504	
Statistics (Non-Detects Only)	9	0.12	5.34	1.176	0.81	1.579	
, , , , , , , , , , , , , , , , , , , ,		0.21	5.34	1.039	0.855	1.207	
Statistics (All: NDs treated as DL value)			5.34				
Statistics (All: NDs treated as DL/2 value)  Statistics (Normal ROS Imputed Data)	16	0.06		0.85	0.58	1.225	
Statistics (Normal ROS Imputed Data)  Statistics (Gamma ROS Imputed Data)	16	-1.631 0.01	5.34 5.34	0.589	0.6	1.524 1.263	
Statistics (Gamma ROS Imputed Data)  Statistics (Lognormal ROS Imputed Data)							
Statistics (Lognornial ROS Imputed Data)	16	0.13	5.34	0.836	0.6	1.23	
	K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV	
Statistics (Non-Detects Only)	1.299	0.94	0.905	-0.27	0.867	-3.21	
Statistics (Non-Detects Only)  Statistics (NDs = DL)	1.299	1.163	0.905	-0.27	0.867	-3.21 -2.571	
Statistics (NDs = DL/2)	1.38	0.955	0.753	-0.366	1.045	-1.561	
, , ,							
Statistics (Legnermal POS Estimates)	0.541	0.482	1.46	-1.394	2.029	-1.456	
Statistics (Lognormal ROS Estimates)				-0.641	0.893	-1.394	
	Jormal COT	Toot Bassill					
	Normal GOF	Test Result	5				
	No NDo	NDs - Di	NDs = DL/2	Normal ROS			
Correlation Coefficient D	No NDs						
Correlation Coefficient R	0.705	0.73	0.659	0.853			

	Test value	Crit. (0.05)	С	onclusion w	ith Alpha(0.0	05)	
Shapiro-Wilk (Detects Only)	0.531	0.829	Data Not No	rmal			
Shapiro-Wilk (NDs = DL)	0.564	0.887	Data Not No	rmal			
Shapiro-Wilk (NDs = DL/2)	0.467	0.887	Data Not No	rmal			
Shapiro-Wilk (Normal ROS Estimates)	0.759	0.887	Data Not No	rmal			
Lilliefors (Detects Only)	0.463	0.274	Data Not No	rmal			
Lilliefors (NDs = DL)	0.388	0.213	Data Not No	rmal			
Lilliefors (NDs = DL/2)	0.428	0.213	Data Not No	rmal			
Lilliefors (Normal ROS Estimates)	0.308	0.213	Data Not No	rmal			
,							
	amma GOF	Test Resul	ts				
	No NDs	NDs = DL	NDs = DL/2	Gamma RO			
Correlation Coefficient R	0.864	0.856	0.822	0.884			
	Test value	Crit. (0.05)	С	onclusion w	ith Alpha(0.0	05)	
Anderson-Darling (Detects Only)	1.129	0.738					
Kolmogorov-Smirnov (Detects Only)	0.394	0.285	Data Not Ga	ımma Distrib	outed		
Anderson-Darling (NDs = DL)	0.894	0.757					
Kolmogorov-Smirnov (NDs = DL)	0.265	0.219	Data Not Ga	ımma Distrib	outed		
Anderson-Darling (NDs = DL/2)	1.404	0.761					
Kolmogorov-Smirnov (NDs = DL/2)	0.299	0.221	Data Not Ga	ımma Distrib			
Anderson-Darling (Gamma ROS Estimates)	1.083	0.793					
Kolmogorov-Smirnov (Gamma ROS Est.)	0.234	0.227	Data Not Ga	ımma Distrik	outed		
Lo	gnormal GO	F Test Resu	ults				
	No NDs	NDs = DL	NDs = DL/2	Log ROS			
Correlation Coefficient R	0.904	0.938	0.904	0.942			
	Test value	Crit. (0.05)	С	onclusion w	ith Alpha(0.0	)5)	
Shapiro-Wilk (Detects Only)	0.852	0.829	Data Appear	r Lognormal			
Shapiro-Wilk (NDs = DL)	0.893	0.887	Data Appear	r Lognormal			
Shapiro-Wilk (NDs = DL/2)	0.839	0.887	Data Not Lo	gnormal			
Shapiro-Wilk (Lognormal ROS Estimates)	0.902	0.887	Data Appear	r Lognormal			
Lilliefors (Detects Only)	0.324	0.274	Data Not Lo	gnormal			
Lilliefors (NDs = DL)	0.221	0.213	Data Not Lo	gnormal			
Lilliefors (NDs = DL/2)	0.246	0.213	Data Not Lo	_			
Lilliefors (Lognormal ROS Estimates)	0.22	0.213	Data Not Lo	gnormal			
		I	I				
Note: Substitution methods such as DL or DL/2	are not reco	mmended.					
trivalent chromium							
Raw Statistics							
Number of Valid C	bservations	16					
Number of Distinct C	bservations	14					
	Minimum	16.16					
	Maximum	70.2					
Mean	of Raw Data	26.43					
			1		1	1	1

Standard Deviation of Raw Data	13.43			
Khat				
Theta hat				
Kstar				
Theta star				
Mean of Log Transformed Data				
Standard Deviation of Log Transformed Data	0.377			
Normal GOF Test Results				
Correlation Coefficient R	0.804			
Shapiro Wilk Test Statistic	0.668			
Shapiro Wilk Critical (0.05) Value	0.887			
Approximate Shapiro Wilk P Value	3.1044E-5			
Lilliefors Test Statistic				
Lilliefors Critical (0.05) Value				
Data not Normal at (0.05) Significance Level	0.210			
Gamma GOF Test Results				
Ganina GOI Test Results				
Correlation Coefficient R	0.883			
A-D Test Statistic				
A-D Test statistic  A-D Critical (0.05) Value				
K-S Test Statistic				
K-S Critical(0.05) Value	0.216			
Data not Gamma Distributed at (0.05) Significance Level				
Lognormal GOF Test Results				
Correlation Coefficient R				
Shapiro Wilk Test Statistic				
Shapiro Wilk Critical (0.05) Value	0.887			
Approximate Shapiro Wilk P Value	0.00584			
Lilliefors Test Statistic	0.245			
Lilliefors Critical (0.05) Value	0.213			
Data not Lognormal at (0.05) Significance Level	1			
Non-parametric GOF Test Results				
		i	1	 1
1				
Data do not follow a discernible distribution at (0.05) Level	of Significan			
Data do not follow a discernible distribution at (0.05) Level	of Significan			
Data do not follow a discernible distribution at (0.05) Level total chromium	of Significan			
	of Significand			
	of Significan			
total chromium	-			
total chromium  Raw Statistics	16			
total chromium  Raw Statistics  Number of Valid Observations	16 14			
total chromium  Raw Statistics  Number of Valid Observations  Number of Distinct Observations	16 14 16			
Raw Statistics  Number of Valid Observations  Number of Distinct Observations  Minimum  Maximum	16 14 16 70.2			
Raw Statistics  Number of Valid Observations  Number of Distinct Observations  Minimum	16 14 16 70.2 26.63			

Khat	5.828		T	
Theta hat				
Kstar	4.777			
Theta star				
Mean of Log Transformed Data				
Standard Deviation of Log Transformed Data				
Standard Deviation of Log Transformed Data	0.537			
Normal GOF Test Results				
Normal doi Tost Nosalis				
Correlation Coefficient R	0.819		1	
Shapiro Wilk Test Statistic				
Shapiro Wilk Critical (0.05) Value				
Approximate Shapiro Wilk P Value				
Lilliefors Test Statistic				
Lilliefors Critical (0.05) Value			1	
Data not Normal at (0.05) Significance Level	5.2.10		+	
			1	
Gamma GOF Test Results			1	
			1	
Correlation Coefficient R	0.901		+	
A-D Test Statistic				
A-D Critical (0.05) Value				
K-S Test Statistic				
K-S Critical(0.05) Value				
Data not Gamma Distributed at (0.05) Significance Level				
Lognormal GOF Test Results				
Correlation Coefficient R	0.909			
Shapiro Wilk Test Statistic	0.833			
Shapiro Wilk Critical (0.05) Value	0.887			
Approximate Shapiro Wilk P Value	0.00674			
Lilliefors Test Statistic	0.245			
Lilliefors Critical (0.05) Value	0.213			
Data not Lognormal at (0.05) Significance Level				
Non-parametric GOF Test Results				
Data do not follow a discernible distribution at (0.05) Level	of Significan			
cobalt			1	
Raw Statistics				
Raw Statistics  Number of Valid Observations				
Raw Statistics	14			
Raw Statistics  Number of Valid Observations	14 6.3			
Raw Statistics  Number of Valid Observations  Number of Distinct Observations  Minimum  Maximum	14 6.3 27			
Raw Statistics  Number of Valid Observations  Number of Distinct Observations  Minimum  Maximum  Mean of Raw Data	14 6.3 27 13.73			
Raw Statistics  Number of Valid Observations  Number of Distinct Observations  Minimum  Maximum	14 6.3 27			

Theta hat	3.011				1	
Kstar	3.745					
Theta star	3.665					
Mean of Log Transformed Data	2.506					
Standard Deviation of Log Transformed Data	0.494					
N 10057 ID II						
Normal GOF Test Results						
	0.050					
Correlation Coefficient R	0.952					
Shapiro Wilk Test Statistic	0.891					
Shapiro Wilk Critical (0.05) Value	0.887					
Approximate Shapiro Wilk P Value	0.0725					
Lilliefors Test Statistic	0.198					
Lilliefors Critical (0.05) Value	0.213					
Data appear Normal at (0.05) Significance Level						
Gamma GOF Test Results						
Correlation Coefficient R						
A-D Test Statistic	0.69					
A-D Critical (0.05) Value	0.742					
K-S Test Statistic	0.218					
K-S Critical(0.05) Value	0.216					
Data appear Gamma Distributed at (0.05) Significance Leve	d					
Lognormal GOF Test Results						
Correlation Coefficient R	0.959					
Shapiro Wilk Test Statistic	0.9					
Shapiro Wilk Critical (0.05) Value	0.887					
Approximate Shapiro Wilk P Value	0.108					
Lilliefors Test Statistic	0.215					
Lilliefors Critical (0.05) Value	0.213					
Data appear Approximate_Lognormal at (0.05) Significance	Level					
copper		 				
Raw Statistics						
Number of Valid Observations	16					
Number of Distinct Observations	12					
Minimum	15					
Maximum	62.8					
Mean of Raw Data	28.85					
Standard Deviation of Raw Data	15.78					
Khat	4.383					
Theta hat	6.582					
Kstar	3.603					
Theta star	8.007					
			i	1		-
Mean of Log Transformed Data	3.244					
Mean of Log Transformed Data Standard Deviation of Log Transformed Data	3.244 0.482					

Normal GOF Test Results						
Normal GOF Test Results						
O-moletice O-efficient D	0.0					
Correlation Coefficient R	0.9					
Shapiro Wilk Test Statistic	0.801					
Shapiro Wilk Critical (0.05) Value	0.887					
Approximate Shapiro Wilk P Value	0.00266					
Lilliefors Test Statistic	0.213					
Lilliefors Critical (0.05) Value	0.213					
Data appear Approximate Normal at (0.05) Significance Lev	el					
Gamma GOF Test Results						
Correlation Coefficient R	0.957					
A-D Test Statistic	0.943					
A-D Critical (0.05) Value	0.742					
K-S Test Statistic	0.212					
K-S Critical(0.05) Value	0.216					
Data follow Appr. Gamma Distribution at (0.05) Significance	Level					
, , ,						
Lognormal GOF Test Results						
Correlation Coefficient R	0.945					
Shapiro Wilk Test Statistic	0.876					
Shapiro Wilk Critical (0.05) Value	0.887					
Approximate Shapiro Wilk P Value	0.0423					
Lilliefors Test Statistic	0.0423					
Lilliefors Critical (0.05) Value	0.213					
Data appear Approximate_Lognormal at (0.05) Significance						
Data appear Approximate_Lognormal at (0.05) Significance	revei					
land						
lead						
Raw Statistics						
Number of Valid Observations	10					
Number of Missing Observations	6					
Number of Distinct Observations	9					
Minimum	0.55					
Maximum	43					
Mean of Raw Data	22.76					
Standard Deviation of Raw Data	12.49					
Khat	1.383					
Theta hat	16.46					
Kstar	1.034					
Theta star	22					
Mean of Log Transformed Data	2.721					
Standard Deviation of Log Transformed Data	1.328					
Normal GOF Test Results						
Correlation Coefficient R	0.95					
	-		1	I	<u>I</u>	j

01 1 1477 7 10 11	0.010			1	
Shapiro Wilk Test Statistic					
Shapiro Wilk Critical (0.05) Value					
Approximate Shapiro Wilk P Value					
Lilliefors Test Statistic					
Lilliefors Critical (0.05) Value	0.262				
Data appear Normal at (0.05) Significance Level	•				
Gamma GOF Test Results					
Correlation Coefficient R	0.86				
A-D Test Statistic	1.256				
A-D Critical (0.05) Value	0.741				
K-S Test Statistic	0.377				
K-S Critical(0.05) Value	0.272				
Data not Gamma Distributed at (0.05) Significance Level					
Lognormal GOF Test Results					
-					
Correlation Coefficient R	0.809				
Shapiro Wilk Test Statistic	0.676				
Shapiro Wilk Critical (0.05) Value					
Approximate Shapiro Wilk P Value					
Lilliefors Test Statistic					
Lilliefors Critical (0.05) Value					
Data not Lognormal at (0.05) Significance Level	0.202				
Data not Edgitornal at (0.00) digililicance Edver					
manganasa					
manganese					
David Obsticking					
Raw Statistics	16				
Number of Valid Observations					
Number of Valid Observations  Number of Distinct Observations	13				
Number of Valid Observations  Number of Distinct Observations  Minimum	13 310				
Number of Valid Observations  Number of Distinct Observations  Minimum  Maximum	13 310 940				
Number of Valid Observations  Number of Distinct Observations  Minimum  Maximum  Mean of Raw Data	13 310 940 547.3				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data	13 310 940 547.3 182.1				
Number of Valid Observations  Number of Distinct Observations  Minimum  Maximum  Mean of Raw Data  Standard Deviation of Raw Data  Khat	13 310 940 547.3 182.1 10.67				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data	13 310 940 547.3 182.1 10.67 51.31				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar	13 310 940 547.3 182.1 10.67 51.31 8.708				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar Theta star Mean of Log Transformed Data	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar Theta star Mean of Log Transformed Data	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar Theta star Mean of Log Transformed Data	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257				
Number of Valid Observations  Number of Distinct Observations  Minimum  Maximum  Mean of Raw Data  Standard Deviation of Raw Data  Khat  Theta hat  Kstar  Theta star  Mean of Log Transformed Data  Standard Deviation of Log Transformed Data	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257				
Number of Valid Observations  Number of Distinct Observations  Minimum  Maximum  Mean of Raw Data  Standard Deviation of Raw Data  Khat  Theta hat  Kstar  Theta star  Mean of Log Transformed Data  Standard Deviation of Log Transformed Data	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257 0.313				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar Theta star Mean of Log Transformed Data Standard Deviation of Log Transformed Data Normal GOF Test Results	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257 0.313				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar Theta star Mean of Log Transformed Data Standard Deviation of Log Transformed Data Normal GOF Test Results  Correlation Coefficient R	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257 0.313				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar Theta star Mean of Log Transformed Data Standard Deviation of Log Transformed Data One of Log Transformed Data Standard Deviation of Log Transformed Data Correlation Coefficient R Shapiro Wilk Test Statistic	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257 0.313				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar Theta star Mean of Log Transformed Data Standard Deviation of Log Transformed Data Overlation of Log Transformed Data Standard Deviation of Log Transformed Data Correlation Coefficient R Shapiro Wilk Test Statistic Shapiro Wilk Critical (0.05) Value	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257 0.313 0.925 0.854 0.887				
Number of Valid Observations Number of Distinct Observations Minimum Maximum Mean of Raw Data Standard Deviation of Raw Data Khat Theta hat Kstar Theta star Mean of Log Transformed Data Standard Deviation of Log Transformed Data Standard Deviation of Log Transformed Data Correlation Coefficient R Shapiro Wilk Test Statistic Shapiro Wilk Critical (0.05) Value Approximate Shapiro Wilk P Value	13 310 940 547.3 182.1 10.67 51.31 8.708 62.85 6.257 0.313 0.925 0.854 0.887 0.0161				

Data not Normal at (0.05) Significance Level			1				1	
Data not Normal at (0.05) Significance Level								
Gamma GOF Test Result	to.							
Gamma GOF Test Result	is							
		0.050						
Correlation C		0.953						
	est Statistic	1.03						
A-D Critical		0.739						
	est Statistic	0.281						
K-S Critical(		0.215						
Data not Gamma Distributed at (0.05) Significar	nce Level							
Lawrence LOOF Took Page	.14							
Lognormal GOF Test Resu	lits							
O a malatian G	) ffi - i + D	0.040						
Correlation C								
Shapiro Wilk T		0.896						
Shapiro Wilk Critical		0.887						
Approximate Shapiro V		0.075						
	est Statistic	0.264						
Lilliefors Critical		0.213						
Data appear Approximate_Lognormal at (0.05)	Significance	Levei						
moral III								
mercury								
	Ni. ma Oha	Nives Miss	Num Valid	Datasta	ND-	% NDs		
Daw Chalistics	Num Obs	Num Miss	16	Detects 13	NDs			
Raw Statistics	16	0	10	13	3	18.75%		
	Number	Minimum	Maximum	Mean	Median	SD		
Statistics (Non-Detects Only)	3	0.0067	0.023	0.0166	0.02	0.00868		
Statistics (Non-Detects Only)	13	0.0067	0.023	0.0166	0.02	0.0000		
Statistics (Non-Detects Only)  Statistics (All: NDs treated as DL value)	16	0.0072	0.28	0.0499	0.032	0.0701		
Statistics (All: NDs treated as DL/2 value)	16	0.0007	0.28	0.0437	0.0255	0.065		
<u> </u>	16	-0.0704		0.0421	0.0255	0.003		
Statistics (Normal ROS Imputed Data)  Statistics (Gamma ROS Imputed Data)		0.0072	0.28	0.0312	0.0255	0.0749		
	16			0.0425				
Statistics (Lognormal ROS Imputed Data)	10	0.00522	0.28	0.0419	0.0255	0.065		
	K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV		
Statistics (Non-Detects Only)	1.377	1.111	0.0363	-3.402	0.807	-0.237		
Statistics (Non-Detects Only)  Statistics (NDs = DL)	1.377	1.111	0.0363	-3.402 -3.557	0.807	-0.237		
Statistics (NDs = DL/2)	1.314	0.934	0.0332	-3.557	0.833	-0.234		
Statistics (NDS = DL/2)  Statistics (Gamma ROS Estimates)	1.098	1.023	0.0384	-3.628	0.979	-0.265		
Statistics (Gamma ROS Estimates)  Statistics (Lognormal ROS Estimates)				-3.628	0.87	-0.24		
Statistics (Logitorinal NOS Estilliates)				-3.031	0.500	-0.20		
	Normal GOF	Test Pecul	te					
r	Normal GOF	I GOL LIGORII						
	No NDs	NDs = DL	NDe - DL /2	Normal ROS				
Correlation Coefficient R	0.661	0.647	0.666	0.806				
Correlation Coefficient R	0.001	0.047	0.000	0.600				
	Test value	Crit. (0.05)		Conclusion wit	th Alpha(A A	5)		
Charina Mills (Datasta Only)	Test value				п Агрпа(0.0	<i>J</i>		
Shapiro-Wilk (NDa = DL)	0.471	0.866	Data Not No					
Shapiro-Wilk (NDs = DL)	0.451	0.887	Data Not No	uillal				

Shapiro-Wilk (NDs = DL/2)	0.475	0.887	Data Not No	rmal			
Shapiro-Wilk (Normal ROS Estimates)	0.686	0.887	Data Not No				
Lilliefors (Detects Only)	0.4	0.234	Data Not No				
Lilliefors (NDs = DL)	0.374	0.213	Data Not No				
Lilliefors (NDs = DL/2)	0.365	0.213	Data Not No				
Lilliefors (Normal ROS Estimates)	0.318	0.213	Data Not No				
Emilions (Normal New Estimates)	0.010	0.210	Bata Not No				
	Samma GOF	Test Result	ts				
	No NDs	NDs = DL	NDs = DL/2	Samma ROS			
Correlation Coefficient R	0.829	0.817	0.84	0.832			
Consider Commission	0.020	0.017	0.01	0.002			
	Test value	Crit. (0.05)	C	onclusion wi	th Alpha(0 (	)5)	
Anderson-Darling (Detects Only)	1.525	0.752		Officialition wi	ui / upi a (o.c	,0,	
Kolmogorov-Smirnov (Detects Only)	0.279	0.241	Data Not Ga	ımma Distrih	uted		
Anderson-Darling (NDs = DL)	1.554	0.758	24.0 140t G	Distrib			
Kolmogorov-Smirnov (NDs = DL)	0.247	0.738	Data Not Ga	mma Distrih	uted		
Anderson-Darling (NDs = DL/2)	1.06	0.762	24.0 140t G	2/30/10			
Kolmogorov-Smirnov (NDs = DL/2)	0.223	0.702	Data Not Ga	ımma Distrih	uted		
Anderson-Darling (Gamma ROS Estimates)	1.267	0.76	244 1101 46				
Kolmogorov-Smirnov (Gamma ROS Est.)	0.231	0.22	Data Not Ga	ımma Distrih	uted		
Tomogorov ominiov (damina 1700 Est.)	0.201	0.22	Bata Not Go				
10	gnormal GO	F Test Resi	ılts				
	gnormar de	1 103111031					
	No NDs	NDs = DL	NDs = DL/2	Log ROS			
Correlation Coefficient R	0.897	0.915	0.952	0.948			
Gonelation Godinelation	0.007	0.510	0.302	0.040			
	Test value	Crit. (0.05)	C	onclusion wi	th Alpha(0 (	)5)	
Shapiro-Wilk (Detects Only)	0.844	0.866	Data Not Lo				
Shapiro-Wilk (NDs = DL)	0.864	0.887	Data Not Lo				
Shapiro-Wilk (NDs = DL/2)	0.93	0.887	Data Appear				
Shapiro-Wilk (Lognormal ROS Estimates)	0.912	0.887	Data Appear				
Lilliefors (Detects Only)			Data Appear				
Lilliefors (NDs = DL)	0.21		Data Appear				
Lilliefors (NDs = DL/2)	0.197	0.213	Data Appear				
Lilliefors (Lognormal ROS Estimates)	0.198	0.213	Data Appear				
(======================================							
Note: Substitution methods such as DL or DL/2	are not reco	mmended.					
nickel							
Raw Statistics							
Number of Valid C	bservations	16					
Number of Distinct C		14					
	Minimum	4.9					
	Maximum	20					
Mean	of Raw Data	8.168					
Standard Deviation		4.026					
	Khat	5.949					
	Theta hat	1.373					

Ketar	1 276					1	
J Data	0.404						
ient R	0.87						
tatistic	0.767						
Value	0.887						
Value 6	6.9828E-4						
tatistic	0.227						
Value	0.213						
ient R	0.938						
-							
icance L	Level						
tatistic	0.884						
Value	0.887						
Value	0.0484						
tatistic	0.18						
Value	0.213						
icance L	_evel						
ı Obs	Num Miss	Num Valid	Detects	NDs	% NDs		
6							
				•			
mher	Minimum	Mavimum	Mean	Median	SD		
5							
5							
3							
5					0.493		
i	0.306	1.7	0.859	0.578	0.492		
hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV		
IIat	IX Stat	THE La Hat	Log Mean	Log Stuv	Log O v		
	Value de atistic Value atistic Value de atistic de atistic Value de atistic Value de atistic	ient R	1.675   1.67	1	1.675	a star	a star   1.675

Statistics (NDs = DL)	3.999	3.291	0.222	-0.251	0.527	-2.102		
Statistics (NDs = DL/2)	2.462	2.042	0.33	-0.424	0.691	-1.629		
Statistics (Gamma ROS Estimates)	3.391	2.797	0.253	-0.307	0.574	-1.874		
Statistics (Lognormal ROS Estimates)		2.737	0.233	-0.307	0.569	-1.868		
Statistics (Logitornial NOS Estimates)				-0.303	0.509	-1.000		
	Normal GOF	Toot Booult	·					
	Normal GOF	rest Result	S					
	Na NDa	ND= - DI	ND= - DL /2	Normal ROS	1			
0 1 0	No NDs							
Correlation Coefficient R	0.958	0.931	0.933	0.939				
		0 :: (0.05)	1			<u>=</u> ,		
	Test value	Crit. (0.05)		Conclusion wi	th Alpha(0.0	5)		
Shapiro-Wilk (Detects Only)	0.895	0.859	Data Appea					
Shapiro-Wilk (NDs = DL)	0.852	0.887	Data Not No					
Shapiro-Wilk (NDs = DL/2)	0.848	0.887	Data Not No					
Shapiro-Wilk (Normal ROS Estimates)	0.862	0.887	Data Not No					
Lilliefors (Detects Only)	0.214	0.243	Data Appea					
Lilliefors (NDs = DL)	0.255	0.213	Data Not No					
Lilliefors (NDs = DL/2)	0.243	0.213	Data Not No					
Lilliefors (Normal ROS Estimates)	0.226	0.213	Data Not No	ormal				
O	amma GOF	Test Resul	ts					
	No NDs	NDs = DL	NDs = DL/2	Gamma ROS				
Correlation Coefficient R	0.941	0.952	0.948	0.953				
			ll .		I.			
	Test value	Crit. (0.05)	C	Conclusion wi	th Alpha(0.0	5)		
Anderson-Darling (Detects Only)	0.53	0.737						
Kolmogorov-Smirnov (Detects Only)	0.205	0.247	Detected D	ata Appear G	amma Distr	ibuted		
Anderson-Darling (NDs = DL)	0.833	0.742						
Kolmogorov-Smirnov (NDs = DL)	0.225	0.216	Data Not G	amma Distrib	outed			
Anderson-Darling (NDs = DL/2)	0.755	0.748						
Kolmogorov-Smirnov (NDs = DL/2)	0.19	0.217	Detected D	ata appear A	pproximate (	Gamma Dist	r	
Anderson-Darling (Gamma ROS Estimates)	0.759	0.743						
Kolmogorov-Smirnov (Gamma ROS Est.)	0.206	0.216	Detected D	ata appear A	pproximate (	Gamma Dist	1	
Lo	gnormal GO	F Test Resu	ults					
	No NDs	NDs = DL	NDs = DL/2	Log ROS				
Correlation Coefficient R	0.961	0.959	0.955	0.959				
			<u> </u>		<u> </u>			
	Test value	Crit. (0.05)		Conclusion wi	ith Alpha(0.0	5)		
Shapiro-Wilk (Detects Only)	0.906	0.859		ar Lognormal		*		
Shapiro-Wilk (NDs = DL)	0.909	0.887		ar Lognormal				
Shapiro-Wilk (NDs = DL/2)	0.887	0.887	Data Not Lo					
Shapiro-Wilk (Lognormal ROS Estimates)	0.901	0.887		ar Lognormal				
Lilliefors (Detects Only)	0.181	0.243		ar Lognormal				
Lilliefors (NDs = DL)	0.201	0.213		ar Lognormal				
Lilliefors (NDs = DL/2)	0.157	0.213		ar Lognormal				
Lilliefors (Lognormal ROS Estimates)	0.137	0.213		ar Lognormal				
Limetors (Lognormal NOS Estimates)	V.Z I I	0.213	Data Appea	a Lognonial				

Note: Substitution methods such as DL or DL/2 are not reco	mmended.					
strontium						
Raw Statistics						
Number of Valid Observations	16					
Number of Distinct Observations	13					
Minimum	14					
Maximum	46					
Mean of Raw Data	21.7					
Standard Deviation of Raw Data	7.877					
Khat	10.41					
Theta hat	2.084					
Kstar	8.501					
Theta star	2.553					
Mean of Log Transformed Data	3.029					
Standard Deviation of Log Transformed Data	0.307					
Normal GOF Test Results						
				<u> </u>		
Correlation Coefficient R	0.879					
Shapiro Wilk Test Statistic	0.791					
Shapiro Wilk Critical (0.05) Value	0.887					
Approximate Shapiro Wilk P Value	0.00141					
Lilliefors Test Statistic	0.208					
Lilliefors Critical (0.05) Value	0.213					
Data appear Approximate Normal at (0.05) Significance Lev	el					
Gamma GOF Test Results						
Correlation Coefficient R	0.926					
A-D Test Statistic	0.604					
A-D Critical (0.05) Value	0.739					
K-S Test Statistic	0.186					
K-S Critical(0.05) Value	0.215					
Data appear Gamma Distributed at (0.05) Significance Leve	I					
Lognormal GOF Test Results						
Correlation Coefficient R	0.951					
Shapiro Wilk Test Statistic	0.91					
Shapiro Wilk Critical (0.05) Value	0.887					
Approximate Shapiro Wilk P Value	0.112					
Lilliefors Test Statistic	0.17					
Lilliefors Critical (0.05) Value	0.213					
Data appear Lognormal at (0.05) Significance Level						
thallium						
Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs	

Raw Statistics 16	6	10	1	9	90.00%		
	!				ļ	Į	
Warning: Only one distinct data value was detected	ed! ProUCL	(or any othe	r software)	should not	be used on su	uch a data s	et!
It is suggested to use alternative site specific values deter	mined by the	Project Tea	m to estim	ate environ	mental param	eters (e.g.,	EPC, BTV
The data set f	or variable tl	nallium was	not proces	sed!			
		T	Г			1	1
vanadium							
Raw Statistics							
Number of Valid Observations	10						
Number of Missing Observations	-						
Number of Distinct Observations							
Minimum							
Maximum							
Mean of Raw Data	57.9						
Standard Deviation of Raw Data	47.63						
Khat							
Theta hat	18.54						
Kstar	2.253						
Theta star	25.7						
Mean of Log Transformed Data	3.89						
Standard Deviation of Log Transformed Data	0.527						
Normal GOF Test Results							
Correlation Coefficient R	0.721						
Shapiro Wilk Test Statistic	0.548						
Shapiro Wilk Critical (0.05) Value	0.842						
Approximate Shapiro Wilk P Value	1.7634E-5						
Lilliefors Test Statistic	0.341						
Lilliefors Critical (0.05) Value	0.262						
Data not Normal at (0.05) Significance Level							
Gamma GOF Test Results							
Correlation Coefficient R							
A-D Test Statistic							
A-D Critical (0.05) Value							
K-S Test Statistic							
K-S Critical(0.05) Value	0.268						
Data not Gamma Distributed at (0.05) Significance Level							
Lognormal COE Test Pessita							
Lognormal GOF Test Results							
Correlation Coefficient R	0.832						
Shapiro Wilk Test Statistic Shapiro Wilk Critical (0.05) Value							
Shapiro wilk Chiicai (0.05) Value	0.84∠						

Approximate Shapiro Wilk P Value	0.00103			
Lilliefors Test Statistic	0.00103			
Lilliefors Critical (0.05) Value	0.249			
Data appear Approximate_Lognormal at (0.05) Significance				
Data appear Approximate_Lognormal at (0.03) Significance	FEAGI			
zinc				
Raw Statistics				
Number of Valid Observations	10			
	6			
Number of Missing Observations  Number of Distinct Observations	10			
Number of Distinct Observations  Minimum	40			
Maximum	230			
Mean of Raw Data	66.9			
Standard Deviation of Raw Data	58.12			
Khat Theta hat	3.009 22.23			
	22.23			
Kstar Theta star	30.79			
Mean of Log Transformed Data	4.028			
Standard Deviation of Log Transformed Data	0.524			
Normal COE Test Possilte				
Normal GOF Test Results				
Correlation Coefficient R	0.674			
	0.485			
Shapiro Wilk Cetting (0.05) Value				
Shapiro Wilk Critical (0.05) Value  Approximate Shapiro Wilk P Value	0.842			
Approximate Snapiro Wilk P Value  Lilliefors Test Statistic	0.414			
Lilliefors Critical (0.05) Value	0.414			
	0.202			
Data not Normal at (0.05) Significance Level				
Commo COE Took Booulko				
Gamma GOF Test Results				
Correlation Coefficient R	0.900			
A-D Test Statistic	0.809 2.033			
A-D Critical (0.05) Value  K-S Test Statistic	0.732 0.412			
K-S Test Statistic  K-S Critical(0.05) Value				
Data not Gamma Distributed at (0.05) Significance Level	0.268			
Pata not Gamina Distributed at (0.05) Significance Level				
Lognormal GOF Test Results				
Lognormal GOF Test Results				
O-malada O-ff ' - D	0.700			
Correlation Coefficient R				
Shapiro Wilk Critical (0.05) Value	0.608			
Shapiro Wilk Critical (0.05) Value	0.842			
Approximate Shapiro Wilk P Value				
Lilliefors Test Statistic	0.388			
Lilliefors Critical (0.05) Value	0.262			
Data not Lognormal at (0.05) Significance Level				

Non-parametric GOF Test Results			
Data do not follow a discernible distribution at (0.05) Level of Significant			

	Outlier Test	s for Select	ed Variables	excluding r	ondetects		
User Selected Options	Julioi 103	3 101 001000	ou variables	- CACIGGING I	ionacicois		
Date/Time of Computation ProUCL 5.19/	/2/2021 1:3	2:32 PM					
·		ckground Inp	ute yle				
	OFF	- Skyrodiid iiip					
1 411 155555							
No Outlier Test for antimony							
,							
Dixon's Outlier Test for arsenic							
Total N = 16							
Number NDs = 0							
Number Detects = 16							
10% critical value: 0.454							
5% critical value: 0.507							
1% critical value: 0.595							
Note: NDs excluded from Outlier Test							
1. Data Value 3.08 is a Potential Outlier (Upper	Tail)?						
Test Statistic: 0.572							
For 10% significance level, 3.08 is an outlier.							
For 5% significance level, 3.08 is an outlier.							
For 1% significance level, 3.08 is not an outlier.							
2. Data Value 1.4 is a Potential Outlier (Lower Ta	il)?						
Test Statistic: 0.337							
For 10% significance level, 1.4 is not an outlier.							
For 5% significance level, 1.4 is not an outlier.							
For 1% significance level, 1.4 is not an outlier.							
Diversity Continue To at few heads are							
Dixon's Outlier Test for barium							
Total N = 16							
Number NDs = 0							
Number NDS = 0  Number Detects = 16							
10% critical value: 0.454							
5% critical value: 0.507							
1% critical value: 0.595							
Note: NDs excluded from Outlier Test							
Total Tibo oxoladed from Oddier Tool							
Data Value 77.9 is a Potential Outlier (Upper 3)	Tail)?						
Coppor	, •						
Test Statistic: 0.353							

For 10% significance level, 77.9 is not an outlier.				
For 5% significance level, 77.9 is not an outlier.				
For 1% significance level, 77.9 is not an outlier.				
1 of 176 significance level, 77.3 is not all outlier.				
Data Value 36 is a Potential Outlier (Lower Tail)?				
2. Data value 30 is a Potential Outlier (Lower Fall)?				
Test Statistic: 0.297				
Test statistic. 0.297				
For 10% significance level, 36 is not an outlier.				
For 5% significance level, 36 is not an outlier.				
For 1% significance level, 36 is not an outlier.				
For 1% significance level, 36 is not an outlier.				
Divonis Outlies Test for headilism				
Dixon's Outlier Test for beryllium				
Takal Ni - 40				
Total N = 16				
Number NDs = 0				
Number Detects = 16				
10% critical value: 0.454				
5% critical value: 0.507				
1% critical value: 0.595				
Note: NDs excluded from Outlier Test				
Data Value 0.99 is a Potential Outlier (Upper Tail)?				
T				
Test Statistic: 0.650				
For 100/ significance level 0.00 is an author				
For 10% significance level, 0.99 is an outlier.				
For 5% significance level, 0.99 is an outlier. For 1% significance level, 0.99 is an outlier.				
For 1% significance level, 0.99 is an outlier.				
Data Value 0.293 is a Potential Outlier (Lower Tail)?				
2. Data value 0.293 is a Potential Outlier (Lower Tall)?				
Took Chatistics 0.216				
Test Statistic: 0.316				
For 100/ cignificance level 0.202 is not an entire				
For 10% significance level, 0.293 is not an outlier.				
For 5% significance level, 0.293 is not an outlier.				
For 1% significance level, 0.293 is not an outlier.				
Divanta Cuttles Test for during				
Dixon's Outlier Test for cadmium				
Total N = 10				
Total N = 16				
Number NDs = 9				
Number Detects = 7				
10% critical value: 0.434				
5% critical value: 0.507				
1% critical value: 0.637				
Note: NDs excluded from Outlier Test				

A Data Value 0.00 is a Data still Outlier (Uses of Tail)	T	ı	Г		ı	T
Data Value 0.38 is a Potential Outlier (Upper Tail)?						
T						
Test Statistic: 0.704						
For 10% significance level, 0.38 is an outlier.						
For 5% significance level, 0.38 is an outlier.						
For 1% significance level, 0.38 is an outlier.						
2. Data Value 0.0918 is a Potential Outlier (Lower Tail)?						
Test Statistic: 0.011						
For 10% significance level, 0.0918 is not an outlier.						
For 5% significance level, 0.0918 is not an outlier.						
For 1% significance level, 0.0918 is not an outlier.						
Dixon's Outlier Test for hexavalent chromium						
Total N = 16						
Number NDs = 7						
Number Detects = 9						
10% critical value: 0.441						
5% critical value: 0.512						
1% critical value: 0.635						
Note: NDs excluded from Outlier Test						
Data Value 5.34 is a Potential Outlier (Upper Tail)?						
Test Statistic: 0.908						
For 10% significance level, 5.34 is an outlier.						
For 5% significance level, 5.34 is an outlier.						
For 1% significance level, 5.34 is an outlier.						
2. Data Value 0.21 is a Potential Outlier (Lower Tail)?						
Test Statistic: 0.328						
For 10% significance level, 0.21 is not an outlier.						
For 5% significance level, 0.21 is not an outlier.						
For 1% significance level, 0.21 is not an outlier.						
Dixon's Outlier Test for trivalent chromium						
Total N = 16						
Number NDs = 0						
Number Detects = 16						
10% critical value: 0.454						
. 5.5 S. Modi Talad. S. 10T				<u> </u>		

5% critical value: 0.507	1			1	1
1% critical value: 0.595					
Note: NDs excluded from Outlier Test					
11000. 1103 excluded HOTH Outlier Test					
Data Value 70.2 is a Potential Outlier (Upper Tail)?					
1. Data value 75.2 is a 1 storital outlier (oppor rail):					
Test Statistic: 0.608					
Tool Gianolio. 9.000					
For 10% significance level, 70.2 is an outlier.					
For 5% significance level, 70.2 is an outlier.					
For 1% significance level, 70.2 is an outlier.					
Data Value 16.16 is a Potential Outlier (Lower Tail)?					
, ,					
Test Statistic: 0.064					
For 10% significance level, 16.16 is not an outlier.					
For 5% significance level, 16.16 is not an outlier.					
For 1% significance level, 16.16 is not an outlier.					
Dixon's Outlier Test for total chromium					
Total N = 16					
Number NDs = 0					
Number Detects = 16					
10% critical value: 0.454					
5% critical value: 0.507					
1% critical value: 0.595					
Note: NDs excluded from Outlier Test					
1. Data Value 70.2 is a Potential Outlier (Upper Tail)?					
Test Statistic: 0.598					
For 10% significance level, 70.2 is an outlier.					
For 5% significance level, 70.2 is an outlier.					
For 1% significance level, 70.2 is an outlier.					
2. Data Value 16 is a Potential Outlier (Lower Tail)?					
Test Statistic: 0.087					
For 10% significance level, 16 is not an outlier.					
For 5% significance level, 16 is not an outlier.					
For 1% significance level, 16 is not an outlier.					
Dixon's Outlier Test for cobalt					

Total N = 16				
Number NDs = 0				
Number Detects = 16				
10% critical value: 0.454				
5% critical value: 0.507				
1% critical value: 0.595				
Note: NDs excluded from Outlier Test				
INDIE: NES EXCILIER TOTAL OUTIER TEST				
Data Value 27 is a Potential Outlier (Upper Tail)?				
1. Data Value 27 is a 1 steritial State (Opper Tail):				
Test Statistic: 0.265				
Test statistic. 0.203				
For 10% significance level, 27 is not an outlier.				
For 5% significance level, 27 is not an outlier.				
For 1% significance level, 27 is not an outlier.				
r or 170 significance level, 27 is not an outlier.				
2 Data Value 6.3 is a Potential Outlier // augr Tail\2				
2. Data Value 6.3 is a Potential Outlier (Lower Tail)?				
Took Chatlatia, 0.071				
Test Statistic: 0.071				
For 100/ piratitionana level 0.2 is and				
For 10% significance level, 6.3 is not an outlier.				
For 5% significance level, 6.3 is not an outlier.				
For 1% significance level, 6.3 is not an outlier.				
Dixon's Outlier Test for copper				
Total N = 16				
Number NDs = 0				
Number Detects = 16				
10% critical value: 0.454				
5% critical value: 0.507				
1% critical value: 0.595				
Note: NDs excluded from Outlier Test				
	[			
Data Value 62.8 is a Potential Outlier (Upper Tail)?				i .
Test Statistic: 0.295				
For 10% significance level, 62.8 is not an outlier.				
For 10% significance level, 62.8 is not an outlier. For 5% significance level, 62.8 is not an outlier.				
For 10% significance level, 62.8 is not an outlier.				
For 10% significance level, 62.8 is not an outlier.  For 5% significance level, 62.8 is not an outlier.  For 1% significance level, 62.8 is not an outlier.				
For 10% significance level, 62.8 is not an outlier.  For 5% significance level, 62.8 is not an outlier.				
For 10% significance level, 62.8 is not an outlier.  For 5% significance level, 62.8 is not an outlier.  For 1% significance level, 62.8 is not an outlier.  2. Data Value 15 is a Potential Outlier (Lower Tail)?				
For 10% significance level, 62.8 is not an outlier. For 5% significance level, 62.8 is not an outlier. For 1% significance level, 62.8 is not an outlier.				
For 10% significance level, 62.8 is not an outlier.  For 5% significance level, 62.8 is not an outlier.  For 1% significance level, 62.8 is not an outlier.  2. Data Value 15 is a Potential Outlier (Lower Tail)?  Test Statistic: 0.029				
For 10% significance level, 62.8 is not an outlier.  For 5% significance level, 62.8 is not an outlier.  For 1% significance level, 62.8 is not an outlier.  2. Data Value 15 is a Potential Outlier (Lower Tail)?  Test Statistic: 0.029  For 10% significance level, 15 is not an outlier.				
For 10% significance level, 62.8 is not an outlier.  For 5% significance level, 62.8 is not an outlier.  For 1% significance level, 62.8 is not an outlier.  2. Data Value 15 is a Potential Outlier (Lower Tail)?  Test Statistic: 0.029				

_		ī			T	1
Dixon's Outlier Test for lead						
Total N = 10						
Number NDs = 0						
Number Detects = 10						
10% critical value: 0.409						
5% critical value: 0.477						
1% critical value: 0.597						
Note: NDs excluded from Outlier Test						
Data Value 43 is a Potential Outlier (Upper Tail)?						
, ,						
Test Statistic: 0.282						
For 10% significance level, 43 is not an outlier.						
For 5% significance level, 43 is not an outlier.						
For 1% significance level, 43 is not an outlier.						
2. Data Value 0.55 is a Potential Outlier (Lower Tail)?						
Test Statistic: 0.110						
rest statistic. 0.110						
For 10% significance level, 0.55 is not an outlier.						
For 5% significance level, 0.55 is not an outlier.						
For 1% significance level, 0.55 is not an outlier.						
For 1% significance level, 0.55 is not an outlier.						
Discrete Outlier Tout for more						
Dixon's Outlier Test for manganese						
T						
Total N = 16						
Number NDs = 0						
Number Detects = 16						
10% critical value: 0.454						
5% critical value: 0.507						
1% critical value: 0.595						
Note: NDs excluded from Outlier Test						
Data Value 940 is a Potential Outlier (Upper Tail)?						
Test Statistic: 0.342						
For 10% significance level, 940 is not an outlier.						
For 5% significance level, 940 is not an outlier.						
For 1% significance level, 940 is not an outlier.						
2. Data Value 310 is a Potential Outlier (Lower Tail)?						
Test Statistic: 0.223						
	1			L	l	1

For 10% significance level, 310 is not an outlier.				
For 5% significance level, 310 is not an outlier.				
For 1% significance level, 310 is not an outlier.				
1 of 170 significance level, 310 is not an oddier.				
Dixon's Outlier Test for mercury				
Dixon's Oddier rest for mercury				
Total N = 16				
Number NDs = 3				
Number Detects = 13				
10% critical value: 0.467				
5% critical value: 0.407				
1% critical value: 0.615				
Note: NDs excluded from Outlier Test				
1. Data Value 0.20 is a Data-Mail Coully of the second				
Data Value 0.28 is a Potential Outlier (Upper Tail)?				
Total Charlesia, 0.011				
Test Statistic: 0.911				
- 100/ 1 M				
For 10% significance level, 0.28 is an outlier.				
For 5% significance level, 0.28 is an outlier.				
For 1% significance level, 0.28 is an outlier.				
2. Data Value 0.0072 is a Potential Outlier (Lower Tail)?				
Test Statistic: 0.338				
5 400/ 1 1/2				
For 10% significance level, 0.0072 is not an outlier.				
For 5% significance level, 0.0072 is not an outlier.				
For 1% significance level, 0.0072 is not an outlier.				
Dixon's Outlier Test for nickel				
Total N = 16				
Number NDs = 0				
Number Detects = 16				
10% critical value: 0.454				
5% critical value: 0.507				
1% critical value: 0.595				
Note: NDs excluded from Outlier Test				
Data Value 20 is a Potential Outlier (Upper Tail)?				
Test Statistic: 0.483				
For 10% significance level, 20 is an outlier.				
For 5% significance level, 20 is not an outlier.				
For 1% significance level, 20 is not an outlier.				

Number NDs = 4 Number Detects = 12 10% critical value: 0.49 5% critical value: 0.546 1% critical value: 0.642 Note: NDs excluded from Outlier Test 1. Data Value 1.7 is a Potential Outlier (Upper Tail)?  Test Statistic: 0.082  For 10% significance level, 1.7 is not an outlier. For 5% significance level, 1.7 is not an outlier.  2. Data Value 0.306 is a Potential Outlier (Lower Tail)?  Test Statistic: 0.151  Test Statistic: 0.151  Test Statistic: 0.361  Test Statistic: 0.151  Test Statistic: 0.151  Test Statistic: 0.151  Total N = 16  Number Detects = 16 10% critical value: 0.454 5% critical value: 0.454 5% critical value: 0.595 Note: NDs excluded from Outlier Test					
Test Statistic: 0.025  For 10% significance level, 4.9 is not an outlier. For 15% significance level, 4.9 is not an outlier. For 15% significance level, 4.9 is not an outlier.  Dixon's Outlier Test for selenium  Dixon's Outlier Test for selenium  Total N = 16 Number NDs = 4 Number Detects = 12 Number Detects = 12 Number Detects = 12 Number NDs = 4 Number Statistic 0.049 S% critical value: 0.546 1% critical value: 0.546 1% critical value: 0.548 1% critical value: 0.549 1% Detects value: 0.42 Note: NDs excluded from Outlier Test  1. Data Value 1.7 is a Potential Outlier (Upper Tell)?  Test Statistic: 0.052  For 10% significance level, 1.7 is not an outlier. For 15% significance level, 1.7 is not an outlier. For 15% significance level, 0.306 is not an outlier. For 15% significance level, 0.306 is not an outlier. For 15% significance level, 0.306 is not an outlier. For 15% significance level, 0.306 is not an outlier. For 15% significance level, 0.306 is not an outlier. For 15% significance level, 0.306 is not an outlier. For 15% significance level, 0.306 is not an outlier.  Dixon's Outlier Test for strontium  Dixon's Outlier Test for strontium  Total N = 16  Number NDs = 0  Number Detects = 16  10% critical value: 0.595 1% critical value: 0.595 1% critical value: 0.595 1% critical value: 0.595 Note: NDs excluded from Outlier Test	2 Data Value 4.9 is a Potential Outlier /Lower Tail\?				
For 10% significance level, 4.9 is not an outlier. For 15% significance level, 4.9 is not an outlier. For 15% significance level, 4.9 is not an outlier.  Dixor's Outlier Test for selenium  Total N = 16  Number NDs = 4  Number Detects = 12  10% critical value: 0.546  1% critical value: 0.546  1% critical value: 0.546  1% critical value: 0.642  Note: NDs excluded from Outlier Test  1. Data Value 1.7 is a Potential Outlier (Upper Tail)?  Test Statistic: 0.082  For 10% significance level, 1.7 is not an outlier. For 5% significance level, 1.7 is not an outlier.  2. Data Value 0.306 is a Potential Outlier (Lower Tail)?  Test Statistic: 0.151  For 15% significance level, 0.306 is not an outlier. For 5% significance level, 0.306 is not an outlier. For 15% significance lev	2. Data Value 4.3 is a l'oteritial Outlier (Lower Tail):				
For 10% significance level, 4.9 is not an outlier. For 15% significance level, 4.9 is not an outlier. For 15% significance level, 4.9 is not an outlier.  Dixor's Outlier Test for selenium  Total N = 16  Number NDs = 4  Number Detects = 12  10% critical value: 0.546  1% critical value: 0.546  1% critical value: 0.546  1% critical value: 0.642  Note: NDs excluded from Outlier Test  1. Data Value 1.7 is a Potential Outlier (Upper Tail)?  Test Statistic: 0.082  For 10% significance level, 1.7 is not an outlier. For 5% significance level, 1.7 is not an outlier.  2. Data Value 0.306 is a Potential Outlier (Lower Tail)?  Test Statistic: 0.151  For 15% significance level, 0.306 is not an outlier. For 5% significance level, 0.306 is not an outlier. For 15% significance lev	Test Statistic: 0.025				
For 5% significance level, 4.9 is not an outlier.  For 1% significance level, 4.9 is not an outlier.  Dixon's Outlier Test for selentum  Total N = 16  Number NDs = 4  Number NDs = 4  Number NDs = 4  Note: 0.546  1% critical value: 0.49  5% critical value: 0.49  5% critical value: 0.546  11. Data Value 1.7 is a Potential Outlier (Upper Tail)?  Test Statistic: 0.082  For 10% significance level, 1.7 is not an outlier.  For 5% significance level, 1.7 is not an outlier.  For 5% significance level, 1.7 is not an outlier.  For 1% significance level, 0.306 is not an outlier.  For 1% significance level, 0.306 is not an outlier.  For 1% significance level, 0.306 is not an outlier.  Total N = 16  Number NDs = 0  Number Datacts = 16  Number NDs = 0  Number NDs = 0  Number NDs = 0  Note: NDs excluded from Outlier Test	Tool Stations. 0.020				
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For 1% significance level, 4.9 is not an outlier.  Dixon's Outlier Test for selenium  Total N = 16  Number NDs = 4  Number Detects = 12  10% critical value: 0.49  5% critical value: 0.642  1% critical value: 0.642  Note: NDs excluded from Outlier Test  1. Data Value 1.7 is a Potential Outlier (Upper Tail)?  Test Statistic: 0.082  For 10% significance level, 1.7 is not an outlier.  For 15% significance level, 1.7 is not an outlier.  For 15% significance level, 1.7 is not an outlier.  For 15% significance level, 1.7 is not an outlier.  For 15% significance level, 0.306 is not an outlier.  For 15% significance level, 0.306 is not an outlier.  For 15% significance level, 0.306 is not an outlier.  Total N = 16  Number NDs = 0  Number Detects = 16  Note: NDs excluded from Outlier Test					
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Note: NDs excluded from Outlier Test  1. Data Value 1.7 is a Potential Outlier (Upper Tail)?  Test Statistic: 0.082  For 10% significance level, 1.7 is not an outlier.  For 5% significance level, 1.7 is not an outlier.  For 1% significance level, 1.7 is not an outlier.  2. Data Value 0.306 is a Potential Outlier (Lower Tail)?  Test Statistic: 0.151  For 10% significance level, 0.306 is not an outlier.  For 5% significance level, 0.306 is not an outlier.  For 5% significance level, 0.306 is not an outlier.  For 1% significance level, 0.306 is not an outlier.  Total N = 16  Number NDs = 0  Number Detects = 16  10% critical value: 0.454  5% critical value: 0.507  1% critical value: 0.507  1% critical value: 0.595  Note: NDs excluded from Outlier Test	5% critical value: 0.546				
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Test Statistic: 0.151  For 10% significance level, 0.306 is not an outlier.  For 5% significance level, 0.306 is not an outlier.  For 1% significance level, 0.306 is not an outlier.  Dixon's Outlier Test for strontium  Total N = 16  Number NDs = 0  Number Detects = 16  10% critical value: 0.454  5% critical value: 0.454  5% critical value: 0.507  1% critical value: 0.595  Note: NDs excluded from Outlier Test	O Date Value 0 000 in a Date tial Outline (Laure Tail)				
For 10% significance level, 0.306 is not an outlier.  For 5% significance level, 0.306 is not an outlier.  For 1% significance level, 0.306 is not an outlier.  Dixon's Outlier Test for strontium  Total N = 16  Number NDs = 0  Number Detects = 16  10% critical value: 0.454  5% critical value: 0.507  1% critical value: 0.595  Note: NDs excluded from Outlier Test	2. Data Value 0.306 is a Potential Outlier (Lower Fall)?				
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For 1% significance level, 0.306 is not an outlier.  Dixon's Outlier Test for strontium  Total N = 16  Number NDs = 0  Number Detects = 16  10% critical value: 0.454  5% critical value: 0.507  1% critical value: 0.595  Note: NDs excluded from Outlier Test					
Dixon's Outlier Test for strontium  Total N = 16 Number NDs = 0 Number Detects = 16 10% critical value: 0.454 5% critical value: 0.507 1% critical value: 0.595 Note: NDs excluded from Outlier Test	-				
Total N = 16  Number NDs = 0  Number Detects = 16  10% critical value: 0.454  5% critical value: 0.507  1% critical value: 0.595  Note: NDs excluded from Outlier Test					
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Total N = 16  Number NDs = 0  Number Detects = 16  10% critical value: 0.454  5% critical value: 0.507  1% critical value: 0.595  Note: NDs excluded from Outlier Test	Dixon's Outlier Test for strontium				
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Number Detects = 16       10% critical value: 0.454         5% critical value: 0.507       5% critical value: 0.595         Note: NDs excluded from Outlier Test       10	Total N = 16				
10% critical value: 0.454  5% critical value: 0.507  1% critical value: 0.595  Note: NDs excluded from Outlier Test	Number NDs = 0				
5% critical value: 0.507  1% critical value: 0.595  Note: NDs excluded from Outlier Test	Number Detects = 16				
1% critical value: 0.595  Note: NDs excluded from Outlier Test	10% critical value: 0.454				
Note: NDs excluded from Outlier Test	5% critical value: 0.507				
	1% critical value: 0.595				
Data Value 46 is a Potential Outlier (Upper Tail)?	Note: NDs excluded from Outlier Test				
Data Value 46 is a Potential Outlier (Upper Tail)?					
	Data Value 46 is a Potential Outlier (Upper Tail)?				
Test Statistic: 0.674	-				

			I	
For 10% significance level, 46 is an outlier.				
For 5% significance level, 46 is an outlier.				
For 1% significance level, 46 is an outlier.				
1 of 170 digninearies level, 40 to all outlier.				
2. Data Value 14 is a Potential Outlier (Lower Tail)?				
2. Data value 14 lo a l'otolidal Gatioi (Lowel l'all):				
Test Statistic: 0.090				
For 10% significance level, 14 is not an outlier.				
For 5% significance level, 14 is not an outlier.				
For 1% significance level, 14 is not an outlier.				
,				
No Outlier Test for thallium				
Dixon's Outlier Test for vanadium				
Total N = 10				
Number NDs = 0				
Number Detects = 10				
10% critical value: 0.409				
5% critical value: 0.477				
1% critical value: 0.597				
Note: NDs excluded from Outlier Test				
Data Value 190 is a Potential Outlier (Upper Tail)?				
Test Statistic: 0.794				
For 10% significance level, 190 is an outlier.				
For 5% significance level, 190 is an outlier.				
For 1% significance level, 190 is an outlier.				
2. Data Value 34 is a Potential Outlier (Lower Tail)?				
T. 101 C. 100				
Test Statistic: 0.030				
For 10% significance level 24 is not as suffice				
For 10% significance level, 34 is not an outlier. For 5% significance level, 34 is not an outlier.				
For 1% significance level, 34 is not an outlier.  For 1% significance level, 34 is not an outlier.				
or 170 significance level, 34 is not an outlier.				
Dixon's Outlier Test for zinc				
DIAGITS GUILIGE TEST FOR ZITTE				
Total N = 10				
Number NDs = 0				
Number Detects = 10				
10% critical value: 0.409				
5% critical value: 0.477				
0 /0 Gridodi Value. U.T / /				

1% critical value: 0.597				
Note: NDs excluded from Outlier Test				
Data Value 230 is a Potential Outlier (Upper Tail)?				
Test Statistic: 0.829				
For 10% significance level, 230 is an outlier.				
For 5% significance level, 230 is an outlier.				
For 1% significance level, 230 is an outlier.				
Data Value 40 is a Potential Outlier (Lower Tail)?				
Test Statistic: 0.086				
For 10% significance level, 40 is not an outlier.				
For 5% significance level, 40 is not an outlier.				
For 1% significance level, 40 is not an outlier.				

	Background Statistics for	or Data Sets	with Non-Detects	
User Selected Options				
=	ProUCL 5.18/20/2021 9:	53:58 AM		
•	ProUCL Background Inp	uts b.xls		
	OFF			
Confidence Coefficient	95%			
	95%			
<b>5</b>	1			
Number of Bootstrap Operations	2000			
antimony				
		General	Statistics	
Total	Number of Observations	2	Number of Missing Observations	2
Number	of Distinct Observations	2		
	Number of Detects	0	Number of Non-Detects	2
Nı	ımber of Distinct Detects	0	Number of Distinct Non-Detects	2
Nu	Minimum Detect	N/A	Minimum Non-Detects	0.32
	Maximum Detect	N/A	Maximum Non-Detect	0.325
	Variance Detected	N/A	Percent Non-Detects	100%
	Mean Detected	N/A	SD Detected	N/A
Moon	of Detected Logged Data	N/A	SD of Detected Logged Data	N/A
iviean c	Di Detecteu Loggeu Data	IN/A	3D of Detected Logged Data	IN/A
	Worning: Th	io data aat	anky hoe 2 cheanystianal	
Data	=		only has 2 observations!	
Data	a set is too small to comp	oute reliable	and meaningful statistics and estimates!	
Data	a set is too small to comp	oute reliable	-	
	a set is too small to comp	oute reliable r variable ar	and meaningful statistics and estimates!	
It is sugge	The data set for	oute reliable r variable ar to 10 obser	and meaningful statistics and estimates!  ntimony was not processed!  vations before using these statistical methods!	
It is sugge	The data set for	oute reliable r variable ar to 10 obser	and meaningful statistics and estimates!	
It is sugge	The data set for	oute reliable r variable ar to 10 obser	and meaningful statistics and estimates!  ntimony was not processed!  vations before using these statistical methods!	
It is sugge If possible, comp	The data set for	oute reliable r variable ar to 10 obser	and meaningful statistics and estimates!  ntimony was not processed!  vations before using these statistical methods!	
It is sugge	The data set for	oute reliable r variable ar to 10 obser	and meaningful statistics and estimates!  ntimony was not processed!  vations before using these statistical methods!	
It is sugge If possible, comp arsenic	The data set for	oute reliable r variable ar to 10 obser	and meaningful statistics and estimates!  ntimony was not processed!  vations before using these statistical methods!	
It is sugge If possible, comp arsenic General Statistics	a set is too small to comp The data set for ested to collect at least 8 pute and collect Data Qu	oute reliable r variable an to 10 obser ality Objecti	and meaningful statistics and estimates!  ntimony was not processed!  vations before using these statistical methods!  ves (DQO) based sample size and analytical results.	
It is sugge If possible, comp arsenic General Statistics	The data set for the data set for the data set for ested to collect at least 8 pute and collect Data Que Number of Observations	to 10 obser ality Objecti	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	4
It is sugge If possible, comp arsenic General Statistics	The data set for the data set for the data set for ested to collect at least 8 to the data and collect Data Que to the data set for the data set for ested to collect at least 8 to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to the data	to 10 obser ality Objecti	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763
It is sugge If possible, comp arsenic General Statistics	The data set for The data set for Steed to collect at least 8 pute and collect Data Que Number of Observations  Minimum Second Largest	to 10 obser ality Object	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125
It is sugge If possible, comp arsenic General Statistics	The data set for the data set for the data set for ested to collect at least 8 to the data and collect Data Que to the data set for the data set for ested to collect at least 8 to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect at least 8 to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to collect Data Que to the data set for ested to the data	to 10 obser ality Objecti 4 1.2 2.3 2.38	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32
It is sugge If possible, comp arsenic General Statistics	The data set for The data set for Steed to collect at least 8 pute and collect Data Que Number of Observations  Minimum  Second Largest  Maximum  Mean	to 10 obser ality Objecti 4 1.2 2.3 2.38 1.958	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538
It is sugge If possible, comp arsenic General Statistics	The data set for The data set for The data set for Ested to collect at least 8 Dute and collect Data Que Number of Observations  Minimum  Second Largest  Maximum  Mean  Coefficient of Variation	to 10 obser ality Objects 4 1.2 2.3 2.38 1.958 0.275	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538 -1.363
It is sugge If possible, comp arsenic General Statistics	The data set for The data set for Steed to collect at least 8 pute and collect Data Que Number of Observations  Minimum  Second Largest  Maximum  Mean	to 10 obser ality Objecti 4 1.2 2.3 2.38 1.958	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538
It is sugge If possible, comp arsenic General Statistics	The data set for The data set for Steed to collect at least 8 pute and collect Data Que Number of Observations  Minimum  Second Largest  Maximum  Mean  Coefficient of Variation  Mean of logged Data	to 10 obser ality Objecti 4 1.2 2.3 2.38 1.958 0.275 0.638	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538 -1.363
It is sugge If possible, comp arsenic General Statistics	The data set for The data set for Steed to collect at least 8 pute and collect Data Que Number of Observations  Minimum  Second Largest  Maximum  Mean  Coefficient of Variation  Mean of logged Data	to 10 obser ality Objecti 4 1.2 2.3 2.38 1.958 0.275 0.638	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538 -1.363
It is sugge If possible, comp arsenic General Statistics Total	The data set for The data set for Steed to collect at least 8 pute and collect Data Que Number of Observations  Minimum  Second Largest  Maximum  Mean  Coefficient of Variation  Mean of logged Data	to 10 obser ality Objecti 4 1.2 2.3 2.38 1.958 0.275 0.638	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538 -1.363
It is sugge If possible, comp arsenic General Statistics Total	The data set for The data set for The data set for Steed to collect at least 8 pute and collect Data Questions  Number of Observations  Minimum  Second Largest  Maximum  Mean  Coefficient of Variation  Mean of logged Data  Critical Values for	to 10 obser ality Objecti 4 1.2 2.3 2.38 1.958 0.275 0.638	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538 -1.363 0.316
It is sugge If possible, comp arsenic General Statistics Total	The data set for The data set for The data set for Steed to collect at least 8 pute and collect Data Questions  Number of Observations  Minimum  Second Largest  Maximum  Mean  Coefficient of Variation  Mean of logged Data  Critical Values for	to 10 obser ality Objecti 4 1.2 2.3 2.38 1.958 0.275 0.638 or Backgrou 5.144	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538 -1.363 0.316
It is sugge If possible, comp arsenic  General Statistics  Total I	The data set for The data set for The data set for Steed to collect at least 8 pute and collect Data Questions  Number of Observations  Minimum  Second Largest  Maximum  Mean  Coefficient of Variation  Mean of logged Data  Critical Values for	to 10 obser ality Objecti 4 1.2 2.3 2.38 1.958 0.275 0.638 or Backgrou 5.144	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538 -1.363 0.316
It is sugge If possible, comp  arsenic  General Statistics  Total	Number of Observations Minimum Second Largest Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values for	to 10 obser ality Objecti  4 1.2 2.3 2.38 1.958 0.275 0.638  Dr Backgrou 5.144  Normal (	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538 -1.363 0.316
It is sugge If possible, comp  arsenic  General Statistics  Total	Number of Observations Minimum Second Largest Maximum Mean Coefficient of Variation Mean of logged Data  Critical Values for ance Factor K (For UTL)	to 10 obser ality Objecti 4 1.2 2.3 2.38 1.958 0.275 0.638 or Backgrou 5.144	and meaningful statistics and estimates!  Intimony was not processed!  Intimony was not processed.  Int	1.763 2.125 2.32 0.538 -1.363 0.316

Data appea	r Normal at	t 5% Significance Level	
Background Si	atistics Ass	suming Normal Distribution	
95% UTL with 95% Coverage	4.727	90% Percentile (z)	2.64
95% UPL (t)	3.374	95% Percentile (z)	2.84
95% USL	2.745	99% Percentile (z)	3.21
35.8 552		(L)	
	Gamma	GOF Test	
A-D Test Statistic	0.468	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance	e Leve
K-S Test Statistic	0.279	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.395	Detected data appear Gamma Distributed at 5% Significance	e Leve
Detected data appear	Gamma Di	stributed at 5% Significance Level	
	Gamma	Statistics	
k hat (MLE)	14.82	k star (bias corrected MLE)	3.87
Theta hat (MLE)	0.132	Theta star (bias corrected MLE)	0.50
nu hat (MLE)	118.5	nu star (bias corrected)	30.9
MLE Mean (bias corrected)	1.958	MLE Sd (bias corrected)	0.99
<del>-</del>		uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	3.878	90% Percentile	3.29
95% Hawkins Wixley (HW) Approx. Gamma UPL	3.973	95% Percentile	3.82
95% WH Approx. Gamma UTL with 95% Coverage	6.703	99% Percentile	4.97
95% HW Approx. Gamma UTL with 95% Coverage	7.191		
95% WH USL	2.892	95% HW USL	2.9
	Lognorma	GOF Test	
Shapiro Wilk Test Statistic	0.83	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.288	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level	
Data appear	Lognormal	at 5% Significance Level	
Pookground Cto	tistics seen	ming Logrammal Distribution	
95% UTL with 95% Coverage	9.598	ming Lognormal Distribution 90% Percentile (z)	2.83
95% UPL (t)	4.341	95% Percentile (z)	3.18
95% USL	3.002	99% Percentile (z)	3.94
•		Free Background Statistics	
Data appea	ır Normal at	: 5% Significance Level	
Nonparametric Upp	er Limits fo	r Background Threshold Values	
Order of Statistic, r	4	95% UTL with 95% Coverage	2.38
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.18
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	N/A	95% BCA Bootstrap UTL with 95% Coverage	N/A
95% UPL	2.38	90% Percentile	2.35
200/ 01 1 1 1 1 1 1	3.763	95% Percentile	2.36
90% Chebyshev UPL	3.703	00701 010011110	

95% USL	2.38		
Note: The use of USL tends to yield a conservative	e estimate	of BTV, especially when the sample size starts exceeding 20.	
		e data set represents a background data set free of outliers	
and consists of observat	ions collect	ed from clean unimpacted locations.	
The use of USL tends to provide a balance	e between	false positives and false negatives provided the data	
represents a background data set and wh	en many on	site observations need to be compared with the BTV.	
barium			
General Statistics			
Total Number of Observations	4	Number of Distinct Observations	4
Minimum	12	First Quartile	16.88
Second Largest	23.5	Median	21
Maximum	38.4	Third Quartile	27.23
Mean	23.1	SD SD	11.23
Coefficient of Variation	0.486	Skewness	0.995
Mean of logged Data	3.052	SD of logged Data	0.485
a. a. legges 2 au	0.002	02 01 109904 2014	
Critical Values fo	r Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462
		l	
	Normal C	GOF Test	
Shapiro Wilk Test Statistic	0.952	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.236	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level	
Data appea	r Normal at	5% Significance Level	
-		uming Normal Distribution	
95% UTL with 95% Coverage	80.89	90% Percentile (z)	37.5
95% UPL (t)	52.66	95% Percentile (z)	41.58
95% USL	39.53	99% Percentile (z)	49.23
	Gamma (	GOF Test	
A-D Test Statistic	0.212	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance	ce Level
K-S Test Statistic	0.18	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance	ce Level
		stributed at 5% Significance Level	
		<u> </u>	
	Gamma	Statistics	
k hat (MLE)	5.85	k star (bias corrected MLE)	1.629
Theta hat (MLE)	3.949	Theta star (bias corrected MLE)	14.18
nu hat (MLE)	46.8	nu star (bias corrected)	13.03
MLE Mean (bias corrected)	23.1	MLE Sd (bias corrected)	18.1
		1	
-	atistics Ass	uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	63.39	90% Percentile	47.18
95% Hawkins Wixley (HW) Approx. Gamma UPL	65.74	95% Percentile	58.55

	,		
95% WH Approx. Gamma UTL with 95% Coverage	134.8	99% Percentile	84.07
95% HW Approx. Gamma UTL with 95% Coverage	151.3		
95% WH USL	41.31	95% HW USL	41.66
	Lognormal	GOF Test	
Shapiro Wilk Test Statistic	0.998	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.164	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level	
		at 5% Significance Level	
2412 37753			
Background Sta	atistics assu	ming Lognormal Distribution	
95% UTL with 95% Coverage	256.5	90% Percentile (z)	39.39
95% UPL (t)	75.81	95% Percentile (z)	46.98
95% USL	43.01	99% Percentile (z)	65.3
30 / 0 002	40.01	33% Fercentile (2)	
Nonparametric	Distribution	Free Background Statistics	
Data appe	ar Normal at	: 5% Significance Level	
Nonparametric Upp	per Limits for	r Background Threshold Values	
Order of Statistic, r	4	95% UTL with 95% Coverage	38.4
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.18
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	N/A	95% BCA Bootstrap UTL with 95% Coverage	N/A
95% UPL	38.4	90% Percentile	33.9
90% Chebyshev UPL	60.78	95% Percentile	36.1
95% Chebyshev UPL	77.85	99% Percentile	37.9
95% USL	38.4		
		of BTV, especially when the sample size starts exceeding 20. le data set represents a background data set free of outliers	
and consists of observa	ations collect	ed from clean unimpacted locations.	
The use of USL tends to provide a balar	nce between	false positives and false negatives provided the data	
represents a background data set and w	hen many on	site observations need to be compared with the BTV.	
ryllium			
	General	Statistics	
Total Number of Observations	4	Number of Missing Observations	0
Number of Distinct Observations	4		
Number of Detects	3	Number of Non-Detects	1
Number of Distinct Detects	3	Number of Distinct Non-Detects	1
Minimum Detect	0.249	Minimum Non-Detect	0.32
Maximum Detect	0.465	Maximum Non-Detect	0.32
Variance Detected	0.0146	Percent Non-Detects	25%
Mean Detected	0.326	SD Detected	0.12
Mean of Detected Logged Data	-1.163	SD of Detected Logged Data	0.34
	1		
Warning: D	ata set has	only 3 Detected Values.	

Critical Values for	r Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462
Norma	d GOF Tes	t on Detects Only	
Shapiro Wilk Test Statistic	0.8	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Lev	el
Lilliefors Test Statistic	0.364	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Lev	el
		nal at 5% Significance Level	
<u> </u>		<u> </u>	
Kaplan Meier (KM) Backç	ground Sta	tistics Assuming Normal Distribution	
KM Mean	0.308	KM SD	0.0906
95% UTL95% Coverage	0.775	95% KM UPL (t)	0.547
90% KM Percentile (z)	0.425	95% KM Percentile (z)	0.457
99% KM Percentile (z)	0.519	95% KM USL	0.441
		istics Assuming Normal Distribution	
Mean	0.284	SD	0.129
95% UTL95% Coverage	0.947	95% UPL (t)	0.623
90% Percentile (z)	0.449	95% Percentile (z)	0.496
99% Percentile (z)	0.584	95% USL	0.473
Gamma GOF T	ests on De	etected Observations Only	
Gamma GOF T	ests on De		
Gamma GOF T Not Enou	ests on De	etected Observations Only	
Gamma GOF T  Not Enou  Gamma S  k hat (MLE)	ests on De	etected Observations Only Derform GOF Test	N/A
Gamma GOF T Not Enot Gamma S	ests on Deugh Data to	Perform GOF Test  Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)	N/A N/A
Gamma GOF T  Not Enou  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)	Tests on Deugh Data to	Perform GOF Test  Detected Data Only  k star (bias corrected MLE)	
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)	Statistics or 12.11 0.0269 72.63 N/A	Perform GOF Test  Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)	N/A N/A
Gamma GOF T  Not Enou  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)	Fests on Deugh Data to Statistics or 12.11 0.0269 72.63	Perform GOF Test  Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)	N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)	Statistics or 12.11 0.0269 72.63 N/A N/A	Perform GOF Test  Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S	Statistics or 12.11 0.0269 72.63 N/A N/A	Perform GOF Test  Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set	Statistics or 12.11 0.0269 72.63 N/A N/A Statistics use	Perform GOF Test  Detected Data Only  Restar (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  sing Imputed Non-Detects  NDs with many tied observations at multiple DLs	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set	Statistics or 12.11 0.0269 72.63 N/A N/A Statistics use thas > 50% mall such a	Perform GOF Test  Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  Sing Imputed Non-Detects NDs with many tied observations at multiple DLs s < 1.0, especially when the sample size is small (e.g., <15-20)	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sor	Statistics or 12.11 0.0269 72.63 N/A N/A Statistics us t has > 50% mall such a sethod may	Perform GOF Test  Detected Data Only  Restar (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  sing Imputed Non-Detects  NDs with many tied observations at multiple DLs	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial	Statistics or 12.11 0.0269 72.63 N/A N/A Statistics use that > 50% mall such a sethod may	Perform GOF Test  Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  sing Imputed Non-Detects  NDs with many tied observations at multiple DLs  s <1.0, especially when the sample size is small (e.g., <15-20)  yield incorrect values of UCLs and BTVs	N/A N/A
Gamma GOF T  Not Enot  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especia	Statistics or 12.11 0.0269 72.63 N/A N/A Statistics use that > 50% mall such a sethod may	Perform GOF Test  Detected Data Only  R star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  Sing Imputed Non-Detects NDs with many tied observations at multiple DLs s <1.0, especially when the sample size is small (e.g., <15-20) yield incorrect values of UCLs and BTVs in the sample size is small.	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especia  For gamma distributed detected data, BTVs an	Statistics or 12.11 0.0269 72.63 N/A N/A Statistics use thas > 50% mall such a sethod may lly true wheeld UCLs may	Perform GOF Test  In Detected Data Only  It is star (bias corrected MLE)  Theta star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  Sing Imputed Non-Detects  NDs with many tied observations at multiple DLs  s <1.0, especially when the sample size is small (e.g., <15-20)  yield incorrect values of UCLs and BTVs  in the sample size is small.  by be computed using gamma distribution on KM estimates	N/A N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial  For gamma distributed detected data, BTVs an	Statistics or 12.11 0.0269 72.63 N/A N/A Statistics use thas > 50% mall such a sethod may lly true wheeld UCLs made 0.249	Perform GOF Test  Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  Sing Imputed Non-Detects NDs with many tied observations at multiple DLs  s <1.0, especially when the sample size is small (e.g., <15-20)  yield incorrect values of UCLs and BTVs on the sample size is small.  by be computed using gamma distribution on KM estimates  Mean	N/A N/A N/A 0.31 0.263
Gamma GOF T  Not Enot  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial  For gamma distributed detected data, BTVs an  Minimum  Maximum	Statistics or 12.11 0.0269 72.63 N/A N/A Statistics us t has > 50% mall such a sethod may lly true when d UCLs may 0.249 0.465	Perform GOF Test  A Detected Data Only  R star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  Sing Imputed Non-Detects  NDs with many tied observations at multiple DLs  s <1.0, especially when the sample size is small (e.g., <15-20)  yield incorrect values of UCLs and BTVs  in the sample size is small.  by be computed using gamma distribution on KM estimates  Mean  Median	N/A N/A N/A 0.31 0.263 0.334
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especia  For gamma distributed detected data, BTVs an  Minimum  Maximum  SD	Statistics or 12.11 0.0269 72.63 N/A N/A Statistics use thas > 50% mall such a sethod may lly true wheeld UCLs may 0.249 0.465 0.103	Perform GOF Test  In Detected Data Only  It is star (bias corrected MLE)  Theta star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  Sing Imputed Non-Detects  In NDs with many tied observations at multiple DLs  Is <1.0, especially when the sample size is small (e.g., <15-20)  yield incorrect values of UCLs and BTVs  In the sample size is small.  It is yield by be computed using gamma distribution on KM estimates  Mean  Median  Median	N/A N/A N/A N/A 0.31 0.263 0.334 3.725
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial  For gamma distributed detected data, BTVs an  Minimum  Maximum  SD  k hat (MLE)	Tests on Debugh Data to 12.11 0.0269 72.63 N/A N/A Statistics uset that so 50% mall such a sethod may lly true whend UCLs made 0.249 0.465 0.103 14.23	Perform GOF Test  In Detected Data Only  In Kestar (bias corrected MLE)  Theta star (bias corrected MLE)  Theta star (bias corrected MLE)  The star (bias corrected MLE)  Percentile of Chisquare (2kstar)  Sing Imputed Non-Detects  The sample size is small (e.g., <15-20)  Sing Imputed Non-Detects  Sing Imputed Non-Detects  The sample size is small (e.g., <15-20)	N/A N/A N/A N/A 0.31 0.263 0.334 3.725
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is si  For such situations, GROS m  This is especia  For gamma distributed detected data, BTVs an  Minimum  Maximum  SD  k hat (MLE)  Theta hat (MLE)	Statistics or 12.11 0.0269 72.63 N/A N/A Statistics ust has > 50% mall such a sethod may lly true when d UCLs may 0.249 0.465 0.103 14.23 0.0218	Perform GOF Test  In Detected Data Only  In Note that Star (bias corrected MLE)  Theta star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  Sing Imputed Non-Detects  NDs with many tied observations at multiple DLs  s <1.0, especially when the sample size is small (e.g., <15-20)  yield incorrect values of UCLs and BTVs  in the sample size is small.  by be computed using gamma distribution on KM estimates  Mean  Median  CV  k star (bias corrected MLE)  Theta star (bias corrected MLE)	N/A N/A N/A N/A 0.31 0.263 0.334 3.725 0.0833
Gamma GOF T  Not Enough  Read (MLE)  Theta hat (MLE)  Theta hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especia  For gamma distributed detected data, BTVs an  Minimum  Maximum  SD  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)	Statistics or 12.11 0.0269 72.63 N/A N/A  Statistics use that so that so the sound of the sound	Perform GOF Test  In Detected Data Only  It is star (bias corrected MLE)  Theta star (bias corrected MLE)  Theta star (bias corrected MLE)  Percentile of Chisquare (2kstar)  Sing Imputed Non-Detects  In NDs with many tied observations at multiple DLs  Is <1.0, especially when the sample size is small (e.g., <15-20)  Yield incorrect values of UCLs and BTVs  In the sample size is small.  In the sample size is small.  In the sample size is small (e.g., <15-20)  In the sample size is small.  In the sample size is small (e.g., <15-20)  In the sample size is small.  In the sample size is small (e.g., <15-20)   N/A N/A N/A N/A 0.31 0.263 0.334 3.725 0.0833 29.8	

		-	Samma ROS Statistics on Imputed Data		
Upper Limits U			and Hawkins Wixley (HW) Methods		
	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	1.083	1.135	95% Approx. Gamma UPL	0.621	0.628
95% Gamma USL	0.461	0.461			
Est	imates of G	amma Paramet	ters using KM Estimates		
	Mean (KM)	0.308		SD (KM)	0.090
	riance (KM)	0.00821	SE of	Mean (KM)	0.055
	k hat (KM)	11.59		k star (KM)	3.064
	nu hat (KM)	92.7	n	u star (KM)	24.51
the	eta hat (KM)	0.0266	thet	a star (KM)	0.10
80% gamma pero	centile (KM)	0.439	90% gamma perc	entile (KM)	0.545
95% gamma pero	centile (KM)	0.643	99% gamma perc	entile (KM)	0.85
				1	
			gamma distribution and KM estimates and Hawkins Wixley (HW) Methods		
Opper Limits t	WH	HW	and mawkins wixley (mw) methods	WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.947	0.983	95% Approx. Gamma UPL	0.571	0.575
95% KM Gamma Percentile	0.456	0.456	95% Gamma USL	0.437	0.436
Loį	gnormal GO	F Test on Dete	cted Observations Only		
Shapiro Wilk To	est Statistic	0.817	Shapiro Wilk GOF Test		
5% Shapiro Wilk C	ritical Value	0.767	Detected Data appear Lognormal at 5% Si	gnificance Le	evel
Lilliefors To	est Statistic	0.356	Lilliefors GOF Test		
5% Lilliefors C	ritical Value	0.425	Detected Data appear Lognormal at 5% Si	gnificance Le	evel
			Detected Data appear Lognormal at 5% Si al at 5% Significance Level	gnificance Le	evel
Detec	cted Data ap	pear Lognorma	al at 5% Significance Level	-	evel
Detection Detection   Background Lognormal RC	cted Data ap	pear Lognorma	al at 5% Significance Level	ts	
Detection   Background Lognormal RC Mean in Or	cted Data ap	pear Lognorma  Assuming Log  0.31	al at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect  Mean in	ts Log Scale	-1.206
Background Lognormal RC  Mean in Or  SD in Or	cted Data ap  OS Statistics  iginal Scale  iginal Scale	Assuming Log 0.31 0.103	al at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect  Mean in	ts Log Scale Log Scale	-1.206 0.295
Background Lognormal RC  Mean in Or  SD in Or  95% UTL95%	DS Statistics iginal Scale iginal Scale % Coverage	Assuming Log 0.31 0.103 1.364	In at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect  Mean in  SD in  95% BCA UTL95%	Log Scale Log Scale Coverage	-1.206 0.295 N/A
Background Lognormal RC  Mean in Or  SD in Or  95% UTL95%  95% Bootstrap (%) UTL95%	DS Statistics iginal Scale iginal Scale 6 Coverage 6 Coverage	0.31 0.103 1.364 N/A	normal Distribution Using Imputed Non-Detect  Mean in  SD in  95% BCA UTL95%	Log Scale Log Scale Coverage Coverage	-1.206 0.295 N/A 0.65
Background Lognormal RC  Mean in Or  SD in Or  95% UTL95%  95% Bootstrap (%) UTL95%	DS Statistics iginal Scale iginal Scale Coverage Coverage creentile (z)	0.31 0.103 1.364 N/A 0.437	normal Distribution Using Imputed Non-Detect  Mean in  SD in  95% BCA UTL95%	Log Scale Log Scale Coverage C	-1.206 0.295 N/A 0.65
Background Lognormal RC  Mean in Or  SD in Or  95% UTL95%  95% Bootstrap (%) UTL95%	DS Statistics iginal Scale iginal Scale 6 Coverage 6 Coverage	0.31 0.103 1.364 N/A	normal Distribution Using Imputed Non-Detect  Mean in  SD in  95% BCA UTL95%	Log Scale Log Scale Coverage Coverage	-1.206 0.295 N/A 0.65
Background Lognormal RC  Mean in Or  SD in Or  95% UTL959  95% Bootstrap (%) UTL959  90% Pc	DS Statistics iginal Scale iginal Scale iginal Scale Coverage Coverage ercentile (z)	0.31 0.103 1.364 N/A 0.437 0.594	normal Distribution Using Imputed Non-Detect  Mean in  SD in  95% BCA UTL95%  9  95% Pe	Log Scale Log Scale Coverage C	-1.206 0.295 N/A
Background Lognormal RC Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Pc	DS Statistics iginal Scale iginal Scale Coverage Coverage crcentile (z) crcentile (z)	0.31 0.103 1.364 N/A 0.437 0.594 on Logged Data	Inormal Distribution Using Imputed Non-Detect Mean in SD in 95% BCA UTL95% 9 95% Pe	Log Scale Log Scale Coverage C	-1.206 0.298 N/A 0.65 0.486
Background Lognormal RC  Mean in Or  SD in Or  95% UTL95%  95% Bootstrap (%) UTL95%  90% Pc  99% Pc  Statistics using KM  KM Mean of Lognormal RC	DS Statistics iginal Scale iginal Scale % Coverage % Coverage ercentile (z) ercentile (z)  # estimates ogged Data	0.31 0.103 1.364 N/A 0.437 0.594 on Logged Data	Inormal Distribution Using Imputed Non-Detect Mean in SD in 95% BCA UTL95% 9 95% Pe	Log Scale Log Scale Coverage Coverage Coverage Coverage Coverage Coverage	-1.206 0.295 N/A 0.65 0.486 0.461
Background Lognormal RC Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Pc	DS Statistics DS	0.31 0.103 1.364 N/A 0.437 0.594 on Logged Data	Inormal Distribution Using Imputed Non-Detect Mean in SD in 95% BCA UTL95% 9 95% Pe	ts Log Scale Log Scale Coverage Coverage Soverage	-1.206 0.298 N/A 0.65 0.466 1.129 0.588
Background Lognormal RC  Mean in Or  SD in Or  95% UTL959  95% Bootstrap (%) UTL959  90% Pe  99% Pe  Statistics using KM  KM Mean of Le  KM SD of Le	DS Statistics DS	0.31 0.103 1.364 N/A 0.437 0.594 on Logged Data 0.259	al at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect  Mean in  SD in  95% BCA UTL95%  9  95% Pe	ts Log Scale Log Scale Coverage Coverage Soverage	-1.206 0.299 N/A 0.65 0.480 0.46
Background Lognormal RC  Mean in Or  SD in Or  95% UTL95%  95% Bootstrap (%) UTL95%  90% Pc  99% Pc  Statistics using KN  KM Mean of Lc  KM SD of Lc  95% KM Percentile Lo	DS Statistics iginal Scale iginal Scale iginal Scale Coverage Coverage creentile (z) creentile (z) destimates ogged Data ogged Data gnormal (z)	0.31 0.103 1.364 N/A 0.437 0.594 on Logged Data -1.213 0.259 0.456	al at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect  Mean in  SD in  95% BCA UTL95%  9  95% Pe	ts Log Scale Log Scale Coverage Coverage Soverage	-1.206 0.298 N/A 0.65 0.466 1.129 0.588
Background Lognormal RC  Mean in Or  SD in Or  95% UTL959  95% Bootstrap (%) UTL959  90% Pc  99% Pc  Statistics using KM  KM Mean of Lc  KM SD of Lc  95% KM Percentile Lo	DS Statistics iginal Scale iginal Scale iginal Scale Coverage Coverage creentile (z) creentile (z) destimates ogged Data ogged Data gnormal (z)	0.31 0.103 1.364 N/A 0.437 0.594 on Logged Data -1.213 0.259 0.456	al at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect Mean in SD in 95% BCA UTL95% 9 95% Pe  a and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL (I	ts Log Scale Log Scale Coverage Coverage Soverage	-1.206 0.298 N/A 0.65 0.486 0.46
Background Lognormal RC  Mean in Or  SD in Or  95% UTL95%  95% Bootstrap (%) UTL95%  90% Pc  99% Pc  Statistics using KN  KM Mean of Lc  KM SD of Lc  95% KM Percentile Lo  Backgr	DS Statistics DS	0.31 0.103 1.364 N/A 0.437 0.594 00 Logged Data -1.213 0.259 0.456	al at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect  Mean in  SD in  95% BCA UTL95%  9  95% Pe  a and Assuming Lognormal Distribution  95% KM UTL (Lognormal)95%  95% KM UPL (I	ts Log Scale Log Scale Coverage Coverage So UPL (t) So Coverage Coverage Lognormal) Lognormal)	-1.206 0.298 N/A 0.65 0.486 0.46 -1.129 0.588 0.434
Background Lognormal RC  Mean in Or  SD in Or  95% UTL95%  95% Bootstrap (%) UTL95%  90% Pc  99% Pc  Statistics using KN  KM Mean of Lc  KM SD of Lc  95% KM Percentile Lo  Backgr	DS Statistics iginal Scale iginal Scale iginal Scale Coverage Coverage creentile (z) creentile (z) destimates ogged Data iginal Scale iginal Scale	0.31 0.103 1.364 N/A 0.437 0.594  on Logged Data -1.213 0.259 0.456  Statistics Assur	al at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect  Mean in  SD in  95% BCA UTL95%  9  95% Pe  a and Assuming Lognormal Distribution  95% KM UTL (Lognormal)95%  95% KM UPL (I  95% KM USL (I  ming Lognormal Distribution  Mean in  SD in	ts Log Scale Coverage	-1.206 0.299 N/A 0.65 0.486 0.46° 1.129 0.588 0.434 -1.331
Background Lognormal RC  Mean in Or  SD in Or  95% UTL959  95% Bootstrap (%) UTL959  90% Pc  Statistics using KM  KM Mean of Lc  KM SD of Lc  95% KM Percentile Lo  Backgr  Mean in Or  SD in Or  95% UTL959	DS Statistics iginal Scale iginal Scale iginal Scale Coverage Coverage creentile (z) creentile (z) destimates ogged Data iginal Scale iginal Scale	0.31 0.103 1.364 N/A 0.437 0.594 0.129 0.456 Statistics Assur	al at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect Mean in SD in 95% BCA UTL95% 9 95% Pe 95% Pe  a and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL (I 95% KM USL (I 95% KM USL (I 95% Imputed Non-Detect Nean in SD in	Log Scale Log Scale Coverage Coverage Coverage Coverage Coverage Coverage Coverage Coverage Coverage Cognormal) Cognormal	-1.206 0.299 N/A 0.65 0.486 0.46 -1.129 0.588 0.434 -1.331 0.438
Background Lognormal RC  Mean in Or  SD in Or  95% UTL95%  95% Bootstrap (%) UTL95%  90% Pc  99% Pc  Statistics using KN  KM Mean of Lc  KM SD of Lc  95% KM Percentile Lo  Backgr  Mean in Or  SD in Or  95% UTL95%	DS Statistics iginal Scale	0.31 0.103 1.364 N/A 0.437 0.594  on Logged Data -1.213 0.259 0.456  Statistics Assur 0.284 0.129 2.511	al at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect Mean in SD in 95% BCA UTL95% 9 95% Pe 95% Pe  a and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL (I 95% KM USL (I 95% KM USL (I 95% Imputed Non-Detect Nean in SD in	Log Scale Log Scale Coverage Sw UPL (t) Scale Coverage Co	-1.206 0.295 N/A 0.65 0.486
Background Lognormal RC Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Pc 99% Pc  Statistics using KM KM Mean of Lc KM SD of Lc 95% KM Percentile Lo  Backgr Mean in Or SD in Or 95% UTL95% 90% Pc	DS Statistics iginal Scale iginal Scale Coverage ercentile (z)	0.31 0.103 1.364 N/A 0.437 0.594 0.456 0.284 0.129 2.511 0.463 0.732	al at 5% Significance Level  Inormal Distribution Using Imputed Non-Detect Mean in SD in 95% BCA UTL95% 9 95% Pe 95% Pe  a and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL (I 95% KM USL (I 95% KM USL (I 95% Imputed Non-Detect Nean in SD in	ts Log Scale Coverage Sourcettle (z)	-1.206 0.295 N/A 0.65 0.486 0.46 -1.129 0.588 0.432 -1.331 0.438 0.836 0.543

Nonparametric Upper Limits for B1			
	Vs(no dist	inction made between detects and nondetects)	
Order of Statistic, r	4	95% UTL with95% Coverage	0.46
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.18
Approximate Sample Size needed to achieve specified CC	59	95% UPL	0.46
95% USL	0.465	95% KM Chebyshev UPL	0.75
Note: The use of USL tends to yield a conservation	e estimate	of BTV, especially when the sample size starts exceeding 20.	
•		he data set represents a background data set free of outliers	
<u> </u>		ted from clean unimpacted locations.	
		false positives and false negatives provided the data	
<u> </u>		nsite observations need to be compared with the BTV.	
represents a background data set and wil	len many o	isite observations need to be compared with the DTV.	
admium			
301110111 			
	General	Statistics	
Total Number of Observations	4	Number of Missing Observations	0
Number of Distinct Observations	4	,	
Number of Detects	0	Number of Non-Detects	4
Number of Distinct Detects	0	Number of Distinct Non-Detects	4
Minimum Detect	N/A	Minimum Non-Detect	0.32
Maximum Detect	N/A	Maximum Non-Detect	0.63
Variance Detected	N/A	Percent Non-Detects	100%
Mean Detected	N/A	SD Detected	N/A
Mean of Detected Logged Data	N/A	SD of Detected Logged Data	N/A
Warning: All observations are Non-Detects	(NDs), the	erefore all statistics and estimates should also be NDs!	
Specifically, sample mean, UCLs, UPLs, and	other stat	stics are also NDs lying below the largest detection limit!	
The Project Team may decide to use alternative sit	e specific	values to estimate environmental parameters (e.g., EPC, BTV)	
			-
· · · · ·			
The data set for	variable c	admium was not processed!	
The data set for	variable c	admium was not processed!	
The data set for	variable c	admium was not processed!	
	variable c	admium was not processed!	
		·	
exavalent chromium	General	Statistics	
exavalent chromium  Total Number of Observations	General 4	·	0
exavalent chromium  Total Number of Observations  Number of Distinct Observations	General 4 4	Statistics  Number of Missing Observations	0
Total Number of Observations Number of Distinct Observations Number of Detects	General 4 4 3	Statistics  Number of Missing Observations  Number of Non-Detects	0
Total Number of Observations Number of Distinct Observations Number of Detects Number of Distinct Detects	General 4 4 3 3 3	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects	0 1 1
Total Number of Observations Number of Distinct Observations Number of Detects Number of Distinct Detects Minimum Detect	General 4 4 3 3 3 0.24	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect	0 1 1 0.4
exavalent chromium  Total Number of Observations Number of Distinct Observations Number of Detects Number of Distinct Detects Minimum Detect Maximum Detect	General 4 4 3 3 0.24 0.671	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect	0 1 1 0.4 0.4
Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected	General 4 4 3 3 0.24 0.671 0.0467	Statistics  Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects	0 1 1 0.4 0.4 25%
Total Number of Observations Number of Distinct Observations Number of Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected	General 4 4 3 3 0.24 0.671 0.0467	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected	0 1 1 0.4 0.4 25% 0.21
Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected	General 4 4 3 3 0.24 0.671 0.0467	Statistics  Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects	0 1 1 0.4 0.4 25%
Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data	General 4 4 3 3 0.24 0.671 0.0467 0.446 -0.892	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected	0 1 1 0.4 0.4 25% 0.21

Critical Values for Tolerance Factor K (For UTL)	r Backgroun 5.144	d Threshold Values (BTVs)  d2max (for USL)	1.462
Tolerance Factor K (For OTE)	5.144	dzmax (ibi OSL)	1.402
Norma	al GOF Test	on Detects Only	
Shapiro Wilk Test Statistic	0.995	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Leve	el
Lilliefors Test Statistic	0.2	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Leve	el
Detected Data ap	ppear Norma	al at 5% Significance Level	
Kaplan Meier (KM) Backç KM Mean	ground Stati 0.395	stics Assuming Normal Distribution	0.17
		KM SD	0.17
95% UTL95% Coverage	1.305	95% KM UPL (t)	0.86
90% KM Percentile (z)	0.622	95% KM Percentile (z)	0.68
99% KM Percentile (z)	0.807	95% KM USL	0.65
DL/2 Substitution Backg	round Statis	stics Assuming Normal Distribution	
Mean	0.385	SD	0.21
95% UTL95% Coverage	1.492	95% UPL (t)	0.95
90% Percentile (z)	0.661	95% Percentile (z)	0.73
99% Percentile (z)	0.885	95% USL	0.69
DL/2 is not a recommended metho	1 51 /0		
Gamma GOF T	ests on Det	vided for comparisons and historical reasons tected Observations Only Perform GOF Test	
Gamma GOF T Not Enou	Tests on Det	tected Observations Only Perform GOF Test	
Gamma GOF T Not Enou	Tests on Det	tected Observations Only	N/A
Gamma GOF T Not Enou Gamma S	Fests on Det ugh Data to Statistics on	Perform GOF Test  Detected Data Only	N/A N/A
Gamma GOF T  Not Enou  Gamma S  k hat (MLE)	Tests on Detugh Data to	Detected Data Only k star (bias corrected MLE)	
Gamma GOF T  Not Enou  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)	Fests on Det ugh Data to Statistics on 6.052 0.0738	Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)	N/A
Gamma GOF T  Not Enou  Gamma S  k hat (MLE)  Theta hat (MLE)	Fests on Det ugh Data to Statistics on 6.052 0.0738 36.31	Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)	N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)	Fests on Det ugh Data to Statistics on 6.052 0.0738 36.31 N/A N/A	Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S	Fests on Det ugh Data to Statistics on 6.052 0.0738 36.31 N/A N/A Statistics usi	Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set	Fests on Det ugh Data to Statistics on 6.052 0.0738 36.31 N/A N/A Statistics usit	Perform GOF Test  Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects  NDs with many tied observations at multiple DLs	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set	Fests on Det ugh Data to  Statistics on  6.052  0.0738  36.31  N/A  N/A  Statistics usi t has > 50% mall such as	Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects NDs with many tied observations at multiple DLs <1.0, especially when the sample size is small (e.g., <15-20)	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sor	Fests on Det ugh Data to Statistics on 6.052 0.0738 36.31 N/A N/A N/A Statistics usi t has > 50% mall such as ethod may y	Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects  NDs with many tied observations at multiple DLs  <1.0, especially when the sample size is small (e.g., <15-20)  vield incorrect values of UCLs and BTVs	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial	Fests on Det ugh Data to Statistics on 6.052 0.0738 36.31 N/A N/A Statistics usi t has > 50% mall such as ethod may y lly true when	Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects  NDs with many tied observations at multiple DLs <1.0, especially when the sample size is small (e.g., <15-20) rield incorrect values of UCLs and BTVs the sample size is small.	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial	Fests on Det ugh Data to Statistics on 6.052 0.0738 36.31 N/A N/A Statistics usi t has > 50% mall such as ethod may y lly true when	Detected Data Only  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects  NDs with many tied observations at multiple DLs  <1.0, especially when the sample size is small (e.g., <15-20)  vield incorrect values of UCLs and BTVs	N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial	Statistics on Oet 0.052 0.0738 36.31 N/A N/A Statistics using the second of the second	Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects  NDs with many tied observations at multiple DLs <1.0, especially when the sample size is small (e.g., <15-20) yield incorrect values of UCLs and BTVs in the sample size is small. If the computed using gamma distribution on KM estimates	N/A N/A N/A
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial  For gamma distributed detected data, BTVs and	Fests on Det ugh Data to  Statistics on 6.052 0.0738 36.31 N/A N/A  Statistics usi t has > 50% mall such as sethod may y lly true when d UCLs may 0.22	Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects  NDs with many tied observations at multiple DLs <1.0, especially when the sample size is small (e.g., <15-20) rield incorrect values of UCLs and BTVs the sample size is small. r be computed using gamma distribution on KM estimates  Mean	N/A N/A N/A 0.39
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial  For gamma distributed detected data, BTVs and  Minimum  Maximum  SD	Fests on Det ugh Data to  Statistics on  6.052  0.0738  36.31  N/A  N/A  Statistics usit has > 50% mall such as tethod may y lly true when d UCLs may  0.22  0.671	Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects  NDs with many tied observations at multiple DLs <1.0, especially when the sample size is small (e.g., <15-20) rield incorrect values of UCLs and BTVs the sample size is small. The be computed using gamma distribution on KM estimates  Mean Median	N/A N/A N/A N/A 0.39 0.33
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial  For gamma distributed detected data, BTVs and  Minimum  Maximum  SD  k hat (MLE)	Fests on Det ugh Data to 6.052 0.0738 36.31 N/A N/A Statistics usi t has > 50% mall such as ethod may y lly true when d UCLs may 0.22 0.671 0.21 4.927	Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects  NDs with many tied observations at multiple DLs <1.0, especially when the sample size is small (e.g., <15-20) yield incorrect values of UCLs and BTVs the sample size is small. y be computed using gamma distribution on KM estimates  Mean Median CV k star (bias corrected MLE)	N/A N/A N/A N/A 0.39 0.33 0.53
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  GROS may not be used when data set  GROS may not be used when data set  GROS may not be used when kstar of detects is so  For such situations, GROS m  This is especial  For gamma distributed detected data, BTVs and  Minimum  Maximum  SD  k hat (MLE)  Theta hat (MLE)	Statistics on 6.052 0.0738 36.31 N/A N/A Statistics usit has > 50% mall such as eithod may y lly true when d UCLs may 0.22 0.671 0.21 4.927 0.0791	Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects NDs with many tied observations at multiple DLs <1.0, especially when the sample size is small (e.g., <15-20) rield incorrect values of UCLs and BTVs the sample size is small. r be computed using gamma distribution on KM estimates  Mean Median CV k star (bias corrected MLE) Theta star (bias corrected MLE)	N/A N/A N/A N/A 0.39 0.33 0.53 1.39
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  GROS may not be used when data set  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial  For gamma distributed detected data, BTVs and  Minimum  Maximum  SD  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)	Statistics on 0.052	Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects NDs with many tied observations at multiple DLs <1.0, especially when the sample size is small (e.g., <15-20) rield incorrect values of UCLs and BTVs the sample size is small. r be computed using gamma distribution on KM estimates  Mean Median CV k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)	N/A N/A N/A N/A 0.39 0.33 0.53 1.39 0.27
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  Gamma ROS S  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial  For gamma distributed detected data, BTVs and  Minimum  Maximum  SD  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)	Fests on Detail Up Data to 6.052 0.0738 36.31 N/A N/A Statistics using that so the second of the sec	Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects  NDs with many tied observations at multiple DLs <1.0, especially when the sample size is small (e.g., <15-20) rield incorrect values of UCLs and BTVs the sample size is small. r be computed using gamma distribution on KM estimates  Mean Median CV k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)	N/A N/A N/A N/A 0.39 0.53 1.39 0.27 11.19
Gamma GOF T  Not Enough  Gamma S  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MLE Sd (bias corrected)  GROS may not be used when data set  GROS may not be used when data set  GROS may not be used when kstar of detects is sr  For such situations, GROS m  This is especial  For gamma distributed detected data, BTVs and  Minimum  Maximum  SD  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)	Statistics on 0.052	Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  ing Imputed Non-Detects NDs with many tied observations at multiple DLs <1.0, especially when the sample size is small (e.g., <15-20) rield incorrect values of UCLs and BTVs the sample size is small. r be computed using gamma distribution on KM estimates  Mean Median CV k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)	N/A N/A

	using wilson	HILLER (WIT	) and Hawkins Wixley (HW) Methods		
	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	2.552	2.894	95% Approx. Gamma UPL	1.15	1.195
95% Gamma USL	0.727	0.733			
Fa	timeter of O	Dosses	natara walio a I/M Catingston		
	Mean (KM)	0.395	neters using KM Estimates	SD (KM)	0.177
Va	riance (KM)	0.0313	SE of	SD (KM) Mean (KM)	0.177
va	k hat (KM)	4.974		k star (KM)	1.41
	nu hat (KM)	39.79		nu star (KM)	11.28
	eta hat (KM)	0.0794		ta star (KM)	0.28
80% gamma per	` ′	0.615	90% gamma pero	` '	0.835
95% gamma per		1.05	99% gamma perc		1.537
5570 gamma pen	centile (Rivi)	1.00	33 // gamma perc	Seriale (IXIVI)	1.557
The following sta	tistics are co	omputed usin	g gamma distribution and KM estimates		
Upper Limits (			) and Hawkins Wixley (HW) Methods		
	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	2.009	2.205	95% Approx. Gamma UPL	0.989	1.014
95% KM Gamma Percentile	0.709	0.714	95% Gamma USL	0.664	0.667
	anormal GO	E Tost on Do	tected Observations Only		
Shapiro Wilk T	-	0.995	Shapiro Wilk GOF Test		
5% Shapiro Wilk C		0.767	Detected Data appear Lognormal at 5% S	ignificance L	evel
	est Statistic	0.2	Lilliefors GOF Test	igriiilodrioo E	
5% Lilliefors C		0.425	Detected Data appear Lognormal at 5% S	ignificance L	evel
			mal at 5% Significance Level	.9	
		pouogo			
Background Lognormal R0	OS Statistics	Assuming Lo	ognormal Distribution Using Imputed Non-Detec	ts	
Mean in O	riginal Scale	0.393	Mean in		
SD in O	riginal Scale			n Log Scale	-1.031
95% UTL95°		0.206	SD in	n Log Scale n Log Scale	-1.031 0.505
OEO/ Destature (O/) LITLOGO	% Coverage	0.206 4.796	SD ii 95% BCA UTL95%	n Log Scale	
95% Bootstrap (%) UTL959	ŭ		95% BCA UTL95%	n Log Scale	0.505
	ŭ	4.796	95% BCA UTL95%	n Log Scale % Coverage	0.505 N/A
90% P	% Coverage	4.796 N/A	95% BCA UTL95%	n Log Scale % Coverage 95% UPL (t)	0.505 N/A 1.347
90% P 99% P	% Coverage ercentile (z) ercentile (z)	4.796 N/A 0.681 1.155	95% BCA UTL95% 95% Pc	n Log Scale % Coverage 95% UPL (t) ercentile (z)	0.505 N/A 1.347 0.818
90% P 99% P Statistics using KN	% Coverage ercentile (z) ercentile (z)  M estimates	4.796 N/A 0.681 1.155 on Logged Da	95% BCA UTL95% 95% Pc	n Log Scale % Coverage 95% UPL (t) ercentile (z) 95% USL	0.505 N/A 1.347 0.818 0.746
90% P 99% P Statistics using KN KM Mean of L	% Coverage ercentile (z) ercentile (z)  M estimates ogged Data	4.796 N/A 0.681 1.155 on Logged Da -1.025	95% BCA UTL95% 95% Pc 95% Pc ata and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95%	n Log Scale 6 Coverage 95% UPL (t) ercentile (z) 95% USL	0.505 N/A 1.347 0.818 0.746
90% P 99% P  Statistics using KN KM Mean of L KM SD of L	% Coverage ercentile (z) ercentile (z)  # estimates ogged Data ogged Data	4.796 N/A 0.681 1.155 on Logged Da -1.025 0.432	95% BCA UTL95% 95% Po 95% Po  ata and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL (	n Log Scale % Coverage 95% UPL (t) ercentile (z) 95% USL % Coverage Lognormal)	0.505 N/A 1.347 0.818 0.746 3.309 1.118
90% P 99% P Statistics using KN KM Mean of L	% Coverage ercentile (z) ercentile (z)  # estimates ogged Data ogged Data	4.796 N/A 0.681 1.155 on Logged Da -1.025	95% BCA UTL95% 95% Pc 95% Pc ata and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95%	n Log Scale % Coverage 95% UPL (t) ercentile (z) 95% USL % Coverage Lognormal)	0.505 N/A 1.347 0.818 0.746
90% P 99% P Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo	% Coverage ercentile (z) ercentile (z)  # estimates ogged Data ogged Data ognormal (z)	4.796 N/A 0.681 1.155 on Logged Da -1.025 0.432 0.73	95% BCA UTL95% 95% Po 95% Po  ata and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL (	n Log Scale % Coverage 95% UPL (t) ercentile (z) 95% USL % Coverage Lognormal)	0.505 N/A 1.347 0.818 0.746 3.309 1.118
90% P 99% P Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo	% Coverage ercentile (z) ercentile (z)  # estimates ogged Data ogged Data ognormal (z)	4.796 N/A 0.681 1.155 on Logged Da -1.025 0.432 0.73	95% BCA UTL95% 95% Po 95% Po  ata and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL ( 95% KM USL (	n Log Scale % Coverage 95% UPL (t) ercentile (z) 95% USL % Coverage Lognormal)	0.505 N/A 1.347 0.818 0.746 3.309 1.118
90% P 99% P 99% P  Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo  Backg Mean in Or	% Coverage ercentile (z) ercentile (z)  M estimates ogged Data ogged Data ognormal (z)	4.796 N/A 0.681 1.155 on Logged Da -1.025 0.432 0.73 Statistics Ass	95% BCA UTL95% 95% PC 95% PC  ata and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL ( 95% KM USL (  suming Lognormal Distribution  Mean in	n Log Scale 6 Coverage 95% UPL (t) ercentile (z) 95% USL 6 Coverage Lognormal) Lognormal)	0.505 N/A 1.347 0.818 0.746 3.309 1.118 0.675
90% P 99% P 99% P  Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo  Backg Mean in Or	% Coverage ercentile (z) ercentile (z)  # estimates ogged Data ogged Data ognormal (z)  # round DL/2 Stiginal Scale riginal Scale	4.796  N/A  0.681  1.155  on Logged Da  -1.025  0.432  0.73  Statistics Ass  0.385	95% BCA UTL95% 95% Po 95% Po 95% Po 95% KM UTL (Lognormal)95% 95% KM UTL (Lognormal)95% 95% KM USL ( 95% KM USL ( 95% KM USL ( Suming Lognormal Distribution  Mean in	n Log Scale 6 Coverage 95% UPL (t) ercentile (z) 95% USL 6 Coverage Lognormal) Lognormal)	0.505 N/A 1.347 0.818 0.746 3.309 1.118 0.675
90% P 99% P  Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo  Backg Mean in Or SD in Or	% Coverage ercentile (z) ercentile (z)  # estimates ogged Data ogged Data ognormal (z)  # round DL/2 Stiginal Scale riginal Scale	4.796  N/A  0.681  1.155  on Logged Da  -1.025  0.432  0.73  Statistics Ass  0.385  0.215	95% BCA UTL95% 95% Po 95% Po 95% Po  ata and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL ( 95% KM USL (  suming Lognormal Distribution  Mean in SD in	n Log Scale 6 Coverage 95% UPL (t) ercentile (z) 95% USL 6 Coverage Lognormal) Lognormal)	0.505 N/A 1.347 0.818 0.746 3.309 1.118 0.675 -1.071 0.553
90% P 99% P 99% P  Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo  Backg Mean in Or SD in Or 95% UTL956	Coverage ercentile (z) ercentile (z) ercentile (z)  M estimates ogged Data ogged Data ognormal (z)  round DL/2 s riginal Scale riginal Scale % Coverage	4.796 N/A 0.681 1.155  on Logged Da -1.025 0.432 0.73  Statistics Ass 0.385 0.215 5.895	95% BCA UTL95% 95% Po 95% Po 95% Po  ata and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL ( 95% KM USL (  suming Lognormal Distribution  Mean in SD in	n Log Scale 6 Coverage 95% UPL (t) ercentile (z) 95% USL 6 Coverage Lognormal) Lognormal) Lognormal) n Log Scale n Log Scale n Log Scale	0.505 N/A 1.347 0.818 0.746 3.309 1.118 0.675 -1.071 0.553 1.469
90% P 99% P 99% P  Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo  Backg Mean in Or SD in Or 95% UTL95% 90% P	Coverage ercentile (z) ercentile (z) ercentile (z)  M estimates ogged Data ogged Data ogged Data ognormal (z)  round DL/2 striginal Scale riginal Scale of Coverage ercentile (z) ercentile (z)	4.796 N/A 0.681 1.155  on Logged Da -1.025 0.432 0.73  Statistics Ass 0.385 0.215 5.895 0.696 1.241	95% BCA UTL95% 95% Po 95% Po 95% Po  ata and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% 95% KM UPL ( 95% KM USL (  suming Lognormal Distribution  Mean in SD in	n Log Scale 6 Coverage 95% UPL (t) ercentile (z) 95% USL 6 Coverage Lognormal) Lognormal) Lognormal) n Log Scale n Log Scale 25% UPL (t) ercentile (z)	0.505 N/A 1.347 0.818 0.746 3.309 1.118 0.675 -1.071 0.553 1.469 0.851
90% P 99% P 99% P  Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo  Backg Mean in Or SD in Or 95% UTL95% 90% P	Coverage ercentile (z) ercentile (z) ercentile (z)  M estimates ogged Data ogged Data ogged Data ognormal (z)  round DL/2 striginal Scale riginal Scale of Coverage ercentile (z) ercentile (z)	4.796 N/A 0.681 1.155  on Logged Da -1.025 0.432 0.73  Statistics Ass 0.385 0.215 5.895 0.696 1.241	95% BCA UTL95% 95% Po 95% Po 95% Po 95% KM UTL (Lognormal)95% 95% KM UPL ( 95% KM USL (  95% KM USL (  95% KM USL (  95% KM USL (  95% Fo 95% Po	n Log Scale 6 Coverage 95% UPL (t) ercentile (z) 95% USL 6 Coverage Lognormal) Lognormal) Lognormal) n Log Scale n Log Scale 25% UPL (t) ercentile (z)	0.505 N/A 1.347 0.818 0.746 3.309 1.118 0.675 -1.071 0.553 1.469 0.851
90% P 99% P 99% P  Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo  Backg Mean in Or SD in Or 95% UTL956 90% P 99% P DL/2 is not a Recomm	Coverage ercentile (z) ercentile (z) ercentile (z) ercentile (z) ercentile (z)  M estimates ogged Data ogged Data ogged Data ognormal (z)  round DL/2 s riginal Scale riginal Scale ercentile (z) ercentile (z) ercentile (z) ended Meth	4.796 N/A 0.681 1.155  on Logged Da -1.025 0.432 0.73  Statistics Ass 0.385 0.215 5.895 0.696 1.241 od. DL/2 prov	95% BCA UTL95% 95% Po 95% Po 95% Po 95% KM UTL (Lognormal)95% 95% KM UPL ( 95% KM USL (  95% KM USL (  95% KM USL (  95% KM USL (  95% Fo 95% Po	n Log Scale 6 Coverage 95% UPL (t) ercentile (z) 95% USL 6 Coverage Lognormal) Lognormal) Lognormal) n Log Scale n Log Scale 25% UPL (t) ercentile (z)	0.505 N/A 1.347 0.818 0.746 3.309 1.118 0.675 -1.071 0.553 1.469 0.851

		nction made between detects and nondetects)	
Order of Statistic, r	4	95% UTL with95% Coverage	0.671
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
Approximate Sample Size needed to achieve specified CC	59	95% UPL	0.671
95% USL	0.671	95% KM Chebyshev UPL	1.257
Note: The use of USL tends to yield a conservative	/e estimate	of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV of	only when th	ne data set represents a background data set free of outliers	
and consists of observation	tions collect	ted from clean unimpacted locations.	
The use of USL tends to provide a balance	ce between	false positives and false negatives provided the data	
represents a background data set and wh	en many or	nsite observations need to be compared with the BTV.	
rivalent chromium			
General Statistics			
Total Number of Observations	4	Number of Distinct Observations	4
Minimum	22.76	First Quartile	37.57
Second Largest	62.88	Median	52.69
Maximum	64.97	Third Quartile	63.4
Mean	48.28	SD	19.8
Coefficient of Variation	0.41	Skewness	-0.776
Mean of logged Data	3.797	SD of logged Data	0.488
Critical Values fo	or Backgrou	and Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462
	Normal (	GOF Test	
Shapiro Wilk Test Statistic	0.894	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.27	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level	
Data appea	r Normal a	t 5% Significance Level	
Background St	atistics Ass	suming Normal Distribution	
95% UTL with 95% Coverage	150.1	90% Percentile (z)	
			73.66
95% UPL (t)	100.4	95% Percentile (z)	73.66
95% UPL (t) 95% USL	100.4 77.24	95% Percentile (z) 99% Percentile (z)	
	77.24		80.85
	77.24	99% Percentile (z)	80.85
95% USL	77.24  Gamma	99% Percentile (z)  GOF Test	80.85 94.35
95% USL  A-D Test Statistic	77.24 <b>Gamma</b> 0.401	GOF Test  Anderson-Darling Gamma GOF Test	80.85 94.35
95% USL  A-D Test Statistic  5% A-D Critical Value	77.24 <b>Gamma</b> 0.401 0.658	GOF Test  Anderson-Darling Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance	80.85 94.35
A-D Test Statistic  5% A-D Critical Value  K-S Test Statistic  5% K-S Critical Value	77.24  Gamma 0.401 0.658 0.297 0.396	GOF Test  Anderson-Darling Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance  Kolmogorov-Smirnov Gamma GOF Test	80.85 94.35
A-D Test Statistic 5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value	77.24  Gamma 0.401 0.658 0.297 0.396  Gamma Di	GOF Test  Anderson-Darling Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance  Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance	80.85 94.35
A-D Test Statistic 5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear	77.24  Gamma 0.401 0.658 0.297 0.396  Gamma Di	GOF Test  Anderson-Darling Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance  Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level	80.85 94.35 e Level
A-D Test Statistic 5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value	77.24  Gamma 0.401 0.658 0.297 0.396 Gamma Di	GOF Test  Anderson-Darling Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance  Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics	80.85 94.35 e Level

MLE Mean (bias corrected)	48.28	MLE Sd (bias corrected)	36.2
-		suming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	127.5	90% Percentile	96.54
95% Hawkins Wixley (HW) Approx. Gamma UPL	133.7	95% Percentile	118.9
95% WH Approx. Gamma UTL with 95% Coverage	264.9	99% Percentile	168.8
95% HW Approx. Gamma UTL with 95% Coverage	301.4		
95% WH USL	84.49	95% HW USL	85.86
	Lognorma	I GOF Test	
Shapiro Wilk Test Statistic	0.866	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.259	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level	
Data appear	Lognormal	at 5% Significance Level	
Background Str	atistics assu	ming Lognormal Distribution	
95% UTL with 95% Coverage		90% Percentile (z)	83.33
95% UPL (t)		95% Percentile (z)	99.49
95% USL	91.02	99% Percentile (z)	138.7
		(-)	
		Free Background Statistics	
Data appe	ar Normal a	t 5% Significance Level	
Nonparametric Upp	per Limits fo	r Background Threshold Values	
Order of Statistic, r	4	95% UTL with 95% Coverage	64.97
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	N/A	95% BCA Bootstrap UTL with 95% Coverage	N/A
95% UPL	64.97	90% Percentile	64.34
90% Chebyshev UPL	114.7	95% Percentile	64.66
95% Chebyshev UPL	144.8	99% Percentile	64.91
95% USL	64.97		
Note: The use of USL tends to yield a conservati	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
•		of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers	
Therefore, one may use USL to estimate a BTV	only when th	, , ,	
Therefore, one may use USL to estimate a BTV and consists of observa	only when thations collect	ne data set represents a background data set free of outliers are from clean unimpacted locations.	
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar	only when thations collect	ne data set represents a background data set free of outliers led from clean unimpacted locations.  false positives and false negatives provided the data	
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar	only when thations collect	ne data set represents a background data set free of outliers are from clean unimpacted locations.	
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar	only when thations collect	ne data set represents a background data set free of outliers led from clean unimpacted locations.  false positives and false negatives provided the data	
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar represents a background data set and w	only when thations collect	ne data set represents a background data set free of outliers led from clean unimpacted locations.  false positives and false negatives provided the data	
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar represents a background data set and w	only when the ations collected acceptations collected acceptations.	ne data set represents a background data set free of outliers sed from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.	4
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar represents a background data set and w  otal chromium  General Statistics  Total Number of Observations	only when the ations collected acceptations collected acceptations are many or the many or	ne data set represents a background data set free of outliers sed from clean unimpacted locations.  If alse positives and false negatives provided the data ansite observations need to be compared with the BTV.  Number of Distinct Observations	4 37 63
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar represents a background data set and w  otal chromium  General Statistics  Total Number of Observations Minimum	only when the ations collected acceptates between their many or the many or their many or their many or their many or their many	ne data set represents a background data set free of outliers and from clean unimpacted locations.  false positives and false negatives provided the data ansite observations need to be compared with the BTV.  Number of Distinct Observations  First Quartile	37.63
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar represents a background data set and w  otal chromium  General Statistics  Total Number of Observations Minimum Second Largest	only when the ations collected between then many or the second of the se	ne data set represents a background data set free of outliers led from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Number of Distinct Observations  First Quartile  Median	37.63 53.03
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar represents a background data set and w  otal chromium  General Statistics  Total Number of Observations Minimum Second Largest Maximum	only when the stions collected between the many or the stimulation of	ne data set represents a background data set free of outliers red from clean unimpacted locations.  false positives and false negatives provided the data risite observations need to be compared with the BTV.  Number of Distinct Observations First Quartile Median Third Quartile	37.63 53.03 64.01
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar represents a background data set and w  otal chromium  General Statistics  Total Number of Observations Minimum Second Largest Maximum Mean	only when the ations collected acceptations collected acceptations are set of the ations collected acceptations are set of the ations and acceptations are set of the ations are	ne data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data nsite observations need to be compared with the BTV.  Number of Distinct Observations  First Quartile  Median  Third Quartile  SD	37.63 53.03 64.01 19.99
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balar represents a background data set and w  total chromium  General Statistics  Total Number of Observations Minimum Second Largest Maximum	only when the stions collected between the many or the stimulation of	ne data set represents a background data set free of outliers red from clean unimpacted locations.  false positives and false negatives provided the data risite observations need to be compared with the BTV.  Number of Distinct Observations First Quartile Median Third Quartile	37.63 53.03 64.01

Critical Values for	or Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.46
,	I.		
	Normal G	GOF Test	
Shapiro Wilk Test Statistic	0.891	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.273	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level	
Data appea	r Normal at	5% Significance Level	
Background St	tatistics Ass	uming Normal Distribution	
95% UTL with 95% Coverage	151.4	90% Percentile (z)	74.2
95% UPL (t)	101.2	95% Percentile (z)	81.4
95% USL	77.84	99% Percentile (z)	95.1
1			
A-D Test Statistic	<b>Gamma G</b> 0.403	GOF Test  Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.403	Detected data appear Gamma Distributed at 5% Significance	o L ove
K-S Test Statistic			e Leve
5% K-S Critical Value	0.3	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance	no I ove
		stributed at 5% Significance Level	e Leve
Detected data appear	Gaillilla Dis	tributed at 5% diginicance Level	
	Gamma S	Statistics	
k hat (MLE)	6.448	k star (bias corrected MLE)	1.7
Theta hat (MLE)	7.539	Theta star (bias corrected MLE)	27.3
nu hat (MLE)	51.58	nu star (bias corrected)	14.2
MLE Mean (bias corrected)	48.61	MLE Sd (bias corrected)	36.4
Rackground St	atietice Aeeı	uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	128.4	90% Percentile	97.2
95% Hawkins Wixley (HW) Approx. Gamma UPL	134.6	95% Percentile	119.7
95% WH Approx. Gamma UTL with 95% Coverage	266.7	99% Percentile	170
95% HW Approx. Gamma UTL with 95% Coverage	303.3	3370 Tercentile	170
95% WH USL	85.08	95% HW USL	86.4
	Lognormal		
Shapiro Wilk Test Statistic	0.866	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.262	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level	
Data appear	Lognormal a	at 5% Significance Level	
Background Stat	tistics assur	ning Lognormal Distribution	
95% UTL with 95% Coverage	550.8	90% Percentile (z)	83.8
95% UPL (t)	161.9	95% Percentile (z)	100.1
95% USL	91.57	99% Percentile (z)	139.5
,			
		Free Background Statistics	

Approx, fused to compute achieved CC   0.211   Approximate Actual Confidence Coefficient achieved by UTL   0.185	Nonparametric Upp	er Limits fo	or Background Threshold Values	
Approximate Sample Size needed to achieve specified CC   S9	Order of Statistic, r	4	95% UTL with 95% Coverage	65.4
95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 65.4 95% BCA Bootstrap UTL with 95% Coverage 95% UPL 65.4 95% BCA Bootstrap UTL with 95% Coverage 95% UPL 15.6 95% Percentile 65.12 95% Chebyshev UPL 15.6 95% Percentile 65.12 95% USL 95% USL 65.4 95% USL 95% USL 65.4 95% USL 95% USL 95% USL 05.4 95	Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
95% UPL   15.6   95% Percentile   64.85   95% Percentile   95% Chebbyshev UPL   115.6   95% Percentile   95% Chebbyshev UPL   146   95% USL   95			Approximate Sample Size needed to achieve specified CC	59
90% Chebyshev UPL 95% Chebyshev UPL 115.6 95% Percentile 95.12 95% Chebyshev UPL 146 95% Percentile 65.34 95% Chebyshev UPL 146 95% Percentile 65.34 95% Chebyshev UPL 146 95% Percentile 65.34 95% USL 95% USL 165.4 95% USL 165.	95% Percentile Bootstrap UTL with 95% Coverage	N/A	95% BCA Bootstrap UTL with 95% Coverage	N/A
S5% Chebyshev UPL   S5% USL   S6.4	95% UPL	65.4	90% Percentile	64.85
Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.  Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.  The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.    Control   Price   Pri	90% Chebyshev UPL	115.6	95% Percentile	65.12
Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.  Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.  The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.  Sobalt  General Statistics  Total Number of Observations  A Number of Distinct Observations of Minimum and a Number of Distinct Observations of Sample of Sam	95% Chebyshev UPL	146	99% Percentile	65.34
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.  The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.  **Cobalt**  **General Statistics**  Total Number of Observations	95% USL	65.4		
and consists of observations collected from clean unimpacted locations.  The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.    Comparison   Provide   Provided   Pro	Note: The use of USL tends to yield a conservative	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.    Compared Statistics	Therefore, one may use USL to estimate a BTV	only when t	he data set represents a background data set free of outliers	
represents a background data set and when many onsite observations need to be compared with the BTV.    Compared Statistics	and consists of observa	tions collec	ted from clean unimpacted locations.	
Total Number of Observations   4	The use of USL tends to provide a balan	ce betweer	n false positives and false negatives provided the data	
Total Number of Observations   4	represents a background data set and wh	nen many o	nsite observations need to be compared with the BTV.	
Total Number of Observations   4			<u> </u>	
Total Number of Observations   4	cobalt			
Total Number of Observations   4				
Minimum   3.9   First Quartile   6.338	General Statistics			
Second Largest	Total Number of Observations	4	Number of Distinct Observations	4
Maximum	Minimum	3.9	First Quartile	6.338
Maximum	Second Largest	7.63	Median	7.39
Mean   8.194   SD   4.269		14.1	Third Quartile	9.246
Coefficient of Variation   0.521	Mean			4.269
Critical Values for Background Threshold Values (BTVs)   Tolerance Factor K (For UTL)   5.144   d2max (for USL)   1.462	Coefficient of Variation			
Critical Values for Background Threshold Values (BTVs)  Tolerance Factor K (For UTL) 5.144 d2max (for USL) 1.462  Normal GOF Test  Shapiro Wilk Test Statistic 0.919 Shapiro Wilk GOF Test  5% Shapiro Wilk Critical Value 0.748 Data appear Normal at 5% Significance Level Lilliefors Test Statistic 0.303 Lilliefors GOF Test  5% Lilliefors Critical Value 0.375 Data appear Normal at 5% Significance Level  Data appear Normal at 5% Significance Level  Background Statistics Assuming Normal Distribution  95% UTL with 95% Coverage 30.15 90% Percentile (z) 13.66 95% UFL (t) 19.43 95% Percentile (z) 15.22 95% USL 14.44 99% Percentile (z) 15.22 95% USL 14.44 99% Percentile (z) 18.12  Gamma GOF Test  A-D Test Statistic 0.29 Anderson-Darling Gamma GOF Test 5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test 5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level				
Normal GOF Test			0.000	
Normal GOF Test  Shapiro Wilk Test Statistic 0.919 Shapiro Wilk GOF Test  5% Shapiro Wilk Critical Value 0.748 Data appear Normal at 5% Significance Level  Lilliefors Test Statistic 0.303 Lilliefors GOF Test  5% Lilliefors Critical Value 0.375 Data appear Normal at 5% Significance Level  Data appear Normal at 5% Significance Level  Background Statistics Assuming Normal Distribution  95% UTL with 95% Coverage 30.15 90% Percentile (2) 13.66  95% UPL (t) 19.43 95% Percentile (2) 15.22  95% USL 14.44 99% Percentile (2) 18.12  Gamma GOF Test  A-D Test Statistic 0.29 Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level	Critical Values fo	or Backgro	und Threshold Values (BTVs)	
Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  0.748  Data appear Normal at 5% Significance Level  Lilliefors Test Statistic  0.303  Lilliefors GOF Test  5% Lilliefors Critical Value  0.375  Data appear Normal at 5% Significance Level  Data appear Normal at 5% Significance Level  Background Statistics Assuming Normal Distribution  Background Statistics Assuming Normal Distribution  95% UTL with 95% Coverage 30.15  95% UPL (t) 19.43  95% Percentile (z) 15.22  95% USL 14.44  99% Percentile (z) 18.12  Gamma GOF Test  A-D Test Statistic 0.29  Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659  Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254  Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396  Detected data appear Gamma Distributed at 5% Significance Level	Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462
Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  0.748  Data appear Normal at 5% Significance Level  Lilliefors Test Statistic  0.303  Lilliefors GOF Test  5% Lilliefors Critical Value  0.375  Data appear Normal at 5% Significance Level  Data appear Normal at 5% Significance Level  Background Statistics Assuming Normal Distribution  Background Statistics Assuming Normal Distribution  95% UTL with 95% Coverage 30.15  95% UPL (t) 19.43  95% Percentile (z) 15.22  95% USL 14.44  99% Percentile (z) 18.12  Gamma GOF Test  A-D Test Statistic 0.29  Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659  Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254  Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396  Detected data appear Gamma Distributed at 5% Significance Level				
5% Shapiro Wilk Critical Value Lilliefors Test Statistic 0.303 Lilliefors GOF Test  5% Lilliefors Critical Value 0.375 Data appear Normal at 5% Significance Level  Data appear Normal at 5% Significance Level  Background Statistics Assuming Normal Distribution  95% UTL with 95% Coverage 30.15 95% UPL (t) 19.43 95% Percentile (z) 15.22 95% USL 14.44 99% Percentile (z) 18.12  Gamma GOF Test  A-D Test Statistic 0.29 Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level		Normal	GOF Test	
Lilliefors Test Statistic  5% Lilliefors Critical Value  0.375  Data appear Normal at 5% Significance Level   Background Statistics Assuming Normal Distribution  95% UTL with 95% Coverage 30.15  95% UPL (t) 19.43  95% UPL (t) 19.43  95% USL 14.44  99% Percentile (z) 15.22  95% USL 14.44  A-D Test Statistic 0.29  Anderson-Darling Gamma GOF Test  S% A-D Critical Value 0.659  Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254  Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396  Detected data appear Gamma Distributed at 5% Significance Level	Shapiro Wilk Test Statistic	0.919	Shapiro Wilk GOF Test	
Data appear Normal at 5% Significance Level	5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level	
Background Statistics Assuming Normal Distribution  95% UTL with 95% Coverage 30.15 90% Percentile (z) 13.66 95% UPL (t) 19.43 95% Percentile (z) 15.22 95% USL 14.44 99% Percentile (z) 18.12  Gamma GOF Test  A-D Test Statistic 0.29 Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level	Lilliefors Test Statistic	0.303	Lilliefors GOF Test	
Background Statistics Assuming Normal Distribution  95% UTL with 95% Coverage 30.15 90% Percentile (z) 13.66 95% UPL (t) 19.43 95% Percentile (z) 15.22 95% USL 14.44 99% Percentile (z) 18.12  Gamma GOF Test  A-D Test Statistic 0.29 Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level	5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level	
95% UTL with         95% Coverage         30.15         90% Percentile (z)         13.66           95% UPL (t)         19.43         95% Percentile (z)         15.22           95% USL         14.44         99% Percentile (z)         18.12           Gamma GOF Test           A-D Test Statistic         0.29         Anderson-Darling Gamma GOF Test           5% A-D Critical Value         0.659         Detected data appear Gamma Distributed at 5% Significance Level           K-S Test Statistic         0.254         Kolmogorov-Smirnov Gamma GOF Test           5% K-S Critical Value         0.396         Detected data appear Gamma Distributed at 5% Significance Level	Data appea	ar Normal a	t 5% Significance Level	
95% UTL with         95% Coverage         30.15         90% Percentile (z)         13.66           95% UPL (t)         19.43         95% Percentile (z)         15.22           95% USL         14.44         99% Percentile (z)         18.12           Gamma GOF Test           A-D Test Statistic         0.29         Anderson-Darling Gamma GOF Test           5% A-D Critical Value         0.659         Detected data appear Gamma Distributed at 5% Significance Level           K-S Test Statistic         0.254         Kolmogorov-Smirnov Gamma GOF Test           5% K-S Critical Value         0.396         Detected data appear Gamma Distributed at 5% Significance Level				
95% UPL (t) 19.43 95% Percentile (z) 15.22 95% USL 14.44 99% Percentile (z) 18.12  Gamma GOF Test  A-D Test Statistic 0.29 Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level	Background S	tatistics As	suming Normal Distribution	
Gamma GOF Test  A-D Test Statistic 0.29 Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level	95% UTL with 95% Coverage	30.15	90% Percentile (z)	13.66
Gamma GOF Test  A-D Test Statistic 0.29 Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level	95% UPL (t)	19.43	95% Percentile (z)	15.22
A-D Test Statistic 0.29 Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level	95% USL	14.44	99% Percentile (z)	18.12
A-D Test Statistic 0.29 Anderson-Darling Gamma GOF Test  5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level				
5% A-D Critical Value 0.659 Detected data appear Gamma Distributed at 5% Significance Level  K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level		Gamma	GOF Test	
K-S Test Statistic 0.254 Kolmogorov-Smirnov Gamma GOF Test  5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level	A-D Test Statistic	0.29	Anderson-Darling Gamma GOF Test	
5% K-S Critical Value 0.396 Detected data appear Gamma Distributed at 5% Significance Level	5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance	ce Level
	K-S Test Statistic	0.254	Kolmogorov-Smirnov Gamma GOF Test	
Detected data appear Gamma Distributed at 5% Significance Level	5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance	ce Level
	Detected data appear	Gamma D	istributed at 5% Significance Level	

	Gamma	Statistics	
k hat (MLE)	5.069	k star (bias corrected MLE)	1.434
Theta hat (MLE)	1.616	Theta star (bias corrected MLE)	5.714
nu hat (MLE)	40.55	nu star (bias corrected)	11.47
MLE Mean (bias corrected)	8.194	MLE Sd (bias corrected)	6.843
Rackground S	tatietice Aec	uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	23.87	90% Percentile	17.26
95% Hawkins Wixley (HW) Approx. Gamma UPL	24.89	95% Percentile	21.67
95% WH Approx. Gamma UTL with 95% Coverage	52.57	99% Percentile	31.65
95% HW Approx. Gamma UTL with 95% Coverage	59.85	33701 elcentue	31.03
95% WH USL	15.18	95% HW USL	15.33
		I GOF Test	
Shapiro Wilk Test Statistic	0.965	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.227	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level	
Data appear	Lognormal	at 5% Significance Level	
		ming Lognormal Distribution	
95% UTL with 95% Coverage		90% Percentile (z)	14.51
95% UPL (t)	29.47	95% Percentile (z)	17.56
95% USL	15.95	99% Percentile (z)	25.11
		Free Background Statistics	
Data appe	ar Normal at	t 5% Significance Level	
		r Background Threshold Values	
Order of Statistic, r	4	95% UTL with 95% Coverage	14.1
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
050/ B	N//A	Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	N/A	95% BCA Bootstrap UTL with 95% Coverage	N/A
95% UPL	14.1	90% Percentile	12.16
90% Chebyshev UPL	22.51	95% Percentile	13.13
95% Chebyshev UPL	29	99% Percentile	13.9
95% USL	14.1		
		of BTV, especially when the sample size starts exceeding 20.	
-		ne data set represents a background data set free of outliers	
		red from clean unimpacted locations.	
<u>'</u>		false positives and false negatives provided the data	
represents a background data set and w	nen many or	nsite observations need to be compared with the BTV.	
20000			
copper			
Conount Statistics			
General Statistics	1	Missebau of Distinct Observed	4
Total Number of Observations	4	Number of Distinct Observations	4 7 265
Minimum	4.2 8.55	First Quartile  Median	7.365 8.485
Second Largest			

Maximum	10.3	Third Quartile	8.986
Mean	7.866	SD	2.589
Coefficient of Variation	0.329	Skewness	-1.323
Mean of logged Data	2.011	SD of logged Data	0.395
Critical Values for	or Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462
	Normal C	GOF Test	
Shapiro Wilk Test Statistic	0.881	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.335	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level	
Data appea	ar Normal at	5% Significance Level	
<u> </u>			
Background St	tatistics Ass	uming Normal Distribution	
95% UTL with 95% Coverage	21.19	90% Percentile (z)	11.18
95% UPL (t)	14.68	95% Percentile (z)	12.13
95% USL	11.65	99% Percentile (z)	13.89
		( )	
	Gamma (	GOF Test	
	0.517	Anderson-Darling Gamma GOF Test	
A-D Test Statistic		, made on Paining damina do. 1000	
A-D Test Statistic 5% A-D Critical Value		Detected data appear Gamma Distributed at 5% Significance	e Level
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significanc	e Level
5% A-D Critical Value K-S Test Statistic	0.657 0.376	Kolmogorov-Smirnov Gamma GOF Test	
5% A-D Critical Value  K-S Test Statistic  5% K-S Critical Value	0.657 0.376 0.395	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance	
5% A-D Critical Value  K-S Test Statistic  5% K-S Critical Value	0.657 0.376 0.395	Kolmogorov-Smirnov Gamma GOF Test	
5% A-D Critical Value  K-S Test Statistic  5% K-S Critical Value	0.657 0.376 0.395 <b>Gamma Dis</b>	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level	
5% A-D Critical Value  K-S Test Statistic  5% K-S Critical Value  Detected data appear	0.657 0.376 0.395 <b>Gamma Dis</b>	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics	e Level
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value  Detected data appear  k hat (MLE)	0.657 0.376 0.395 <b>Gamma Dis</b>	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)	e Level
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear  k hat (MLE) Theta hat (MLE)	0.657 0.376 0.395 <b>Gamma Dis</b> <b>Gamma</b> 3 9.824 0.801	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)  Theta star (bias corrected MLE)	2.623 2.999
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value  Detected data appear  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)	0.657 0.376 0.395 <b>Gamma Dis</b> 9.824 0.801 78.59	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)	2.623 2.999 20.98
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear  k hat (MLE) Theta hat (MLE)	0.657 0.376 0.395 <b>Gamma Dis</b> <b>Gamma</b> 3 9.824 0.801	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)  Theta star (bias corrected MLE)	2.623 2.999
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)	0.657 0.376 0.395 <b>Gamma Dis</b> 9.824 0.801 78.59 7.866	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)	2.623 2.999 20.98
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value  Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St	0.657 0.376 0.395 <b>Gamma Dis</b> 9.824 0.801 78.59 7.866	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)	2.623 2.999 20.98 4.857
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value  Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St 95% Wilson Hilferty (WH) Approx. Gamma UPL	0.657 0.376 0.395 Gamma Dis  9.824 0.801 78.59 7.866  atistics Ass	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)  uming Gamma Distribution	2.623 2.999 20.98 4.857
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St 95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL	0.657 0.376 0.395 Gamma Dis  Gamma 3 9.824 0.801 78.59 7.866 atistics Ass 17.78 18.42	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile  95% Percentile	2.623 2.999 20.98 4.857 14.38 17.17
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value  Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St 95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UPL	0.657 0.376 0.395 Gamma Dis  Gamma Dis  9.824 0.801 78.59 7.866 atistics Ass 17.78 18.42 33.5	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)  uming Gamma Distribution	2.623 2.999 20.98 4.857
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value  Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage	0.657 0.376 0.395  Gamma Dis  9.824 0.801 78.59 7.866  atistics Ass 17.78 18.42 33.5 36.97	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile  95% Percentile  99% Percentile	2.623 2.999 20.98 4.857 14.38 17.17 23.27
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value  Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St 95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UPL	0.657 0.376 0.395 Gamma Dis  Gamma Dis  9.824 0.801 78.59 7.866 atistics Ass 17.78 18.42 33.5	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE)  Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile  95% Percentile	2.623 2.999 20.98 4.857 14.38 17.17
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value  Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage	0.657 0.376 0.395 Gamma Dis  Gamma 3 9.824 0.801 78.59 7.866  atistics Ass 17.78 18.42 33.5 36.97 12.56	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile	2.623 2.999 20.98 4.857 14.38 17.17 23.27
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value  Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage	0.657 0.376 0.395  Gamma Dis  9.824 0.801 78.59 7.866  atistics Ass 17.78 18.42 33.5 36.97 12.56  Lognormal	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile	2.623 2.999 20.98 4.857 14.38 17.17 23.27
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value  Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage	0.657 0.376 0.395 Gamma Dis Gamma S 9.824 0.801 78.59 7.866  atistics Ass 17.78 18.42 33.5 36.97 12.56  Lognormal 0.82	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile	2.623 2.999 20.98 4.857 14.38 17.17 23.27
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value	0.657 0.376 0.395 Gamma Dis Gamma Dis 9.824 0.801 78.59 7.866  atistics Ass 17.78 18.42 33.5 36.97 12.56  Lognormal 0.82 0.748	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  wming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile	2.623 2.999 20.98 4.857 14.38 17.17 23.27
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St 95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% WH Approx. Gamma UTL with 95% Coverage 95% WH USL  Shapiro Wilk Test Statistic	0.657 0.376 0.395 Gamma Dis Gamma S 9.824 0.801 78.59 7.866  atistics Ass 17.78 18.42 33.5 36.97 12.56  Lognormal 0.82	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile 95% HW USL  GOF Test  Shapiro Wilk Lognormal GOF Test  Data appear Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test	2.623 2.999 20.98 4.857 14.38 17.17 23.27
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value	0.657 0.376 0.395 Gamma Dis Gamma Dis 9.824 0.801 78.59 7.866  atistics Ass 17.78 18.42 33.5 36.97 12.56  Lognormal 0.82 0.748	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  wming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile	2.623 2.999 20.98 4.857 14.38 17.17 23.27
5% A-D Critical Value  K-S Test Statistic  5% K-S Critical Value  Detected data appear  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  Background St  95% Wilson Hilferty (WH) Approx. Gamma UPL  95% Hawkins Wixley (HW) Approx. Gamma UPL  95% WH Approx. Gamma UTL with 95% Coverage  95% WH Approx. Gamma UTL with 95% Coverage  95% WH USL  Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  Lilliefors Test Statistic  5% Lilliefors Critical Value	0.657 0.376 0.395  Gamma Dis  9.824 0.801 78.59 7.866  atistics Ass 17.78 18.42 33.5 36.97 12.56  Lognormal 0.82 0.748 0.369 0.375	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile 95% HW USL  GOF Test  Shapiro Wilk Lognormal GOF Test  Data appear Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test	2.623 2.999 20.98 4.857 14.38 17.17 23.27
5% A-D Critical Value  K-S Test Statistic  5% K-S Critical Value  Detected data appear  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  Background St  95% Wilson Hilferty (WH) Approx. Gamma UPL  95% Hawkins Wixley (HW) Approx. Gamma UPL  95% WH Approx. Gamma UTL with 95% Coverage  95% WH Approx. Gamma UTL with 95% Coverage  95% WH USL  Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  Lilliefors Test Statistic  5% Lilliefors Critical Value	0.657 0.376 0.395  Gamma Dis  9.824 0.801 78.59 7.866  atistics Ass 17.78 18.42 33.5 36.97 12.56  Lognormal 0.82 0.748 0.369 0.375	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 95% HW USL  GOF Test  Shapiro Wilk Lognormal GOF Test Data appear Lognormal at 5% Significance Level Lilliefors Lognormal at 5% Significance Level	2.623 2.999 20.98 4.857 14.38 17.17 23.27
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear	0.657 0.376 0.395 Gamma Dis Gamma Dis 9.824 0.801 78.59 7.866 atistics Ass 17.78 18.42 33.5 36.97 12.56  Lognormal 0.82 0.748 0.369 0.375 Lognormal	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 95% HW USL  GOF Test  Shapiro Wilk Lognormal GOF Test Data appear Lognormal at 5% Significance Level Lilliefors Lognormal at 5% Significance Level	2.623 2.999 20.98 4.857 14.38 17.17 23.27
5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear  k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background St  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear	0.657 0.376 0.395 Gamma Dis Gamma Dis 9.824 0.801 78.59 7.866 atistics Ass 17.78 18.42 33.5 36.97 12.56  Lognormal 0.82 0.748 0.369 0.375 Lognormal	Kolmogorov-Smirnov Gamma GOF Test  Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level  Statistics  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile 95% HW USL  GOF Test  Shapiro Wilk Lognormal GOF Test Data appear Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level at 5% Significance Level	2.623 2.999 20.98 4.857 14.38 17.17 23.27

95% USL	13.3	99% Percentile (z)	18.7
Nonparametric	Distribution	Free Background Statistics	
·		t 5% Significance Level	
Nonparametric Upp	er Limits fo	r Background Threshold Values	
Order of Statistic, r	4	95% UTL with 95% Coverage	10.3
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	N/A	95% BCA Bootstrap UTL with 95% Coverage	N/A
95% UPL	10.3	90% Percentile	9.772
90% Chebyshev UPL	16.55	95% Percentile	10.03
95% Chebyshev UPL	20.49	99% Percentile	10.24
95% USL	10.3		
Note: The use of USL tends to yield a conservati	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
·		ne data set represents a background data set free of outliers	
		ted from clean unimpacted locations.	
		false positives and false negatives provided the data	
		nsite observations need to be compared with the BTV.	
ead			
General Statistics			
Total Number of Observations	2	Number of Distinct Observations	2
10141.1141.11251.01.02501.14110.10		Number of Missing Observations	2
Minimum	4	First Quartile	4.725
Second Largest	4	Median	5.45
Maximum	6.9	Third Quartile	6.175
Mean	5.45	SD	2.051
Coefficient of Variation	0.376	Skewness	N/A
-		only has 2 observations!  and meaningful statistics and estimates!	
-		lead was not processed!	
		·	
It is suggested to collect at least 8	to 10 obser	vations before using these statistical methods!	
If possible, compute and collect Data Qu	ality Object	ives (DQO) based sample size and analytical results.	
If possible, compute and collect Data Qu	ality Object	ives (DQO) based sample size and analytical results.	
If possible, compute and collect Data Qu	ality Object	ives (DQO) based sample size and analytical results.	
	ality Object	ives (DQO) based sample size and analytical results.	
	ality Object	ives (DQO) based sample size and analytical results.	
nanganese	ality Object	ives (DQO) based sample size and analytical results.	
nanganese	ality Object	ives (DQO) based sample size and analytical results.  Number of Distinct Observations	4
nanganese General Statistics			4 277.5
nanganese  General Statistics  Total Number of Observations	4	Number of Distinct Observations	
nanganese  General Statistics  Total Number of Observations  Minimum	4 180	Number of Distinct Observations First Quartile	277.5
Total Number of Observations  Minimum Second Largest	4 180 449	Number of Distinct Observations First Quartile Median	277.5 379.5
Total Number of Observations  Minimum Second Largest Maximum	4 180 449 579	Number of Distinct Observations First Quartile Median Third Quartile	277.5 379.5 481.5

Critical Values for	or Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.46
		1	
	Normal G	GOF Test	
Shapiro Wilk Test Statistic	0.992	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.156	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level	
Data appea	ar Normal at	5% Significance Level	
Background S	tatistics Ass	uming Normal Distribution	
95% UTL with 95% Coverage	1267	90% Percentile (z)	600.6
95% UPL (t)	833.4	95% Percentile (z)	663.2
95% USL	631.8	99% Percentile (z)	780.
		1	
A-D Test Statistic	<b>Gamma (</b> 0.22	GOF Test  Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance	20 1 01
K-S Test Statistic	0.039	Kolmogorov-Smirnov Gamma GOF Test	Je Lev
5% K-S Critical Value	0.21	Detected data appear Gamma Distributed at 5% Significance	so Lov
		stributed at 5% Significance Level	e Lev
Dottotta data appoar	Gailling Die	an o'a o'gumoanoo zovo	
	Gamma	Statistics	
k hat (MLE)	5.755	k star (bias corrected MLE)	1.6
Theta hat (MLE)	65.94	Theta star (bias corrected MLE)	236.4
nu hat (MLE)	46.04	nu star (bias corrected)	12.
MLE Mean (bias corrected)	379.5	MLE Sd (bias corrected)	299.
Background St	atistics Ass	uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	1049	90% Percentile	777.9
95% Hawkins Wixley (HW) Approx. Gamma UPL	1099	95% Percentile	966.
95% WH Approx. Gamma UTL with 95% Coverage	2240	99% Percentile	
95% HW Approx. Gamma UTL with 95% Coverage	2554		
95% WH USL	682.1	95% HW USL	691.
,			
Shapiro Wilk Test Statistic	Lognormal 0.969	GOF Test  Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.969	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.748	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.194	Data appear Lognormal at 5% Significance Level	
		at 5% Significance Level	
<u> </u>		ming Lognormal Distribution	604
95% UTL with 95% Coverage	4717	90% Percentile (z)	664.9
95% UPL (t)	1318	95% Percentile (z)	799.4
95% USL	728.8	99% Percentile (z)	1130
Nonparametric	Distribution	Free Background Statistics	
		5% Significance Level	

Nonparametric Upp	er Limits fo	or Background Threshold Values	
Order of Statistic, r	4	95% UTL with 95% Coverage	579
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	N/A	95% BCA Bootstrap UTL with 95% Coverage	N/A
95% UPL	579	90% Percentile	540
90% Chebyshev UPL	958.1	95% Percentile	559.5
95% Chebyshev UPL	1220	99% Percentile	575.1
95% USL	579		
· · · · · · · · · · · · · · · · · · ·		of BTV, especially when the sample size starts exceeding 20.	
		he data set represents a background data set free of outliers	
		ted from clean unimpacted locations.	
		false positives and false negatives provided the data	
represents a background data set and wl	nen many o	nsite observations need to be compared with the BTV.	
mercury			
		Statistics	
Total Number of Observations	4	Number of Missing Observations	0
Number of Distinct Observations	4		
Number of Detects	2	Number of Non-Detects	2
Number of Distinct Detects	2	Number of Distinct Non-Detects	2
Minimum Detect	0.0052	Minimum Non-Detect	0.0255
Maximum Detect	0.0078	Maximum Non-Detect	0.026
Variance Detected		Percent Non-Detects	50%
Mean Detected	0.0065	SD Detected	0.00184
Mean of Detected Logged Data	-5.056	SD of Detected Logged Data	0.287
Warning: D	ata eat has	only 2 Detected Values.	
		only 2 Detected values.  Ingful or reliable statistics and estimates.	
This is not enough to comp	die meanii	igiti of reliable statistics and estimates.	
Critical Values fo	or Backgrou	und Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462
residing radio ( ( or e r z)	0.111	delinax (idi doe)	1.102
Norm	al GOF Te	st on Detects Only	
		o Perform GOF Test	
	g		
Kaplan Meier (KM) Back	caround Sta	atistics Assuming Normal Distribution	
KM Mean		KM SD	0.0013
95% UTL95% Coverage	0.0132	95% KM UPL (t)	0.00992
90% KM Percentile (z)	0.00817	95% KM Percentile (z)	0.00864
99% KM Percentile (z)	0.00952	95% KM USL	0.0084
55.5 5.55.mio (2)		333.44. 302	
DL/2 Substitution Back	ground Sta	tistics Assuming Normal Distribution	
Mean	0.00969	SD	0.00383
95% UTL95% Coverage	0.0294	95% UPL (t)	0.0198
90% Percentile (z)	0.0146	95% Percentile (z)	0.016
5575 : 5.00Hallo (2)		(Z)	

	ercentile (z)	0.0186	95% USL	0.0153
DL/2 is not a recomm	` '		ovided for comparisons and historical reasons	
Gi	amma GOF	Tests on De	etected Observations Only	
	Not End	ough Data to	Perform GOF Test	
			Detected Data Only	
	k hat (MLE)		k star (bias corrected MLE)	N/A
	a hat (MLE)		Theta star (bias corrected MLE)	N/A
	u hat (MLE)	98.65	nu star (bias corrected)	N/A
MLE Mean (bias		N/A	OFO/ Payantile of Chicagogy (Olyston)	NI/A
MLE Sd (bias	s corrected)	N/A	95% Percentile of Chisquare (2kstar)	N/A
Eet	imates of G	amma Dara	meters using KM Estimates	
	Mean (KM)		SD (KM)	0.0013
	riance (KM)		SE of Mean (KM)	0.0013
va	k hat (KM)	25	k star (KM)	6.417
	nu hat (KM)		nu star (KM)	51.33
	eta hat (KM)		theta star (KM)	0.00101
80% gamma pero		0.0085	90% gamma percentile (KM)	0.00993
95% gamma pero	' '	0.0112	99% gamma percentile (KM)	0.0139
			<u> </u>	
The following sta	tistics are c	omputed usi	ing gamma distribution and KM estimates	
Upper Limits ι	ısing Wilsor	Hilferty (W	H) and Hawkins Wixley (HW) Methods	
	WH	HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.0157	0.0162	95% Approx. Gamma UPL 0.0105	0.0106
95% KM Gamma Percentile	0.00879	0.00882	95% Gamma USL 0.0085	0.00852
Lo <sub>i</sub>	100			
	gnormai GO	F Test on D	etected Observations Only	
			etected Observations Only Deform GOF Test	
	Not End	ough Data to	Perform GOF Test	
	Not End	ough Data to Assuming I	D Perform GOF Test  Lognormal Distribution Using Imputed Non-Detects	
Mean in Or	Not End  OS Statistics  iginal Scale	Assuming 0.00643	Derform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale	
Mean in Or SD in Or	Not End  OS Statistics  iginal Scale  iginal Scale	Assuming 0.00643	Derform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale  SD in Log Scale	0.166
Mean in Or SD in Or 95% UTL95%	Not End  OS Statistics  iginal Scale  iginal Scale  6 Coverage	6 Assuming I 0.00643 0.00106 0.0149	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale  SD in Log Scale  95% BCA UTL95% Coverage	0.166 N/A
Mean in Or SD in Or 95% UTL959 95% Bootstrap (%) UTL959	Not End  OS Statistics  iginal Scale  iginal Scale  6 Coverage  6 Coverage	6 Assuming III 0.00643 0.00106 0.0149 N/A	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t)	0.166 N/A 0.00984
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po	Not End  OS Statistics  iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z)	0.00643 0.00106 0.0149 N/A 0.00787	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z)	0.166 N/A 0.00984 0.00836
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po	Not End  OS Statistics  iginal Scale  iginal Scale  6 Coverage  6 Coverage	6 Assuming III 0.00643 0.00106 0.0149 N/A	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t)	0.166
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po	Not End DS Statistics iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z)	0.00643 0.00106 0.0149 N/A 0.00787 0.00936	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL	0.166 N/A 0.00984 0.00836
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po	Not End  OS Statistics  iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z) ercentile (z)	0.00643 0.00106 0.0149 N/A 0.00787 0.00936	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution	0.166 N/A 0.00984 0.00836
Mean in Or SD in Or 95% UTL959 95% Bootstrap (%) UTL959 90% Po 99% Po Statistics using KN KM Mean of L	Not End  OS Statistics iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z) ercentile (z)  M estimates ogged Data	0.00643 0.00106 0.0149 N/A 0.00787 0.00936	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% Coverage	0.166 N/A 0.00984 0.00836 0.00811
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po	Not End  OS Statistics  iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z) ercentile (z)  M estimates ogged Data ogged Data	6 Assuming   0.00643 0.00106 0.0149 N/A 0.00787 0.00936 on Logged I	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution	0.166 N/A 0.00984 0.00836 0.00811
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po 99% Po Statistics using KN KM Mean of L	Not End  OS Statistics  iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z) ercentile (z)  M estimates ogged Data ogged Data	0.00643 0.00106 0.0149 N/A 0.00787 0.00936 on Logged I -5.056 0.203	Derform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% Coverage 95% KM UPL (Lognormal)	0.166 N/A 0.00984 0.00836 0.00811 0.0181 0.0109
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po 99% Po  Statistics using KN KM Mean of L KM SD of L	Not End  DS Statistics iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z) ercentile (z)  M estimates ogged Data ogged Data gnormal (z)	0.00643 0.00106 0.0149 N/A 0.00787 0.00936 on Logged I -5.056 0.203 0.00889	Derform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% Coverage 95% KM UPL (Lognormal)	0.166 N/A 0.00984 0.00836 0.00811 0.0181 0.0109
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po 99% Po  Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo	Not End  DS Statistics iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z) ercentile (z)  M estimates ogged Data ogged Data gnormal (z)	0.00643 0.00106 0.0149 N/A 0.00787 0.00936 on Logged I -5.056 0.203 0.00889	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% Coverage 95% KM USL (Lognormal)	0.166 N/A 0.00984 0.00836 0.00811 0.0181 0.0109
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po 99% Po Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo  Backgi	Not End DS Statistics iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z) ercentile (z) M estimates ogged Data ogged Data gnormal (z)	0.00643 0.00106 0.0149 N/A 0.00787 0.00936 on Logged I -5.056 0.203 0.00889	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% Coverage 95% KM UPL (Lognormal) 95% KM USL (Lognormal)	0.166 N/A 0.00984 0.00836 0.00811 0.0181 0.0109 0.00857
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po 99% Po Statistics using KN KM Mean of L KM SD of L 95% KM Percentile Lo  Backgi	Not End DS Statistics iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z) ercentile (z) M estimates ogged Data ogged Data gnormal (z) round DL/2 siginal Scale iginal Scale	0.00643 0.00106 0.0149 N/A 0.00787 0.00936 0.203 0.00889 Statistics As 0.00969	Derform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% Coverage 95% KM UPL (Lognormal) 95% KM USL (Lognormal)	0.166 N/A 0.00984 0.00836 0.00811 0.0181 0.0109 0.00857
Mean in Or SD in Or 95% UTL95% 95% Bootstrap (%) UTL95% 90% Po 99% Po Statistics using KM KM Mean of L KM SD of L 95% KM Percentile Lo  Backgr Mean in Or SD in Or 95% UTL95%	Not End DS Statistics iginal Scale iginal Scale 6 Coverage 6 Coverage ercentile (z) ercentile (z) M estimates ogged Data ogged Data gnormal (z) round DL/2 siginal Scale iginal Scale	0.00643 0.00106 0.0149 N/A 0.00787 0.00936 On Logged I -5.056 0.203 0.00889 Statistics As 0.00969 0.00383	Deform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% Coverage 95% KM UPL (Lognormal) 95% KM USL (Lognormal) Suming Lognormal Distribution  Mean in Log Scale SD in Log Scale	0.166 N/A 0.00984 0.00836 0.00811 0.0181 0.0109 0.00857 -4.704 0.439

DL/2 is not a Recommended Metho	od. DL/2 pr	ovided for comparisons and historical reasons.	
Nonnarametric	Dietribution	Free Background Statistics	
•		ernible Distribution (0.05)	
Data do not re	niow a Disc	errible Distribution (0.00)	
Nonparametric Upper Limits for BT	Vs(no disti	nction made between detects and nondetects)	
Order of Statistic, r	4	95% UTL with95% Coverage	0.026
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
Approximate Sample Size needed to achieve specified CC	59	95% UPL	0.026
95% USL	0.026	95% KM Chebyshev UPL	0.0128
Note: The use of USL tends to yield a concentation	o octimata	of BTV, especially when the sample size starts exceeding 20.	
		ne data set represents a background data set free of outliers	
		ted from clean unimpacted locations.	
		false positives and false negatives provided the data	
·		nsite observations need to be compared with the BTV.	
represents a background data set and wil	err many or	isite observations freed to be compared with the DTV.	
nickel			
THOROUGH THE THE THE THE THE THE THE THE THE TH			
General Statistics			
Total Number of Observations	4	Number of Distinct Observations	4
Minimum	3.8	First Quartile	5.9
Second Largest	7.1	Median	6.85
Maximum	9.54	Third Quartile	7.71
Mean	6.76	SD	2.355
Coefficient of Variation	0.348	Skewness	-0.225
Mean of logged Data	1.859	SD of logged Data	0.384
Critical Values for	r Backgrou	ind Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462
Tolorance Factor IX (For CT2)	0.111	deniar (ioi doe)	1.102
	Normal (	GOF Test	
Shapiro Wilk Test Statistic	0.976	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.223	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level	
Data appea	r Normal a	t 5% Significance Level	
Background St	atistics Ass	suming Normal Distribution	
95% UTL with 95% Coverage	18.87	90% Percentile (z)	9.777
95% UPL (t)	12.96	95% Percentile (z)	10.63
95% USL	10.2	99% Percentile (z)	12.24
		GOF Test	
A-D Test Statistic	0.289	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significant	ce Level
K-S Test Statistic	0.263	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.395	Detected data appear Gamma Distributed at 5% Significance	ce Level
Detected data appear	Gamma Di	stributed at 5% Significance Level	

	Gamma	Statistics	
k hat (MLE)	9.852	k star (bias corrected MLE)	2.63
Theta hat (MLE)	0.686	Theta star (bias corrected MLE)	2.571
nu hat (MLE)	78.82	nu star (bias corrected)	21.04
MLE Mean (bias corrected)	6.76	MLE Sd (bias corrected)	4.169
Background S'	tatistics Ass	suming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	15.26	90% Percentile	12.35
95% Hawkins Wixley (HW) Approx. Gamma UPL	15.73	95% Percentile	14.74
95% WH Approx. Gamma UTL with 95% Coverage	28.74	99% Percentile	19.97
95% HW Approx. Gamma UTL with 95% Coverage	31.44		
95% WH USL	10.78	95% HW USL	10.88
	Lognorma	I GOF Test	
Shapiro Wilk Test Statistic	0.939	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.279	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level	
Data appear	Lognormal	at 5% Significance Level	
···		<del>-</del>	
Background Sta	itistics assu	ming Lognormal Distribution	
95% UTL with 95% Coverage	46.32	90% Percentile (z)	10.5
95% UPL (t)	17.64	95% Percentile (z)	12.08
95% USL	11.26	99% Percentile (z)	15.69
Nonparametric	Distribution	Free Background Statistics	
Data appea	ar Normal a	t 5% Significance Level	
Nonparametric Upp	er Limits fo	r Background Threshold Values	
Nonparametric Upp Order of Statistic, r	er Limits fo	r Background Threshold Values  95% UTL with 95% Coverage	9.54
		-	9.54 0.185
Order of Statistic, r	4	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC	
Order of Statistic, r	4	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL	0.185
Order of Statistic, r  Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL	4 0.211	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC	0.185 59
Order of Statistic, r  Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL  90% Chebyshev UPL	0.211 N/A 9.54 14.66	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile	0.185 59 N/A 8.808 9.174
Order of Statistic, r  Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL	4 0.211 N/A 9.54 14.66 18.23	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile	0.185 59 N/A 8.808
Order of Statistic, r  Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL  90% Chebyshev UPL	0.211 N/A 9.54 14.66	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile	0.185 59 N/A 8.808 9.174
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL	N/A 9.54 14.66 18.23 9.54	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 99% Percentile	0.185 59 N/A 8.808 9.174
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL	N/A 9.54 14.66 18.23 9.54	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 99% Percentile	0.185 59 N/A 8.808 9.174
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL  Note: The use of USL tends to yield a conservati Therefore, one may use USL to estimate a BTV	4 0.211 N/A 9.54 14.66 18.23 9.54 ve estimate only when the	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 99% Percentile	0.185 59 N/A 8.808 9.174
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL  Note: The use of USL tends to yield a conservati Therefore, one may use USL to estimate a BTV and consists of observa	N/A 9.54 14.66 18.23 9.54 ve estimate only when the stitions collected	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 99% Percentile	0.185 59 N/A 8.808 9.174
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL  Note: The use of USL tends to yield a conservati Therefore, one may use USL to estimate a BTV and consists of observations of USL tends to provide a balance.	N/A 9.54 14.66 18.23 9.54 ve estimate only when the strong collections collections collections between	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 99% Percentile 99% Percentile of BTV, especially when the sample size starts exceeding 20. The data set represents a background data set free of outliers are from clean unimpacted locations. If alse positives and false negatives provided the data	0.185 59 N/A 8.808 9.174
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL  Note: The use of USL tends to yield a conservati Therefore, one may use USL to estimate a BTV and consists of observations of USL tends to provide a balance.	N/A 9.54 14.66 18.23 9.54 ve estimate only when the strong collections collections collections between	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 99% Percentile	0.185 59 N/A 8.808 9.174
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL  Note: The use of USL tends to yield a conservati Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi	N/A 9.54 14.66 18.23 9.54 ve estimate only when the strong collections collections collections desired the strong collections	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 99% Percentile 99% Percentile of BTV, especially when the sample size starts exceeding 20. The data set represents a background data set free of outliers are from clean unimpacted locations. If alse positives and false negatives provided the data	0.185 59 N/A 8.808 9.174
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL  Note: The use of USL tends to yield a conservati Therefore, one may use USL to estimate a BTV and consists of observations of USL tends to provide a balance.	N/A 9.54 14.66 18.23 9.54 ve estimate only when the strong collections collections collections desired the strong collections	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 99% Percentile 99% Percentile of BTV, especially when the sample size starts exceeding 20. The data set represents a background data set free of outliers are from clean unimpacted locations. If alse positives and false negatives provided the data	0.185 59 N/A 8.808 9.174
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL  Note: The use of USL tends to yield a conservati Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi	N/A 9.54 14.66 18.23 9.54 ve estimate only when the tions collecting between them many or	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 95% Percentile 99% Percentile  of BTV, especially when the sample size starts exceeding 20. The data set represents a background data set free of outliers are defrom clean unimpacted locations. If alse positives and false negatives provided the data Insite observations need to be compared with the BTV.	0.185 59 N/A 8.808 9.174
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL  Note: The use of USL tends to yield a conservati Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi	N/A 9.54 14.66 18.23 9.54 ve estimate only when the only when the only when the only one	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 99% Percentile 99% Percentile sed from clean unimpacted locations. false positives and false negatives provided the data insite observations need to be compared with the BTV.	0.185 59 N/A 8.808 9.174 9.467
Order of Statistic, r Approx, f used to compute achieved CC  95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 90% Chebyshev UPL 95% Chebyshev UPL 95% USL  Note: The use of USL tends to yield a conservati Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi	N/A 9.54 14.66 18.23 9.54 ve estimate only when the tions collecting between them many or	95% UTL with 95% Coverage Approximate Actual Confidence Coefficient achieved by UTL Approximate Sample Size needed to achieve specified CC 95% BCA Bootstrap UTL with 95% Coverage 90% Percentile 95% Percentile 95% Percentile 99% Percentile  of BTV, especially when the sample size starts exceeding 20. The data set represents a background data set free of outliers are defrom clean unimpacted locations. If also positives and false negatives provided the data Insite observations need to be compared with the BTV.	0.185 59 N/A 8.808 9.174

mber of Distinct Detects 2 Number	er of Distinct Non-Detects	1
Minimum Detect 0.272	Minimum Non-Detect	0.64
Maximum Detect 0.409	Maximum Non-Detect	0.64
Variance Detected 0.00945	Percent Non-Detects	50%
Mean Detected 0.34	SD Detected	0.097
Detected Logged Data -1.099 SD o	of Detected Logged Data	0.29
Warning: Data set has only 2 Detected Values. s is not enough to compute meaningful or reliable statistics and estimate	es.	
Critical Values for Background Threshold Values (BTVs)		
nce Factor K (For UTL) 5.144	d2max (for USL)	1.462
Normal GOF Test on Detects Only		
Not Enough Data to Perform GOF Test		
Kaplan Meier (KM) Background Statistics Assuming Normal Distribution		
KM Mean 0.34	KM SD	0.068
15% UTL95% Coverage 0.694	95% KM UPL (t)	0.52
90% KM Percentile (z) 0.428	95% KM Percentile (z)	0.453
99% KM Percentile (z) 0.5	95% KM USL	0.44
DL/2 Substitution Background Statistics Assuming Normal Distribution		
Mean 0.33	SD	0.057
5% UTL95% Coverage 0.625	95% UPL (t)	0.48
90% Percentile (z) 0.404	95% Percentile (z)	0.424
99% Percentile (z) 0.464 tarecommended method. DL/2 provided for comparisons and historical	95% USL	0.414
Gamma GOF Tests on Detected Observations Only		
Not Enough Data to Perform GOF Test		
Gamma Statistics on Detected Data Only		
	star (bias corrected MLE)	N/A
· · · · ·	star (bias corrected MLE)	N/A
nu hat (MLE) 96.62	nu star (bias corrected)	N/A
E Mean (bias corrected) N/A		
MLE Sd (bias corrected) N/A 95% Percent	tile of Chisquare (2kstar)	N/A
Estimates of Gamma Parameters using KM Estimates		
Mean (KM) 0.34	SD (KM)	0.068
Variance (KM) 0.00473	SE of Mean (KM)	0.068
k hat (KM) 24.49	k star (KM)	6.29
	nu star (KM)	50.32
nu hat (KM) 195.9		0.054
theta hat (KM) 0.0139	theta star (KM)	
theta hat (KM) 0.0139 gamma percentile (KM) 0.446 90%	theta star (KM) 6 gamma percentile (KM) 6 gamma percentile (KM)	0.522

Upper Limits ι	using Wilsor	n Hilferty (W	H) and Hawkins Wixley (HW) Methods	
	WH	HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.827	0.853	95% Approx. Gamma UPL 0.551	0.555
95% KM Gamma Percentile	0.462	0.463	95% Gamma USL 0.446	0.447
		E T B	onto the difference time a Contra	
Loį			etected Observations Only Derform GOF Test	
	NOL EIN	ougn Data to	5 Fellotti GOF Test	
Background Lognormal RC	OS Statistics	Assumina	Lognormal Distribution Using Imputed Non-Detects	
	iginal Scale	0.34	Mean in Log Scale	-1.099
	iginal Scale	0.0794	SD in Log Scale	0.237
95% UTL95%		1.125	95% BCA UTL95% Coverage	N/A
95% Bootstrap (%) UTL95%		N/A	95% UPL (t)	0.621
. , ,	ercentile (z)	0.451	95% Percentile (z)	0.492
99% P	ercentile (z)	0.578	95% USL	0.471
		1		
_			Data and Assuming Lognormal Distribution	0.050
KM Mean of L		-1.099	95% KM UTL (Lognormal)95% Coverage	0.956
KM SD of L		0.205	95% KM UPL (Lognormal)	0.571
95% KM Percentile Lo	gnormal (z)	0.467	95% KM USL (Lognormal)	0.45
Backgr	round DL/2	Statistics As	ssuming Lognormal Distribution	
ν.	riginal Scale	0.33	Mean in Log Scale	-1.119
SD in Or	riginal Scale	0.0573	SD in Log Scale	0.169
95% UTL95%	% Coverage	0.779	95% UPL (t)	0.509
90% P	ercentile (z)	0.405	95% Percentile (z)	0.431
99% P	ercentile (z)	0.484	95% USL	0.418
DL/2 is not a Recomm	ended Meth	od. DL/2 pro	ovided for comparisons and historical reasons.	
	-		Free Background Statistics ernible Distribution (0.05)	
۵	ata do not i	ollow a Disc	emible distribution (0.05)	
Nonparametric Upper	Limits for B	TVs(no disti	nction made between detects and nondetects)	
<u> </u>	of Statistic, r	4	95% UTL with95% Coverage	0.64
Approx, f used to compute a		4 0.211	95% UTL with95% Coverage Approximate Actual Confidence Coefficient achieved by UTL	0.64
Approx, f used to compute a  Approximate Sample Size needed to achieve s	chieved CC			
	chieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
* * * * * * * * * * * * * * * * * * * *	chieved CC pecified CC	0.211 59	Approximate Actual Confidence Coefficient achieved by UTL 95% UPL	0.185 0.64
Approximate Sample Size needed to achieve s  Note: The use of USL tends to yield	chieved CC pecified CC 95% USL	0.211 59 0.64	Approximate Actual Confidence Coefficient achieved by UTL  95% UPL  95% KM Chebyshev UPL  of BTV, especially when the sample size starts exceeding 20.	0.185 0.64
Approximate Sample Size needed to achieve s  Note: The use of USL tends to yield and the second state of the second secon	chieved CC pecified CC 95% USL a conservati	0.211 59 0.64  ive estimate only when the	Approximate Actual Confidence Coefficient achieved by UTL  95% UPL  95% KM Chebyshev UPL  of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers	0.185 0.64
Approximate Sample Size needed to achieve s  Note: The use of USL tends to yield and consist	chieved CC pecified CC 95% USL a conservation attemption and a BTV as of observations.	0.211 59 0.64  ive estimate only when thations collect	Approximate Actual Confidence Coefficient achieved by UTL  95% UPL  95% KM Chebyshev UPL  of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers  ed from clean unimpacted locations.	0.185 0.64
Approximate Sample Size needed to achieve s  Note: The use of USL tends to yield and consist  Therefore, one may use USL to estil  and consist  The use of USL tends to pro	chieved CC pecified CC 95% USL a conservati mate a BTV is of observa	0.211 59 0.64  Ive estimate only when the ations collections between	Approximate Actual Confidence Coefficient achieved by UTL  95% UPL  95% KM Chebyshev UPL  of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers  ted from clean unimpacted locations.  false positives and false negatives provided the data	0.185 0.64
Approximate Sample Size needed to achieve s  Note: The use of USL tends to yield and consist  Therefore, one may use USL to estil  and consist  The use of USL tends to pro	chieved CC pecified CC 95% USL a conservati mate a BTV is of observa	0.211 59 0.64  Ive estimate only when the ations collections between	Approximate Actual Confidence Coefficient achieved by UTL  95% UPL  95% KM Chebyshev UPL  of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers  ed from clean unimpacted locations.	0.185 0.64
Approximate Sample Size needed to achieve s  Note: The use of USL tends to yield  Therefore, one may use USL to estir  and consist  The use of USL tends to pro  represents a background dat	chieved CC pecified CC 95% USL a conservati mate a BTV is of observa	0.211 59 0.64  Ive estimate only when the ations collections between	Approximate Actual Confidence Coefficient achieved by UTL  95% UPL  95% KM Chebyshev UPL  of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers  ted from clean unimpacted locations.  false positives and false negatives provided the data	0.185 0.64
Approximate Sample Size needed to achieve s  Note: The use of USL tends to yield  Therefore, one may use USL to estil  and consist  The use of USL tends to pro	chieved CC pecified CC 95% USL a conservati mate a BTV is of observa	0.211 59 0.64  Ive estimate only when the ations collections between	Approximate Actual Confidence Coefficient achieved by UTL  95% UPL  95% KM Chebyshev UPL  of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers  ted from clean unimpacted locations.  false positives and false negatives provided the data	0.185 0.64
Approximate Sample Size needed to achieve s  Note: The use of USL tends to yield  Therefore, one may use USL to estir  and consist  The use of USL tends to pro  represents a background dat	chieved CC pecified CC 95% USL a conservati mate a BTV is of observa	0.211 59 0.64  Ive estimate only when the ations collections between	Approximate Actual Confidence Coefficient achieved by UTL  95% UPL  95% KM Chebyshev UPL  of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers  ted from clean unimpacted locations.  false positives and false negatives provided the data	0.185 0.64
Approximate Sample Size needed to achieve s  Note: The use of USL tends to yield: Therefore, one may use USL to estir and consist The use of USL tends to pro represents a background dat	chieved CC pecified CC 95% USL a conservati mate a BTV is of observa vide a balar ta set and w	0.211 59 0.64  Ive estimate only when the ations collections between	Approximate Actual Confidence Coefficient achieved by UTL  95% UPL  95% KM Chebyshev UPL  of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers  ted from clean unimpacted locations.  false positives and false negatives provided the data	0.185 0.64
Approximate Sample Size needed to achieve s  Note: The use of USL tends to yield Therefore, one may use USL to estin and consist The use of USL tends to pro represents a background dat  strontium  General Statistics	chieved CC pecified CC 95% USL a conservati mate a BTV is of observa vide a balar ta set and w	0.211 59 0.64  Ive estimate only when the ations collect once between then many or	Approximate Actual Confidence Coefficient achieved by UTL  95% UPL  95% KM Chebyshev UPL  of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers  red from clean unimpacted locations.  false positives and false negatives provided the data  nsite observations need to be compared with the BTV.	0.185 0.64 0.675

Maximum			
		Third Quartile	11.84
Mean		SD	2.739
Coefficient of Variation	0.276	Skewness	-0.0471
Mean of logged Data	2.264	SD of logged Data	0.285
Critical Values	for Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)		d2max (for USL)	1.462
Tolerance Factor N (For OTE)	5.144	dzīnax (loi oot)	1.402
	Normal C	GOF Test	
Shapiro Wilk Test Statistic	0.944	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.219	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level	
Data appe	ear Normal at	5% Significance Level	
		suming Normal Distribution	
95% UTL with 95% Coverage		90% Percentile (z)	13.42
95% UPL (t)		95% Percentile (z)	14.42
95% USL	13.92	99% Percentile (z)	16.29
	Gamma (	GOF Test	
A-D Test Statistic		Anderson-Darling Gamma GOF Test	
5% A-D Critical Value		Detected data appear Gamma Distributed at 5% Significance	re I evel
K-S Test Statistic		Kolmogorov-Smirnov Gamma GOF Test	DO ECVO
5% K-S Critical Value		Detected data appear Gamma Distributed at 5% Significance	no Lovol
Detected data appea	r Gamma Dis	stributed at 5% Significance Level	
	Gamma	Statistics	
k hat (MLE)	16.87	k star (bias corrected MLE)	4.384
k hat (MLE) Theta hat (MLE)		k star (bias corrected MLE) Theta star (bias corrected MLE)	
Theta hat (MLE)	0.588	Theta star (bias corrected MLE)	2.261
Theta hat (MLE)	0.588	Theta star (bias corrected MLE) nu star (bias corrected)	2.261 35.07
Theta hat (MLE)	0.588	Theta star (bias corrected MLE)	2.261
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)	0.588 134.9 9.913	Theta star (bias corrected MLE) nu star (bias corrected)	2.261 35.07
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)	0.588 134.9 9.913 Statistics Ass	Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)	2.261 35.07
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S	0.588 134.9 9.913 Statistics Ass 18.91	Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)  uming Gamma Distribution	2.261 35.07 4.734
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL	0.588 134.9 9.913 Statistics Ass 18.91 19.23	Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution 90% Percentile	2.261 35.07 4.734 16.26
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL	0.588 134.9 9.913 Statistics Ass 18.91 19.23 31.87	Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile  95% Percentile	2.261 35.07 4.734 16.26 18.76
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage	0.588 134.9 9.913 Statistics Ass 18.91 19.23 31.87 33.66	Theta star (bias corrected MLE)  nu star (bias corrected)  MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile  95% Percentile	2.261 35.07 4.734 16.26 18.76
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage	0.588 134.9 9.913 Statistics Ass 18.91 19.23 31.87 33.66 14.33	Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile	2.261 35.07 4.734 16.26 18.76 24.09
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL	0.588 134.9 9.913  Statistics Ass 18.91 19.23 31.87 33.66 14.33  Lognormal	Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile	2.261 35.07 4.734 16.26 18.76 24.09
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage	0.588 134.9 9.913 Statistics Ass 18.91 19.23 31.87 33.66 14.33	Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 95% HW USL	2.261 35.07 4.734 16.26 18.76 24.09
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL	0.588 134.9 9.913 Statistics Ass 18.91 19.23 31.87 33.66 14.33	Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile	2.261 35.07 4.734 16.26 18.76 24.09
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic	0.588 134.9 9.913  Statistics Ass 18.91 19.23 31.87 33.66 14.33  Lognormal 0.942 0.748 0.234	Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 95% HW USL	2.261 35.07 4.734 16.26 18.76 24.09
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic	0.588 134.9 9.913  Statistics Ass 18.91 19.23 31.87 33.66 14.33  Lognormal 0.942 0.748 0.234 0.375	Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  wming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile 95% HW USL  GOF Test  Shapiro Wilk Lognormal GOF Test Data appear Lognormal at 5% Significance Level Lilliefors Lognormal at 5% Significance Level	2.261 35.07 4.734 16.26 18.76 24.09
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic	0.588 134.9 9.913  Statistics Ass 18.91 19.23 31.87 33.66 14.33  Lognormal 0.942 0.748 0.234 0.375	Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile 95% HW USL  GOF Test  Shapiro Wilk Lognormal GOF Test  Data appear Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test	2.261 35.07 4.734 16.26 18.76 24.09
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value  Data appea	0.588 134.9 9.913  Statistics Ass 18.91 19.23 31.87 33.66 14.33  Lognormal 0.942 0.748 0.234 0.375 r Lognormal	Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  uming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile 95% HW USL  GOF Test  Shapiro Wilk Lognormal GOF Test Data appear Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test  Data appear Lognormal at 5% Significance Level at 5% Significance Level	2.261 35.07 4.734 16.26 18.76 24.09
Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)  Background S  95% Wilson Hilferty (WH) Approx. Gamma UPL 95% Hawkins Wixley (HW) Approx. Gamma UPL 95% WH Approx. Gamma UTL with 95% Coverage 95% HW Approx. Gamma UTL with 95% Coverage 95% WH USL  Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value  Data appea	0.588 134.9 9.913 Statistics Ass 18.91 19.23 31.87 33.66 14.33  Lognormal 0.942 0.748 0.234 0.375 r Lognormal	Theta star (bias corrected MLE) nu star (bias corrected) MLE Sd (bias corrected)  wming Gamma Distribution  90% Percentile 95% Percentile 99% Percentile 99% Percentile 95% HW USL  GOF Test  Shapiro Wilk Lognormal GOF Test Data appear Lognormal at 5% Significance Level Lilliefors Lognormal at 5% Significance Level	2.261 35.07 4.734 16.26 18.76 24.09

95% USL	14.61	99% Percentile (z)	18.69
Nonparametric	Distribution	Free Background Statistics	
		t 5% Significance Level	
Nonparametric Upp	er Limits fo	r Background Threshold Values	
Order of Statistic, r	4	95% UTL with 95% Coverage	12.85
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
pp - , p		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	N/A	95% BCA Bootstrap UTL with 95% Coverage	N/A
95% UPL	12.85	90% Percentile	12.45
90% Chebyshev UPL	19.1	95% Percentile	12.65
95% Chebyshev UPL	23.26	99% Percentile	12.81
95% USL	12.85		
Note: The use of USL tends to yield a conservative	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV of	only when th	he data set represents a background data set free of outliers	
and consists of observa	tions collec	ted from clean unimpacted locations.	
The use of USL tends to provide a balan	ce between	false positives and false negatives provided the data	
represents a background data set and wh	nen many oi	nsite observations need to be compared with the BTV.	
<del>-</del>		<u>*</u>	
hallium			
	General	Statistics	
Total Number of Observations	2	Number of Missing Observations	2
Number of Distinct Observations	1	-	
Number of Detects	0	Number of Non-Detects	2
Number of Distinct Detects	0	Number of Distinct Non-Detects	1
Minimum Detect	N/A	Minimum Non-Detect	0.64
Maximum Detect	N/A	Maximum Non-Detect	0.64
Variance Detected	N/A	Percent Non-Detects	100%
Mean Detected	N/A	SD Detected	N/A
Mean of Detected Logged Data	N/A	SD of Detected Logged Data	N/A
Warning: Th	is data set	only has 2 observations!	
		and meaningful statistics and estimates!	
		hallium was not processed!	
		<del>-</del>	
It is suggested to collect at least 8	to 10 obser	rvations before using these statistical methods!	
		ives (DQO) based sample size and analytical results.	
· · · · · · · · · · · · · · · · · · ·		<u> </u>	
/anadium			
General Statistics			
Total Number of Observations	2	Number of Distinct Observations	2
		Number of Missing Observations	2
		9	
Minimum	19	First Quartile	23.25
Minimum Second Largest	19 19	First Quartile  Median	23.25

Mea	an 27.5	SD	12.02
Coefficient of Variation	on 0.437	Skewness	N/A
		only has 2 observations!	
	-	and meaningful statistics and estimates!	
i ne data set	tor variable va	anadium was not processed!	
It is suggested to collect at leas	t 8 to 10 obse	rvations before using these statistical methods!	
		tives (DQO) based sample size and analytical results.	
	,	, , , , , , , , , , , , , , , , , , , ,	
c			
neral Statistics			
Total Number of Observation	ns 2	Number of Distinct Observations	2
		Number of Missing Observations	2
Minimu	m 19	First Quartile	22.38
Second Large	st 19	Median	25.75
Maximu	m 32.5	Third Quartile	29.13
Mea	an 25.75	SD	9.546
Coefficient of Variation	on 0.371	Skewness	N/A
<u> </u>		only has 2 observations!	
	-	e and meaningful statistics and estimates!	
The data s	et for variable	e zinc was not processed!	
	t 8 to 10 obse	rvations before using these statistical methods!	
		tives (DQO) based sample size and analytical results.	

	Background Statistics for			
User Selected Options	D1101 F 10/00/0001 0:	47.00 AM		
•	ProUCL 5.18/20/2021 9:4			
From File Full Precision	ProUCL Background Inp	uts_a.xis 		
Confidence Coefficient	95%			
	95%			
Different or Future K Observations	1			
Number of Bootstrap Operations	2000			
Namber of Bootestap Operations				
aluminum				
General Statistics				
Total	Number of Observations	0	Number of Distinct Observations	0
			Number of Missing Observations	5
	Minimum	N/A	First Quartile	N/A
	Second Largest	N/A	Median	N/A
	Maximum	N/A	Third Quartile	N/A
	Mean	N/A	SD	N/A
	Coefficient of Variation	N/A	Skewness	N/A
It is sugge	The data set for	variable aluminum v	ningful statistics and estimates!	
It is sugge If possible, comp	The data set for	ute reliable and mea variable aluminum v to 10 observations b	ningful statistics and estimates! vas not processed! efore using these statistical methods!	
It is sugge If possible, comp	The data set for	ute reliable and mea variable aluminum v to 10 observations b	ningful statistics and estimates!  vas not processed!  efore using these statistical methods!  D) based sample size and analytical results.	
It is sugge If possible, comp antimony	The data set for	ute reliable and mea variable aluminum v to 10 observations b ality Objectives (DQ	ningful statistics and estimates!  vas not processed!  efore using these statistical methods!  D) based sample size and analytical results.	3
It is sugge If possible, comp antimony Total	The data set for steed to collect at least 8 pute and collect Data Qu	to 10 observations be ality Objectives (DQ	ningful statistics and estimates!  vas not processed!  efore using these statistical methods!  D) based sample size and analytical results.	3
It is sugge If possible, comp antimony Total	The data set for steed to collect at least 8 pute and collect Data Qu	to 10 observations be ality Objectives (DQ:	ningful statistics and estimates!  vas not processed!  efore using these statistical methods!  D) based sample size and analytical results.	3
It is sugge If possible, comp antimony  Total Number	The data set for The data set for Steed to collect at least 8 pute and collect Data Que Number of Observations of Distinct Observations	to 10 observations be ality Objectives (DQ	ningful statistics and estimates! was not processed!  efore using these statistical methods!  D) based sample size and analytical results.  Number of Missing Observations	
It is sugge If possible, comp antimony  Total Number	The data set for The data set for Steed to collect at least 8 Dute and collect Data Que Number of Observations of Distinct Observations Number of Detects	cute reliable and mean variable aluminum variabl	ningful statistics and estimates! was not processed!  efore using these statistical methods!  D) based sample size and analytical results.  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect	2
It is sugge If possible, comp antimony  Total Number	The data set for The data set for Steed to collect at least 8 pute and collect Data Que Number of Observations of Distinct Observations Number of Detects Imber of Distinct Detects Minimum Detect Maximum Detect	to 10 observations be ality Objectives (DQs)  General Statistics  2  1  0  0	ningful statistics and estimates!  vas not processed!  efore using these statistical methods!  D) based sample size and analytical results.  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects	2 1 5 5
It is sugge If possible, comp antimony  Total Number	Number of Observations of Distinct Observations Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected	General Statistics  2 1 0 0 N/A N/A N/A	Number of Missing Observations  Number of Distinct Non-Detects  Maximum Non-Detect  Percent Non-Detects	2 1 5 5
It is sugge If possible, comp  antimony  Total  Number	The data set for The data set for Sested to collect at least 8 pute and collect Data Que Number of Observations of Distinct Observations Number of Detects Imber of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected	General Statistics 2 1 0 0 N/A N/A N/A N/A	ningful statistics and estimates!  was not processed!  efore using these statistical methods!  D) based sample size and analytical results.  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected	2 1 5 5 100% N/A
It is sugge If possible, comp  antimony  Total  Number	Number of Observations of Distinct Observations Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected	General Statistics  2 1 0 0 N/A N/A N/A	Number of Missing Observations  Number of Distinct Non-Detects  Maximum Non-Detect  Percent Non-Detects	2 1 5 5
It is sugge If possible, comp  antimony  Total  Number  Nu	The data set for The data set for Sested to collect at least 8 pute and collect Data Que Number of Observations of Distinct Observations Number of Detects Minimum Detect Maximum Detect Variance Detected Mean Detected of Detected Logged Data Warning: The	General Statistics  2 1 0 0 N/A	ningful statistics and estimates!  vas not processed!  efore using these statistical methods!  D) based sample size and analytical results.  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data	2 1 5 5 100% N/A
It is sugge If possible, comp  antimony  Total  Number  Nu	The data set for The data set for Sested to collect at least 8 pute and collect Data Questions of Distinct Observations Number of Detects Imber of Distinct Detects Maximum Detect Maximum Detect Variance Detected Mean Detected of Detected Logged Data  Warning: The set is too small to compare the set of the data of the	General Statistics  2  1  0  0  N/A  N/A  N/A  N/A  N/A  N/A  N/	ningful statistics and estimates!  vas not processed!  efore using these statistical methods!  D) based sample size and analytical results.  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  2 observations!  ningful statistics and estimates!	2 1 5 5 100% N/A
It is sugge If possible, comp  antimony  Total  Number  Nu	The data set for The data set for Sested to collect at least 8 pute and collect Data Questions of Distinct Observations Number of Detects Imber of Distinct Detects Maximum Detect Maximum Detect Variance Detected Mean Detected of Detected Logged Data  Warning: The set is too small to compare the set of the data of the	General Statistics  2 1 0 0 N/A	ningful statistics and estimates!  vas not processed!  efore using these statistical methods!  D) based sample size and analytical results.  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  2 observations!  ningful statistics and estimates!	2 1 5 5 100% N/A
It is sugge If possible, comp  antimony  Total  Number  Nu  Mean o	Number of Observations Observations Observations Of Distinct Observations Number of Detects Of Distinct Detects Of Detected Of Detected Of Detected Logged Data	General Statistics  2 1 0 0 N/A	ningful statistics and estimates!  vas not processed!  efore using these statistical methods!  D) based sample size and analytical results.  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  2 observations!  ningful statistics and estimates!	2 1 5 5 100% N/A

rsenic			
	General	Statistics	
Total Number of Observations	4	Number of Missing Observations	1
Number of Distinct Observations	3		
Number of Detects	2	Number of Non-Detects	2
Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	0.42	Minimum Non-Detect	10
Maximum Detect	0.44	Maximum Non-Detect	10
Variance Detected	2.0000E-4	Percent Non-Detects	50%
Mean Detected	0.43	SD Detected	0.014
Mean of Detected Logged Data	-0.844	SD of Detected Logged Data	0.0329
		only 2 Detected Values.	
This is not enough to comp	oute meaning	gful or reliable statistics and estimates.	
Critical Values f	or Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462
Norm	al GOF Test	t on Detects Only	
		Perform GOF Test	
		tistics Assuming Normal Distribution	
KM Mean	0.43	KM SD	0.01
95% UTL95% Coverage	0.481	95% KM UPL (t)	0.456
90% KM Percentile (z)	0.443	95% KM Percentile (z)	0.446
99% KM Percentile (z)	0.453	95% KM USL	0.445
DL/2 Substitution Back	ground Stati	stics Assuming Normal Distribution	
Mean	2.715	SD	2.639
95% UTL95% Coverage	16.29	95% UPL (t)	9.657
90% Percentile (z)	6.096	95% Percentile (z)	7.055
99% Percentile (z)	8.853	95% USL	6.574
DL/2 is not a recommended meth	od. DL/2 pro	ovided for comparisons and historical reasons	
Gamma GOF	Tests on De	stected Observations Only	
		Perform GOF Test	
Gamma	Statistics on	Detected Data Only	
k hat (MLE)		k star (bias corrected MLE)	N/A
Theta hat (MLE)	2.3260E-4	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	7395	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	<u>'</u>	
MLE Sd (bias corrected)	N/A	95% Percentile of Chisquare (2kstar)	N/A
Estimates of G	amma Parar	meters using KM Estimates	
Mean (KM)	0.43	SD (KM)	0.01
Variance (KM)		SE of Mean (KM)	0.01
		SE OF MICHI (KW)	3.51

		T		
	nu hat (KM)		nu star (KM)	3699
	eta hat (KM)		theta star (KM)	
80% gamma pero	` '	0.447	90% gamma percentile (KM)	0.456
95% gamma pero	centile (KM)	0.463	99% gamma percentile (KM)	0.478
The following star	tistics are c	omputed us	ing gamma distribution and KM estimates	
			H) and Hawkins Wixley (HW) Methods	
	WH	HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.483	0.484	95% Approx. Gamma UPL 0.457	0.457
95% KM Gamma Percentile	0.447	0.447	95% Gamma USL 0.445	0.445
Log			Detected Observations Only Detected Observations Only Detected Observations Only	
	1101 E.I.	Jugii Dulu k	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	
Background Lognormal RC	S Statistics	Assuming	Lognormal Distribution Using Imputed Non-Detects	
Mean in Or	iginal Scale	0.43	Mean in Log Scale	-0.844
SD in Or	iginal Scale	0.0115	SD in Log Scale	0.0269
95% UTL95%	6 Coverage	0.494	95% BCA UTL95% Coverage	N/A
95% Bootstrap (%) UTL95%	6 Coverage	N/A	95% UPL (t)	0.461
90% Pe	ercentile (z)	0.445	95% Percentile (z)	0.449
99% Pe	ercentile (z)	0.458	95% USL	0.447
Statistics using KN	A estimates	on Logged I	Data and Assuming Lognormal Distribution	
KM Mean of Lo		-0.844	95% KM UTL (Lognormal)95% Coverage	0.485
KM SD of Lo	ogged Data	0.0233	95% KM UPL (Lognormal)	0.457
95% KM Percentile Lo	gnormal (z)	0.447	95% KM USL (Lognormal)	0.445
	151.6			
			ssuming Lognormal Distribution	
Mean in Or	•	2.715	Mean in Log Scale	0.383
	iginal Scale	2.639	SD in Log Scale	1.417
95% UTL95%			95% UPL (t)	60.96
	ercentile (z)	9.009	95% Percentile (z)	15.07
	ercentile (z)		95% USL	11.64
DD2 is not a Recomm	enaea metr	ioa. DL/2 pro	ovided for comparisons and historical reasons.	
Nor	parametric	Distribution	Free Background Statistics	
D	ata do not f	ollow a Disc	cernible Distribution (0.05)	
			inction made between detects and nondetects)	- 10
	f Statistic, r	4	95% UTL with95% Coverage	10
Approx, f used to compute a		0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
Approximate Sample Size needed to achieve s		59	95% UPL	10
	95% USL	10	95% KM Chebyshev UPL	0.479
Note: The use of USL tends to yield a	a conservati	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estir	mate a BTV	only when th	ne data set represents a background data set free of outliers	
and consist	s of observa	ations collect	ted from clean unimpacted locations.	
The use of USL tends to pro	vide a balar	nce between	false positives and false negatives provided the data	

ium			
neral Statistics			
Total Number of Observations	5	Number of Distinct Observations	4
Minimum	23.1	First Quartile	23.2
Second Largest	27	Median	24
Maximum	27	Third Quartile	27
Mean	24.86	SD	1.98
Coefficient of Variation	0.0798	Skewness	0.47
Mean of logged Data	3.211	SD of logged Data	0.07
Critical Values fo	or Backgrour	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	4.203	d2max (for USL)	1.67
	Normal G	GOF Test	
Shapiro Wilk Test Statistic	0.782	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.762	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.268	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.343	Data appear Normal at 5% Significance Level	
Data appea	r Normal at	5% Significance Level	
		uming Normal Distribution	
95% UTL with 95% Coverage	33.2	90% Percentile (z)	27.4
95% UPL (t)	29.49	95% Percentile (z)	28.1
95% USL	28.18	99% Percentile (z)	29.4
	Gamma G		
A-D Test Statistic	0.647	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.678	Detected data appear Gamma Distributed at 5% Significance	e Leve
K-S Test Statistic	0.286	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level	e Leve
Detected data appear	Gaillilla Dis	unbuted at 3% digitificance Level	
Is heat (MILES)	Gamma S	Statistics k star (bias corrected MLE)	70.6
k hat (MLE)	198.8 0.125	,	79.6
Theta hat (MLE)		Theta star (bias corrected MLE)	0.31
nu hat (MLE)	1988	nu star (bias corrected)	796.4
MLE Mean (bias corrected)	24.86	MLE Sd (bias corrected)	2.78
Background Sta	atistics Assu	uming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	29.71	90% Percentile	28.4
95% Hawkins Wixley (HW) Approx. Gamma UPL	29.74	95% Percentile	29.6
95% WH Approx. Gamma UTL with 95% Coverage	34.05	99% Percentile	31.8
95% HW Approx. Gamma UTL with 95% Coverage	34.17	1	
95% WH USL	28.26	95% HW USL	28.2
	Lognormal	GOF Test	
Shapiro Wilk Test Statistic	0.787	Shapiro Wilk Lognormal GOF Test	
50/ 01 1 14/11 0 11 11/ 1	0.762	Data appear Lognormal at 5% Significance Level	
5% Shapiro Wilk Critical Value	0.702	Data appear Lognormal at 0 % dignificance Level	

34.57 29.83 28.3  Distribution ar Normal at	Data appear Lognormal at 5% Significance Level at 5% Significance Level  ming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z)  Free Background Statistics t 5% Significance Level	27.44 28.24 29.81
34.57 29.83 28.3  Distribution ar Normal at	ming Lognormal Distribution  90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)	28.24
34.57 29.83 28.3  Distribution ar Normal at	90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)	28.24
34.57 29.83 28.3  Distribution ar Normal at	90% Percentile (z) 95% Percentile (z) 99% Percentile (z) 99% Percentile (z)	28.24
29.83 28.3 Distribution ar Normal at	95% Percentile (z) 99% Percentile (z) Free Background Statistics	28.24
28.3  Distribution ar Normal at	99% Percentile (z)  Free Background Statistics	
Distribution ar Normal at	Free Background Statistics	
ar Normal at		
	t 5% Significance Level	
er Limits for		
	r Background Threshold Values	
5	95% UTL with 95% Coverage	27
0.263	Approximate Actual Confidence Coefficient achieved by UTL	0.226
		59
27		27
27	90% Percentile	27
31.38	95% Percentile	27
34.34	99% Percentile	27
27		
ve estimate	of BTV, especially when the sample size starts exceeding 20.	
General	Statistics	
4	Number of Missing Observations	1
2		
0	Number of Non-Detects	4
0	Number of Distinct Non-Detects	2
N/A	Minimum Non-Detect	0.1
N/A	Maximum Non-Detect	2
N/A	Percent Non-Detects	100%
N/A	SD Detected	N/A
N/A	SD of Detected Logged Data	N/A
	]	
e (NDe) the	arofore all statistics and estimates should also be NDsI	
		<u></u>
	(a.g., =1 0, 51 v.	-
r variable be	ervilium was not processed!	
r variable be	eryllium was not processed!	
r variable be	eryllium was not processed!	
r variable be	eryllium was not processed!	
r variable be	eryllium was not processed!	
	27 31.38 34.34 27 ive estimate only when the stions collect nice between then many or the stions with the stions collect nice between then many or the stions collect nice between then many or the stions collect nice between then many or the stions collect nice between the stions collec	27 90% Percentile 31.38 95% Percentile 34.34 99% Percentile 27  ive estimate of BTV, especially when the sample size starts exceeding 20. only when the data set represents a background data set free of outliers ations collected from clean unimpacted locations. Increase between false positives and false negatives provided the data then many onsite observations need to be compared with the BTV.  General Statistics  4 Number of Missing Observations 2 0 Number of Non-Detects 0 Number of Distinct Non-Detects N/A Minimum Non-Detect N/A Maximum Non-Detect N/A Percent Non-Detects N/A Percent Non-Detects N/A SD Detected

s 4	Number of Missing Observations	1
s 2	Trainibel of Missing Specifications	· · · · · · · · · · · · · · · · · · ·
	Number of Non-Detects	4
		2
		0.08
		1
	Percent Non-Detects	100%
d N/A	SD Detected	N/A
a N/A	SD of Detected Logged Data	N/A
(AID-) 4h		
		•
site specific	values to estimate environmental parameters (e.g., EPC, BTV	).
or variable c	admium was not processed!	
\$ 0		0
		5
		N/A
ı N/A	Skewness	N/A
This data sat	anly has 0 shapeystianal	
	-	
	calcium was not processed:	
8 to 10 obse	nystions before using these statistical methods	
uality Objec	uves (DQC) based sample size and analytical results.	
Genera	Statistics	
		3
	radified of wildowing Observations	
	Number of Non-Detects	2
		1
t N/A	Minimum Non-Detect	0.74
t N/A	Maximum Non-Detect	0.74
IN/M	iviaximum non-Detect	0.74
	Darcent Non Datasta	100%
d N/A	Percent Non-Detects	100% N/A
d N/A	SD Detected	N/A
d N/A		
	s 0 s 0 s 0 st N/A st N/A d N/A d N/A d N/A d N/A cts (NDs), the nd other state site specific for variable of s 0 n N/A n N/A n N/A n N/A first data set npute reliable for variable of s 10 obse duality Object  General s 2 s 1 s 0 s 0	Number of Non-Detects Number of Distinct Non-Detects Number of Distinct Non-Detects Number of Distinct Non-Detects Number of Distinct Non-Detect Number of Distinct Non-Detect Number of Non-Detect Number of Non-Detect Number of Non-Detects Number of Non-Detects Number of Distinct Observations Number of Distinct Observations Number of Missing Observations Number of Missing Observations Number of Missing Observations Number of Non-Detects Number of Number of Non-Detects Number of Non-Detects Number of Distinct Non-Detects

Data set is too small to comp	ute reliable and mea	ningful statistics and estimates!	
The data set for varial	ole hexavalent chror	nium was not processed!	
		efore using these statistical methods!  O) based sample size and analytical results.	
ii possible, compute and collect Data Qui	anty Objectives (DQ	of based sample size and analytical results.	
trivalent chromium			
General Statistics			
Total Number of Observations	0	Number of Distinct Observations	0
		Number of Missing Observations	5
Minimum	N/A	First Quartile	N/A
Second Largest	N/A	Median	N/A
Maximum	N/A	Third Quartile	N/A
Mean	N/A	SD	N/A
Coefficient of Variation	N/A	Skewness	N/A
Warning: Th	is data set only has	0 observations!	
Data set is too small to comp	ute reliable and mea	ningful statistics and estimates!	
The data set for vari	able trivalent chrom	um was not processed!	
la !	to 10 observations b	efore using these statistical methods!	
it is suggested to collect at least 8			
		O) based sample size and analytical results.	
		O) based sample size and analytical results.	
		O) based sample size and analytical results.	
		O) based sample size and analytical results.	
If possible, compute and collect Data Qua		O) based sample size and analytical results.	
If possible, compute and collect Data Qua			
If possible, compute and collect Data Qua	ality Objectives (DQ		1
If possible, compute and collect Data Qua	ality Objectives (DQ		1
If possible, compute and collect Data Quantum otal chromium  Total Number of Observations	General Statistics		1 2
otal chromium  Total Number of Observations Number of Distinct Observations	General Statistics 4 3	Number of Missing Observations	
otal chromium  Total Number of Observations Number of Distinct Observations Number of Detects	General Statistics  4  3  2  0.45	Number of Missing Observations  Number of Non-Detects	2 1 5
otal chromium  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect	General Statistics 4 3 2 2 0.45 0.53	Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect	2 1 5
If possible, compute and collect Data Quantitation of Computer of Observations  Number of Distinct Observations  Number of Distinct Detects  Number of Distinct Detects  Minimum Detect  Maximum Detect  Variance Detected	General Statistics 4 3 2 0.45 0.53 0.0032	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects	2 1 5 5 5
If possible, compute and collect Data Quantotal chromium  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected	General Statistics 4 3 2 0.45 0.53 0.0032 0.49	Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected	2 1 5 5 5 50% 0.0566
If possible, compute and collect Data Quantotal chromium  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected	General Statistics 4 3 2 0.45 0.53 0.0032	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects	2 1 5 5 5
Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data	General Statistics 4 3 2 0.45 0.53 0.0032 0.49	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects SD Detected SD of Detected Logged Data	2 1 5 5 5 50% 0.0566
Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Da	General Statistics 4 3 2 0.45 0.53 0.0032 0.49 -0.717	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects SD Detected SD of Detected Logged Data	2 1 5 5 5 50% 0.0566
Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Da	General Statistics 4 3 2 0.45 0.53 0.0032 0.49 -0.717	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects SD Detected SD of Detected Logged Data	2 1 5 5 5 50% 0.0566
Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Da	General Statistics 4 3 2 0.45 0.53 0.0032 0.49 -0.717	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects SD Detected SD of Detected Logged Data	2 1 5 5 5 50% 0.0566
If possible, compute and collect Data Quantities  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Da This is not enough to comp	General Statistics 4 3 2 0.45 0.53 0.0032 0.49 -0.717	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects SD Detected SD of Detected Logged Data  stected Values.  liable statistics and estimates.	2 1 5 5 5 50% 0.0566
If possible, compute and collect Data Quantities  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Da This is not enough to comp	General Statistics  4  3  2  0.45  0.53  0.0032  0.49  -0.717  ata set has only 2 Deute meaningful or re	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects SD Detected SD of Detected Logged Data  stected Values.  liable statistics and estimates.	2 1 5 5 5 50% 0.0566
If possible, compute and collect Data Quantotal chromium  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Data  This is not enough to comp	General Statistics  4  3  2  0.45  0.53  0.0032  0.49  -0.717  ata set has only 2 Deute meaningful or reserved and the set of the se	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects SD Detected SD of Detected Logged Data  Stected Values.  Statistics and estimates.	2 1 5 5 50% 0.0566 0.116
If possible, compute and collect Data Quantotal chromium  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Da This is not enough to comp  Critical Values for Tolerance Factor K (For UTL)	General Statistics  4  3  2  0.45  0.53  0.0032  0.49  -0.717  ata set has only 2 Deute meaningful or reserved and the set of the se	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects SD Detected SD of Detected Logged Data  Stected Values.  Itable statistics and estimates.	2 1 5 5 50% 0.0566 0.116
otal chromium  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean of Detected Logged Data  Warning: Da This is not enough to comp  Critical Values for Tolerance Factor K (For UTL)	General Statistics  4  3  2  0.45  0.53  0.0032  0.49  -0.717  ata set has only 2 Deute meaningful or reserved and the set of the se	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects SD Detected SD of Detected Logged Data  Stected Values.  Statistics and estimates.	2 1 5 5 50% 0.0566 0.116
If possible, compute and collect Data Quantum  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Date This is not enough to comp  Critical Values for Tolerance Factor K (For UTL)  Normanical Normanical Supplementaries of Computer Supplementaries of Compute	General Statistics  4 3 2 0.45 0.53 0.0032 0.49 -0.717  ata set has only 2 Determinent or Background Three 5.144  al GOF Test on Determinent or Background Three 5.144	Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects SD Detected SD of Detected Logged Data  Stected Values.  Statistics and estimates.	2 1 5 5 50% 0.0566 0.116

ŀ	KM Mean	0.49	KM SD	0.04
95% UTL95% (	Coverage	0.696	95% KM UPL (t)	0.595
90% KM Pero	entile (z)	0.541	95% KM Percentile (z)	0.556
99% KM Pero	entile (z)	0.583	95% KM USL	0.548
DL/2 Substitut	tion Back	ground Sta	tistics Assuming Normal Distribution	
	Mean	1.495	SD	1.161
95% UTL95% C	Coverage	7.467	95% UPL (t)	4.55
90% Pero	entile (z)	2.983	95% Percentile (z)	3.405
99% Pero	entile (z)	4.196	95% USL	3.193
DL/2 is not a recommen	ded meth	od. DL/2 pr	rovided for comparisons and historical reasons	
		<u> </u>	·	
Gam	ma GOF	Tests on D	etected Observations Only	
			o Perform GOF Test	
	Gamma	Statistics o	n Detected Data Only	
k h	nat (MLE)	149.7	k star (bias corrected MLE)	N/A
	nat (MLE)	0.00327	Theta star (bias corrected MLE)	N/A
	nat (MLE)	598.9	nu star (bias corrected)	N/A
MLE Mean (bias c	` ′	N/A		
MLE Sd (bias c		N/A	95% Percentile of Chisquare (2kstar)	N/A
WEE Ou (blub o	orrected)	14// (	30% Forestime of Offisquare (Ensury)	14// (
Ectim	ates of G	amma Dara	ameters using KM Estimates	
	ean (KM)	0.49	SD (KM)	0.04
	nce (KM)	0.49	SE of Mean (KM)	0.04
	, ,		` '	
	hat (KM)	150.1	k star (KM)	37.68
	hat (KM)	1201	nu star (KM)	301.5
	hat (KM)	0.00327	theta star (KM)	0.013
80% gamma percer	` ′	0.556	90% gamma percentile (KM)	0.595
95% gamma percer	itile (KIVI)	0.628	99% gamma percentile (KM)	0.695
The fellowing station			in a common distribution and I/M askingston	
_		-	sing gamma distribution and KM estimates	
			/H) and Hawkins Wixley (HW) Methods	1.04/
	WH	HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.725	0.729	95% Approx. Gamma UPL 0.602	0.603
95% KM Gamma Percentile	0.558	0.558	95% Gamma USL 0.55	0.55
Logne			Detected Observations Only	
	Not End	ougn Data t	o Perform GOF Test	
	<u> </u>			
			Lognormal Distribution Using Imputed Non-Detects	
Mean in Origi		0.49	Mean in Log Scale	-0.717
SD in Origin		0.0462	SD in Log Scale	0.0945
95% UTL95% C	_	0.794	95% BCA UTL95% Coverage	N/A
95% Bootstrap (%) UTL95% (		N/A	95% UPL (t)	0.626
90% Pero	` '	0.551	95% Percentile (z)	0.57
99% Pero	entile (z)	0.608	95% USL	0.561
Statistics using KM e	stimates	on Logged	Data and Assuming Lognormal Distribution	
KM Mean of Log	ged Data	-0.717	95% KM UTL (Lognormal)95% Coverage	0.744

KM SD of Logged Data	0.0818	95% KM UPL (Lognormal)	0.606
95% KM Percentile Lognormal (z)	0.559	95% KM USL (Lognormal)	0.55
		ssuming Lognormal Distribution	0.000
Mean in Original Scale	1.495	Mean in Log Scale	0.0998
SD in Original Scale	1.161	SD in Log Scale	0.945
95% UTL95% Coverage	142.8	95% UPL (t)	13.29
90% Percentile (z)	3.71	95% Percentile (z)	5.23
99% Percentile (z)	9.96	95% USL	4.402
DL/2 is not a Recommended Metho	od. DL/2 pr	ovided for comparisons and historical reasons.	
Nonparametric [	Distribution	Free Background Statistics	
		cernible Distribution (0.05)	
		,	
Nonparametric Upper Limits for BT	Vs(no disti	inction made between detects and nondetects)	
Order of Statistic. r	4	95% UTL with95% Coverage	5
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
Approximate Sample Size needed to achieve specified CC	59	95% UPL	5
95% USL	5	95% KM Chebyshev UPL	0.685
30 % 662		30% NW Chebyshov of E	0.000
Note: The use of USL tends to yield a conservative	/e estimate	of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV of	only when th	ne data set represents a background data set free of outliers	
	-		
and consists of observat	tions collect	ted from clean unimpacted locations	
		ted from clean unimpacted locations.	
The use of USL tends to provide a balance represents a background data set and wh	ce between	false positives and false negatives provided the data naite observations need to be compared with the BTV.	
The use of USL tends to provide a balance represents a background data set and wh	ce between nen many or	false positives and false negatives provided the data nsite observations need to be compared with the BTV.	
The use of USL tends to provide a balance represents a background data set and whe	ce between nen many or General	false positives and false negatives provided the data naite observations need to be compared with the BTV.  Statistics	
The use of USL tends to provide a balance represents a background data set and who balt Total Number of Observations	General	false positives and false negatives provided the data nsite observations need to be compared with the BTV.	1
The use of USL tends to provide a balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and the background data set and the balance represents a background data set and the background	General 4	false positives and false negatives provided the data naite observations need to be compared with the BTV.  Statistics  Number of Missing Observations	
The use of USL tends to provide a balance represents a background data set and who balt Total Number of Observations	General	false positives and false negatives provided the data naite observations need to be compared with the BTV.  Statistics	1 2
The use of USL tends to provide a balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and when the balance represents a background data set and the background data set and the balance represents a background data set and the background	General 4	false positives and false negatives provided the data naite observations need to be compared with the BTV.  Statistics  Number of Missing Observations	
The use of USL tends to provide a balance represents a background data set and who balt  Total Number of Observations  Number of Distinct Observations  Number of Detects	General 4 2 2	false positives and false negatives provided the data naite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects	2
The use of USL tends to provide a balance represents a background data set and who balt  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects	General 4 2 2 1	false positives and false negatives provided the data naite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects	2
The use of USL tends to provide a balance represents a background data set and who balt  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect	General 4 2 2 1 0.16	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect	2 1 5
The use of USL tends to provide a balance represents a background data set and who balt  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect	General 4 2 2 1 0.16 0.16	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect	2 1 5 5
The use of USL tends to provide a balance represents a background data set and who balt  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected	General 4 2 2 1 0.16 0.16 0	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects	2 1 5 5 50%
The use of USL tends to provide a balance represents a background data set and whobalt  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected	General 4 2 2 1 0.16 0.16 0	Statistics  Number of Missing Observations  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected	2 1 5 5 50%
The use of USL tends to provide a balance represents a background data set and whobalt  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data	General 4 2 1 0.16 0.16 0 -1.833	Statistics  Number of Missing Observations  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected	2 1 5 5 50% 0
The use of USL tends to provide a balance represents a background data set and who balt  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Only one distinct data value was detected	General 4 2 1 0.16 0.16 0.16 -1.833	Statistics  Number of Missing Observations  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data	2 1 5 5 5 50% 0
The use of USL tends to provide a balance represents a background data set and who balt  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Only one distinct data value was detected	General 4 2 1 0.16 0.16 0.16 -1.833	Statistics  Number of Missing Observations  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  (or any other software) should not be used on such a data set	2 1 5 5 5 50% 0
The use of USL tends to provide a balance represents a background data set and when the popular and the popula	General 4 2 1 0.16 0.16 0.16 -1.833	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  (or any other software) should not be used on such a data set	2 1 5 5 5 50% 0
The use of USL tends to provide a balance represents a background data set and when the popular and the popula	General 4 2 1 0.16 0.16 0.16 -1.833	Statistics  Number of Missing Observations  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  (or any other software) should not be used on such a data set	2 1 5 5 5 50% 0
The use of USL tends to provide a balance represents a background data set and when the popular and the popula	General 4 2 1 0.16 0.16 0.16 -1.833	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  (or any other software) should not be used on such a data set	2 1 5 5 5 50% 0
The use of USL tends to provide a balance represents a background data set and when the provide a balance represents a background data set and when the provided a balance represents a background data set and when the provided and when the provided represents a background data set and w	General 4 2 1 0.16 0.16 0.16 -1.833	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  (or any other software) should not be used on such a data set	2 1 5 5 5 50% 0
The use of USL tends to provide a balance represents a background data set and when the provide a balance represents a background data set and when the provided a balance represents a background data set and when the provided with the provided and when the provided represents a background data set and when the provided represents a backgro	General 4 2 1 0.16 0.16 0.16 -1.833 dl ProUCL hined by the	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  (or any other software) should not be used on such a data set a Project Team to estimate environmental parameters (e.g., Efficiency in the software) should not processed!	2 1 5 5 5 50% 0
The use of USL tends to provide a balance represents a background data set and when the provide a balance represents a background data set and when the provided a balance represents a background data set and when the provided a balance represents a background data set and when the provided and when the provided a balance represents a background data set and when the provided a balance represents a background data set and when the provided a balance represents a background data set and when the provided data set and when the provided data set and when the provided da	General 4 2 1 0.16 0.16 0.16 -1.833 d! ProUCL hined by the	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  (or any other software) should not be used on such a data set a Project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project Team to estimate environmental parameters (e.g., Efficiency of the software) should not be used on such a data set as a project the software of the software	2 1 5 5 50% 0 0
The use of USL tends to provide a balance represents a background data set and who balt  Total Number of Observations Number of Detects Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data  Warning: Only one distinct data value was detected t is suggested to use alternative site specific values determined background and was detected to the suggested to use alternative site specific values determined background data set and who shall be a set and who shall	General 4 2 1 0.16 0.16 0.16 -1.833 dl ProUCL hined by the	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  (or any other software) should not be used on such a data set a Project Team to estimate environmental parameters (e.g., Efficiency in the software) should not processed!	2 1 5 5 5 50% 0

Number of Detects			
	2	Number of Non-Detects	2
Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	1.1	Minimum Non-Detect	10
Maximum Detect	1.2	Maximum Non-Detect	10
Variance Detected	0.005	Percent Non-Detects	50%
Mean Detected	1.15	SD Detected	0.070
Mean of Detected Logged Data	0.139	SD of Detected Logged Data	0.061
Warning: Da	ata set has	only 2 Detected Values.	
This is not enough to comp	ute meanin	gful or reliable statistics and estimates.	
Critical Values for	or Backgrou	ind Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462
		1	
Norm	al GOF Tes	t on Detects Only	
Not End	ough Data to	Perform GOF Test	
Kaplan Meier (KM) Back	ground Sta	tistics Assuming Normal Distribution	
KM Mean	1.15	KM SD	0.05
95% UTL95% Coverage	1.407	95% KM UPL (t)	1.282
90% KM Percentile (z)	1.214	95% KM Percentile (z)	1.232
99% KM Percentile (z)	1.266	95% KM USL	1.223
		<u> </u>	
DL/2 Substitution Back	around Stat	istics Assuming Normal Distribution	
		istics Assuming Normal Distribution	2.223
Mean	3.075	SD	
Mean 95% UTL95% Coverage	3.075 14.51	SD 95% UPL (t)	8.924
Mean 95% UTL95% Coverage 90% Percentile (z)	3.075 14.51 5.924	95% UPL (t) 95% Percentile (z)	8.924 6.732
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z)	3.075 14.51 5.924 8.247	95% UPL (t) 95% Percentile (z) 95% USL	8.924 6.732
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z)	3.075 14.51 5.924 8.247	95% UPL (t) 95% Percentile (z)	8.924 6.732
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) DL/2 is not a recommended meth	3.075 14.51 5.924 8.247 od. DL/2 pro	95% UPL (t) 95% Percentile (z) 95% USL ovided for comparisons and historical reasons	8.924 6.732
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) DL/2 is not a recommended meth	3.075 14.51 5.924 8.247 od. DL/2 pre	95% UPL (t) 95% Percentile (z) 95% USL 95% USL ovided for comparisons and historical reasons	8.924 6.732
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) DL/2 is not a recommended meth	3.075 14.51 5.924 8.247 od. DL/2 pre	95% UPL (t) 95% Percentile (z) 95% USL ovided for comparisons and historical reasons	8.924 6.732
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) DL/2 is not a recommended meth  Gamma GOF Not End	3.075 14.51 5.924 8.247 od. DL/2 pro	95% UPL (t) 95% Percentile (z) 95% USL povided for comparisons and historical reasons etected Observations Only o Perform GOF Test	2.223 8.924 6.732 6.326
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) DL/2 is not a recommended meth  Gamma GOF Not End	3.075 14.51 5.924 8.247 od. DL/2 pre  Tests on De  bugh Data to	95% UPL (t) 95% Percentile (z) 95% USL povided for comparisons and historical reasons etected Observations Only Deferorm GOF Test	8.924 6.732 6.326
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) DL/2 is not a recommended meth  Gamma GOF Not End  Gamma k hat (MLE)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De ough Data to  Statistics or	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  ovided for comparisons and historical reasons  etected Observations Only Deform GOF Test  n Detected Data Only k star (bias corrected MLE)	8.924 6.732 6.326
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) DL/2 is not a recommended meth  Gamma GOF Not End  Gamma k hat (MLE) Theta hat (MLE)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De  bugh Data to  Statistics on  528.7 0.00218	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  ovided for comparisons and historical reasons  etected Observations Only Deferorm GOF Test  n Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE)	8.924 6.732 6.326 N/A
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) DL/2 is not a recommended meth  Gamma GOF Not End  Gamma k hat (MLE) Theta hat (MLE) nu hat (MLE)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De ough Data to  Statistics or 528.7 0.00218 2115	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  ovided for comparisons and historical reasons  etected Observations Only Deform GOF Test  n Detected Data Only k star (bias corrected MLE)	8.924 6.732 6.326
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) DL/2 is not a recommended meth  Gamma GOF Not End  Gamma k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De ough Data to  Statistics or 528.7 0.00218 2115 N/A	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  povided for comparisons and historical reasons  etected Observations Only Perform GOF Test  Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)	8.924 6.732 6.326 N/A N/A
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) DL/2 is not a recommended meth  Gamma GOF Not End  Gamma k hat (MLE) Theta hat (MLE) nu hat (MLE)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De ough Data to  Statistics or 528.7 0.00218 2115	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  ovided for comparisons and historical reasons  etected Observations Only Deferorm GOF Test  n Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE)	8.924 6.732 6.326 N/A
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z)  DL/2 is not a recommended meth  Gamma GOF  Not End  Gamma  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De ough Data to  Statistics or 528.7 0.00218 2115 N/A N/A	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  povided for comparisons and historical reasons  etected Observations Only Deform GOF Test  In Detected Data Only    k star (bias corrected MLE)   Theta star (bias corrected MLE)   nu star (bias corrected)  95% Percentile of Chisquare (2kstar)	8.924 6.732 6.326 N/A N/A
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z)  DL/2 is not a recommended meth  Gamma GOF  Not End  Gamma  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  Estimates of G	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on Do  ough Data to  Statistics or 528.7 0.00218 2115 N/A N/A	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  povided for comparisons and historical reasons  etected Observations Only Deferorm GOF Test  A Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)	8.924 6.732 6.326 N/A N/A N/A
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z)  DL/2 is not a recommended meth  Gamma GOF Not End  Gamma k hat (MLE) Theta hat (MLE) nu hat (MLE) MLE Mean (bias corrected) MLE Sd (bias corrected)  Estimates of G Mean (KM)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De  ough Data to  Statistics or 528.7 0.00218 2115 N/A N/A  N/A  amma Para 1.15	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  povided for comparisons and historical reasons  etected Observations Only Deform GOF Test  A Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)	8.924 6.732 6.326 N/A N/A N/A
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z) 99% Percentile (z)  DL/2 is not a recommended meth  Gamma GOF Not End  R hat (MLE) Theta hat (MLE) Theta hat (MLE) MLE Mean (bias corrected) MLE Sd (bias corrected)  MLE Sd (bias corrected)  Estimates of G  Mean (KM) Variance (KM)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De  pugh Data to  528.7 0.00218 2115 N/A N/A  amma Para 1.15 0.0025	95% UPL (t) 95% Percentile (z) 95% USL povided for comparisons and historical reasons  etected Observations Only Deferorm GOF Test  A Detected Data Only    k star (bias corrected MLE)   Theta star (bias corrected MLE)   nu star (bias corrected)    95% Percentile of Chisquare (2kstar)	8.924 6.732 6.326 N/A N/A N/A N/A
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z)  DL/2 is not a recommended meth  Gamma GOF  Not End  Gamma  k hat (MLE)  Theta hat (MLE)  nu hat (MLE)  MLE Mean (bias corrected)  MLE Sd (bias corrected)  MES Mean (KM)  Variance (KM)  k hat (KM)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De ough Data to  Statistics or 528.7 0.00218 2115 N/A N/A  amma Para 1.15 0.0025 529	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  povided for comparisons and historical reasons  etected Observations Only Deferorm GOF Test  A Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  meters using KM Estimates  SD (KM) SE of Mean (KM) k star (KM)	8.924 6.732 6.326 N/A N/A N/A N/A 0.05 0.05
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z)  DL/2 is not a recommended meth  Gamma GOF Not End  R hat (MLE) Theta hat (MLE) Theta hat (MLE) MLE Mean (bias corrected) MLE Sd (bias corrected)  MES d (bias corrected)  Estimates of G Mean (KM) Variance (KM) k hat (KM) nu hat (KM)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De ough Data to  Statistics or 528.7 0.00218 2115 N/A N/A amma Para 1.15 0.0025 529 4232	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  povided for comparisons and historical reasons  elected Observations Only Deform GOF Test  The Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  meters using KM Estimates  SD (KM) SE of Mean (KM) k star (KM) nu star (KM)	8.924 6.732 6.326 N/A N/A N/A N/A 0.05 0.05 132.4
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z)  DL/2 is not a recommended meth  Gamma GOF Not End  Residual MLE) Theta hat (MLE) Theta hat (MLE) MLE Mean (bias corrected) MLE Sd (bias corrected) MLE Sd (bias corrected)  Estimates of G Mean (KM) Variance (KM) k hat (KM) nu hat (KM) nu hat (KM) theta hat (KM)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on Do  bugh Data to  Statistics or 528.7 0.00218 2115 N/A N/A  amma Para 1.15 0.0025 529 4232 0.00217	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  ovided for comparisons and historical reasons  etected Observations Only Deferor GOF Test  The perform GOF Test  The star (bias corrected MLE) The star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  meters using KM Estimates  SD (KM) SE of Mean (KM) k star (KM) nu star (KM) nu star (KM) theta star (KM)	8.924 6.732 6.326 N/A N/A N/A N/A 0.05 0.05 132.4 1059 0.0086
Mean 95% UTL95% Coverage 90% Percentile (z) 99% Percentile (z)  DL/2 is not a recommended meth  Gamma GOF Not End  R hat (MLE) Theta hat (MLE) Theta hat (MLE) MLE Mean (bias corrected) MLE Sd (bias corrected)  MES d (bias corrected)  Estimates of G Mean (KM) Variance (KM) k hat (KM) nu hat (KM)	3.075 14.51 5.924 8.247 od. DL/2 pro  Tests on De ough Data to  Statistics or 528.7 0.00218 2115 N/A N/A amma Para 1.15 0.0025 529 4232	95% UPL (t) 95% UPL (t) 95% Percentile (z) 95% USL  povided for comparisons and historical reasons  elected Observations Only Deform GOF Test  The Detected Data Only  k star (bias corrected MLE) Theta star (bias corrected MLE) nu star (bias corrected)  95% Percentile of Chisquare (2kstar)  meters using KM Estimates  SD (KM) SE of Mean (KM) k star (KM) nu star (KM)	8.924 6.732 6.326 N/A N/A N/A N/A 0.05 0.05

_		•	ing gamma distribution and KM estimates	
Upper Limits using V	Vilson	Hilferty (W	H) and Hawkins Wixley (HW) Methods	
WH		HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage 1.4		1.429	95% Approx. Gamma UPL 1.286	1.286
95% KM Gamma Percentile 1.2	233	1.234	95% Gamma USL 1.224	1.224
Lognorma	al GO	F Test on D	Detected Observations Only	
No	ot End	ough Data to	o Perform GOF Test	
Background Lognormal ROS Stat	tistics	Assuming	Lognormal Distribution Using Imputed Non-Detects	
Mean in Original S		1.15	Mean in Log Scale	0.139
SD in Original S		0.0577	SD in Log Scale	0.0502
95% UTL95% Cove	-	1.488	95% BCA UTL95% Coverage	N/A
95% Bootstrap (%) UTL95% Cove	erage	N/A	95% UPL (t)	1.311
90% Percenti	le (z)	1.225	95% Percentile (z)	1.248
99% Percenti	le (z)	1.291	95% USL	1.237
Statistics using KM estim	nates o	on Logged	Data and Assuming Lognormal Distribution	
KM Mean of Logged		0.139	95% KM UTL (Lognormal)95% Coverage	1.437
KM SD of Logged		0.0435	95% KM UPL (Lognormal)	1.288
95% KM Percentile Lognorma		1.234	95% KM USL (Lognormal)	1.224
			ssuming Lognormal Distribution	
Mean in Original S		3.075	Mean in Log Scale	0.874
SD in Original S		2.223	SD in Log Scale	0.85
95% UTL95% Cove	erage	189.7	95% UPL (t)	22.42
90% Percenti	` '	7.122	95% Percentile (z)	9.698
99% Percenti	٠,	17.31	95% USL ovided for comparisons and historical reasons.	8.306
DDZ is not a recommended	WOUN	ou. DD2 pr	ovace for companions and motorical reasons.	
·			Free Background Statistics	
Data do	not fo	ollow a Disc	ernible Distribution (0.05)	
Nonparametric Upper Limits	for B1	ΓVs(no disti	inction made between detects and nondetects)	
Order of Statis	stic, r	4	95% UTL with95% Coverage	10
Approx, f used to compute achieved	d CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
Approximate Sample Size needed to achieve specified	d CC	59	95% UPL	10
95%	USL	10	95% KM Chebyshev UPL	1.394
			of BTV, especially when the sample size starts exceeding 20.  ne data set represents a background data set free of outliers	
·				
			ted from clean unimpacted locations.	
			false positives and false negatives provided the data	
represents a background data set a	and wh	nen many oi	nsite observations need to be compared with the BTV.	
on				
	-	General	Statistics	
Total Number of Observa	Itione	2	Number of Missing Observations	3

Number of Detects	0	Number of Non-Detects	2
Number of Distinct Detects	0	Number of Distinct Non-Detects	1
Minimum Detect	N/A	Minimum Non-Detect	0.2
Maximum Detect	N/A	Maximum Non-Detect	0.2
Variance Detected	N/A	Percent Non-Detects	100%
Mean Detected	N/A	SD Detected	N/A
Mean of Detected Logged Data	N/A	SD of Detected Logged Data	N/A
		1	
Warning: Ti	nis data set	only has 2 observations!	
Data set is too small to com	pute reliable	e and meaningful statistics and estimates!	
The data se	t for variabl	e iron was not processed!	
It is suggested to collect at least 8	to 10 obse	rvations before using these statistical methods!	
If possible, compute and collect Data Qu	ality Objec	tives (DQO) based sample size and analytical results.	
ad			
	Genera	Statistics	
Total Number of Observations	2	Number of Missing Observations	3
Number of Distinct Observations	1		
Number of Detects	0	Number of Non-Detects	2
Number of Distinct Detects	0	Number of Distinct Non-Detects	1
Minimum Detect	N/A	Minimum Non-Detect	5
Maximum Detect	N/A	Maximum Non-Detect	5
Variance Detected	N/A	Percent Non-Detects	100%
Mean Detected	N/A	SD Detected	N/A
Mean of Detected Logged Data	N/A	SD of Detected Logged Data	N/A
	1 3 3 3		
Warning: Ti	nis data set	only has 2 observations!	
		e and meaningful statistics and estimates!	
		e lead was not processed!	
		·	
It is suggested to collect at least 8	to 10 obse	rvations before using these statistical methods!	
		tives (DQO) based sample size and analytical results.	
agnesium			
eneral Statistics			
Total Number of Observations	0	Number of Distinct Observations	0
		Number of Missing Observations	5
		First Oversile	N/A
Minimum	N/A	First Quartile	
Minimum Second Largest		Hirst Quartile  Median	N/A
			N/A N/A
Second Largest	N/A	Median	
Second Largest Maximum	N/A N/A	Median Third Quartile SD	N/A
Second Largest  Maximum  Mean	N/A N/A N/A	Median Third Quartile	N/A N/A
Second Largest  Maximum  Mean  Coefficient of Variation	N/A N/A N/A N/A	Median Third Quartile SD	N/A N/A

The data set for	variable ma	gnesium was not processed!	
It is suggested to collect at least 8	to 10 obser	vations before using these statistical methods!	
If possible, compute and collect Data Qua	ality Objecti	ves (DQO) based sample size and analytical results.	
manganese			
	General	Statistics	
Total Number of Observations	4	Number of Missing Observations	1
Number of Distinct Observations	4	-	
Number of Detects	3	Number of Non-Detects	1
Number of Distinct Detects	3	Number of Distinct Non-Detects	1
Minimum Detect	11	Minimum Non-Detect	10
Maximum Detect	22.2	Maximum Non-Detect	10
Variance Detected	38.41	Percent Non-Detects	25%
Mean Detected	18.13	SD Detected	6.198
Mean of Detected Logged Data	2.851	SD of Detected Logged Data	0.393
Warning: Da	ata set has o	only 3 Detected Values.	
		gful or reliable statistics and estimates.	
Critical Values fo	r Backgrou	nd Threshold Values (BTVs)	
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462
,			
Norm	al GOF Tes	t on Detects Only	
Shapiro Wilk Test Statistic	0.816	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Lev	rel
Lilliefors Test Statistic	0.356	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Lev	rel
Detected Data a	ppear Norm	nal at 5% Significance Level	
Kanlan Majar (KM) Back	around Stat	tistics Assuming Normal Distribution	
KM Mean	16.1	KM SD	5.622
95% UTL95% Coverage	45.02	95% KM UPL (t)	30.89
90% KM Percentile (z)	23.31	95% KM Percentile (z)	25.35
99% KM Percentile (z)	29.18	95% KM USL	24.32
33 % TAW 1 GIOGRAPH (2)	_5.10	30 % TAVI OOL	
DL/2 Substitution Backe	ground Stati	stics Assuming Normal Distribution	
Mean	14.85	SD	8.29
95% UTL95% Coverage	57.5	95% UPL (t)	36.66
90% Percentile (z)	25.47	95% Percentile (z)	28.49
99% Percentile (z)	34.14	95% USL	26.97
		ovided for comparisons and historical reasons	
Gamma GOF	Tests on De	etected Observations Only	
		Perform GOF Test	
Gamma	Statistics on	Detected Data Only	

	k hat (MLE)	10.78	k star (bias correct	ted MLE)	N/A
	a hat (MLE)	1.682	Theta star (bias correct		N/A
	u hat (MLE)	64.69	nu star (bias co		N/A
MLE Mean (bias	corrected)	N/A	· · · · · · · · · · · · · · · · · · ·	,	
MLE Sd (bias	corrected)	N/A	95% Percentile of Chisquare	e (2kstar)	N/A
G	amma ROS	Statistics usi	ing Imputed Non-Detects		
			NDs with many tied observations at multiple DLs		
			<1.0, especially when the sample size is small (e.g.,	, <15-20)	
			vield incorrect values of UCLs and BTVs		
Tr	nis is especia	ally true when	n the sample size is small.		
For gamma distributed detected d	ata, BTVs a	nd UCLs may	be computed using gamma distribution on KM estim	nates	
	Minimum	4.816		Mean	14.8
	Maximum	22.2		Median	16.1
	SD	8.363		CV	0.56
	k hat (MLE)	3.208	k star (bias correct	ted MLE)	0.969
Theta	a hat (MLE)	4.615	Theta star (bias correct	ted MLE)	15.28
nı	u hat (MLE)	25.66	nu star (bias co	orrected)	7.74
MLE Mean (bias	corrected)	14.8	MLE Sd (bias co	orrected)	15.04
95% Percentile of Chisqu	are (2kstar)	5.869	90% Pe	Percentile	34.36
95%	6 Percentile	44.85	99% Pe	ercentile	69.28
The following statis	stics are cor	nputed using	Gamma ROS Statistics on Imputed Data		
Upper Limits ս	sing Wilson	Hilferty (WH	l) and Hawkins Wixley (HW) Methods		
	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	131.9	162.7	95% Approx. Gamma UPL	53.28	57.8
95% Gamma USL	31.12	32.01			
Est	imates of Ga	amma Param	neters using KM Estimates		
	Mean (KM)	16.1	:	SD (KM)	5.622
Va	riance (KM)	31.61	SE of Me	ean (KM)	3.443
	k hat (KM)	8.2	ks	star (KM)	2.21
1	nu hat (KM)	65.6	nu s	star (KM)	17.73
the	ta hat (KM)	1.963	theta s	star (KM)	7.26
				otal (Itili)	
80% gamma pero	centile (KM)	23.81	90% gamma percen		
80% gamma pero	` ′	23.81 36.98	90% gamma percen 99% gamma percen	ntile (KM)	30.57
95% gamma pero	centile (KM)	36.98		ntile (KM)	30.57
95% gamma pero	centile (KM)	36.98	99% gamma percen	ntile (KM)	30.57
95% gamma pero	centile (KM)	36.98	99% gamma percen ng gamma distribution and KM estimates l) and Hawkins Wixley (HW) Methods	ntile (KM)	30.57
95% gamma pero	centile (KM)	36.98 omputed usin	99% gamma percen ng gamma distribution and KM estimates l) and Hawkins Wixley (HW) Methods	ntile (KM)	30.57 51.11
95% gamma pero The following star Upper Limits u	tistics are cousing Wilson	36.98 omputed usin Hilferty (WH	99% gamma percen ng gamma distribution and KM estimates d) and Hawkins Wixley (HW) Methods 95% Approx. Gamma UPL	ntile (KM) ntile (KM)	30.57 51.11
95% gamma pero The following star Upper Limits u  95% Approx. Gamma UTL with 95% Coverage 95% KM Gamma Percentile	tistics are cousing Wilson WH 65.9 26.59	36.98  computed usin Hilferty (WH HW 71.26 26.8	99% gamma percen ng gamma distribution and KM estimates d) and Hawkins Wixley (HW) Methods 95% Approx. Gamma UPL	wh wh wh wh wh wh	30.57 51.11 HW 36.2
95% gamma pero The following star Upper Limits u  95% Approx. Gamma UTL with 95% Coverage 95% KM Gamma Percentile	tistics are cosing Wilson WH 65.9 26.59	36.98  computed usin Hilferty (WH HW 71.26 26.8	99% gamma percen ng gamma distribution and KM estimates d) and Hawkins Wixley (HW) Methods 95% Approx. Gamma UPL 95% Gamma USL	wh wh wh wh wh wh	30.57 51.11 HW 36.2
95% gamma pero  The following star  Upper Limits u  95% Approx. Gamma UTL with 95% Coverage  95% KM Gamma Percentile	tistics are consisting Wilson WH 65.9 26.59 cgnormal GO est Statistic	36.98  Description of the second of the seco	99% gamma percen ng gamma distribution and KM estimates i) and Hawkins Wixley (HW) Methods 95% Approx. Gamma UPL 95% Gamma USL	WH 35.35 25.15	30.57 51.11 HW 36.2 25.28
95% gamma perc  The following star  Upper Limits u  95% Approx. Gamma UTL with 95% Coverage 95% KM Gamma Percentile  Log  Shapiro Wilk To  5% Shapiro Wilk Co	tistics are consisting Wilson WH 65.9 26.59 cgnormal GO est Statistic	36.98  computed usin Hilferty (WH HW 71.26 26.8  F Test on De 0.799	99% gamma percen  ng gamma distribution and KM estimates  i) and Hawkins Wixley (HW) Methods  95% Approx. Gamma UPL 95% Gamma USL  etected Observations Only  Shapiro Wilk GOF Test	WH 35.35 25.15	30.57 51.11 HW 36.2 25.28
95% gamma perc  The following star  Upper Limits u  95% Approx. Gamma UTL with 95% Coverage 95% KM Gamma Percentile  Log  Shapiro Wilk To  5% Shapiro Wilk Co	tistics are consing Wilson WH 65.9 26.59  gnormal GO est Statistic ritical Value est Statistic	36.98  computed usin Hilferty (WH HW 71.26 26.8  F Test on De 0.799 0.767	99% gamma percen  ng gamma distribution and KM estimates  i) and Hawkins Wixley (HW) Methods  95% Approx. Gamma UPL 95% Gamma USL  etected Observations Only  Shapiro Wilk GOF Test  Detected Data appear Lognormal at 5% Signi	WH 35.35 25.15	30.57 51.11 HW 36.2 25.28

Mean in Original Scale  SD in Original Scale	15.22	Maan in Las Caala	2 606
		Mean in Log Scale	2.606
<b>-</b>	7.712	SD in Log Scale	0.586
95% UTL95% Coverage	275.3	95% BCA UTL95% Coverage	N/A
95% Bootstrap (%) UTL95% Coverage	N/A	95% UPL (t)	63.21
90% Percentile (z)	28.68	95% Percentile (z)	35.48
99% Percentile (z)	52.88	95% USL	31.88
Statistics using KM estimates	on Logged	Data and Assuming Lognormal Distribution	
KM Mean of Logged Data	2.714	95% KM UTL (Lognormal)95% Coverage	98.78
KM SD of Logged Data	0.365	95% KM UPL (Lognormal)	39.44
95% KM Percentile Lognormal (z)	27.51	95% KM USL (Lognormal)	25.74
		ssuming Lognormal Distribution	
Mean in Original Scale	14.85	Mean in Log Scale	2.54
SD in Original Scale	8.29	SD in Log Scale	0.699
95% UTL95% Coverage	461.2	95% UPL (t)	79.71
90% Percentile (z)	31.05	95% Percentile (z)	40.02
99% Percentile (z)	64.42	95% USL	35.23
DL/2 is not a Recommended Meth	od. DL/2 pr	ovided for comparisons and historical reasons.	
		Free Background Statistics	
Data appear to follow a	Discernible	Distribution at 5% Significance Level	
		inction made between detects and nondetects)	
Order of Statistic, r	4	95% UTL with95% Coverage	22.2
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.18
Approximate Sample Size needed to achieve specified CC	59	95% UPL	22.2
95% USL	22.2	95% KM Chebyshev UPL	43.5
Note: The use of LISL tends to yield a conservati	ve estimate	of BTV, especially when the sample size starts exceeding 20	
		of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV	only when tl	he data set represents a background data set free of outliers	
Therefore, one may use USL to estimate a BTV and consists of observa	only when that	he data set represents a background data set free of outliers ted from clean unimpacted locations.	
Therefore, one may use USL to estimate a BTV and consists of observa  The use of USL tends to provide a balance.	only when the tions collections between	he data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data	
Therefore, one may use USL to estimate a BTV and consists of observa  The use of USL tends to provide a balance.	only when the tions collections between	he data set represents a background data set free of outliers ted from clean unimpacted locations.	
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and when	only when the tions collections between	he data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data	
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and when	only when the tions collections between	he data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data	
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and when	only when the strict on the strict of the st	he data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data	
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi	only when the strict on the strict of the st	the data set represents a background data set free of outliers ted from clean unimpacted locations.  If alse positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics	1
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and with nercury  Total Number of Observations	only when the strong collections collections between then many or strong General 4	the data set represents a background data set free of outliers ted from clean unimpacted locations.  If alse positives and false negatives provided the data insite observations need to be compared with the BTV.	1
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi  lercury  Total Number of Observations Number of Distinct Observations	only when the strions collections collections collections collections then many or strictly desired to the strictly desired to	he data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations	
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and will percury  Total Number of Observations	General  1 0	ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects	4
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi  ercury  Total Number of Observations Number of Distinct Observations Number of Distinct Detects	General 4 1 0	ted from clean unimpacted locations.  If alse positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects	4
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi  nercury  Total Number of Observations Number of Distinct Observations Number of Detects Number of Distinct Detects Minimum Detect	General  1 0 0 N/A	he data set represents a background data set free of outliers ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect	4 1 0.2
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi  nercury  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect	General  1 0 0 N/A N/A	ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect	4 1 0.2 0.2
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi nercury  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected	General 4 1 0 0 N/A N/A	ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects	4 1 0.2 0.2 100%
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected	General  4  1  0  N/A  N/A  N/A	Statistics  Number of Missing Observations  Number of Distinct Non-Detects  Maximum Non-Detect  Maximum Non-Detects  SD Detected	4 1 0.2 0.2 100% N/A
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and wi  nercury  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected	General 4 1 0 0 N/A N/A	ted from clean unimpacted locations.  false positives and false negatives provided the data insite observations need to be compared with the BTV.  Statistics  Number of Missing Observations  Number of Non-Detects Number of Distinct Non-Detects Minimum Non-Detect Maximum Non-Detect Percent Non-Detects	4 1 0.2 0.2 100%
Therefore, one may use USL to estimate a BTV and consists of observa The use of USL tends to provide a balan represents a background data set and will ercury  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Detected Mean of Detected Logged Data	General 4 1 0 0 N/A N/A N/A N/A	Statistics  Number of Missing Observations  Number of Distinct Non-Detects  Maximum Non-Detect  Maximum Non-Detects  SD Detected	4 1 0.2 0.2 100% N/A

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).										
The data set for	or variable m	nercury was not processed!								
nickel										
	General									
Total Number of Observations	4	Number of Missing Observations	1							
Number of Distinct Observations	3	Number of New Potents								
Number of Detects  Number of Distinct Detects	2	Number of Non-Detects  Number of Distinct Non-Detects	2							
Minimum Detects	_	Minimum Non-Detect	10							
Maximum Detect		Maximum Non-Detect	10							
Variance Detected		Percent Non-Detects	50%							
Mean Detected	0.31	SD Detected	0.0283							
Mean of Detected Logged Data	-1.173	SD of Detected Logged Data	0.0283							
Manda e										
-		only 2 Detected Values.  gful or reliable statistics and estimates.								
This is not enough to comp	Jate meaning	grador reliable statistics and estimates.								
0.511/1	- D. I.	17. 1.117.1.07.0								
		nd Threshold Values (BTVs)	1 400							
Tolerance Factor K (For UTL)	5.144	d2max (for USL)	1.462							
Norm	nal GOF Tes	t on Detects Only								
Not En	ough Data to	Perform GOF Test								
Kaplan Meier (KM) Bac	karound Stat	tistics Assuming Normal Distribution								
KM Mean	_	KM SD	0.02							
95% UTL95% Coverage	0.413	95% KM UPL (t)	0.363							
90% KM Percentile (z)	0.336	95% KM Percentile (z)	0.343							
99% KM Percentile (z)	0.357	95% KM USL	0.339							
		stics Assuming Normal Distribution	0.700							
Mean		SD OFFICIAL (A)	2.708							
95% UTL95% Coverage	16.58	95% UPL (t)	9.78							
90% Percentile (z)		95% Percentile (z)	7.109							
99% Percentile (z)	8.954	95% USL pvided for comparisons and historical reasons	6.615							
DDZ is not a recommended mean	iod. DEZ pro	vided for comparisons and mistorical reasons								
		etected Observations Only								
Not En	ougn Data to	Perform GOF Test								
Gamma	Statistics or	Detected Data Only								
k hat (MLE)	239.9	k star (bias corrected MLE)	N/A							
Theta hat (MLE)	0.00129	Theta star (bias corrected MLE)	N/A							
nu hat (MLE)	959.7	nu star (bias corrected)	N/A							
MLE Mean (bias corrected)	N/A									
MLE Sd (bias corrected)	N/A	95% Percentile of Chisquare (2kstar)	N/A							

			meters using KM Estimates					
	Mean (KM)	0.31	SD (KM)	0.02				
Val	riance (KM)		SE of Mean (KM)	0.02				
	k hat (KM)	240.3	k star (KM)	60.23				
	nu hat (KM)	1922	nu star (KM)	481.8				
	ta hat (KM)	0.00129	theta star (KM)	0.005				
80% gamma pero		0.343	90% gamma percentile (KM)	0.36				
95% gamma pero	centile (KM)	0.378	99% gamma percentile (KM)	0.41				
			ing gamma distribution and KM estimates					
Upper Limits ι	sing Wilsor	n Hilferty (W	H) and Hawkins Wixley (HW) Methods					
	WH	HW	WH	HW				
95% Approx. Gamma UTL with 95% Coverage	0.424	0.426	95% Approx. Gamma UPL 0.365	0.36				
95% KM Gamma Percentile	0.344	0.344	95% Gamma USL 0.34	0.34				
Loį	normal GC	F Test on D	etected Observations Only					
	Not En	ough Data to	Perform GOF Test					
Background Lognormal RC	S Statistics	Assuming	Lognormal Distribution Using Imputed Non-Detects					
Mean in Or		0.31	Mean in Log Scale	-1.17				
	iginal Scale	0.0231	SD in Log Scale	0.07				
95% UTL95%		0.454	95% BCA UTL95% Coverage					
95% Bootstrap (%) UTL95%		N/A	95% UPL (t)	0.37				
. , ,	ercentile (z)	0.34	95% Percentile (z)					
	ercentile (z)	0.368	95% USL					
Statistics using KM	l estimates	on Logged I	Data and Assuming Lognormal Distribution					
KM Mean of L		-1.173	95% KM UTL (Lognormal)95% Coverage	0.43				
KM SD of Lo		0.0646	95% KM UPL (Lognormal)					
95% KM Percentile Lo		0.344	95% KM USL (Lognormal)	0.36				
Dados	d DI (0	Otatiatiaa Aa	Distribution					
			ssuming Lognormal Distribution	0.21				
Mean in Or		2.655	Mean in Log Scale					
	iginal Scale	2.708	SD in Log Scale	1.60 85.42				
95% UTL95%	ercentile (z)	4851	95% UPL (t)					
	ercentile (z)	9.758 52.33	95% Percentile (z) 95% USL	17.5 13.0				
			ovided for comparisons and historical reasons.					
Nor	narametric	Dietribution	Free Background Statistics					
			ernible Distribution (0.05)					
Manager and December 1	l imite for D	T\/o/== -!:-:	notion made between detects and southers.					
•			nction made between detects and nondetects)	10				
	f Statistic, r	4	95% UTL with95% Coverage	10				
Approx, f used to compute a		0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.18				
Approximate Sample Size needed to achieve s	95% USL	59 10	95% UPL 95% KM Chebyshev UPL	10 0.40				

	only when th	e data set represents a background data set free of outliers	
		ed from clean unimpacted locations.	
		false positives and false negatives provided the data	
represents a background data set and w	hen many on	site observations need to be compared with the BTV.	
ootassium			
General Statistics			
Total Number of Observations	0	Number of Distinct Observations	0
		Number of Missing Observations	5
Minimum	N/A	First Quartile	N/A
Second Larges	N/A	Median	N/A
Maximum	N/A	Third Quartile	N/A
Mear		SD	N/A
Coefficient of Variation	N/A	Skewness	N/A
Warning: T	his data set o	only has 0 observations!	
		and meaningful statistics and estimates!	
	-	tassium was not processed!	
		vations before using these statistical methods!	
If possible, compute and collect Data Q	uality Objecti	ves (DQO) based sample size and analytical results.	
selenium	General	Statistics	
Total Number of Observations	4	Number of Missing Observations	1
Number of Distinct Observations	3		
Number of Detects	2	Number of Non-Detects	2
Number of Distinct Detects	2	Number of Distinct Non-Detects	
Minimum Detec	0.096	Minimum Non-Detect	1
Maximum Detec	0.11	Maximum Non-Detect	20
Variance Detected		Percent Non-Detects	20 20 50%
Mean Detected	0.103	SD Detected	20 20 50% 0.0099
	0.103		20 20 50% 0.0099
Mean Detected  Mean of Detected Logged Data	0.103 -2.275	SD Detected	20 20 50% 0.0099
Mean Detected  Mean of Detected Logged Data  Warning: I	0.103 -2.275 Data set has	SD Detected SD of Detected Logged Data	20 20 50% 0.0099
Mean Detected  Mean of Detected Logged Data  Warning: I	0.103 -2.275 Data set has	SD Detected SD of Detected Logged Data only 2 Detected Values.	20 20 50% 0.0099
Mean Detected  Mean of Detected Logged Data  Warning: I  This is not enough to com	0.103 -2.275  Pata set has opute meaning	SD Detected SD of Detected Logged Data only 2 Detected Values. gful or reliable statistics and estimates.	20 20 50% 0.0099
Mean Detected  Mean of Detected Logged Data  Warning: I  This is not enough to com  Critical Values	0.103 -2.275 Data set has opute meaning	SD Detected SD of Detected Logged Data only 2 Detected Values. gful or reliable statistics and estimates.  Ind Threshold Values (BTVs)	20 20 50% 0.0099 0.0963
Mean Detected  Mean of Detected Logged Data  Warning: I  This is not enough to com	0.103 -2.275 Data set has opute meaning	SD Detected SD of Detected Logged Data only 2 Detected Values. gful or reliable statistics and estimates.	20 20 50% 0.0099 0.0963
Mean Detected  Mean of Detected Logged Data  Warning: I  This is not enough to com  Critical Values  Tolerance Factor K (For UTL)	0.103 -2.275  Pata set has opute meaning  for Backgrou  5.144	SD Detected SD of Detected Logged Data only 2 Detected Values. gful or reliable statistics and estimates.  Ind Threshold Values (BTVs)	20 20 50% 0.0099 0.0963
Mean Detected  Mean of Detected Logged Data  Warning: I  This is not enough to com  Critical Values  Tolerance Factor K (For UTL)	0.103 -2.275 Data set has opute meaning for Backgrou 5.144	SD Detected SD of Detected Logged Data only 2 Detected Values. gful or reliable statistics and estimates.  Ind Threshold Values (BTVs)  d2max (for USL)	20 20 50% 0.0099 0.0963
Mean Detected  Mean of Detected Logged Data  Warning: I  This is not enough to com  Critical Values  Tolerance Factor K (For UTL)	0.103 -2.275 Data set has opute meaning for Backgrou 5.144	SD Detected SD of Detected Logged Data only 2 Detected Values. gful or reliable statistics and estimates.  Ind Threshold Values (BTVs)	20 20 50% 0.0099 0.0963
Mean Detected  Mean of Detected Logged Data  Warning: I  This is not enough to com  Critical Values  Tolerance Factor K (For UTL)  Norr  Not Er	0.103 -2.275  Pata set has opute meaning  for Backgrou 5.144  nal GOF Testough Data to	SD Detected SD of Detected Logged Data only 2 Detected Values. gful or reliable statistics and estimates.  Ind Threshold Values (BTVs)  d2max (for USL)	20
Mean Detected  Mean of Detected Logged Data  Warning: I  This is not enough to com  Critical Values  Tolerance Factor K (For UTL)  Norr  Not Er	0.103 -2.275 Data set has opute meaning for Backgrou 5.144 mal GOF Testough Data to	SD Detected SD of Detected Logged Data  only 2 Detected Values. gful or reliable statistics and estimates.  d2max (for USL)  t on Detects Only Perform GOF Test	20 20 50% 0.0099 0.0963

	Percentile (z)	0.112	95% KM Percentile (z)	0.115
99% KM F	Percentile (z)	0.119	95% KM USL	0.113
DL/2 Subs	titution Back	ground Stat	istics Assuming Normal Distribution	
	Mean	5.052	SD	5.714
95% UTL95	% Coverage	34.44	95% UPL (t)	20.09
90% F	Percentile (z)	12.37	95% Percentile (z)	14.45
99% F	Percentile (z)	18.34	95% USL	13.41
DL/2 is not a recomm	nended meth	od. DL/2 pro	ovided for comparisons and historical reasons	
G	amma GOF	Tests on De	etected Observations Only	
	Not End	ough Data to	Perform GOF Test	
		Statistics or	n Detected Data Only	
	k hat (MLE)	216.2	k star (bias corrected MLE)	N/A
The	ta hat (MLE)	4.7646E-4	Theta star (bias corrected MLE)	N/A
1	nu hat (MLE)	864.7	nu star (bias corrected)	N/A
MLE Mean (bia	as corrected)	N/A		
MLE Sd (bia	as corrected)	N/A	95% Percentile of Chisquare (2kstar)	N/A
Es	stimates of G	amma Para	meters using KM Estimates	
	Mean (KM)	0.103	SD (KM)	0.007
Va	ariance (KM)	4.9000E-5	SE of Mean (KM)	0.007
	k hat (KM)	216.5	k star (KM)	54.29
	nu hat (KM)	1732	nu star (KM)	434.4
th	eta hat (KM)	4.7573E-4	theta star (KM)	0.0019
80% gamma pe	rcentile (KM)	0.115	90% gamma percentile (KM)	0.121
95% gamma pe	rcentile (KM)	0.127	99% gamma percentile (KM)	0.138
The following sta	atistics are co	omputed usi	ing gamma distribution and KM estimates	
Upper Limits	using Wilson	Hilferty (W	H) and Hawkins Wixley (HW) Methods	
	WH	HW	WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.143	0.144	95% Approx. Gamma UPL 0.122	0 100
95% KM Gamma Percentile				0.123
	0.115	0.115	95% Gamma USL 0.113	0.123
Lo	ognormal GO	F Test on D	Detected Observations Only	
Lo	ognormal GO	F Test on D		
	ognormal GO Not End	F Test on D	Detected Observations Only Dependent of Perform GOF Test	
Background Lognormal R	ognormal GO  Not End  OS Statistics	F Test on Dough Data to	Detected Observations Only Detected Observations Only Detected Observation Using Imputed Non-Detects	0.113
Background Lognormal R Mean in O	ognormal GO Not End OS Statistics Original Scale	F Test on Dough Data to	Detected Observations Only Dependent of Perform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale	-2.275
Background Lognormal R Mean in O SD in O	OS Statistics Original Scale Original Scale	F Test on Dough Data to  Assuming I  0.103  0.00808	Detected Observations Only Deperform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale	-2.275 0.0786
Background Lognormal R  Mean in O  SD in O  95% UTL95	OS Statistics Original Scale Original Scale Original Scale Original Scale	F Test on D ough Data to Assuming I 0.103 0.00808 0.154	Detected Observations Only Deperform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage	-2.275 0.0786 N/A
Background Lognormal R  Mean in O  SD in O  95% UTL95  95% Bootstrap (%) UTL95	OS Statistics Original Scale Original Scale Original Scale Original Scale Original Scale Original Scale	F Test on Dough Data to  Assuming I  0.103  0.00808  0.154  N/A	Detected Observations Only Deperform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t)	-2.275 0.0786 N/A 0.126
Background Lognormal R  Mean in O  SD in O  95% UTL95  95% Bootstrap (%) UTL95	OS Statistics Original Scale	F Test on D ough Data to 6 Assuming I 0.103 0.00808 0.154 N/A 0.114	Detected Observations Only Deperform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z)	-2.275 0.0786 N/A 0.126 0.117
Background Lognormal R  Mean in O  SD in O  95% UTL95  95% Bootstrap (%) UTL95	OS Statistics Original Scale Original Scale Original Scale Original Scale Original Scale Original Scale	F Test on Dough Data to  Assuming I  0.103  0.00808  0.154  N/A	Detected Observations Only Deperform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t)	-2.275 0.0786 N/A 0.126 0.117
Background Lognormal R  Mean in O  SD in O  95% UTL95  95% Bootstrap (%) UTL95  90% F	OS Statistics OS Statistics Original Scale	F Test on D ough Data to Assuming I 0.103 0.00808 0.154 N/A 0.114 0.123	Detected Observations Only Deperform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL	-2.275 0.0786 N/A 0.126 0.117
Background Lognormal R  Mean in O  SD in O  95% UTL95  95% Bootstrap (%) UTL95  90% F  99% F	OS Statistics OS Statistics Original Scale	F Test on D  ough Data to  Assuming I  0.103  0.00808  0.154  N/A  0.114  0.123  on Logged I	Detected Observations Only Deperform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution	-2.275 0.0786 N/A 0.126 0.117 0.115
Background Lognormal R  Mean in O  SD in O  95% UTL95  95% Bootstrap (%) UTL95  90% F  99% F  Statistics using K  KM Mean of I	OS Statistics Original Scale	F Test on D  ough Data to  Assuming I  0.103  0.00808  0.154  N/A  0.114  0.123  on Logged I  -2.275	Detected Observations Only Deferor GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution 95% KM UTL (Lognormal)95% Coverage	-2.275 0.0786 N/A 0.126 0.117 0.115
Background Lognormal R  Mean in O  SD in O  95% UTL95  95% Bootstrap (%) UTL95  90% F  99% F  Statistics using K  KM Mean of I	OS Statistics OS Statistics Original Scale Original	F Test on D  ough Data to  Assuming I  0.103  0.00808  0.154  N/A  0.114  0.123  on Logged I	Detected Observations Only Deperform GOF Test  Lognormal Distribution Using Imputed Non-Detects  Mean in Log Scale SD in Log Scale 95% BCA UTL95% Coverage 95% UPL (t) 95% Percentile (z) 95% USL  Data and Assuming Lognormal Distribution	0.113 -2.275 0.0786 N/A 0.126 0.117 0.115

		ssuming Lognormal Distribution	
Mean in Original Scale	5.052	Mean in Log Scale	0.0136
SD in Original Scale	5.714	SD in Log Scale	2.644
95% UTL95% Coverage		95% UPL (t)	1064
90% Percentile (z)	30.01	95% Percentile (z)	78.42
99% Percentile (z)	475.2	95% USL	48.42
DL/2 is not a Recommended Meth	oa. DL/2 pr	ovided for comparisons and historical reasons.	
<u> </u>		Free Background Statistics	
Data do not fo	ollow a Disc	cernible Distribution (0.05)	
Nonparametric Upper Limits for B	ΓVs(no dist	inction made between detects and nondetects)	
Order of Statistic, r	4	95% UTL with95% Coverage	20
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
Approximate Sample Size needed to achieve specified CC	59	95% UPL	20
95% USL	20	95% KM Chebyshev UPL	0.137
30% 002		30% NW Gliebyshev of E	0.107
Note: The use of USL tends to yield a conservation	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV	only when t	he data set represents a background data set free of outliers	
and consists of observa	tions collec	ted from clean unimpacted locations.	
The use of USL tends to provide a balan	ce between	false positives and false negatives provided the data	
represents a background data set and wh	nen many o	nsite observations need to be compared with the BTV.	
General Statistics  Total Number of Observations	4	Number of Distinct Observations	3
		Number of Missing Observations	1
Minimum	85.3	First Quartile	85.45
Second Largest	100	Median	92.75
Maximum	100	Third Quartile	100
Mean	92.7	SD	8.43
Coefficient of Variation	0.0909	Skewness	00
Mean of logged Data	4.526	SD of logged Data	-4.875E-4
			-4.875E-4 0.0911
Critical Values for	or Backgrou	und Threshold Values (BTVs)	
Critical Values fo	or Backgrou 5.144	und Threshold Values (BTVs) d2max (for USL)	
	5.144		0.0911
	5.144	d2max (for USL)	0.0911
Tolerance Factor K (For UTL)	5.144 Normal	d2max (for USL)	0.0911
Tolerance Factor K (For UTL)  Shapiro Wilk Test Statistic	5.144 Normal 0.737	GOF Test Shapiro Wilk GOF Test	0.0911
Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic	5.144 Normal ( 0.737 0.748 0.307	GOF Test  Shapiro Wilk GOF Test  Data Not Normal at 5% Significance Level  Lilliefors GOF Test	0.0911
Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  Lilliefors Test Statistic  5% Lilliefors Critical Value	5.144 Normal ( 0.737 0.748 0.307 0.375	GOF Test  Shapiro Wilk GOF Test  Data Not Normal at 5% Significance Level	0.0911
Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value  Data appear Appr	5.144  Normal (  0.737  0.748  0.307  0.375  roximate No	GOF Test  Shapiro Wilk GOF Test  Data Not Normal at 5% Significance Level  Lilliefors GOF Test  Data appear Normal at 5% Significance Level  ormal at 5% Significance Level	0.0911
Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  Lilliefors Test Statistic  5% Lilliefors Critical Value  Data appear Appr	5.144  Normal (0.737) 0.748 0.307 0.375  roximate No	GOF Test  Shapiro Wilk GOF Test  Data Not Normal at 5% Significance Level  Lilliefors GOF Test  Data appear Normal at 5% Significance Level  ormal at 5% Significance Level  suming Normal Distribution	1.462
Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value  Data appear Appr  Background St 95% UTL with 95% Coverage	5.144  Normal of the state of t	GOF Test  Shapiro Wilk GOF Test  Data Not Normal at 5% Significance Level  Lilliefors GOF Test  Data appear Normal at 5% Significance Level  ormal at 5% Significance Level  suming Normal Distribution  90% Percentile (z)	1.462
Shapiro Wilk Test Statistic  5% Shapiro Wilk Critical Value  Lilliefors Test Statistic  5% Lilliefors Critical Value  Data appear Appr	5.144  Normal (0.737) 0.748 0.307 0.375  roximate No	GOF Test  Shapiro Wilk GOF Test  Data Not Normal at 5% Significance Level  Lilliefors GOF Test  Data appear Normal at 5% Significance Level  ormal at 5% Significance Level  suming Normal Distribution	1.462

		GOF Test	
A-D Test Statistic	0.706	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.657	Data Not Gamma Distributed at 5% Significance Lev	el
K-S Test Statistic	0.341	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significant	ce Level
Detected data follow Ap	pr. Gamma	Distribution at 5% Significance Level	
	Gamma	Statistics	
k hat (MLE)	160.9	k star (bias corrected MLE)	40.39
Theta hat (MLE)	0.576	Theta star (bias corrected MLE)	2.295
nu hat (MLE)		nu star (bias corrected)	323.1
MLE Mean (bias corrected)	92.7	MLE Sd (bias corrected)	14.59
(,		,	
	tatistics Ass	suming Gamma Distribution	
95% Wilson Hilferty (WH) Approx. Gamma UPL	116.5	90% Percentile	111.8
95% Hawkins Wixley (HW) Approx. Gamma UPL	116.7	95% Percentile	117.9
95% WH Approx. Gamma UTL with 95% Coverage	143	99% Percentile	130
95% HW Approx. Gamma UTL with 95% Coverage	144.1		
95% WH USL	105.4	95% HW USL	105.4
	Lognorms	al GOF Test	
Shapiro Wilk Test Statistic	0.737	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.737	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.748	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.307	Data appear Lognormal at 5% Significance Level	
		normal at 5% Significance Level	
Баш арреат друго	Aimate Log	normal at 5% digimicance Level	
Background Sta	itistics assu	ıming Lognormal Distribution	
95% UTL with 95% Coverage	147.7	90% Percentile (z)	103.9
95% UPL (t)	117.5	95% Percentile (z)	107.4
95% USL	105.6	99% Percentile (z)	114.2
<u> </u>		Free Background Statistics	
Data appear App	roximate No	ormal at 5% Significance Level	
Nonparametric Uni	er Limits fo	or Background Threshold Values	
Order of Statistic, r	4	95% UTL with 95% Coverage	100
Approx, f used to compute achieved CC	0.211	Approximate Actual Confidence Coefficient achieved by UTL	0.185
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	N/A	95% BCA Bootstrap UTL with 95% Coverage	N/A
95% UPL	100	90% Percentile	100
90% Chebyshev UPL	121	95% Percentile	100
95% Chebyshev UPL	133.8	99% Percentile	100
95% USL	100		
		1	
Note: The use of USL tends to yield a conservati	ve estimate	of BTV, especially when the sample size starts exceeding 20.	
Therefore, one may use USL to estimate a BTV	only when t	he data set represents a background data set free of outliers	
		ted from clean unimpacted locations.	
		false positives and false negatives provided the data	

	en many o		
ilver			
General Statistics			
Total Number of Observations	0	Number of Distinct Observations	0
Minimum	N/A	Number of Missing Observations	5 N/A
Minimum Second Largest	N/A N/A	First Quartile	N/A N/A
Second Largest  Maximum	N/A	Median Third Quartile	N/A
Mean	N/A	SD	N/A
Coefficient of Variation	N/A	Skewness	N/A
ossilisti valtatori	1471	G.Co.m.occ	
_		only has 0 observations!	
		e and meaningful statistics and estimates!	
The data set t	or variable	silver was not processed!	
		rvations before using these statistical methods!	
If possible, compute and collect Data Qua	ality Objec	tives (DQO) based sample size and analytical results.	
sodium			
General Statistics			
Total Number of Observations	0	Number of Distinct Observations	0
		Number of Missing Observations	5
Minimum	N/A	First Quartile	N/A
Second Largest	N/A	Median	N/A
Maximum	N/A	Third Quartile	N/A
Mean	N/A	SD	N/A
Coefficient of Variation	N/A	Skewness	N/A
Warning: Th	ie data eat	only has 0 observations!	
Data set is too small to comp	ute reliable	e and meaningful statistics and estimates!	
Data set is too small to comp	ute reliable	e and meaningful statistics and estimates!	
Data set is too small to comp  The data set for	ute reliable or variable	e and meaningful statistics and estimates!	
Data set is too small to comp  The data set fo	ute reliable or variable to 10 obse	e and meaningful statistics and estimates! sodium was not processed!	
Data set is too small to comp  The data set fo	ute reliable or variable to 10 obse	e and meaningful statistics and estimates! sodium was not processed! rvations before using these statistical methods!	
Data set is too small to comp  The data set fo	ute reliable or variable to 10 obse	e and meaningful statistics and estimates! sodium was not processed! rvations before using these statistical methods!	
Data set is too small to comp The data set fo  It is suggested to collect at least 8  If possible, compute and collect Data Qua	ute reliable or variable to 10 obse	e and meaningful statistics and estimates! sodium was not processed! rvations before using these statistical methods!	
Data set is too small to comp The data set fo  It is suggested to collect at least 8  If possible, compute and collect Data Qua	ute reliable or variable to 10 obse	e and meaningful statistics and estimates! sodium was not processed! rvations before using these statistical methods!	
Data set is too small to comp The data set fo  It is suggested to collect at least 8  If possible, compute and collect Data Qua	ute reliable or variable to 10 obse ality Object	e and meaningful statistics and estimates! sodium was not processed! rvations before using these statistical methods!	
Data set is too small to comp The data set fo  It is suggested to collect at least 8  If possible, compute and collect Data Qua	ute reliable or variable to 10 obse ality Object	e and meaningful statistics and estimates! sodium was not processed!  rvations before using these statistical methods! tives (DQO) based sample size and analytical results.	3
Data set is too small to comp The data set for It is suggested to collect at least 8 If possible, compute and collect Data Que	ute reliable or variable to 10 obse ality Object	e and meaningful statistics and estimates! sodium was not processed!  rvations before using these statistical methods! tives (DQO) based sample size and analytical results.	3
Data set is too small to comp The data set for It is suggested to collect at least 8 If possible, compute and collect Data Quenthallium Total Number of Observations	ute reliable or variable to 10 obse ality Objec  General	e and meaningful statistics and estimates! sodium was not processed!  rvations before using these statistical methods! tives (DQO) based sample size and analytical results.	3
Data set is too small to comp The data set for It is suggested to collect at least 8 If possible, compute and collect Data Quantitation thallium  Total Number of Observations Number of Distinct Observations	ute reliable or variable to 10 obse ality Object  General 2 1	e and meaningful statistics and estimates! sodium was not processed!  rvations before using these statistical methods! tives (DQO) based sample size and analytical results.  Statistics  Number of Missing Observations	
Data set is too small to comp The data set for It is suggested to collect at least 8 If possible, compute and collect Data Que thallium  Total Number of Observations Number of Distinct Observations Number of Detects	ute reliable or variable to 10 obse ality Object  General 2 1 0	and meaningful statistics and estimates! sodium was not processed!  rvations before using these statistical methods! tives (DQO) based sample size and analytical results.  Statistics  Number of Missing Observations  Number of Non-Detects	2
Data set is too small to comp The data set for It is suggested to collect at least 8 If possible, compute and collect Data Que thallium  Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects	ute reliable or variable to 10 obse ality Objec  General 2 1 0 0	and meaningful statistics and estimates!  sodium was not processed!  rvations before using these statistical methods!  tives (DQO) based sample size and analytical results.  Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects	2

	Mean Detected	N/A	SD Detected	N/A
	Mean of Detected Logged Data	N/A	SD of Detected Logged Data	N/A
	55			
	Warning: Th	is data set	only has 2 observations!	
	Data set is too small to comp	ute reliable	and meaningful statistics and estimates!	
	The data set fo	r variable tl	nallium was not processed!	
	It is a compared to collect at least 0	ta 10 ahaas	vestions hadous vising the secretarities I methods	
			vations before using these statistical methods!  ves (DQO) based sample size and analytical results.	
	ii possible, compute and collect bata Qui	anty Object	ves (DQO) based sample size and analytical results.	
nadium				
	Total Number of Observations		Statistics	
	Total Number of Observations  Number of Distinct Observations	2	Number of Missing Observations	3
	Number of Distinct Observations  Number of Detects	0	Number of Non-Detects	2
	Number of Distinct Detects	0	Number of Distinct Non-Detects	1
	Minimum Detect	N/A	Minimum Non-Detect	5
	Maximum Detect	N/A	Maximum Non-Detect	5
	Variance Detected	N/A	Percent Non-Detects	100%
	Mean Detected	N/A	SD Detected	N/A
	Mean of Detected Logged Data	N/A	SD of Detected Logged Data	N/A
	It is suggested to collect at least 8	to 10 obser	vations before using these statistical methods!	
			vations before using these statistical methods! ves (DQO) based sample size and analytical results.	
inc				
nc		ality Object	ves (DQO) based sample size and analytical results.	
nc		ality Object	ves (DQO) based sample size and analytical results.  Statistics	3
nc	If possible, compute and collect Data Qu	ality Object	ves (DQO) based sample size and analytical results.	3
nc	If possible, compute and collect Data Quantum Total Number of Observations	General 2	ves (DQO) based sample size and analytical results.  Statistics	3
nc	Total Number of Observations Number of Distinct Observations	General 2	ves (DQO) based sample size and analytical results.  Statistics  Number of Missing Observations	
nc	Total Number of Observations Number of Distinct Observations Number of Detects	General 2 1 0	ves (DQO) based sample size and analytical results.  Statistics  Number of Missing Observations  Number of Non-Detects	2
nc	Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects	General 2 1 0	Ves (DQO) based sample size and analytical results.  Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects	2
nc	Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect	General 2 1 0 0 N/A	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect	2 1 30 30
nc	Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect	General 2 1 0 0 N/A N/A	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect	2 1 30 30
nc	Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected	General 2 1 0 0 N/A N/A N/A	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects	2 1 30 30 100%
nc	Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean Of Detected Logged Data	General 2 1 0 0 N/A N/A N/A N/A N/A	Statistics  Number of Missing Observations  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected	2 1 30 30 100% N/A
inc	Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean of Detected Logged Data  Warning: Th	General 2 1 0 0 N/A N/A N/A N/A N/A ute reliable	Statistics  Number of Missing Observations  Number of Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data  only has 2 observations!  and meaningful statistics and estimates!	2 1 30 30 100% N/A
nc	Total Number of Observations Number of Distinct Observations Number of Distinct Detects Number of Distinct Detects Minimum Detect Maximum Detect Variance Detected Mean of Detected Logged Data  Warning: Th	General 2 1 0 0 N/A N/A N/A N/A N/A ute reliable	Statistics  Number of Missing Observations  Number of Distinct Non-Detects  Number of Distinct Non-Detects  Minimum Non-Detect  Maximum Non-Detect  Percent Non-Detects  SD Detected  SD of Detected Logged Data	2 1 30 30 100% N/A

If possible, compute and collect Data Qu	ality Objectiv	ves (DQO) based sample size and analytical results.	
ardness			
eneral Statistics			
Total Number of Observations	2	Number of Distinct Observations	2
		Number of Missing Observations	3
Minimum	53600	First Quartile	53700
Second Largest	53600	Median	53800
Maximum	54000	Third Quartile	53900
Mean	53800	SD	282.8
Coefficient of Variation	0.00526	Skewness	N/A
Warning: Th	nis data set o	nly has 2 observations!	
Data set is too small to comp	oute reliable	and meaningful statistics and estimates!	
The data set fo	r variable Ha	rdness was not processed!	
It is suggested to collect at least 8	to 10 observ	rations before using these statistical methods!	
If possible, compute and collect Data Qu	ality Objectiv	res (DQO) based sample size and analytical results.	

# **Appendix C - DEQ Risk Calculator Documentation**

# **Appendix C-1**

**Exposure Point Concentration Tables** 

# **Appendix C-2**

Exposure Unit #1 – Resident and Non-Residential Worker (0-2 ft bgs soil samples, background concentrations included)

# **Appendix C-3**

Exposure Unit #1 – Construction Worker (0-10 ft bgs soil samples, background concentrations included)

# **Appendix C-4**

Exposure Unit #2 Trail – Greenway User and Construction Worker (soil samples, background concentrations included)

# **Appendix C-5**

Exposure Unit #2 Creek – Greenway User (sediment and surface water samples, background concentrations included)

# Appendix C-6

Exposure Unit #3 – Resident, Non-Residential Worker, and Greenway User (0-2 ft bgs soil samples, background concentrations included)

# **Appendix C-7**

Exposure Unit #3 - Construction Worker (0-10 ft bgs soil samples, background concentrations included)

# **Appendix C-8**

Exposure Unit #1 – Resident and Non-Residential Worker (0-2 ft bgs soil samples, background concentrations excluded)

### **Appendix C-9**

Exposure Unit #1 – Construction Worker (0-10 ft bgs soil samples, background concentrations excluded)

### **Appendix C-10**

Exposure Unit #2 Trail – Greenway User and Construction Worker (soil samples, background concentrations excluded)

# **Appendix C-11**

Exposure Unit #2 Creek – Greenway User (sediment and surface water samples, background concentrations excluded)

# **Appendix C-12**

Exposure Unit #3 – Resident, Non-Residential Worker, and Greenway User (0-2 ft bgs soil samples, background concentrations excluded)

### **Appendix C-13**

Exposure Unit #3 - Construction Worker (0-10 ft bgs soil samples, background concentrations excluded)

# Appendix C-1 Exposure Point Concentration Tables Exposure Unit #1 Direct Contact to Soil Pathway 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job. No. TCH-009

Sample ID	Sample Date	Material Sampled (Soil or CCP)	Sample Depth	arsenic	barium	beryllium	cadmium	hexavalent chromium	trivalent chromium	cobalt	copper	lead	manganese	mercury	nickel	selenium	strontium	thallium	vanadium	zinc
	Site-Specific BSV		3.015	87.86	0.929	0.313	5.725	70.2	36.31	77.3	59.11	1,149	0.256	19.49	2.503	43.19	0.981	227	230	
S-4	04/29/13	CCP	1 ft	14	24	ND	1.5	NA	NA	30	65	20	1,500	0.011	43	ND	NA	ND	21	120
S-5*	01/31/14	ССР	0-4 ft	37	2,800	NA	ND	1.3	19.7	NA	NA	10	NA	0.30	NA	3.2	NA	NA	NA	NA
S-6*	01/31/14	CCP	0-4 ft	43	3,200	NA	ND	2.7	19.3	NA	NA	12	NA	0.42	NA	6.1	NA	NA	NA	NA
GP-1	02/03/14	ССР	8-12 ft	3.5	86	NA	ND	ND	8.8	NA	NA	26	NA	0.083	NA	ND	NA	NA	NA	NA
GP-2	02/03/14	CCP	26-28 ft	41	1,100	NA	ND	ND	19	NA	NA	11	NA	0.24	NA	4.0	NA	NA	NA	NA
GP-3	02/03/14	CCP	10-12 ft	48	1,200	NA	ND	0.53	22.47	NA	NA	39	NA	0.42	NA	ND	NA	NA	NA	NA
GP-4	02/04/14	CCP	10-12 ft	59	2,900	NA	ND	ND	20	NA	NA	11	NA	0.51	NA	5.8	NA	NA	NA	NA
	02/04/14	CCP	4-6 ft	72	2,800	NA	ND	ND	19	NA	NA	9.5	NA	0.33	NA	2.6	NA	NA	NA	NA
GP-5	04/03/19	CCP	4-6 ft	95.9	2,350	5.46	< 0.956	0.836 J	12.3	7.05	50.9	NA	34.7	1.2	11.1	12	325	NA	NA	NA
	04/03/19 <sup>1</sup>	CCP	4-6 ft	95.9	2,630	6.99	< 0.931	0.712 J	16.2	10.3	62.5	NA	53.4	0.39	17.1	13	308	NA	NA	NA
GP-6	02/04/14	CCP	9-11 ft	65	850	NA	ND	ND	19	NA	NA	27	NA	11	NA	4.1	NA	NA	NA	NA
GI -0	04/04/19	CCP	9-10 ft	6.73	178	0.758	0.118 J	<1.11	10.0	5.18	11	NA	687	0.05	6.24	0.88	21.7	NA	NA	NA
GP-7	02/04/14	CCP	10-12 ft	55	1,700	NA	ND	ND	19	NA	NA	11	NA	0.26	NA	4.3	NA	NA	NA	NA
GP-8	02/04/14	CCP	11-15 ft	54	4,100	NA	ND	ND	20	NA	NA	9.2	NA	0.29	NA	4.5	NA	NA	NA	NA
GP-11	02/04/14	CCP	4-6 ft	16	450	NA	ND	ND	16	NA	NA	23	NA	0.35	NA	ND	NA	NA	NA	NA
GP-12	02/04/14	CCP	2-4 ft	52	2,000	NA	ND	ND	19	NA	NA	14	NA	0.28	NA	2.1	NA	NA	NA	NA
HH-1	11/03/16	Soil	0-1 ft	5.9	120	1.00	< 0.29	0.45	20.55	7.9	25	27	350	0.052	8.8	0.69	31	<0.58	48	50
пп-1	11/03/16 <sup>1</sup>	Soil	0-1 ft	3.4	110	0.79	< 0.35	0.54	19.46	8.4	17	18	360 BH	0.067	12	< 0.71	30	< 0.71	41	35
HH-2	11/03/16	Soil	0-1 ft	4.9	140	0.93	< 0.29	0.43	13.57	12	21	30	260	0.085	5.9	1.0	25	<0.58	48	43
HH-3	11/03/16	Soil	0-1 ft	9.9	200	1.30	< 0.33	0.46 J	17.54	7.8	31	24	350	0.076	8.9	2.4	36	< 0.65	53	100
HH-4	11/03/16	Soil	0-1 ft	2.4	72	1.00	<0.28	0.50	44.5	16	37	2.3	630	< 0.023	33	< 0.56	42	0.60	73	70
HH-5	11/03/16	Soil	0-1 ft	2.4	73	0.75	< 0.30	< 0.14	23	8.4	19	9.3	410	< 0.025	14	1.2	23	< 0.60	39	51
MW-7	11/01/16	Soil	0-1 ft	2.6	67	0.87	< 0.30	0.89	9.11	3.9	180	7.6	100	0.030	2.9	< 0.59	6.7	< 0.59	61	46
	Maximum Concent	rations - All Samples		95.9	4,100	6.99	1.5	2.7	44.5	30	180	39	1,500	11	43	13	325	0.60	73	120
Max		ns - Shallow (0-2') Inte	erval	14	200	1.30	1.5	0.89	44.5	30	180	30	1,500	0.085	43	2.4	42	0.60	73	120
		nstruction Worker (0-1		95.9	3,200	6.99	1.5	2.7	44.5	30	180	30	1,500	11	43	13	325	0.60	73	120

Notes:

Red indicates concentration is below recommended site-specific background screening value (BSV).

Orange shading indicates maximum concentration in all samples.

Blue shading indicated maximum concentrations in samples that include the shallow (0-2 ft) interval.

Purple shading indicates maximum concentrations in samples that include the 0-10 ft interval.

Grey shading indicates concentration is maximum concentration in all use scenarios.

CCP = Coal Combustion Product; ND = Not Detected; NA = Not Analyzed.

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.

BH = Method blank greater than one-half laboratory reporting limit, but sample concentration greater than 10x the method blank.

<sup>&</sup>lt;sup>1</sup> Duplicate sample taken.

<sup>\*</sup>Location resampled at 0-1 ft interval (HH-2 and HH-5); 0-1 ft sample considered more representative of shallow interval.

# Appendix C-1 Exposure Point Concentration Tables Exposure Unit #2 Direct Contact to Soil Pathway 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job. No. TCH-009

Sample ID	Date	Material Sampled (Soil or CCP)	Sample Depth	arsenic	barium	beryllium	cadmium	hexavalent chromium	trivalent chromium	cobalt	copper	lead	manganese	mercury	nickel	selenium	strontium	thallium	vanadium	zinc
		-Specific BSV		3.015	87.86	0.929	0.313	5.725	70.2	36.31	77.3	59.11	1,149	0.256	19.49	2.503	43.19	0.981	227	230
SS-7	02/18/16	Soil	2-12 in	3.1	84	0.60	ND	NA	NA	6.9	15	13	500	0.038	5.9	ND	31	ND	37	37
HH-8	10/27/16	Soil	0-1 ft	3.6	100	1.00	< 0.30	< 0.35	19	12	29	18	570	0.036	9.0	<0.60	28	<0.60	52	54
MW-6	11/02/16	Soil	0-1 ft	2.9	38	0.61	< 0.26	0.21 J	9.79	9.5	23	12	570	0.082	8.2	1.0	22	0.81	31	77
SED-3A	04/05/19	Soil	0-1 ft	3.45	33.9	0.418 J	<0.582	<1.16	17.4	16.5	6.97	NA	560	< 0.0054	5.82	0.237 J	9.6	NA	NA	NA
SED-5A	04/04/19	Soil	0-1 ft	1.25	13.5	0.156 J	< 0.571	0.352 J	13.2	5.95	39.1	NA	243	0.0071	4.38	< 0.571	10.9	NA	NA	NA
SED-8	04/05/19	Drainage Pathway Soil	2-6 in	2.41	49.1	0.313 J	0.122 J	<1.25	12.0	7.01	14.3	NA	423	0.063	4.66	1.01	15.2	NA	NA	NA
SED-9	04/05/19	Drainage Pathway Soil	2-6 in	1.16	33.8	0.199 J	< 0.660	0.461 J	21.6	9.11	10.1	NA	431	0.013	6.68	<0.660	16.7	NA	NA	NA
SED-10	04/05/19	Drainage Pathway Soil	2-6 in	1.29	24.4	0.118 J	0.221 J	0.418 J	12.0	4.43	10.8	NA	195	0.037	4.03	0.273 J	8.1	NA	NA	NA
SED-12	08/27/19	Drainage Pathway Soil	0-2 in	4.73	102	0.765 J	0.214 J	<1.68	27.6	6.17	23.1	NA	341	0.042	7.69	0.961	25.4	NA	NA	NA
OLD 12	04/05/19	Drainage Pathway Soil	2-6 in	3.97	122	0.499 J	0.204 J	<1.74	9.45	6.04	19.7	NA	319	0.077	4.95	1.36	32.8	NA	NA	NA
SED-13	08/27/19	Drainage Pathway Soil	0-2 in	12.4	958	1.56	0.284 J	<2.03	29.4	13.9	38.9	NA	538	0.12	19.2	3.07	125	NA	NA	NA
OLD-10	04/05/19	Drainage Pathway Soil	2-6 in	14.5	724	1.1	0.171 J	<1.58	14.0	7.58	27.1	NA	563	0.075	8.73	1.69	70.5	NA	NA	NA
SED-18	04/05/19	Drainage Pathway Soil	2-6 in	4.53	137	0.534 J	< 0.689	<1.38	18.7	11.1	28.2	NA	464	0.051	9	1.85	32.6	NA	NA	NA
SED-19	04/05/19	Drainage Pathway Soil	2-6 in	1.55	20	0.161 J	<0.588	0.435 J	21.7	7.98	8.38	NA	266	0.0073	4.94	0.334 J	15	NA	NA	NA
SED-20	04/05/19	Drainage Pathway Soil	2-6 in	0.792	31.4	0.152 J	< 0.687	<1.37	5.76	4.5	9.1	NA	360	0.012	2.19	0.263 J	11.5	NA	NA	NA
SED-21	04/05/19	Drainage Pathway Soil	2-6 in	1.12	25.9	0.149 J	< 0.591	<1.18	20.9	4.44	6.58	NA	221	0.011	2.7	0.286 J	12.8	NA	NA	NA
Excavation G-1	04/16/20	Soil	2-3 ft	3.68	58.8	<3.08	<1.23	0.478 J	20.0	5.73	14.5	NA	193	0.052	6.94	<3.08	6.2	NA	NA	NA
Excavation H-3	05/11/20	Soil	1-2 ft	2.41	71.0	<3.28	<1.31	0.410 J	40.2	14.1	43.4	NA	251	0.0485 J	12.5	1.46 J	58.1	NA	NA	NA
Excavation H-5	05/11/20	Soil	1-2 ft	1.10 J	74.5	<3.04	<1.22	0.497 J	21.1	8.25	16.9	NA	558	<0.0486	6.77	<3.04	32.2	NA	NA	NA
Excavation H-6	05/11/20	Soil	1-2 ft	1.02 J	96.0	<2.97	<1.19	<1.19	14.9	7.57	10.7	NA	557	0.0222 J	4.03	<2.97	20.5	NA	NA	NA
Excavation H-7	11/09/20	Soil	0-1 ft	1.10 J	73.7	0.767 J	<1.22	<1.22	8.04	3.68	15.0	NA	233	0.022	4.63	0.479 J	9.6	NA	NA	NA
Excavation I-1	04/08/20	Soil	1-2 ft	2.91	67.2	<2.77	<1.11	0.457 J	26.2	13.0	18.3	NA	594	0.042	8.25	<2.77	26.3	NA	NA	NA
Excavation I-2	04/08/20	Soil	1-2 ft	3.65	74.1	<2.85	<1.14	0.313 J	23.3	12.0	21.4	NA	544	0.022	8.70	<2.85	17.2	NA	NA	NA
Excavation I-3	04/08/20	Soil	1-2 ft	2.18	61.5	<2.88	<1.15	0.387 J	13.1	9.23	19.5	NA	419	0.019	6.02	<2.88	13.3	NA	NA	NA
	Maximur	n Concentrations*		14.5	958	1.56	0.284	0.497	40.2	16.5	43.4	18	594	0.12	19.2	3.07	125	0.81	52	77

## Notes

Red indicates concentration is below recommended site-specific background screening value (BSV).

Orange shading indicates maximum exposure unit concentration.

CCP = Coal Combustion Product; ND = Not Detected; NA = Not Analyzed.

Site-Specific Background Screening Value (BSV) represents 95% upper threshold level (UTL) with 95% coverage calculated using EPA ProUCL 5.1.

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.

<sup>\*</sup>Maximum concentration for samples collected in shallow (0-2 ft) soil interval are the same as maximum concentrations.

## Appendix C-1 Exposure Point Concentration Tables Exposure Unit #2

Direct Contact to Sediment Pathway 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job. No. TCH-009

Sediment Sampling Point ID	Sample Date	arsenic	barium	beryllium	hexavalent chromium	trivalent chromium	cobalt	copper	manganese	mercury	nickel	selenium	strontium
Recommended S	Site-Specific BSV	2.74	38.4	0.48	0.79	69.5	16.388	13.8	759	0.0078	9.92	0.409	16.9
SED-3 (Adjacent)	04/05/19	1.36	16.4	0.111 J	0.670 J	13.5	5.18	20.2	225	0.0054 J	4.81	< 0.607	9.2
SED-4 (Adjacent)	04/05/19	2.35	20.3	0.191 J	0.456 J	63.8	7.26	8.39	293	0.0080	10.5	0.344 J	30.7
SED-5 (Downstream)	04/04/19	1.82	24.3	0.233 J	0.595 J	16.8	5.9	8.86	399	<0.0035	4.86	<0.617	6.2
Maximum Co	oncentrations	2.35	24.3	0.233	0.670	63.8	7.26	20.2	399	0.0080	10.5	0.344	30.7

## Notes:

Red indicates concentration is below recommended site-specific background screening value (BSV).

## Orange shading indicates maximum exposure unit concentration.

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.

## Appendix C-1 Exposure Point Concentration Tables Exposure Unit #2

## Direct Contact to Surface Water Pathway 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job. No. TCH-009

Surface Water Sampling Point ID	Sample Date	arsenic	barium	total chromium	cobalt	copper²	manganese	nickel <sup>2</sup>	selenium	strontium
Recommended S	Site-Specific BSV	0.44	27	0.53	0.16	1.2	22.2	0.33	0.11	100
	11/03/16	<10	27	<5.0	<5.0	<10	34	<10	<20	100
SW-3 (Adjacent)	11/03/16 <sup>1</sup>	<10	27	< 5.0	<5.0	<10	33	<10	<20	110
	04/05/19	0.45	25.7	0.62	0.26	2.8	37.4	0.50	0.11 J	88.8
	11/03/16	<10	27	<5.0	<5.0	<10	25	<10	<20	110
SW-4 (Adjacent)	04/05/19	0.42	23.6	< 0.50	0.14	1.0	24.6	0.26 J	0.10 J	89.1
	04/05/19 <sup>1</sup>	0.41	23.7	< 0.50	0.14	0.98	24.8	0.26 J	0.088 J	87.7
SW-5 (Downstream)	11/03/16	<10	26	<5.0	<5.0	<10	24	<10	<20	100
SW-5 (DOWNStream)	04/04/19	0.40	16.9	< 0.50	0.14	0.88	19.5	0.21 J	0.12 J	81.8
SW-21 (Drainage	04/05/19	0.40	32.1	0.73	0.36	3.2	29.5	0.62	0.11 J	69.9
Pathway)	04/05/19 <sup>2</sup>	0.15	18.3	< 0.50	0.094 J	3.1	9.3	0.43 J	< 0.50	43.5
Maximum Co	ncentrations	0.45	32.1	0.73	0.36	3.2	37.4	0.62	0.12	110

## Notes:

Red indicates concentration is below recommended site-specific background screening value (BSV).

## Orange shading indicates maximum exposure unit concentration.

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.

<sup>&</sup>lt;sup>1</sup> Duplicate sample taken.

<sup>&</sup>lt;sup>2</sup> Sample was field filtered.

## Appendix C-1 Exposure Point Concentration Tables Exposure Unit #3 Direct Contact to Soil Pathway 828 Martin Luther King, Jr. Blvd. Chapel Hill, North Carolina H&H Job. No. TCH-009

Sample ID	Sample Date	Material Sampled (Soil or CCP)	Sample Depth	arsenic	barium	beryllium	cadmium	hexavalent chromium	trivalent chromium	cobalt	copper	manganese	mercury	nickel	selenium	strontium
Recom	mended Site	e-Specific BS	V	3.015	87.86	0.929	0.313	5.725	70.2	36.31	77.3	1,149	0.256	19.49	2.503	43.19
HH-9	04/03/19	CCP	0-1 ft	3.37	131	0.398 J	0.178 J	<1.29	12.7	5.97	14.5	260	0.31	3.59	0.722	33.2
HH-10	04/03/19	CCP	0-1 ft	60.3	2,970	5.14	0.162 J	<1.60	13.8	9.84	51.3	73.3	0.22	17.1	5.04	269
HH-11	04/03/19	CCP	0-1 ft	42.5	3,260	5.9	0.220 J	0.467 J	18.7	13.4	55.3	113	0.43	23.5	9.05	234
S-7	01/31/14	CCP	0-4 ft	44	2,500	NA	ND	1.4	27.6	NA	NA	11	NA	0.44	NA	4.5
Excavation H-1	05/11/20	Soil	1-2 ft	1.16	37.2	<2.76	<1.10	<1.10	20.1	10.7	15.3	412	< 0.0442	5.80	<2.76	29.3
Excavation H-2	05/11/20	Soil	1-2 ft	1.93	100	<3.25	<1.30	0.578 J	43.8	19.1	59.2	265	0.0494 J	16.2	1.58 J	56.8
Excavation H-4	05/11/20	Soil	2-3 ft	2.03	67.1	<3.04	<1.22	0.388 J	25.8	20.8	24.0	1,480	0.0237 J	7.81	<3.04	38.1
Max	Maximum Concentrations			60.3	3,260	5.9	0.220	1.4	43.8	20.8	59.2	1,480	0.43	23.5	9.05	269
Maximum Cond	<b>Maximum Concentrations - Shallow Interval Only</b>			60.3	3,260	5.9	0.220	1.4	43.8	19.1	59.2	412	0.43	23.5	9.05	269

## Notes:

Red indicates concentration is below recommended site-specific background screening value (BSV).

Orange shading indicates maximum exposure unit concentration.

CCP = Coal Combustion Product.

J = Detected above method detection limit but below laboratory reporting limit; therefore, result is an estimated concentration.



Version Date:	June 2021
Basis:	May 2021 EPA RSL Table
Site Name:	828 MLK Jr. Blvd Property
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina
DEQ Section:	Brownfields Program
Site ID:	BPN 21061-17-060
Exposure Unit ID:	EU #1 Resident & Non-Residential Worker
Submittal Date:	
Prepared By:	Hart & Hickman, PC
r repared by:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina
Reviewed By:	

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Exposure Cint ID.	EU #1 Resident & Pon-Residential Worker	Check bo	
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Input Form 1A	Complete Exposure Pathways	<b>V</b>	
Input Form 1B	Exposure Factors and Target Risks	<b>✓</b>	
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	Groundwater to Groundwater - Forward Mode		
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1	Groundwater to Surface Water - Forward Mode		
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Output Form 4F	Groundwater to Groundwater - Backward Mode		
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Complete Exposure Pathways		Input Form 1A		
Version Date: June 2021 Basis: May 2021 EPA RSL T Site ID: BPN 21061-17-060	'able			
	sident & Non-Residential Worker			
-	ulated for complete exposure pathways.			
Receptor	Pathway	Check box if pathway complete		
DIRECT CON	TACT SOIL AND WATER PATHWAYS			
Resident	Soil	<b>✓</b>		
Resident	Groundwater Use			
Non-Residential Worker	Soil	>		
Non-Residential Worker	Groundwater Use			
Construction Worker	Soil			
Dagwartay/Tragnaggar	Soil			
Recreator/Trespasser	Surface Water			
VAP	OR INTRUSION PATHWAYS			
	Groundwater to Indoor Air			
Resident	Soil Gas to Indoor Air			
	Indoor Air			
	Groundwater to Indoor Air			
Non-Residential Worker	Soil Gas to Indoor Air			
	Indoor Air			
CONTAM	IINANT MIGRATION PATHWAYS			
Groundwater	Source Soil			
Oroundwater	Source Groundwater			
Surface Water	Source Soil			
Surface water	Source Groundwater			

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #1 Resident & Non-Residential Worker

	1	1	
Exposure Parameter	Default Value	Site Specific	Justification
	Genera	Value al	
Target Cancer Risk (individual)	1.0E-06	1.0E-06	
Target Cancer Risk (cumulative)	1.0E-04	1.0E-04	
Target Hazard Index (individual)	2.0E-01	2.0E-01	
Target Hazard Index (unulative)	1.0E+00	1.0E+00	
Target Hazard fidex (cumulative)	Residential		
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	15	15	
Exposure Duration (ED) (yr)	6	6	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	2373	
Soil Adherence Factor (AF) (mg/cm²)	0.2	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	6365	6365	
Water Ingestion Rate (IRW) (L/d)	0.78	0.78	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.54	0.78	
	0.34		
Water Event Frequency (EV) (events/day)	Residential	A dult	
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	20	20	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
2	6032	6032	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.07	0.07	
Soil Adherence Factor (AF) (mg/cm²) Soil Ingestion Rate (IRS) (mg/day)	100	100	
1	19652	19652	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	2.5		
Water Ingestion Rate (IRW) (L/d)	0.71	2.5	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71	
Water Event Frequency (EV) (events/day)	Non-Residentia	1	
I :f-time (I T) ()	70	70	
Lifetime (LT) (years)	80	80	
Body Weight (BW) (kg)  Exposure Duration (ED) (vr)	25	25	
Exposure Fraguency (FF) (d/yr)	250		
Exposure Frequency (EF) (d/yr)	8	250 8	
Exposure Time (ET) (hr)	3527		
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.12	3527	
Soil Adherence Factor (AF) (mg/cm²)	100	0.12	
Soil Ingestion Rate (IR) (mg/day)		100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	0.83	0.83	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67	
Water Event Frequency (EV) (events/day)	1	1	
T.C.: (T.T.)	Construction 70		
Lifetime (LT) (years)		70	
Body Weight (BW) (kg)	80	80	
Working Weeks (EW) (wk/yr)	50	50	
Exposure Duration (ED) (yr)	1	1	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.3	0.3	
Soil Ingestion Rate (IR) (mg/day)	330	330	

Exposure Factors and Target Risks Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

## Exposure Unit ID: EU #1 Resident & Non-Residential Worker

Exposure Parameter	Defau	lt Value	Site Specific Value	Justification
		User Defined		
		Trespasser		
Lifetime (LT) (years)	70	NA	70	
Averaging Time (AT) (days/yr)	365	NA	365	
Body Weight (BW) (kg)	15	NA	15	
Exposure Duration 0-2 (ED) (yr)	2	NA	2	
Exposure Duration 2-6 (ED) (yr)	4	NA	4	
Exposure Frequency (EF) (d/yr)	195	NA	195	
Exposure Time (ET) (hr)	2	NA	2	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365	
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	2	
Water Event Frequency (EV) (events/day)	1	NA	1	
	Ī	Jser Defined	d Adult	
	Recreator	Trespasser		
Lifetime (LT) (years)	70	70	70	
Body Weight (BW) (kg)	80	45	80	
Exposure Duration 6-16 (ED) (yr)	10	10	10	
Exposure Duration 16-26 (ED) (yr)	10	0	10	
Exposure Frequency (EF) (d/yr)	195	90	195	
Exposure Time (ET) (hr)	2	2	2	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	200	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652	
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	2	
Water Event Frequency (EV) (events/day)	1	1	1	

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #1 Resident & Non-Residential Worker

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from shallow samples (0-2 ft) collected within the exposure unit.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (mg/kg)	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
14	S-4	7440-38-2	Arsenic, Inorganic			mg/kg										
200	HH-3	7440-39-3	Barium			mg/kg										
1.3	HH-3	7440-41-7	Beryllium and compounds			mg/kg										
1.5	S-4	7440-43-9	Cadmium (Diet)			mg/kg										
44.5	HH-4	16065-83-1	Chromium(III), Insoluble Salts			mg/kg										
0.89	MW-7	18540-29-9	Chromium(VI)			mg/kg										
30	S-4	7440-48-4	Cobalt			mg/kg										
180	MW-7	7440-50-8	Copper			mg/kg										
30	HH-2	7439-92-1	~Lead and Compounds			mg/kg										
1500	S-4	7439-96-5	Manganese (Non-diet)			mg/kg										
0.085	HH-2	7439-97-6	~Mercury (elemental)			mg/kg										
43	S-4	7440-02-0	Nickel Soluble Salts			mg/kg										
2.4	HH-3	7782-49-2	Selenium			mg/kg										
42	HH-4	7440-24-6	Strontium, Stable			mg/kg										
0.6	HH-4	7440-28-0	Thallium (Soluble Salts)			mg/kg										
73	HH-4	7440-62-2	Vanadium and Compounds			mg/kg										
120	S-4	7440-66-6	Zinc and Compounds			mg/kg										

Risk for Individual Pathways	Output Form 1A
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Version Date: June 2021

**Basis:** May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

**Exposure Unit ID:** EU #1 Resident & Non-Residential Worker

DIRE	CCT CONTACT SOIL AND WATE	R CALCULATO	ORS									
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?								
Resident	Soil	2.4E-05	3.6E+00	YES								
Resident	Groundwater Use*	NC	NC	NC								
Non-Residential Worker	Soil	4.8E-06	2.4E-01	NO								
Non-Residential Worker	Groundwater Use*	NC	NC	NC								
Construction Worker	Soil	NC	NC	NC								
Recreator/Trespasser	Soil	NC	NC	NC								
Recreator/Trespasser	Surface Water*	NC	NC	NC								
VAPOR INTRUSION CALCULATORS												
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded								
	Groundwater to Indoor Air	NC	NC	NC								
Resident	Soil Gas to Indoor Air	NC	NC	NC								
	Indoor Air	NC	NC	NC								
	Groundwater to Indoor Air	NC	NC	NC								
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC								
	Indoor Air	NC	NC	NC								
	CONTAMINANT MIGRATION CA	LCULATORS										
Pathway	Source	Target Rec	eptor Concentratio	ons Exceeded?								
Groundwater	Source Soil	Exceedence of	2L at Receptor?	NC								
Groundwater	Source Groundwater	Exceedence of	2L at Receptor?	NC								
Surface Water	Source Soil	Exceedence of	2B at Receptor?	NC								
Surface Water	Source Groundwater	Exceedence of 2B at Receptor? NC										

## Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based closure.
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

Output Form 2A

DEQ Risk Calculator - Direct Contact - Resident Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

## Exposure Unit ID: EU #1 Resident & Non-Residential Worker

\* - Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

\*\* - Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 400 mg/kg for residential soil.

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk*	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient*	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	14	14	14	1.8E-05	2.5E-06	3.6E-10	2.1E-05	3.6E-01	4.2E-02	1.5E-05	4.0E-01
7440-39-3	Barium	200	200	200					1.3E-02		6.5E-06	1.3E-02
7440-41-7	Beryllium and compounds	1.3	1.3	1.3			1.9E-11	1.9E-11	8.3E-03		1.1E-06	8.3E-03
7440-43-9	Cadmium (Diet)	1.5	1.5	1.5			1.6E-11	1.6E-11	1.9E-02	1.8E-03	2.4E-06	2.1E-02
16065-83-1	Chromium(III), Insoluble Salts	44.5	44.5	44.5					3.8E-04			3.8E-04
18540-29-9	Chromium(VI)	0.89	0.89	0.89	2.9E-06		1.2E-09	2.9E-06	3.8E-03		1.4E-07	3.8E-03
7440-48-4	Cobalt	30	30	30			1.6E-09	1.6E-09	1.3E+00		8.1E-05	1.3E+00
7440-50-8	Copper	180	180	180					5.8E-02			5.8E-02
7439-92-1	~Lead and Compounds	30	30	30					<\$L**	<sl**< td=""><td>&lt;\$L**</td><td></td></sl**<>	<\$L**	
7439-96-5	Manganese (Non-diet)	1500	1500	1500					8.0E-01		4.8E-04	8.0E-01
7439-97-6	~Mercury (elemental)	0.085	0.085	0.085							7.3E-03	7.3E-03
7440-02-0	Nickel Soluble Salts	43	43	43			6.7E-11	6.7E-11	2.7E-02		7.7E-06	2.7E-02
7782-49-2	Selenium	2.4	2.4	2.4					6.1E-03		1.9E-09	6.1E-03
7440-24-6	Strontium, Stable	42	42	42					8.9E-04			8.9E-04
7440-28-0	Thallium (Soluble Salts)	0.6	0.6	0.6					7.7E-01			7.7E-01
7440-62-2	Vanadium and Compounds	73	73	73					1.9E-01		1.2E-05	1.9E-01
7440-66-6	Zinc and Compounds	120	120	120					5.1E-03			5.1E-03

Cumulative:

2.4E-05

3.6E+00

DEQ Risk Calculator - Direct Contact - Non-Residential Worker Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Output Form 2C

## Exposure Unit ID: EU #1 Resident & Non-Residential Worker

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

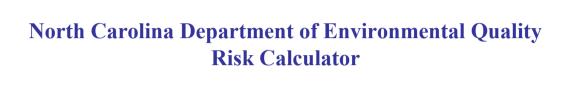
  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 800 mg/kg for commercial/industrial soil.

			1			r	1					
CAS#	Chemical Name:	Ingestion Concentration	Dermal Concentration	Inhalation Concentration	Ingestion Carcinogenic	Dermal Carcinogenic	Inhalation Carcinogenic	Calculated Carcinogenic	Ingestion Hazard	Dermal Hazard	Inhalation Hazard	Calculated Non- Carcinogenic
0.15 //	Chemical Fame.	(mg/kg)	(mg/kg)	(mg/kg)*	Risk	Risk	Risk	Risk	Ouotient	Quotient	Quotient	Hazard
		(6, 4.6)	(6, 1.6)	(1116/116)	Telox	TCI.DIC	Telok	Tubic	Quotient	Quotient	Quotient	Ouotient
7440-38-2	Arsenic, Inorganic	14	14	14	3.9E-06	8.2E-07	8.3E-11	4.7E-06	2.4E-02	5.1E-03	3.6E-06	2.9E-02
7440-39-3	Barium	200	200	200					8.6E-04		1.5E-06	8.6E-04
7440-41-7	Beryllium and compounds	1.3	1.3	1.3			4.3E-12	4.3E-12	5.6E-04		2.5E-07	5.6E-04
7440-43-9	Cadmium (Diet)	1.5	1.5	1.5			3.7E-12	3.7E-12	1.3E-03	2.2E-04	5.8E-07	1.5E-03
16065-83-1	Chromium(III), Insoluble Salts	44.5	44.5	44.5					2.5E-05			2.5E-05
18540-29-9	Chromium(VI)	0.89	0.89	0.89	1.4E-07		1.0E-10	1.4E-07	2.5E-04		3.4E-08	2.5E-04
7440-48-4	Cobalt	30	30	30			3.7E-10	3.7E-10	8.6E-02		1.9E-05	8.6E-02
7440-50-8	Copper	180	180	180					3.9E-03			3.9E-03
7439-92-1	~Lead and Compounds	30	30	30					<sl**< td=""><td><sl**< td=""><td><sl**< td=""><td></td></sl**<></td></sl**<></td></sl**<>	<sl**< td=""><td><sl**< td=""><td></td></sl**<></td></sl**<>	<sl**< td=""><td></td></sl**<>	
7439-96-5	Manganese (Non-diet)	1500	1500	1500					5.4E-02		1.2E-04	5.4E-02
7439-97-6	~Mercury (elemental)	0.085	0.085	0.085							1.7E-03	1.7E-03
7440-02-0	Nickel Soluble Salts	43	43	43			1.5E-11	1.5E-11	1.8E-03		1.8E-06	1.8E-03
7782-49-2	Selenium	2.4	2.4	2.4					4.1E-04		4.6E-10	4.1E-04
7440-24-6	Strontium, Stable	42	42	42					6.0E-05			6.0E-05
7440-28-0	Thallium (Soluble Salts)	0.6	0.6	0.6					5.1E-02			5.1E-02
7440-62-2	Vanadium and Compounds	73	73	73					1.3E-02		2.8E-06	1.3E-02
7440-66-6	Zinc and Compounds	120	120	120					3.4E-04			3.4E-04

Cumulative:

4.8E-06

2.4E-01



Version Date:	June 2021
Basis:	May 2021 EPA RSL Table
Site Name:	828 MLK Jr. Blvd Property
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina
DEQ Section:	Brownfields Program
Site ID:	BPN 21061-17-060
Exposure Unit ID:	EU #1 Construction Worker
Submittal Date:	
Duanawad Dya	Hart & Hickman, PC
Prepared By:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina
Reviewed By:	

Table of Contents		T	OC
Version Date: June	e 2021		
Basis: May 2021 E	PA RSL Table		
Site ID: BPN 2106			
Evnosura Unit ID:	EU #1 Construction Worker		_
Exposure Unit ID.	EU #1 Construction worker	Check box	
Form No.	Description	if included	
	DATA INPUT SHEETS		
	Input Section 1 - Exposure Pathways & Parameters		
Input Form 1A	Complete Exposure Pathways	<b>V</b>	
Input Form 1B	Exposure Factors and Target Risks	<b>V</b>	
Input Form 1C	Contaminant Migration Parameters		
Input Form 1D	Sample Statistics		
	<b>Input Section 2 - Exposure Point Concentrations</b>		
Input Form 2A	Soil Exposure Point Concentration Table	<b>✓</b>	
Input Form 2B	Groundwater Exposure Point Concentration Table		
Input Form 2C	Surface Water Exposure Point Concentration Table		
Input Form 2D	Soil Gas Exposure Point Concentration Table		
Input Form 2E	Indoor Air Exposure Point Concentration Table		
	DATA OUTPUT SHEETS		
	Output Section 1 - Summary Output for All Calculators		
Output Form 1A	Risk for Individual Pathways	<b>V</b>	
Output Form 1B	•		
•	Output Section 2 - Direct Contact Soil and Groundwater Calculators		
Output Form 2A		П	
	Resident Groundwater Use		
	Non-Residential Worker Soil	П	
	Non-Residential Worker Groundwater Use	П	
	Construction Worker Soil	<u></u>	
•	Recreator/Trespasser Soil		
	Recreator/Trespasser Surface Water	П	-
•	Output Section 3 - Vapor Intrusion Calculators		
Output Form 3A	Resident Groundwater to Indoor Air		
	Resident Soil Gas to Indoor Air		
	Resident Indoor Air		
*	Non-Residential Worker Groundwater to Indoor Air		
	Non-Residential Worker Soil Gas to Indoor Air		
Output Form 3F	Non-Residential Worker Indoor Air		
•	Output Section 4 - Contaminant Migration Worksheets		
Output Form 4A	Soil to Groundwater - Forward Mode		
	Groundwater to Groundwater - Forward Mode		
•	Soil to Surface Water - Forward Mode		
1	Groundwater to Surface Water - Forward Mode		
Output Form 4E	Soil to Groundwater - Backward Mode		
Output Form 4F	Groundwater to Groundwater - Backward Mode		
•	Soil to Surface Water - Backward Mode		
	Groundwater to Surface Water - Backward Mode		

Complete Exposure Pathways Input Form 1A									
Version Date: June 2021 Basis: May 2021 EPA RSL Table									
Site ID: BPN 21061-17-060									
Exposure Unit ID: EU #1 Co	nstruction Worker								
Note: Risk output will only be calc	ulated for complete exposure pathways.								
Receptor	Pathway	Check box if pathway complete							
DIRECT CON	TACT SOIL AND WATER PATHWAYS								
Resident	Soil								
Resident	Groundwater Use								
Non-Residential Worker	Soil								
Non-Residential Worker	Groundwater Use								
Construction Worker	Soil	<b>✓</b>							
Dagrantor/Tragnagar	Soil								
Recreator/Trespasser	Surface Water								
VAP	OR INTRUSION PATHWAYS								
	Groundwater to Indoor Air								
Resident	Soil Gas to Indoor Air								
	Indoor Air								
	Groundwater to Indoor Air								
Non-Residential Worker	Soil Gas to Indoor Air								
	Indoor Air								
CONTAM	IINANT MIGRATION PATHWAYS								
Groundwater	Source Soil								
Groundwater	Source Groundwater								
Surface Water	Source Soil								
Surface water	Source Groundwater								

Exposure Factors and Target Risks Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #1 Construction Worker

Exposure Parameter	Default Value	Site Specific	Justification						
•	Genera	Value							
Towart Canaar Diele (individual)	1.0E-06	1.0E-06							
Target Cancer Risk (individual)  Target Cancer Risk (augustativa)	1.0E-04	1.0E-00							
Target Cancer Risk (cumulative)  Target Hazard Index (individual)	2.0E-01	2.0E-01							
Target Hazard Index (individual)  Target Hazard Index (augustativa)	1.0E+00	1.0E+00							
Target Hazard Index (cumulative)	Residential								
Lifetime (LT) (years)	70	70							
Body Weight (BW) (kg)	15	15							
Exposure Duration (ED) (yr)	6	6							
Exposure Frequency (EF) (d/yr)	350	350							
Exposure Time (ET) (hr)	24	24							
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	2373							
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	0.2							
Soil Ingestion Rate (IRS) (mg/day)	200	200							
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	6365	6365							
Water Ingestion Rate (IRW) (L/d)	0.78	0.78							
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.54	0.78							
	1	1							
Water Event Frequency (EV) (events/day)	Residential								
Lifetime (LT) (years)	70	70							
Body Weight (BW) (kg)	80	80							
Exposure Duration (ED) (yr)	20	20							
Exposure Frequency (EF) (d/yr)	350	350							
Exposure Time (ET) (hr)	24	24							
2	6032	6032							
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.07	0.07							
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> ) Soil Ingestion Rate (IRS) (mg/day)	100	100							
1	19652	19652							
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	2.5	2.5							
Water Ingestion Rate (IRW) (L/d)	0.71								
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71							
Water Event Frequency (EV) (events/day)		1							
Lifetime (LT) ()	Non-Residentia 70	70							
Lifetime (LT) (years)	80	80							
Body Weight (BW) (kg)  Exposure Duration (ED) (vr)	25	25							
Exposure Duration (ED) (yr)	250								
Exposure Frequency (EF) (d/yr)	8	250 8							
Exposure Time (ET) (hr)	3527								
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.12	3527							
Soil Adherence Factor (AF) (mg/cm²)	100	0.12							
Soil Ingestion Rate (IR) (mg/day)		100							
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652							
Water Ingestion Rate (IRW) (L/d)	0.83	0.83							
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67							
Water Event Frequency (EV) (events/day)	1	1 W							
L'C. (LT)	Construction 70								
Lifetime (LT) (years)	80	70							
Body Weight (BW) (kg)		80							
Working Weeks (EW) (wk/yr)	50	50							
Exposure Duration (ED) (yr)	1	1							
Exposure Frequency (EF) (d/yr)	250	250							
Exposure Time (ET) (hr)	8	8							
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527							
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.3	0.3							
Soil Ingestion Rate (IR) (mg/day)	330	330							

Exposure Factors and Target Risks Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #1 Construction Worker

Exposure Parameter	Defau	lt Value	Site Specific Value	Justification
	τ	Jser Defined	l Child	
		Trespasser		
Lifetime (LT) (years)	70	NA	70	
Averaging Time (AT) (days/yr)	365	NA	365	
Body Weight (BW) (kg)	15	NA	15	
Exposure Duration 0-2 (ED) (yr)	2	NA	2	
Exposure Duration 2-6 (ED) (yr)	4	NA	4	
Exposure Frequency (EF) (d/yr)	195	NA	195	
Exposure Time (ET) (hr)	2	NA	2	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365	
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	2	
Water Event Frequency (EV) (events/day)	1	NA	1	
	Ţ	Jser Defined	d Adult	
	Recreator	Trespasser		
Lifetime (LT) (years)	70	70	70	
Body Weight (BW) (kg)	80	45	80	
Exposure Duration 6-16 (ED) (yr)	10	10	10	
Exposure Duration 16-26 (ED) (yr)	10	0	10	
Exposure Frequency (EF) (d/yr)	195	90	195	
Exposure Time (ET) (hr)	2	2	2	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	200	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652	
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	2	
Water Event Frequency (EV) (events/day)	1	1	1	

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #1 Construction Worker

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from samples collected between 0 to 10 ft within the exposure unit.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (mg/kg)	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
95.9	GP-5	7440-38-2	Arsenic, Inorganic			mg/kg										
3200	S-6	7440-39-3	Barium			mg/kg										
6.99	GP-5	7440-41-7	Beryllium and compounds			mg/kg										
1.5	S-4	7440-43-9	Cadmium (Diet)			mg/kg										
44.5	HH-4	16065-83-1	Chromium(III), Insoluble Salts			mg/kg										
2.7	S-6	18540-29-9	Chromium(VI)			mg/kg										
30	S-4	7440-48-4	Cobalt			mg/kg										
180	MW-7	7440-50-8	Copper			mg/kg										
30	HH-2	7439-92-1	~Lead and Compounds			mg/kg										
1500	S-4	7439-96-5	Manganese (Non-diet)			mg/kg										
11	GP-6	7439-97-6	~Mercury (elemental)			mg/kg									4	
43	S-4	7440-02-0	Nickel Soluble Salts			mg/kg									4	
13	GP-5	7782-49-2	Selenium			mg/kg										
325	GP-5	7440-24-6	Strontium, Stable			mg/kg										
0.6	HH-4	7440-28-0	Thallium (Soluble Salts)			mg/kg										
73	HH-4	7440-62-2	Vanadium and Compounds			mg/kg										
120	S-4	7440-66-6	Zinc and Compounds			mg/kg									/	

Risk for Individual Pathways	Output Form 1A
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Version Date: June 2021

**Basis:** May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

**Exposure Unit ID:** EU #1 Construction Worker

DIRE	ECT CONTACT SOIL AND WATE	R CALCULATO	RS						
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?					
Resident	Soil	NC	NC	NC					
Resident	Groundwater Use*	NC	NC	NC					
Non-Residential Worker	Soil	NC	NC	NC					
Non-Residential Worker	Groundwater Use*	NC	NC	NC					
Construction Worker	Soil	7.0E-06	1.1E+01	YES					
Pageatar/Traspassar	Soil	NC	NC	NC					
Recreator/Trespasser	Surface Water*	NC	NC	NC					
VAPOR INTRUSION CALCULATORS									
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?					
	Groundwater to Indoor Air	NC	NC	NC					
Resident	Soil Gas to Indoor Air	NC	NC	NC					
	Indoor Air	NC	NC	NC					
	Groundwater to Indoor Air	NC	NC	NC					
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC					
	Indoor Air	NC	NC	NC					
	CONTAMINANT MIGRATION CA	LCULATORS							
Pathway	Source	Source Target Receptor Concentrations Exceeded?							
Groundwater	Source Soil	Exceedence of	2L at Receptor?	NC					
Groundwater	Source Groundwater	Exceedence of	Exceedence of 2L at Receptor? NC						
Surface Water	Source Soil	Exceedence of	Exceedence of 2B at Receptor? NO						
Surface water	Source Groundwater	Exceedence of	Exceedence of 2B at Receptor?						

## Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based closure.
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

Output Form 2E

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 800 mg/kg for commercial/industrial soil.

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	95.9	95.9	95.9	3.5E-06	5.6E-07	1.3E-06	5.3E-06	5.7E-01	9.1E-02	1.4E+00	2.1E+00
7440-39-3	Barium	3200	3200	3200					4.7E-02		1.4E-01	1.9E-01
7440-41-7	Beryllium and compounds	6.99	6.99	6.99			5.2E-08	5.2E-08	4.1E-03		7.9E-02	8.3E-02
7440-43-9	Cadmium (Diet)	1.5	1.5	1.5			8.3E-09	8.3E-09	8.8E-03	1.1E-03	3.4E-02	4.4E-02
16065-83-1	Chromium(III), Insoluble Salts	44.5	44.5	44.5					8.7E-05		2.0E-03	2.1E-03
18540-29-9	Chromium(VI)	2.7	2.7	2.7	5.4E-08		7.0E-07	7.5E-07	1.6E-03		2.0E-03	3.6E-03
7440-48-4	Cobalt	30	30	30			8.3E-07	8.3E-07	2.9E-02		3.4E-01	3.7E-01
7440-50-8	Copper	180	180	180					5.3E-02			5.3E-02
7439-92-1	~Lead and Compounds	30	30	30					<sl**< td=""><td><sl**< td=""><td><sl**< td=""><td></td></sl**<></td></sl**<></td></sl**<>	<sl**< td=""><td><sl**< td=""><td></td></sl**<></td></sl**<>	<sl**< td=""><td></td></sl**<>	
7439-96-5	Manganese (Non-diet)	1500	1500	1500					1.8E-01		6.7E+00	6.9E+00
7439-97-6	~Mercury (elemental)	11	11	11							1.1E+00	1.1E+00
7440-02-0	Nickel Soluble Salts	43	43	43			3.4E-08	3.4E-08	6.3E-03		4.8E-02	5.5E-02
7782-49-2	Selenium	13	13	13					7.7E-03		1.5E-04	7.8E-03
7440-24-6	Strontium, Stable	325	325	325					4.8E-04			4.8E-04
7440-28-0	Thallium (Soluble Salts)	0.6	0.6	0.6					4.4E-02			4.4E-02
7440-62-2	Vanadium and Compounds	73	73	73					2.2E-02		1.6E-01	1.9E-01
7440-66-6	Zinc and Compounds	120	120	120					1.2E-03			1.2E-03

Cumulative:

7.0E-06

1.1E+01



Version Date:	June 2021
Basis:	May 2021 EPA RSL Table
Site Name:	828 MLK Jr. Blvd Property
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina
DEQ Section:	Brownfields Program
Site ID:	BPN 21061-17-060
Exposure Unit ID:	EU #2 Lower Level Trail - Greenway User and Construction Worker
Submittal Date:	
Prepared By:	Hart & Hickman, PC
r repared by:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina
Reviewed By:	

Table of Contents		TOC
Version Date: June	2021	
Basis: May 2021 E	PA RSL Table	
Site ID: BPN 2106	1-17-060	
Exposure Unit ID:	EU #2 Lower Level Trail - Greenway User and Construction Worker	
	·	Check box
Form No.	Description	if included
	DATA INPUT SHEETS	
	Input Section 1 - Exposure Pathways & Parameters	
Input Form 1A	Complete Exposure Pathways	<b>✓</b>
Input Form 1B	Exposure Factors and Target Risks	<b>✓</b>
Input Form 1C	Contaminant Migration Parameters	
Input Form 1D	Sample Statistics	
	<b>Input Section 2 - Exposure Point Concentrations</b>	
Input Form 2A	Soil Exposure Point Concentration Table	<b>J</b>
Input Form 2B	Groundwater Exposure Point Concentration Table	
Input Form 2C	Surface Water Exposure Point Concentration Table	
Input Form 2D	Soil Gas Exposure Point Concentration Table	
Input Form 2E	Indoor Air Exposure Point Concentration Table	
	DATA OUTPUT SHEETS	
	Output Section 1 - Summary Output for All Calculators	
Output Form 1A	Risk for Individual Pathways	<b>/</b>
Output Form 1B	· · · · · · · · · · · · · · · · · · ·	
<u> </u>	Output Section 2 - Direct Contact Soil and Groundwater Calculators	
Output Form 2A	A	
*	Resident Groundwater Use	
	Non-Residential Worker Soil	
	Non-Residential Worker Groundwater Use	
	Construction Worker Soil	
	Recreator/Trespasser Soil	<u> </u>
	Recreator/Trespasser Surface Water	
<u> </u>	Output Section 3 - Vapor Intrusion Calculators	
Output Form 3A	Resident Groundwater to Indoor Air	
	Resident Soil Gas to Indoor Air	
	Resident Indoor Air	
	Non-Residential Worker Groundwater to Indoor Air	
	Non-Residential Worker Soil Gas to Indoor Air	
Output Form 3F		
3 <b></b> p 1 3 2 1	Output Section 4 - Contaminant Migration Worksheets	
Output Form 4A	Soil to Groundwater - Forward Mode	
Output Form 4B		
<u>+</u>	Soil to Surface Water - Forward Mode	
•	Groundwater to Surface Water - Forward Mode	
	Soil to Groundwater - Backward Mode	
	Groundwater to Groundwater - Backward Mode	
•	Soil to Surface Water - Backward Mode	
	Groundwater to Surface Water - Backward Mode	

Complete Exposure Pathways		Input Form 1A
Version Date: June 2021 Basis: May 2021 EPA RSL T Site ID: BPN 21061-17-060	able	
Exposure Unit ID: EU #2 Lo	wer Level Trail - Greenway User and C	onstruction Wor
Note: Risk output will only be calc	ulated for complete exposure pathways.	
Receptor	Pathway	Check box if pathway complete
DIRECT CON	TACT SOIL AND WATER PATHWAYS	
Resident	Soil	
Resident	Groundwater Use	
Non-Residential Worker	Soil	
Non-Nesidentiai workei	Groundwater Use	
Construction Worker	Soil	<b>✓</b>
Dagrantor/Trachassar	Soil	<b>✓</b>
Recreator/Trespasser	Surface Water	
VAP	OR INTRUSION PATHWAYS	
	Groundwater to Indoor Air	
Resident	Soil Gas to Indoor Air	
	Indoor Air	
	Groundwater to Indoor Air	
Non-Residential Worker	Soil Gas to Indoor Air	
	Indoor Air	
CONTAM	IINANT MIGRATION PATHWAYS	
Groundwater	Source Soil	
Groundwater	Source Groundwater	
Surface Water	Source Soil	
Surface water	Source Groundwater	

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #2 Lower Level Trail - Greenway User and Construction Worker

Exposure Parameter	Default Value	Site Specific Value	Justification
	Genera		
Target Cancer Risk (individual)	1.0E-06	1.0E-06	
Target Cancer Risk (cumulative)	1.0E-04	1.0E-04	
Target Hazard Index (individual)	2.0E-01	2.0E-01	
Target Hazard Index (cumulative)	1.0E+00	1.0E+00	
	Residential	Child	
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	15	15	
Exposure Duration (ED) (yr)	6	6	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	6365	6365	
Water Ingestion Rate (IRW) (L/d)	0.78	0.78	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.54	0.54	
Water Event Frequency (EV) (events/day)	1	1	
	Residential	Adult	
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	20	20	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	2.5	2.5	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71	
Water Event Frequency (EV) (events/day)	1	1	
	Non-Residentia	al Worker	
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	25	25	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.12	0.12	
Soil Ingestion Rate (IR) (mg/day)	100	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	0.83	0.83	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67	
Water Event Frequency (EV) (events/day)	1	1	
	Construction	Worker	
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Working Weeks (EW) (wk/yr)	50	50	
Exposure Duration (ED) (yr)	1	1	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.3	0.3	
Soil Ingestion Rate (IR) (mg/day)	330	330	

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #2 Lower Level Trail - Greenway User and Construction Worker

Exposure Parameter	Defau	lt Value	Site Specific Value	Justification
	d Child			
	Recreator			
Lifetime (LT) (years)	70	NA	70	
Averaging Time (AT) (days/yr)	365	NA	365	
Body Weight (BW) (kg)	15	NA	15	
Exposure Duration 0-2 (ED) (yr)	2	NA	2	
Exposure Duration 2-6 (ED) (yr)	4	NA	4	
Exposure Frequency (EF) (d/yr)	195	NA	52	98th percentile based on trail use polling data
Exposure Time (ET) (hr)	2	NA	0.5	98th percentile based on trail use polling data
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365	
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	0.5	98th percentile based on trail use polling data
Water Event Frequency (EV) (events/day)	1	NA	1	
		Jser Defined	l Adult	
		Trespasser		
Lifetime (LT) (years)	70	70	70	
Body Weight (BW) (kg)	80	45	80	
Exposure Duration 6-16 (ED) (yr)	10	10	10	
Exposure Duration 16-26 (ED) (yr)	10	0	10	
Exposure Frequency (EF) (d/yr)	195	90	364	98th percentile based on trail use polling data
Exposure Time (ET) (hr)	2	2	1	98th percentile based on trail use polling data
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	200	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652	
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	1	98th percentile based on trail use polling data
Water Event Frequency (EV) (events/day)	1	1	1	

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #2 Lower Level Trail - Greenway User and Construction Worker

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from all samples collected within the exposure unit. Note that all maximum concentrations were within the 0-2 ft bgs interval; therefore, both the construction worker and greenway user receptor were evaluated.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (mg/kg)	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
14.5	SED-13	7440-38-2	Arsenic, Inorganic			mg/kg										
958	SED-13	7440-39-3	Barium			mg/kg										
1.56	SED-13	7440-41-7	Beryllium and compounds			mg/kg										
0.284	SED-13	7440-43-9	Cadmium (Diet)			mg/kg										
40.2	Excavation H-3	16065-83-1	Chromium(III), Insoluble Salts			mg/kg										
0.497	Excavation H-5	18540-29-9	Chromium(VI)			mg/kg										
16.5	SED-3A	7440-48-4	Cobalt			mg/kg										
43.4	Excavation H-3	7440-50-8	Copper			mg/kg										
18	HH-8	7439-92-1	~Lead and Compounds			mg/kg										
594	Excavation I-1	7439-96-5	Manganese (Non-diet)			mg/kg										
0.12	SED-13	7439-97-6	~Mercury (elemental)			mg/kg										
19.2	SED-13	7440-02-0	Nickel Soluble Salts			mg/kg										
3.07	SED-13	7782-49-2	Selenium			mg/kg										
125	SED-13	7440-24-6	Strontium, Stable			mg/kg										
0.81	MW-6	7440-28-0	Thallium (Soluble Salts)			mg/kg										
52	HH-8	7440-62-2	Vanadium and Compounds			mg/kg										
77	MW-6	7440-66-6	Zinc and Compounds			mg/kg										

Risk for Individual Pathways

Output Form 1A

Version Date: June 2021

**Basis:** May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

Exposure Unit ID: EU #2 Lower Level Trail - Greenway User and Construction Worker

DIRE	CCT CONTACT SOIL AND WATE	R CALCULATO	RS		
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?	
Resident	Soil	NC	NC	NC	
Resident	Groundwater Use*	NC	NC	NC	
Non-Residential Worker	Soil	NC	NC	NC	
Non-Residential Worker	Groundwater Use*	NC	NC	NC	
Construction Worker	Soil	1.4E-06	3.6E+00	YES	
Recreator/Trespasser	Soil	8.4E-06	4.1E-01	NO	
Recreator/Trespasser	Surface Water*	NC	NC	NC	
	VAPOR INTRUSION CALCU	LATORS			
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?	
	Groundwater to Indoor Air	NC	NC	NC	
Resident	Soil Gas to Indoor Air	NC	NC	NC	
	Indoor Air	NC	NC	NC	
	Groundwater to Indoor Air	NC	NC	NC	
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC	
	Indoor Air	NC	NC	NC	
	CONTAMINANT MIGRATION CA	LCULATORS			
Pathway	Source	Target Rec	eptor Concentratio	ons Exceeded?	
Groundwater	Source Soil	Exceedence of	2L at Receptor?	NC	
Groundwater	Source Groundwater	Exceedence of	2L at Receptor?	NC	
Surface Water	Source Soil	Exceedence of	2B at Receptor?	NC	
Surface water	Source Groundwater	Exceedence of	Exceedence of 2B at Receptor?		

## Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based closure.
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

Output Form 2E

DEQ Risk Calculator - Direct Contact - Construction Worker Soil
Version Date: June 2021
Basis: May 2021 EPA RSL Table
Site ID: BPN 21061-17-060
Exposure Unit ID: EU #2 Lower Level Trail - Greenway User and Construction Worker

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 800 mg/kg for commercial/industrial soil.

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	14.5	14.5	14.5	5.3E-07	8.4E-08	1.9E-07	8.0E-07	8.5E-02	1.4E-02	2.2E-01	3.2E-01
7440-39-3	Barium	958	958	958					1.4E-02		4.3E-02	5.7E-02
7440-41-7	Beryllium and compounds	1.56	1.56	1.56			1.2E-08	1.2E-08	9.2E-04		1.8E-02	1.8E-02
7440-43-9	Cadmium (Diet)	0.284	0.284	0.284			1.6E-09	1.6E-09	1.7E-03	2.1E-04	6.4E-03	8.3E-03
16065-83-1	Chromium(III), Insoluble Salts	40.2	40.2	40.2					7.9E-05		1.8E-03	1.9E-03
18540-29-9	Chromium(VI)	0.497	0.497	0.497	1.0E-08		1.3E-07	1.4E-07	2.9E-04		3.7E-04	6.6E-04
7440-48-4	Cobalt	16.5	16.5	16.5			4.6E-07	4.6E-07	1.6E-02		1.9E-01	2.0E-01
7440-50-8	Copper	43.4	43.4	43.4					1.3E-02			1.3E-02
7439-92-1	~Lead and Compounds	18	18	18					<sl**< td=""><td><sl**< td=""><td><sl**< td=""><td></td></sl**<></td></sl**<></td></sl**<>	<sl**< td=""><td><sl**< td=""><td></td></sl**<></td></sl**<>	<sl**< td=""><td></td></sl**<>	
7439-96-5	Manganese (Non-diet)	594	594	594					7.3E-02		2.7E+00	2.7E+00
7439-97-6	~Mercury (elemental)	0.12	0.12	0.12							1.2E-02	1.2E-02
7440-02-0	Nickel Soluble Salts	19.2	19.2	19.2			1.5E-08	1.5E-08	2.8E-03		2.2E-02	2.4E-02
7782-49-2	Selenium	3.07	3.07	3.07					1.8E-03		3.4E-05	1.8E-03
7440-24-6	Strontium, Stable	125	125	125					1.8E-04			1.8E-04
7440-28-0	Thallium (Soluble Salts)	0.81	0.81	0.81					6.0E-02			6.0E-02
7440-62-2	Vanadium and Compounds	52	52	52					1.5E-02		1.2E-01	1.3E-01
7440-66-6	Zinc and Compounds	77	77	77					7.6E-04			7.6E-04

Cumulative:

1.4E-06

3.6E+00

Output Form 2F

DEQ Risk Calculator - Direct Contact - Recreator/Trespasser Soil
Version Date: June 2021
Basis: May 2021 EPA RSL Table
Site ID: BPN 21061-17-060
Exposure Unit ID: EU #2 Lower Level Trail - Greenway User and Construction Worker

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 400 mg/kg for residential soil.

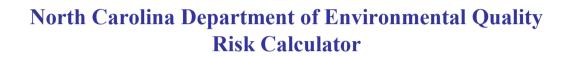
  Receptor Type: Greenway user

		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation	Calculated	Ingestion	Dermal	Inhalation	Calculated Non-
CAS#	Chemical Name:	Concentration	Concentration	Concentration	Carcinogenic	Carcinogenic	Carcinogenic	Carcinogenic	Hazard	Hazard	Hazard	Carcinogenic
		(mg/kg)	(mg/kg)	(mg/kg)*	Risk	Risk	Risk	Risk	Quotient	Quotient	Quotient	Hazard
											-	Quotient
7440-38-2	Arsenic, Inorganic	14.5	14.5	14.5	6.8E-06	1.2E-06	1.6E-11	8.0E-06	5.5E-02	7.6E-03	6.8E-07	6.3E-02
7440-39-3	Barium	958	958	958					9.1E-03		1.3E-06	9.1E-03
7440-41-7	Beryllium and compounds	1.56	1.56	1.56			9.7E-13	9.7E-13	1.5E-03		5.5E-08	1.5E-03
7440-43-9	Cadmium (Diet)	0.284	0.284	0.284			1.3E-13	1.3E-13	5.4E-04	6.0E-05	2.0E-08	6.0E-04
16065-83-1	Chromium(III), Insoluble Salts	40.2	40.2	40.2					5.1E-05			5.1E-05
18540-29-9	Chromium(VI)	0.497	0.497	0.497	3.9E-07		3.0E-11	3.9E-07	3.1E-04		3.5E-09	3.1E-04
7440-48-4	Cobalt	16.5	16.5	16.5			3.9E-11	3.9E-11	1.0E-01		1.9E-06	1.0E-01
7440-50-8	Copper	43.4	43.4	43.4					2.1E-03			2.1E-03
7439-92-1	~Lead and Compounds	18	18	18					<sl**< td=""><td><sl**< td=""><td><sl**< td=""><td></td></sl**<></td></sl**<></td></sl**<>	<sl**< td=""><td><sl**< td=""><td></td></sl**<></td></sl**<>	<sl**< td=""><td></td></sl**<>	
7439-96-5	Manganese (Non-diet)	594	594	594					4.7E-02		8.3E-06	4.7E-02
7439-97-6	~Mercury (elemental)	0.12	0.12	0.12							4.5E-04	4.5E-04
7440-02-0	Nickel Soluble Salts	19.2	19.2	19.2			1.3E-12	1.3E-12	1.8E-03		1.5E-07	1.8E-03
7782-49-2	Selenium	3.07	3.07	3.07					1.2E-03		1.1E-10	1.2E-03
7440-24-6	Strontium, Stable	125	125	125					4.0E-04			4.0E-04
7440-28-0	Thallium (Soluble Salts)	0.81	0.81	0.81					1.5E-01			1.5E-01
7440-62-2	Vanadium and Compounds	52	52	52					2.0E-02		3.6E-07	2.0E-02
7440-66-6	Zinc and Compounds	77	77	77					4.9E-04			4.9E-04

Cumulative:

8.4E-06

4.1E-01



Version Date:	June 2021
Basis:	May 2021 EPA RSL Table
Site Name:	828 MLK Jr. Blvd Property
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina
DEQ Section:	Brownfields Program
Site ID:	BPN 21061-17-060
Exposure Unit ID:	EU #2 Lower Level Creek - Greenway User
Submittal Date:	
Prepared By:	Hart & Hickman, PC
r repared by:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina
Reviewed By:	

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Evnosura Unit ID:	EU #2 Lower Level Creek - Greenway User	
Exposure Unit ID.	EU #2 Lower Lever Creek - Greenway Oser	Check box
Form No.	Description	if included
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Input Form 1A	Complete Exposure Pathways	<b>✓</b>
Input Form 1B	Exposure Factors and Target Risks	<b>V</b>
Input Form 1C	Contaminant Migration Parameters	
Input Form 1D	Sample Statistics	
	Input Section 2 - Exposure Point Concentrations	
Input Form 2A	Soil Exposure Point Concentration Table	✓
Input Form 2B	Groundwater Exposure Point Concentration Table	
Input Form 2C	Surface Water Exposure Point Concentration Table	<b>✓</b>
Input Form 2D	Soil Gas Exposure Point Concentration Table	
Input Form 2E	Indoor Air Exposure Point Concentration Table	
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· · · · · · · · · · · · · · · · · · ·	Output Section 2 - Direct Contact Soil and Groundwater Calculators	
Output Form 2A		П
	Resident Groundwater Use	П
	Non-Residential Worker Soil	П
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•	Output Section 3 - Vapor Intrusion Calculators	
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Output Form 3F	Non-Residential Worker Indoor Air	
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Output Form 4A	Soil to Groundwater - Forward Mode	
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•	Soil to Surface Water - Forward Mode	
1	Groundwater to Surface Water - Forward Mode	
Output Form 4E	Soil to Groundwater - Backward Mode	
Output Form 4F	Groundwater to Groundwater - Backward Mode	
•	Soil to Surface Water - Backward Mode	
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<b>Complete Exposure Pathways</b>		Input Form 1A
Version Date: June 2021 Basis: May 2021 EPA RSL T Site ID: BPN 21061-17-060	able	
	wer Level Creek - Greenway User	
-	ulated for complete exposure pathways.	
Receptor	Pathway	Check box if pathway complete
DIRECT CON	TACT SOIL AND WATER PATHWAYS	
Resident	Soil	
Resident	Groundwater Use	
Non-Residential Worker	Soil	
Non-Residential Worker	Groundwater Use	
Construction Worker	Soil	
Dagwartay/Tragnaggar	Soil	<b>✓</b>
Recreator/Trespasser	Surface Water	<b>✓</b>
VAP	OR INTRUSION PATHWAYS	
	Groundwater to Indoor Air	
Resident	Soil Gas to Indoor Air	
	Indoor Air	
	Groundwater to Indoor Air	
Non-Residential Worker	Soil Gas to Indoor Air	
	Indoor Air	
CONTAM	IINANT MIGRATION PATHWAYS	
Groundwater	Source Soil	
Oroundwater	Source Groundwater	
Surface Water	Source Soil	
Surface water	Source Groundwater	

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #2 Lower Level Creek - Greenway User

	1	1	
Exposure Parameter	Default Value	Site Specific	Justification
	Genera	Value	
Target Cancer Risk (individual)	1.0E-06	1.0E-06	
Target Cancer Risk (cumulative)	1.0E-04	1.0E-04	
Target Hazard Index (individual)	2.0E-01	2.0E-01	
Target Hazard Index (cumulative)	1.0E+00	1.0E+00	
Target Hazaru muex (cumurative)	Residential		
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	15	15	
Exposure Duration (ED) (yr)	6	6	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	2373	
Soil Adherence Factor (AF) (mg/cm²)	0.2	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	6365	6365	
Water Ingestion Rate (IRW) (L/d)	0.78	0.78	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.54	0.78	
	0.34		
Water Event Frequency (EV) (events/day)	Residential	A dult	
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	20	20	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
2	6032	6032	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.07	0.07	
Soil Adherence Factor (AF) (mg/cm²) Soil Ingestion Rate (IRS) (mg/day)	100	100	
1	19652	19652	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	2.5		
Water Ingestion Rate (IRW) (L/d)	0.71	2.5	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71	
Water Event Frequency (EV) (events/day)	Non-Residentia	1 -1 W	
Lifetime (LT) (correct)	70	70	
Lifetime (LT) (years)	80		
Body Weight (BW) (kg)	25	80 25	
Exposure Fraguency (FF) (d/yr)	250		
Exposure Frequency (EF) (d/yr)	8	250 8	
Exposure Time (ET) (hr)	3527		
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.12	3527	
Soil Adherence Factor (AF) (mg/cm²)	100	0.12	
Soil Ingestion Rate (IR) (mg/day)		100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	0.83	0.83	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67	
Water Event Frequency (EV) (events/day)	1	1	
T.C.: (T.T.)	Construction 70		
Lifetime (LT) (years)		70	
Body Weight (BW) (kg)	80	80	
Working Weeks (EW) (wk/yr)	50	50	
Exposure Duration (ED) (yr)	1	1	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.3	0.3	
Soil Ingestion Rate (IR) (mg/day)	330	330	

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #2 Lower Level Creek - Greenway User

Exposure Parameter	Default Value		Site Specific Value	Justification				
User Defined Child								
Recreator Trespasser								
Lifetime (LT) (years)	70	NA	70					
Averaging Time (AT) (days/yr)	365	NA	365					
Body Weight (BW) (kg)	15	NA	15					
Exposure Duration 0-2 (ED) (yr)	2	NA	2					
Exposure Duration 2-6 (ED) (yr)	4	NA	4					
Exposure Frequency (EF) (d/yr)	195	NA	52	98th percentile based on trail polling data				
Exposure Time (ET) (hr)	2	NA	0.5	98th percentile based on trail polling data				
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373					
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2					
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200					
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365					
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124					
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	0.5	98th percentile based on trail polling data				
Water Event Frequency (EV) (events/day)	1	NA	1					
		Jser Defined	d Adult					
	Recreator Trespasser							
Lifetime (LT) (years)	70	70	70					
Body Weight (BW) (kg)	80	45	80					
Exposure Duration 6-16 (ED) (yr)	10	10	10					
Exposure Duration 16-26 (ED) (yr)	10	0	10					
Exposure Frequency (EF) (d/yr)	195	90	364	98th percentile based on trail polling data				
Exposure Time (ET) (hr)	2	2	1	98th percentile based on trail polling data				
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032					
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07					
Soil Ingestion Rate (IRS) (mg/day)	100	200	100					
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652					
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985					
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	1	98th percentile based on trail polling data				
Water Event Frequency (EV) (events/day)	1	1	1					

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #2 Lower Level Creek - Greenway User

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from sediment samples collected at the site during the most recent sampling event.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (mg/kg)	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
2.35	SED-4	7440-38-2	Arsenic, Inorganic			mg/kg										
24.3	SED-5	7440-39-3	Barium			mg/kg										
0.233	SED-5	7440-41-7	Beryllium and compounds			mg/kg										
63.8	SED-4	16065-83-1	Chromium(III), Insoluble Salts			mg/kg										
0.67	SED-3	18540-29-9	Chromium(VI)			mg/kg										
7.26	SED-4	7440-48-4	Cobalt			mg/kg										
20.2	SED-3	7440-50-8	Copper			mg/kg										
399	SED-5	7439-96-5	Manganese (Non-diet)			mg/kg										
0.008	SED-4	7439-97-6	~Mercury (elemental)			mg/kg										
10.5	SED-4	7440-02-0	Nickel Soluble Salts			mg/kg										
0.344	SED-4	7782-49-2	Selenium			mg/kg										
30.7	SED-4	7440-24-6	Strontium Stable			mg/kg									4	

Exposure Point Concentrations	Input Form 2C
Version Date: June 2021	
Basis: May 2021 EPA RSL Table	
Site ID: BPN 21061-17-060	
Exposure Unit ID: EU #2 Lower Level Creek - Greenway User	

Surface Water Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations detected in surface water samples over the last 5 years of sampling.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (ug/L)	Notes:	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
0.45	SW-3	7440-38-2	Arsenic, Inorganic			ug/L										
32.1	SW-21	7440-39-3	Barium			ug/L										
0.73	SW-21	16065-83-1	Chromium(III), Insoluble Salts			ug/L										
0.36	SW-21	7440-48-4	Cobalt			ug/L										
3.2	SW-21	7440-50-8	Copper			ug/L										
37.4	SW-3	7439-96-5	Manganese (Non-diet)			ug/L										
0.62	SW-21	7440-02-0	Nickel Soluble Salts			ug/L										
0.12	SW-5	7782-49-2	Selenium			ug/L										
110	SW-3 and SW-4	7440-24-6	Strontium, Stable			ug/L										

Risk for Individual Pathways	Output Form 1A
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Version Date: June 2021

**Basis:** May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

Exposure Unit ID: EU #2 Lower Level Creek - Greenway User

DIRE	CCT CONTACT SOIL AND WATE	R CALCULATO	RS						
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?					
Resident	Soil	NC	NC	NC					
Resident	Groundwater Use*	NC	NC	NC					
Non-Residential Worker	Soil	NC	NC	NC					
Non-Residential Worker	Groundwater Use*	NC	NC	NC					
Construction Worker	Soil	NC	NC	NC					
Recreator/Trespasser	Soil	1.8E-06	9.1E-02	NO					
Recleator/Trespasser	Surface Water*	3.2E-07	1.7E-02	NO					
	VAPOR INTRUSION CALCULATORS								
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?					
	Groundwater to Indoor Air	NC	NC	NC					
Resident	Soil Gas to Indoor Air	NC	NC	NC					
	Indoor Air	NC	NC	NC					
	Groundwater to Indoor Air	NC	NC	NC					
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC					
	Indoor Air	NC	NC	NC					
	CONTAMINANT MIGRATION CA	ALCULATORS							
Pathway	Source	Target Rec	eptor Concentratio	ns Exceeded?					
Groundwater	Source Soil	Exceedence of	Exceedence of 2L at Receptor?						
Olouliuwatei	Source Groundwater	Exceedence of	Exceedence of 2L at Receptor?						
Surface Water	Source Soil	Exceedence of	NC						
Burrace Water	Source Groundwater	Exceedence of	Exceedence of 2B at Receptor?						

# Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based closure.
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

DEQ Risk Calculator - Direct Contact - Recreator/Trespasser Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060 Exposure Unit ID: EU #2 Lower Level Creek - Greenway User

Output Form 2F

\* - Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

\*\* - Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 400 mg/kg for residential soil.

Receptor Type: Greenway user

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	2.35	2.35	2.35	1.1E-06	2.0E-07	2.6E-12	1.3E-06	8.9E-03	1.2E-03	1.1E-07	1.0E-02
7440-39-3	Barium	24.3	24.3	24.3					2.3E-04		3.4E-08	2.3E-04
7440-41-7	Beryllium and compounds	0.233	0.233	0.233			1.5E-13	1.5E-13	2.2E-04		8.2E-09	2.2E-04
16065-83-1	Chromium(III), Insoluble Salts	63.8	63.8	63.8					8.1E-05			8.1E-05
18540-29-9	Chromium(VI)	0.67	0.67	0.67	5.3E-07		4.1E-11	5.3E-07	4.2E-04		4.7E-09	4.2E-04
7440-48-4	Cobalt	7.26	7.26	7.26			1.7E-11	1.7E-11	4.6E-02		8.5E-07	4.6E-02
7440-50-8	Copper	20.2	20.2	20.2					9.6E-04			9.6E-04
7439-96-5	Manganese (Non-diet)	399	399	399					3.2E-02		5.6E-06	3.2E-02
7439-97-6	~Mercury (elemental)	0.008	0.008	0.008							3.0E-05	3.0E-05
7440-02-0	Nickel Soluble Salts	10.5	10.5	10.5			7.1E-13	7.1E-13	1.0E-03		8.2E-08	1.0E-03
7782-49-2	Selenium	0.344	0.344	0.344					1.3E-04		1.2E-11	1.3E-04
7440-24-6	Strontium, Stable	30.7	30.7	30.7					9.7E-05			9.7E-05

Cumulative:

1.8E-06

9.1E-02

DEQ Risk Calculator - Direct Contact - Recreator/Trespasser Surface Water	Output Form 2G
Version Date: June 2021	

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

# Exposure Unit ID: EU #2 Lower Level Creek - Greenway User

Receptor Type: Greenway user

CAS#	Chemical Name:	Ingestion Concentration (ug/L)	Dermal Concentration (ug/L)	Ingestion Carcinogenic Risk	Dermal Contact Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Contact Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	0.45	0.45	2.7E-07	4.5E-08	3.2E-07	1.8E-03	3.7E-04	2.2E-03
7440-39-3	Barium	32.1	32.1				2.0E-04	5.6E-04	7.6E-04
16065-83-1	Chromium(III), Insoluble Salts	0.73	0.73				6.0E-07	9.2E-06	9.8E-06
7440-48-4	Cobalt	0.36	0.36				1.5E-03	1.2E-04	1.6E-03
7440-50-8	Copper	3.2	3.2				9.8E-05	2.0E-05	1.2E-04
7439-96-5	Manganese (Non-diet)	37.4	37.4				1.9E-03	9.5E-03	1.1E-02
7440-02-0	Nickel Soluble Salts	0.62	0.62				3.8E-05	3.8E-05	7.6E-05
7782-49-2	Selenium	0.12	0.12				2.9E-05	5.9E-06	3.5E-05
7440-24-6	Strontium, Stable	110	110				2.3E-04	4.5E-05	2.7E-04

Cumulative: 3.2E-07

1.7E-02



Version Date:	June 2021
Basis:	May 2021 EPA RSL Table
Site Name:	828 MLK Jr. Blvd Property
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina
DEQ Section:	Brownfields Program
Site ID:	BPN 21061-17-060
Exposure Unit ID:	EU #3 Embankment - Resident, Non-Residential Worker, and Greenway
Submittal Date:	
Prepared By:	Hart & Hickman, PC
r repared by:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina
Reviewed By:	

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Exposure Unit ID:	EU #3 Embankment - Resident, Non-Residential Worker, and Greenway User	
Form No.	Description	Check box if included
	DATA INPUT SHEETS	
	Input Section 1 - Exposure Pathways & Parameters	
Input Form 1A	Complete Exposure Pathways	7
Input Form 1B	Exposure Factors and Target Risks	7
Input Form 1C	Contaminant Migration Parameters	
Input Form 1D	Sample Statistics	Ш
I 2.A	Input Section 2 - Exposure Point Concentrations	
Input Form 2A Input Form 2B	Soil Exposure Point Concentration Table Groundwater Exposure Point Concentration Table	<b>✓</b>
Input Form 2C	Surface Water Exposure Point Concentration Table	
Input Form 2D	Soil Gas Exposure Point Concentration Table	
Input Form 2E	Indoor Air Exposure Point Concentration Table	
p.w.1 01111 225	DATA OUTPUT SHEETS	
	Output Section 1 - Summary Output for All Calculators	
Output Form 1A	Risk for Individual Pathways	<b>√</b>
Output Form 1B	Sitewide Risk	
-	Output Section 2 - Direct Contact Soil and Groundwater Calculators	
Output Form 2A	Resident Soil	<b>✓</b>
Output Form 2B	Resident Groundwater Use	
	Non-Residential Worker Soil	7
	Non-Residential Worker Groundwater Use	
	Construction Worker Soil	
	Recreator/Trespasser Soil	<b>✓</b>
Output Form 2G	Recreator/Trespasser Surface Water	
	Output Section 3 - Vapor Intrusion Calculators	
	Resident Groundwater to Indoor Air	
	Resident Soil Gas to Indoor Air	
	Resident Indoor Air	
	Non-Residential Worker Groundwater to Indoor Air Non-Residential Worker Soil Gas to Indoor Air	
Output Form 3F	Non-Residential Worker Indoor Air  Non-Residential Worker Indoor Air	
Output Form 51	Output Section 4 - Contaminant Migration Worksheets	
Output Form 1A	Soil to Groundwater - Forward Mode	П
	Groundwater - Forward Mode	
	Soil to Surface Water - Forward Mode	
	Groundwater to Surface Water - Forward Mode	
Output Form 4E	Soil to Groundwater - Backward Mode	
Output Form 4F		
Output Form 4G	Soil to Surface Water - Backward Mode	
Output Form 4H	Groundwater to Surface Water - Backward Mode	

Complete Exposure Pathways		Input Form 1A						
Version Date: June 2021 Basis: May 2021 EPA RSL Table Lite ID: BPN 21061-17-060								
Exposure Unit ID: EU #3 Embankment - Resident, Non-Residential Worker, and Gi								
lote: Risk output will only be calculated for complete exposure pathways.								
Receptor	Pathway	Check box if pathway complete						
DIRECT CON	TACT SOIL AND WATER PATHWAYS							
Resident	Soil	<b>✓</b>						
Resident	Groundwater Use							
Non-Residential Worker	Soil	<b>✓</b>						
Non-residential worker	Groundwater Use							
Construction Worker	Construction Worker Soil							
Dagrantor/Traspassar	Soil	<b>✓</b>						
Recreator/Trespasser	Surface Water							
VAP	OR INTRUSION PATHWAYS							
	Groundwater to Indoor Air							
Resident	Soil Gas to Indoor Air							
	Indoor Air							
	Groundwater to Indoor Air							
Non-Residential Worker	Soil Gas to Indoor Air							
	Indoor Air							
CONTAM	IINANT MIGRATION PATHWAYS							
Groundwater	Source Soil							
Oloulidwaici	Source Groundwater							
Surface Water	Source Soil							
Surface water	Source Groundwater							

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #3 Embankment - Resident, Non-Residential Worker, and Greenway User

Exposure Parameter	Default Value	Site Specific Value	Justification				
General							
Target Cancer Risk (individual)	1.0E-06	1.0E-06					
Target Cancer Risk (cumulative)	1.0E-04	1.0E-04					
Target Hazard Index (individual)	2.0E-01	2.0E-01					
Target Hazard Index (cumulative)	1.0E+00	1.0E+00					
T.C. (TED) (	Residential 70						
Lifetime (LT) (years)	15	70					
Body Weight (BW) (kg)	6	15					
Exposure Duration (ED) (yr)	350	6 350					
Exposure Frequency (EF) (d/yr) Exposure Time (ET) (hr)	24	24					
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	2373					
1	0.2	0.2					
Soil Adherence Factor (AF) (mg/cm²)	200						
Soil Ingestion Rate (IRS) (mg/day)	6365	200					
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)  Water Ingestion Rate (IRW) (L/d)	0.78	6365 0.78					
Water Ingestion Rate (IRW) (L/d) Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.54						
	0.54	0.54					
Water Event Frequency (EV) (events/day)	Residential						
Lifetime (LT) (years)	70	70					
Body Weight (BW) (kg)	80	80					
Exposure Duration (ED) (yr)	20	20					
Exposure Frequency (EF) (d/yr)	350	350					
Exposure Time (ET) (hr)	24	24					
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032					
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.07					
Soil Ingestion Rate (IRS) (mg/day)	100	100					
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652					
Water Ingestion Rate (IRW) (L/d)	2.5	2.5					
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71					
Water Event Frequency (EV) (events/day)	1	1					
* * * * * * * * * * * * * * * * * * * *	Non-Residentia	al Worker					
Lifetime (LT) (years)	70	70					
Body Weight (BW) (kg)	80	80					
Exposure Duration (ED) (yr)	25	25					
Exposure Frequency (EF) (d/yr)	250	250					
Exposure Time (ET) (hr)	8	8					
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527					
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.12	0.12					
Soil Ingestion Rate (IR) (mg/day)	100	100					
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652					
Water Ingestion Rate (IRW) (L/d)	0.83	0.83					
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67					
Water Event Frequency (EV) (events/day)	1	1					
	Construction						
Lifetime (LT) (years)	70	70					
Body Weight (BW) (kg)	80	80					
Working Weeks (EW) (wk/yr)	50	50					
Exposure Duration (ED) (yr)	1	1					
Exposure Frequency (EF) (d/yr)	250	250					
Exposure Time (ET) (hr)	8	8					
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527					
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.3	0.3					
Soil Ingestion Rate (IR) (mg/day)	330	330					

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #3 Embankment - Resident, Non-Residential Worker, and Greenway User

Exposure Parameter	Defau	lt Value	Site Specific Value	Justification
		Jser Defined	d Child	
		Trespasser		
Lifetime (LT) (years)	70	NA	70	
Averaging Time (AT) (days/yr)	365	NA	365	
Body Weight (BW) (kg)	15	NA	15	
Exposure Duration 0-2 (ED) (yr)	2	NA	2	
Exposure Duration 2-6 (ED) (yr)	4	NA	4	
Exposure Frequency (EF) (d/yr)	195	NA	52	Based on 98% percentile of trail users
Exposure Time (ET) (hr)	2	NA	0.5	Based on 98% percentile of trail users
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365	
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	2	
Water Event Frequency (EV) (events/day)	1	NA	1	
		Jser Defined	d Adult	
	Recreator	Trespasser		
Lifetime (LT) (years)	70	70	70	
Body Weight (BW) (kg)	80	45	80	
Exposure Duration 6-16 (ED) (yr)	10	10	10	
Exposure Duration 16-26 (ED) (yr)	10	0	10	
Exposure Frequency (EF) (d/yr)	195	90	364	Based on 98% percentile of trail users
Exposure Time (ET) (hr)	2	2	1	Based on 98% percentile of trail users
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	200	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652	
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	2	
Water Event Frequency (EV) (events/day)	1	1	1	

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #3 Embankment - Resident, Non-Residential Worker, and Greenway User

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from samples collected from shallow (0-2 ft) soil within the exposure unit.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (mg/kg)	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
60.3	HH-10	7440-38-2	Arsenic, Inorganic			mg/kg										
3260	HH-11	7440-39-3	Barium			mg/kg										
5.9	HH-11	7440-41-7	Beryllium and compounds			mg/kg										
0.22	HH-11	7440-43-9	Cadmium (Diet)			mg/kg										
43.8	Excavation H-2	16065-83-1	Chromium(III), Insoluble Salts			mg/kg										
1.4	S-7	18540-29-9	Chromium(VI)			mg/kg										
19.1	Excavation H-2	7440-48-4	Cobalt			mg/kg										
59.2	Excavation H-2	7440-50-8	Copper			mg/kg										
412	Excavation H-1	7439-96-5	Manganese (Non-diet)			mg/kg										
0.43	HH-11	7439-97-6	~Mercury (elemental)			mg/kg										
23.5	HH-11	7440-02-0	Nickel Soluble Salts			mg/kg										
9.05	HH-11	7782-49-2	Selenium			mg/kg										
269	HH-10	7440-24-6	Strontium, Stable			mg/kg										

Risk for Individual Pathways

Output Form 1A

Version Date: June 2021

**Basis:** May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

Exposure Unit ID: EU #3 Embankment - Resident, Non-Residential Worker, and Greenway User

DIRE	CCT CONTACT SOIL AND WATE	R CALCULATO	ORS		
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?	
Resident	Soil	9.4E-05	3.1E+00	YES	
Resident	Groundwater Use*	NC	NC	NC	
Non-Residential Worker	Soil	2.0E-05	2.2E-01	NO	
Non-Residential Worker	Groundwater Use*	NC	NC	NC	
Construction Worker	Soil	NC	NC	NC	
Recreator/Trespasser	Soil	3.4E-05	4.6E-01	NO	
Recleator/Trespasser	Surface Water*	NC	NC	NC	
	VAPOR INTRUSION CALCU	LATORS			
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?	
	Groundwater to Indoor Air	NC	NC	NC	
Resident	Soil Gas to Indoor Air	NC	NC	NC	
	Indoor Air	NC	NC	NC	
	Groundwater to Indoor Air	NC	NC	NC	
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC	
	Indoor Air	NC	NC	NC	
	CONTAMINANT MIGRATION CA	LCULATORS			
Pathway	Source	Target Rec	eptor Concentratio	ons Exceeded?	
Groundwater	Source Soil	Exceedence of	2L at Receptor?	NC	
Groundwater	Source Groundwater	Exceedence of	Exceedence of 2L at Receptor?		
Surface Water	Source Soil	Exceedence of 2B at Receptor? NC			
Surface Water	Source Groundwater	Exceedence of 2B at Receptor? NC			

# Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based closure.
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

Output Form 2A

DEQ Risk Calculator - Direct Contact - Resident Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #3 Embankment - Resident, Non-Residential Worker, and Greenway User

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 400 mg/kg for residential soil.

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk*	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient*	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	60.3	60.3	60.3	7.8E-05	1.1E-05	1.6E-09	8.9E-05	1.5E+00	1.8E-01	6.5E-05	1.7E+00
7440-39-3	Barium	3260	3260	3260					2.1E-01		1.1E-04	2.1E-01
7440-41-7	Beryllium and compounds	5.9	5.9	5.9			8.5E-11	8.5E-11	3.8E-02		4.8E-06	3.8E-02
7440-43-9	Cadmium (Diet)	0.22	0.22	0.22			2.4E-12	2.4E-12	2.8E-03	2.7E-04	3.6E-07	3.1E-03
16065-83-1	Chromium(III), Insoluble Salts	43.8	43.8	43.8					3.7E-04			3.7E-04
18540-29-9	Chromium(VI)	1.4	1.4	1.4	4.6E-06		2.0E-09	4.6E-06	6.0E-03		2.3E-07	6.0E-03
7440-48-4	Cobalt	19.1	19.1	19.1			1.0E-09	1.0E-09	8.1E-01		5.1E-05	8.1E-01
7440-50-8	Copper	59.2	59.2	59.2					1.9E-02			1.9E-02
7439-96-5	Manganese (Non-diet)	412	412	412					2.2E-01		1.3E-04	2.2E-01
7439-97-6	~Mercury (elemental)	0.43	0.43	0.43							3.7E-02	3.7E-02
7440-02-0	Nickel Soluble Salts	23.5	23.5	23.5			3.7E-11	3.7E-11	1.5E-02		4.2E-06	1.5E-02
7782-49-2	Selenium	9.05	9.05	9.05					2.3E-02		7.3E-09	2.3E-02
7440-24-6	Strontium, Stable	269	269	269					5.7E-03			5.7E-03

Cumulative:

9.4E-05

3.1E+00

### Exposure Unit ID: EU #3 Embankment - Resident, Non-Residential Worker, and Greenway User

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 800 mg/kg for commercial/industrial soil.

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	60.3	60.3	60.3	1.7E-05	3.5E-06	3.6E-10	2.0E-05	1.0E-01	2.2E-02	1.5E-05	1.3E-01
7440-39-3	Barium	3260	3260	3260					1.4E-02		2.5E-05	1.4E-02
7440-41-7	Beryllium and compounds	5.9	5.9	5.9			1.9E-11	1.9E-11	2.5E-03		1.1E-06	2.5E-03
7440-43-9	Cadmium (Diet)	0.22	0.22	0.22			5.4E-13	5.4E-13	1.9E-04	3.2E-05	8.5E-08	2.2E-04
16065-83-1	Chromium(III), Insoluble Salts	43.8	43.8	43.8					2.5E-05			2.5E-05
18540-29-9	Chromium(VI)	1.4	1.4	1.4	2.1E-07		1.6E-10	2.1E-07	4.0E-04		5.4E-08	4.0E-04
7440-48-4	Cobalt	19.1	19.1	19.1			2.4E-10	2.4E-10	5.5E-02		1.2E-05	5.5E-02
7440-50-8	Copper	59.2	59.2	59.2					1.3E-03			1.3E-03
7439-96-5	Manganese (Non-diet)	412	412	412					1.5E-02		3.2E-05	1.5E-02
7439-97-6	~Mercury (elemental)	0.43	0.43	0.43							8.9E-03	8.9E-03
7440-02-0	Nickel Soluble Salts	23.5	23.5	23.5			8.4E-12	8.4E-12	1.0E-03		1.0E-06	1.0E-03
7782-49-2	Selenium	9.05	9.05	9.05					1.5E-03		1.7E-09	1.5E-03
7440-24-6	Strontium, Stable	269	269	269					3.8E-04			3.8E-04

Cumulative:

2.0E-05

2.2E-01

DEQ Risk Calculator - Direct Contact - Recreator/Trespasser Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Output Form 2F

Exposure Unit ID: EU #3 Embankment - Resident, Non-Residential Worker, and Greenway User

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 400 mg/kg for residential soil.

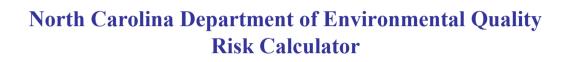
Receptor Type: Greenway User

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	60.3	60.3	60.3	2.8E-05	5.1E-06	6.7E-11	3.3E-05	2.3E-01	3.2E-02	2.8E-06	2.6E-01
7440-39-3	Barium	3260	3260	3260					3.1E-02		4.6E-06	3.1E-02
7440-41-7	Beryllium and compounds	5.9	5.9	5.9			3.7E-12	3.7E-12	5.6E-03		2.1E-07	5.6E-03
7440-43-9	Cadmium (Diet)	0.22	0.22	0.22			1.0E-13	1.0E-13	4.2E-04	4.6E-05	1.5E-08	4.6E-04
16065-83-1	Chromium(III), Insoluble Salts	43.8	43.8	43.8					5.5E-05			5.5E-05
18540-29-9	Chromium(VI)	1.4	1.4	1.4	1.1E-06		8.5E-11	1.1E-06	8.9E-04		9.8E-09	8.9E-04
7440-48-4	Cobalt	19.1	19.1	19.1			4.5E-11	4.5E-11	1.2E-01		2.2E-06	1.2E-01
7440-50-8	Copper	59.2	59.2	59.2					2.8E-03			2.8E-03
7439-96-5	Manganese (Non-diet)	412	412	412					3.3E-02		5.8E-06	3.3E-02
7439-97-6	~Mercury (elemental)	0.43	0.43	0.43							1.6E-03	1.6E-03
7440-02-0	Nickel Soluble Salts	23.5	23.5	23.5			1.6E-12	1.6E-12	2.2E-03		1.8E-07	2.2E-03
7782-49-2	Selenium	9.05	9.05	9.05					3.4E-03		3.2E-10	3.4E-03
7440-24-6	Strontium, Stable	269	269	269					8.5E-04			8.5E-04

Cumulative:

3.4E-05

4.6E-01



Version Date:	June 2021
Basis:	May 2021 EPA RSL Table
Site Name:	828 MLK Jr. Blvd Property
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina
DEQ Section:	Brownfields Program
Site ID:	BPN 21061-17-060
Exposure Unit ID:	EU #3 Embankment - Construction Worker
Submittal Date:	
Prepared By:	Hart & Hickman, PC
r repared by:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina
Reviewed By:	

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Complete Exposure Pathways		Input Form 1A										
Version Date: June 2021 Basis: May 2021 EPA RSL T Site ID: BPN 21061-17-060	able											
Exposure Unit ID: EU #3 Embankment - Construction Worker												
-	Note: Risk output will only be calculated for complete exposure pathways.											
Receptor	Check box if pathway complete											
DIRECT CONTACT SOIL AND WATER PATHWAYS												
Resident	Soil											
Resident	Groundwater Use											
Non-Residential Worker Soil												
Non-Residential Worker												
Construction Worker	Soil	<b>✓</b>										
December / Tracemossor	Soil											
Recreator/Trespasser	Surface Water											
VAP	OR INTRUSION PATHWAYS											
	Groundwater to Indoor Air											
Resident	Soil Gas to Indoor Air											
	Indoor Air											
	Groundwater to Indoor Air											
Non-Residential Worker	Soil Gas to Indoor Air											
	Indoor Air											
CONTAM	IINANT MIGRATION PATHWAYS											
Groundwater	Source Soil											
Oroundwater	Source Groundwater											
Surface Water	Source Soil											
Surface water	Source Groundwater											

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #3 Embankment - Construction Worker

		,	
Exposure Parameter	Default Value	Site Specific	Justification
•	Genera	Value	
Towart Canaar Diele (individual)	1.0E-06	1.0E-06	
Target Cancer Risk (individual)  Target Cancer Risk (augustativa)	1.0E-04	1.0E-00	
Target Cancer Risk (cumulative)  Target Hazard Index (individual)	2.0E-01	2.0E-01	
Target Hazard Index (individual)  Target Hazard Index (augustativa)	1.0E+00	1.0E+00	
Target Hazard Index (cumulative)	Residential		
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	15	15	
Exposure Duration (ED) (yr)	6	6	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	6365	6365	
Water Ingestion Rate (IRW) (L/d)	0.78	0.78	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.54	0.78	
	1	1	
Water Event Frequency (EV) (events/day)	Residential		
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	20	20	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
2	6032	6032	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.07	0.07	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> ) Soil Ingestion Rate (IRS) (mg/day)	100	100	
1	19652	19652	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	2.5	2.5	
Water Ingestion Rate (IRW) (L/d)	0.71		
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71	
Water Event Frequency (EV) (events/day)		1	
Lifetime (LT) ()	Non-Residentia 70	70	
Lifetime (LT) (years)	80	80	
Body Weight (BW) (kg)  Exposure Duration (ED) (vr)	25	25	
Exposure Duration (ED) (yr)	250		
Exposure Frequency (EF) (d/yr)	8	250 8	
Exposure Time (ET) (hr)	3527		
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.12	3527	
Soil Adherence Factor (AF) (mg/cm²)	100	0.12	
Soil Ingestion Rate (IR) (mg/day)		100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	0.83	0.83	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67	
Water Event Frequency (EV) (events/day)	1	1 W	
L'C. (LT)	Construction 70		
Lifetime (LT) (years)	80	70	
Body Weight (BW) (kg)		80	
Working Weeks (EW) (wk/yr)	50	50	
Exposure Duration (ED) (yr)	1	1	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.3	0.3	
Soil Ingestion Rate (IR) (mg/day)	330	330	

Exposure Factors and Target Risks Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #3 Embankment - Construction Worker

Exposure Parameter	Defau	lt Value	Site Specific Value	Justification
		User Defined	d Child	
		Trespasser		
Lifetime (LT) (years)	70	NA	70	
Averaging Time (AT) (days/yr)	365	NA	365	
Body Weight (BW) (kg)	15	NA	15	
Exposure Duration 0-2 (ED) (yr)	2	NA	2	
Exposure Duration 2-6 (ED) (yr)	4	NA	4	
Exposure Frequency (EF) (d/yr)	195	NA	52	Based on 98% percentile of trail users
Exposure Time (ET) (hr)	2	NA	0.5	Based on 98% percentile of trail users
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365	
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	2	
Water Event Frequency (EV) (events/day)	1	NA	1	
	Ţ	Jser Defined	l Adult	
	Recreator	Trespasser		
Lifetime (LT) (years)	70	70	70	
Body Weight (BW) (kg)	80	45	80	
Exposure Duration 6-16 (ED) (yr)	10	10	10	
Exposure Duration 16-26 (ED) (yr)	10	0	10	
Exposure Frequency (EF) (d/yr)	195	90	364	Based on 98% percentile of trail users
Exposure Time (ET) (hr)	2	2	1	Based on 98% percentile of trail users
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	200	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652	
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	2	
Water Event Frequency (EV) (events/day)	1	1	1	

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #3 Embankment - Construction Worker

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from all samples collected within the exposure unit.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (mg/kg)	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
60.3	HH-10	7440-38-2	Arsenic, Inorganic			mg/kg										
3260	HH-11	7440-39-3	Barium			mg/kg										
5.9	HH-11	7440-41-7	Beryllium and compounds			mg/kg										
0.22	HH-11	7440-43-9	Cadmium (Diet)			mg/kg										
43.8	Excavation H-2	16065-83-1	Chromium(III), Insoluble Salts			mg/kg										
1.4	S-7	18540-29-9	Chromium(VI)			mg/kg										
20.8	Excavation H-4	7440-48-4	Cobalt			mg/kg										
59.2	Excavation H-2	7440-50-8	Copper			mg/kg										
1480	Excavation H-4	7439-96-5	Manganese (Non-diet)			mg/kg										
0.43	HH-11	7439-97-6	~Mercury (elemental)			mg/kg										
23.5	HH-11	7440-02-0	Nickel Soluble Salts			mg/kg										
9.05	HH-11	7782-49-2	Selenium			mg/kg										
269	HH-10	7440-24-6	Strontium, Stable			mg/kg										

Risk for Individual Pathways	Output Form 1A
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Version Date: June 2021

**Basis:** May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

Exposure Unit ID: EU #3 Embankment - Construction Worker

DIRE	CCT CONTACT SOIL AND WATE	R CALCULATO	ORS							
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?						
Resident	Soil	NC	NC	NC						
Resident	Groundwater Use*	NC	NC	NC						
Non-Residential Worker	Soil	NC	NC	NC						
Non-Residential Worker	Groundwater Use*	NC	NC	NC						
Construction Worker	Soil	4.4E-06	8.8E+00	YES						
Recreator/Trespasser	Soil	NC	NC	NC						
Recreator/Trespasser	Surface Water*	NC	NC	NC						
VAPOR INTRUSION CALCULATORS										
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?						
	Groundwater to Indoor Air	NC	NC	NC						
Resident	Soil Gas to Indoor Air	NC	NC	NC						
	Indoor Air	NC	NC	NC						
	Groundwater to Indoor Air	NC	NC	NC						
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC						
	Indoor Air	NC	NC	NC						
	CONTAMINANT MIGRATION CA	LCULATORS								
Pathway	Source	Target Rec	eptor Concentratio	ons Exceeded?						
Groundwater	Source Soil	Exceedence of	2L at Receptor?	NC						
Groundwater	Source Groundwater	Exceedence of	Exceedence of 2L at Receptor?							
Surface Water	Source Soil	Exceedence of	Exceedence of 2B at Receptor?							
Surface water	Source Groundwater	Exceedence of	Exceedence of 2B at Receptor?							

# Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based closure.
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

DEQ Risk Calculator - Direct Contact - Construction Worker Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPX 21061-17-060 Exposure Unit ID: EU #3 Embankment - Construction Worker

Output Form 2E

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 800 mg/kg for commercial/industrial soil.

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	60.3	60.3	60.3	2.2E-06	3.5E-07	8.0E-07	3.3E-06	3.6E-01	5.7E-02	9.0E-01	1.3E+00
7440-39-3	Barium	3260	3260	3260					4.8E-02		1.5E-01	1.9E-01
7440-41-7	Beryllium and compounds	5.9	5.9	5.9			4.4E-08	4.4E-08	3.5E-03		6.6E-02	7.0E-02
7440-43-9	Cadmium (Diet)	0.22	0.22	0.22			1.2E-09	1.2E-09	1.3E-03	1.7E-04	4.9E-03	6.4E-03
16065-83-1	Chromium(III), Insoluble Salts	43.8	43.8	43.8					8.6E-05		2.0E-03	2.1E-03
18540-29-9	Chromium(VI)	1.4	1.4	1.4	2.8E-08		3.6E-07	3.9E-07	8.3E-04		1.0E-03	1.9E-03
7440-48-4	Cobalt	20.8	20.8	20.8			5.8E-07	5.8E-07	2.0E-02		2.3E-01	2.5E-01
7440-50-8	Copper	59.2	59.2	59.2					1.7E-02			1.7E-02
7439-96-5	Manganese (Non-diet)	1480	1480	1480					1.8E-01		6.6E+00	6.8E+00
7439-97-6	~Mercury (elemental)	0.43	0.43	0.43							4.4E-02	4.4E-02
7440-02-0	Nickel Soluble Salts	23.5	23.5	23.5			1.9E-08	1.9E-08	3.5E-03		2.6E-02	3.0E-02
7782-49-2	Selenium	9.05	9.05	9.05					5.3E-03		1.0E-04	5.4E-03
7440-24-6	Strontium, Stable	269	269	269					4.0E-04			4.0E-04

Cumulative:

4.4E-06

8.8E+00



Version Date:	June 2021						
Basis:	May 2021 EPA RSL Table						
Site Name:	828 MLK Jr. Blvd Property						
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina						
DEQ Section:	Brownfields Program						
Site ID:	BPN 21061-17-060						
Exposure Unit ID:	EU#1 - Resident & Non-Residential Worker excluding Background						
Submittal Date:							
Prepared By:	Hart & Hickman, PC						
r repared by:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina						
Reviewed By:							

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Basis: May 2021 E		
Site ID: BPN 2106		
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Exposure Unit ID:	EU#1 - Resident & Non-Residential Worker excluding Background	
Form No.	Description	Check box if included
	DATA INPUT SHEETS	II IIIciuucu
	Input Section 1 - Exposure Pathways & Parameters	
Input Form 1A	Complete Exposure Pathways	7
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mpar I offir ID	Input Section 2 - Exposure Point Concentrations	
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Input Form 2B	Groundwater Exposure Point Concentration Table	
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Input Form 2D	Soil Gas Exposure Point Concentration Table	
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0	Output Section 2 - Direct Contact Soil and Groundwater Calculators	
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	Non-Residential Worker Soil	<u> </u>
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	Construction Worker Soil	
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	Output Section 3 - Vapor Intrusion Calculators	
	Resident Groundwater to Indoor Air	
	Resident Soil Gas to Indoor Air	
	Resident Indoor Air	
	Non-Residential Worker Groundwater to Indoor Air	<u>L</u>
•	Non-Residential Worker Soil Gas to Indoor Air	
Output Form 3F	Non-Residential Worker Indoor Air	
	Output Section 4 - Contaminant Migration Worksheets	
*	Soil to Groundwater - Forward Mode	
Output Form 4B	Groundwater to Groundwater - Forward Mode	
Output Form 4C	Soil to Surface Water - Forward Mode	
Output Form 4D		
Output Form 4E	Soil to Groundwater - Backward Mode	
Output Form 4F	Groundwater to Groundwater - Backward Mode	
Output Form 4G	Soil to Surface Water - Backward Mode	
Output Form 4H	Groundwater to Surface Water - Backward Mode	

Complete Exposure Pathways Input Form 1A											
Version Date: June 2021 Basis: May 2021 EPA RSL T	able										
Site ID: BPN 21061-17-060											
Exposure Unit ID: EU#1 - Re	esident & Non-Residential Worker exclu	uding Backgroui									
Note: Risk output will only be calc	ulated for complete exposure pathways.										
Receptor	Pathway	Check box if pathway complete									
DIRECT CONTACT SOIL AND WATER PATHWAYS											
Resident	Soil	<b>V</b>									
	Groundwater Use										
Non-Residential Worker	Soil	<b>V</b>									
NOII-RESIGNITIAL WOLKEL	Groundwater Use										
Construction Worker	Construction Worker Soil										
Dograptor/Trachasser	Soil										
Recreator/Trespasser	Surface Water										
VAP	OR INTRUSION PATHWAYS										
	Groundwater to Indoor Air										
Resident	Soil Gas to Indoor Air										
	Indoor Air										
	Groundwater to Indoor Air										
Non-Residential Worker	Soil Gas to Indoor Air										
	Indoor Air										
CONTAM	IINANT MIGRATION PATHWAYS										
Groundwater	Source Soil										
Groundwater	Source Groundwater										
Surface Water	Source Soil										
Surface water	Source Groundwater										

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#1 - Resident & Non-Residential Worker excluding Background

Exposure Parameter	Default Value	Site Specific Value	Justification
	Genera		
Target Cancer Risk (individual)	1.0E-06	1.0E-06	
Target Cancer Risk (cumulative)	1.0E-04	1.0E-04	
Target Hazard Index (individual)	2.0E-01	2.0E-01	
Target Hazard Index (cumulative)	1.0E+00	1.0E+00	
L'C' (LT) (	Residential 70	Child 70	
Lifetime (LT) (years)	15		
Body Weight (BW) (kg)	6	15	
Exposure Duration (ED) (yr)	350	6	
Exposure Frequency (EF) (d/yr)	24	350	
Exposure Time (ET) (hr)	2373	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	0.2	2373	
Soil Adherence Factor (AF) (mg/cm²)	200	0.2	
Soil Ingestion Rate (IRS) (mg/day)		200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	6365 0.78	6365	
Water Exposure Time (ET ) /br/avent)	0.78	0.78	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.34	0.54	
Water Event Frequency (EV) (events/day)		1	
Lifatima (LT) (vansa)	Residential 70	Adult 70	
Lifetime (LT) (years) Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	20	20	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	
1	0.07	0.07	
Soil Adherence Factor (AF) (mg/cm²) Soil Ingestion Rate (IRS) (mg/day)	100	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	2.5	2.5	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71	
Water Event Frequency (EV) (events/day)	1	1	
water Event Frequency (EV) (events/day)	Non-Residentia		
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	25	25	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm²)	0.12	0.12	
Soil Ingestion Rate (IR) (mg/day)	100	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	0.83	0.83	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67	
Water Event Frequency (EV) (events/day)	1	1	
	Construction		
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Working Weeks (EW) (wk/yr)	50	50	
Exposure Duration (ED) (yr)	1	1	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.3	0.3	
Soil Ingestion Rate (IR) (mg/day)	330	330	

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#1 - Resident & Non-Residential Worker excluding Background

Exposure Parameter	Defau	lt Value	Site Specific Value	Justification
		Jser Defined		
		Trespasser		
Lifetime (LT) (years)	70	NA	70	
Averaging Time (AT) (days/yr)	365	NA	365	
Body Weight (BW) (kg)	15	NA	15	
Exposure Duration 0-2 (ED) (yr)	2	NA	2	
Exposure Duration 2-6 (ED) (yr)	4	NA	4	
Exposure Frequency (EF) (d/yr)	195	NA	195	
Exposure Time (ET) (hr)	2	NA	2	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365	
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	2	
Water Event Frequency (EV) (events/day)	1	NA	1	
	Ţ	Jser Defined	d Adult	
	Recreator	Trespasser		
Lifetime (LT) (years)	70	70	70	
Body Weight (BW) (kg)	80	45	80	
Exposure Duration 6-16 (ED) (yr)	10	10	10	
Exposure Duration 16-26 (ED) (yr)	10	0	10	
Exposure Frequency (EF) (d/yr)	195	90	195	
Exposure Time (ET) (hr)	2	2	2	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	200	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652	
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	2	
Water Event Frequency (EV) (events/day)	1	1	1	

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#1 - Resident & Non-Residential Worker excluding Background

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from shallow samples (0-2 ft) collected within the exposure unit with background concentrations removed.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (mg/kg)	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
14	S-4	7440-38-2	Arsenic, Inorganic			mg/kg										
200	HH-3	7440-39-3	Barium			mg/kg										
1.3	HH-3	7440-41-7	Beryllium and compounds			mg/kg										
1.5	S-4	7440-43-9	Cadmium (Diet)			mg/kg										
180	MW-7	7440-50-8	Copper			mg/kg										
1500	S-4	7439-96-5	Manganese (Non-diet)			mg/kg										
43	S-4	7440-02-0	Nickel Soluble Salts			mg/kg										

Risk for Individual Pathways

Output Form 1A

Version Date: June 2021

Basis: May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

Exposure Unit ID: EU#1 - Resident & Non-Residential Worker excluding Background

DIRECT CONTACT SOIL AND WATER CALCULATORS									
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded					
Resident	Soil	2.1E-05	1.3E+00	YES					
Resident	Groundwater Use*	NC	NC	NC					
Non-Residential Worker	Soil	4.7E-06	9.1E-02	NO					
Non-Residential Worker	Groundwater Use*	NC	NC	NC					
Construction Worker	Soil	NC	NC	NC					
Decreater/Trasmesser	Soil	NC	NC	NC					
Recreator/Trespasser	Surface Water*	NC	NC	NC					
	VAPOR INTRUSION CALCU	LATORS							
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded					
	Groundwater to Indoor Air	NC	NC	NC					
Resident	Soil Gas to Indoor Air	NC	NC	NC					
	Indoor Air	NC	NC	NC					
	Groundwater to Indoor Air	NC	NC	NC					
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC					
	Indoor Air	NC	NC	NC					
	CONTAMINANT MIGRATION CA	LCULATORS							
Pathway	Source	Target Rec	eptor Concentratio	ns Exceeded?					
Groundwater	Source Soil	Exceedence of	2L at Receptor?	NC					
Groundwater	Source Groundwater	Exceedence of	Exceedence of 2L at Receptor?						
Surface Water	Source Soil	Exceedence of	Exceedence of 2B at Receptor?						
Surface water	Source Groundwater	Exceedence of	Exceedence of 2B at Receptor?						

# Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

Output Form 2A

DEQ Risk Calculator - Direct Contact - Resident Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

### Exposure Unit ID: EU#1 - Resident & Non-Residential Worker excluding Background

\* - Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

\*\* - Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 400 mg/kg for residential soil.

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk*	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient*	Calculated Non- Carcinogenic Hazard
7440-38-2	Arsenic, Inorganic	14	14	14	1.8E-05	2.5E-06	3.6E-10	2.1E-05	3.6E-01	4.2E-02	1.5E-05	Quotient 4.0E-01
7440-39-3	Barium	200	200	200					1.3E-02		6.5E-06	1.3E-02
7440-41-7	Beryllium and compounds	1.3	1.3	1.3			1.9E-11	1.9E-11	8.3E-03		1.1E-06	8.3E-03
7440-43-9	Cadmium (Diet)	1.5	1.5	1.5			1.6E-11	1.6E-11	1.9E-02	1.8E-03	2.4E-06	2.1E-02
7440-50-8	Copper	180	180	180					5.8E-02			5.8E-02
7439-96-5	Manganese (Non-diet)	1500	1500	1500					8.0E-01		4.8E-04	8.0E-01
7440-02-0	Nickel Soluble Salts	43	43	43			6.7E-11	6.7E-11	2.7E-02		7.7E-06	2.7E-02

Cumulative:

2.1E-05

1.3E+00

DEQ Risk Calculator - Direct Contact - Non-Residential Worker Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Output Form 2C

### Exposure Unit ID: EU#1 - Resident & Non-Residential Worker excluding Background

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 800 mg/kg for commercial/industrial soil.

												Calculated
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation	Calculated	Ingestion	Dermal	Inhalation	Non-
CAS#	Chemical Name:	Concentration	Concentration	Concentration	Carcinogenic	Carcinogenic	Carcinogenic	Carcinogenic	Hazard	Hazard	Hazard	Carcinogenic
		(mg/kg)	(mg/kg)	(mg/kg)*	Risk	Risk	Risk	Risk	Quotient	Quotient	Quotient	Hazard
												Quotient
7440-38-2	Arsenic, Inorganic	14	14	14	3.9E-06	8.2E-07	8.3E-11	4.7E-06	2.4E-02	5.1E-03	3.6E-06	2.9E-02
7440-39-3	Barium	200	200	200					8.6E-04		1.5E-06	8.6E-04
7440-41-7	Beryllium and compounds	1.3	1.3	1.3			4.3E-12	4.3E-12	5.6E-04		2.5E-07	5.6E-04
7440-43-9	Cadmium (Diet)	1.5	1.5	1.5			3.7E-12	3.7E-12	1.3E-03	2.2E-04	5.8E-07	1.5E-03
7440-50-8	Copper	180	180	180					3.9E-03			3.9E-03
7439-96-5	Manganese (Non-diet)	1500	1500	1500					5.4E-02		1.2E-04	5.4E-02
7440-02-0	Nickel Soluble Salts	43	43	43			1.5E-11	1.5E-11	1.8E-03		1.8E-06	1.8E-03

Cumulative:

4.7E-06

9.1E-02



Version Date:	June 2021						
Basis:	May 2021 EPA RSL Table						
Site Name:	828 MLK Jr. Blvd Property						
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina						
DEQ Section:	Brownfields Program						
Site ID:	BPN 21061-17-060						
Exposure Unit ID:	EU #1 - Construction Worker excluding Background						
Submittal Date:							
Prepared By:	Hart & Hickman, PC						
r repared by:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina						
Reviewed By:							

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Input Form 1A	Complete Exposure Pathways	<b>√</b>					
Input Form 1B	Exposure Factors and Target Risks	<b>V</b>					
Input Form 1C	Contaminant Migration Parameters						
Input Form 1D	Sample Statistics						
	Input Section 2 - Exposure Point Concentrations						
Input Form 2A	Soil Exposure Point Concentration Table	✓					
Input Form 2B	Groundwater Exposure Point Concentration Table						
Input Form 2C	Surface Water Exposure Point Concentration Table						
Input Form 2D	Soil Gas Exposure Point Concentration Table						
Input Form 2E	Indoor Air Exposure Point Concentration Table						
	DATA OUTPUT SHEETS						
	Output Section 1 - Summary Output for All Calculators						
Output Form 1A	Risk for Individual Pathways	✓					
Output Form 1B							
3 wp w 1 3 m 1 B	Output Section 2 - Direct Contact Soil and Groundwater Calculators						
Output Form 2A							
	Resident Groundwater Use						
	Non-Residential Worker Soil						
	Non-Residential Worker Groundwater Use						
	Construction Worker Soil						
	Recreator/Trespasser Soil						
	Recreator/Trespasser Surface Water						
3 th p th 1 5 m 2 5	Output Section 3 - Vapor Intrusion Calculators						
Output Form 3A	Resident Groundwater to Indoor Air						
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	Resident Indoor Air						
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Output Form 3F	Non-Residential Worker Indoor Air						
output Form 31	Output Section 4 - Contaminant Migration Worksheets						
Output Form 4A	Soil to Groundwater - Forward Mode						
Output Form 4B	Groundwater to Groundwater - Forward Mode						
Output Form 4C							
	Groundwater to Surface Water - Forward Mode						
Output Form 4E	Soil to Groundwater - Backward Mode						
Output Form 4F	Groundwater to Groundwater - Backward Mode						
Output Form 4G							
Output Form 4H							
Superion III							

Complete Exposure Pathways	Input Form 1A										
Version Date: June 2021 Basis: May 2021 EPA RSL Table											
Site ID: BPN 21061-17-060											
Exposure Unit ID: EU #1 - Construction Worker excluding Background											
Note: Risk output will only be calculated for complete exposure pathways.											
Receptor	Pathway	Check box if pathway complete									
DIRECT CONTACT SOIL AND WATER PATHWAYS											
Resident	Soil										
Resident	Groundwater Use										
Non-Residential Worker	Soil										
Non-Residential Worker	Groundwater Use										
Construction Worker	Soil	<b>✓</b>									
Doorootor/Tragnagaar	Soil										
Recreator/Trespasser	Surface Water										
VAPOR INTRUSION PATHWAYS											
	Groundwater to Indoor Air										
Resident	Soil Gas to Indoor Air										
	Indoor Air										
	Groundwater to Indoor Air										
Non-Residential Worker	Soil Gas to Indoor Air										
	Indoor Air										
CONTAMINANT MIGRATION PATHWAYS											
Groundwater	Source Soil										
Groundwater	Source Groundwater										
Surface Water	Source Soil										
Surface water	Source Groundwater										

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #1 - Construction Worker excluding Background

Exposure Parameter	Default Value	Site Specific Value	Justification						
B. 10 B.	Genera								
Target Cancer Risk (individual)	1.0E-06	1.0E-06							
Target Cancer Risk (cumulative)	1.0E-04	1.0E-04							
Target Hazard Index (individual)	2.0E-01	2.0E-01							
Target Hazard Index (cumulative)	1.0E+00	1.0E+00							
Residential Child  70 70									
Lifetime (LT) (years)	15	15							
Body Weight (BW) (kg)	6	6							
Exposure Duration (ED) (yr)	350	350							
Exposure Frequency (EF) (d/yr) Exposure Time (ET) (hr)	24	24							
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	2373							
1 1 1	0.2								
Soil Adherence Factor (AF) (mg/cm²)	200	0.2							
Skin Surface Area - Water Exposure (SA.) (cm2)	6365	200							
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	0.78	6365							
Water Exposure Time (ET ) (br/avent)	0.78	0.78							
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.54	0.54							
Water Event Frequency (EV) (events/day)	Residential	1 A dult							
Lifatima (LT) (yaana)	Residential 70	Adult 70							
Lifetime (LT) (years)  Rody Weight (RW) (kg)	80	80							
Body Weight (BW) (kg)  Exposure Duration (ED) (vr)	20	20							
Exposure Duration (ED) (yr)	350								
Exposure Frequency (EF) (d/yr)	24	350 24							
Exposure Time (ET) (hr)	6032	6032							
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.07								
Soil Adherence Factor (AF) (mg/cm²)	100	0.07							
Soil Ingestion Rate (IRS) (mg/day)	19652	100							
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	2.5	19652							
Water Ingestion Rate (IRW) (L/d)	0.71	2.5							
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71							
Water Event Frequency (EV) (events/day)		1 Worker							
Lifetime (LT) (veges)	Non-Residentia	70							
Lifetime (LT) (years)	80	80							
Body Weight (BW) (kg)  Exposure Duration (ED) (yr)	25	25							
Exposure Duration (ED) (yr)	250	250							
Exposure Frequency (EF) (d/yr)	8	8							
Exposure Time (ET) (hr)  Skin Surface Area Soil Exposure (SA) (cm²)	3527								
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.12	3527 0.12							
Soil Adherence Factor (AF) (mg/cm²) Soil Ingestion Rate (IR) (mg/day)	100	100							
1	19652								
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	0.83	19652							
Water Exposure Time (ET ) (br/avent)	0.83	0.83							
Water Exposure Time (ET <sub>event</sub> ) (hr/event) Water Event Frequency (EV) (events/day)	1	0.67							
water Event Frequency (EV) (events/day)	Construction	Worker							
Lifetime (LT) (years)	70	70							
Body Weight (BW) (kg)	80	80							
Working Weeks (EW) (wk/yr)	50	50							
Exposure Duration (ED) (yr)	1	1							
* * * * * * * * * * * * * * * * * * * *	250	250							
Exposure Frequency (EF) (d/yr)	8	8							
Exposure Time (ET) (hr)	3527								
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	0.3	3527							
Soil Adherence Factor (AF) (mg/cm²) Soil Ingestion Rate (IR) (mg/day)	330	0.3 330							

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #1 - Construction Worker excluding Background

Exposure Parameter	Defau	lt Value	Site Specific Value	Justification				
User Defined Child								
Recreator Trespasser								
Lifetime (LT) (years)	70	NA	70					
Averaging Time (AT) (days/yr)	365	NA	365					
Body Weight (BW) (kg)	15	NA	15					
Exposure Duration 0-2 (ED) (yr)	2	NA	2					
Exposure Duration 2-6 (ED) (yr)	4	NA	4					
Exposure Frequency (EF) (d/yr)	195	NA	195					
Exposure Time (ET) (hr)	2	NA	2					
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373					
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2					
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200					
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365					
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124					
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	2					
Water Event Frequency (EV) (events/day)	1	NA	1					
		Jser Defined	l Adult					
		Trespasser						
Lifetime (LT) (years)	70	70	70					
Body Weight (BW) (kg)	80	45	80					
Exposure Duration 6-16 (ED) (yr)	10	10	10					
Exposure Duration 16-26 (ED) (yr)	10	0	10					
Exposure Frequency (EF) (d/yr)	195	90	195					
Exposure Time (ET) (hr)	2	2	2					
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032					
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07					
Soil Ingestion Rate (IRS) (mg/day)	100	200	100					
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652					
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985					
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	2					
Water Event Frequency (EV) (events/day)	1	1	1					

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU #1 - Construction Worker excluding Background

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from samples collected between 0 to 10 ft within the exposure unit, excluding background levels.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (mg/kg)	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
95.9	GP-5	7440-38-2	Arsenic, Inorganic			mg/kg										
3200	S-6	7440-39-3	Barium			mg/kg										
6.99	GP-5	7440-41-7	Beryllium and compounds			mg/kg										
1.5	S-4	7440-43-9	Cadmium (Diet)			mg/kg										
180	MW-7	7440-50-8	Copper			mg/kg										
1500	S-4	7439-96-5	Manganese (Non-diet)			mg/kg										
11	GP-6	7439-97-6	~Mercury (elemental)			mg/kg										
43	S-4	7440-02-0	Nickel Soluble Salts			mg/kg										
13	GP-5	7782-49-2	Selenium			mg/kg										
325	GP-5	7440-24-6	Strontium, Stable			mg/kg										

Risk for Individual Pathways

Output Form 1A

Version Date: June 2021

**Basis: May 2021 EPA RSL Table** 

Site ID: BPN 21061-17-060

Exposure Unit ID: EU #1 - Construction Worker excluding Background

DIRI	ECT CONTACT SOIL AND WATE	R CALCULATO	RS			
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?		
Resident	Soil	NC	NC	NC		
Resident	Groundwater Use*	NC	NC	NC		
Non-Residential Worker	Soil	NC	NC	NC		
Non-Residential Worker	Groundwater Use*	NC	NC	NC		
Construction Worker	Soil	5.4E-06	1.1E+01	YES		
Pageatar/Traspassar	Soil	NC	NC	NC		
Recreator/Trespasser	Surface Water*	NC	NC	NC		
	VAPOR INTRUSION CALCU	LATORS				
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?		
	Groundwater to Indoor Air	NC	NC	NC		
Resident	Soil Gas to Indoor Air	NC	NC	NC		
	Indoor Air	NC	NC	NC		
	Groundwater to Indoor Air	NC	NC	NC		
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC		
	Indoor Air	NC	NC	NC		
	CONTAMINANT MIGRATION CA	LCULATORS				
Pathway	Source	Target Rec	eptor Concentratio	ons Exceeded?		
Groundwater	Source Soil	Exceedence of	2L at Receptor?	NC		
Groundwater	Source Groundwater	Exceedence of	Exceedence of 2L at Receptor? NC			
Surface Water	Source Soil	Exceedence of 2B at Receptor? NC				
Surface water	Source Groundwater	Exceedence of	2B at Receptor?	NC		

## Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based closure.
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

Output Form 2E

# DEQ Risk Calculator - Direct Contact - Construction Worker Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060 Exposure Unit ID: EU#1 - Construction Worker excluding Background

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 800 mg/kg for commercial/industrial soil.

												Calculated
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation	Calculated	Ingestion	Dermal	Inhalation	Non-
CAS#	Chemical Name:	Concentration	Concentration	Concentration	Carcinogenic	Carcinogenic	Carcinogenic	Carcinogenic	Hazard	Hazard	Hazard	Carcinogenic
		(mg/kg)	(mg/kg)	(mg/kg)*	Risk	Risk	Risk	Risk	Quotient	Quotient	Quotient	Hazard
												Quotient
7440-38-2	Arsenic, Inorganic	95.9	95.9	95.9	3.5E-06	5.6E-07	1.3E-06	5.3E-06	5.7E-01	9.1E-02	1.4E+00	2.1E+00
7440-39-3	Barium	3200	3200	3200					4.7E-02		1.4E-01	1.9E-01
7440-41-7	Beryllium and compounds	6.99	6.99	6.99			5.2E-08	5.2E-08	4.1E-03		7.9E-02	8.3E-02
7440-43-9	Cadmium (Diet)	1.5	1.5	1.5			8.3E-09	8.3E-09	8.8E-03	1.1E-03	3.4E-02	4.4E-02
7440-50-8	Copper	180	180	180					5.3E-02			5.3E-02
7439-96-5	Manganese (Non-diet)	1500	1500	1500					1.8E-01		6.7E+00	6.9E+00
7439-97-6	~Mercury (elemental)	11	11	11							1.1E+00	1.1E+00
7440-02-0	Nickel Soluble Salts	43	43	43			3.4E-08	3.4E-08	6.3E-03		4.8E-02	5.5E-02
7782-49-2	Selenium	13	13	13					7.7E-03		1.5E-04	7.8E-03
7440-24-6	Strontium, Stable	325	325	325					4.8E-04			4.8E-04

Cumulative:

5.4E-06

1.1E+01



Version Date:	June 2021
Basis:	May 2021 EPA RSL Table
Site Name:	828 MLK Jr. Blvd Property
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina
DEQ Section:	Brownfields Program
Site ID:	BPN 21061-17-060
Exposure Unit ID:	EU#2 Trail - Greenway User & Construction Worker excluding Background
Submittal Date:	
Duananad Dva	Hart & Hickman, PC
Prepared By:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina
Reviewed By:	

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		Check box
Form No.	Description	if included
	DATA INPUT SHEETS	
	Input Section 1 - Exposure Pathways & Parameters	
Input Form 1A	Complete Exposure Pathways	<b>V</b>
Input Form 1B	Exposure Factors and Target Risks	✓
Input Form 1C	Contaminant Migration Parameters	
Input Form 1D	Sample Statistics	
	Input Section 2 - Exposure Point Concentrations	
Input Form 2A	Soil Exposure Point Concentration Table	✓
Input Form 2B	Groundwater Exposure Point Concentration Table	
Input Form 2C	Surface Water Exposure Point Concentration Table	
Input Form 2D	Soil Gas Exposure Point Concentration Table	
Input Form 2E	Indoor Air Exposure Point Concentration Table	
	DATA OUTPUT SHEETS	
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Output Form 1B	Sitewide Risk	
•	Output Section 2 - Direct Contact Soil and Groundwater Calculators	
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*	Resident Groundwater Use	
	Non-Residential Worker Soil	
	Non-Residential Worker Groundwater Use	
	Construction Worker Soil	7
	Recreator/Trespasser Soil	<u> </u>
	Recreator/Trespasser Surface Water	
•	Output Section 3 - Vapor Intrusion Calculators	
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	Non-Residential Worker Groundwater to Indoor Air	
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Output Form 4A	Soil to Groundwater - Forward Mode	П
Output Form 4B		
<u>+</u>	Soil to Surface Water - Forward Mode	
•	Groundwater to Surface Water - Forward Mode	
	Soil to Groundwater - Backward Mode	
	Groundwater to Groundwater - Backward Mode	
•	Soil to Surface Water - Backward Mode	
	Groundwater to Surface Water - Backward Mode	

Complete Exposure Pathways		Input Form 1A
Version Date: June 2021 Basis: May 2021 EPA RSL T Site ID: BPN 21061-17-060	able	
Exposure Unit ID: EU#2 Tra	il - Greenway User & Construction Wo	rker excluding F
Note: Risk output will only be calc	ulated for complete exposure pathways.	
Receptor	Pathway	Check box if pathway complete
DIRECT CON	TACT SOIL AND WATER PATHWAYS	
Resident	Soil	
Resident	Groundwater Use	
Non-Residential Worker	Soil	
Non-Residential worker	Groundwater Use	
Construction Worker	Soil	<b>V</b>
Dograntor/Tragnaggar	Soil	<b>✓</b>
Recreator/Trespasser	Surface Water	
VAP	OR INTRUSION PATHWAYS	
	Groundwater to Indoor Air	
Resident	Soil Gas to Indoor Air	
	Indoor Air	
	Groundwater to Indoor Air	
Non-Residential Worker	Soil Gas to Indoor Air	
	Indoor Air	
CONTAM	INANT MIGRATION PATHWAYS	
Groundwater	Source Soil	
Groundwater	Source Groundwater	
Surface Water	Source Soil	
Surface water	Source Groundwater	

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#2 Trail - Greenway User & Construction Worker excluding Background

Exposure Parameter	Default Value	Site Specific Value	Justification
	Genera	al	
Target Cancer Risk (individual)	1.0E-06	1.0E-06	
Target Cancer Risk (cumulative)	1.0E-04	1.0E-04	
Target Hazard Index (individual)	2.0E-01	2.0E-01	
Target Hazard Index (cumulative)	1.0E+00	1.0E+00	
	Residential	Child	
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	15	15	
Exposure Duration (ED) (yr)	6	6	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	6365	6365	
Water Ingestion Rate (IRW) (L/d)	0.78	0.78	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.54	0.54	
Water Event Frequency (EV) (events/day)	1	1	
<u> </u>	Residential		
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	20	20	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	2.5	2.5	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71	
Water Event Frequency (EV) (events/day)	1	1	
	Non-Residentia	al Worker	
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	25	25	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.12	0.12	
Soil Ingestion Rate (IR) (mg/day)	100	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	0.83	0.83	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67	
Water Event Frequency (EV) (events/day)	1	1	
	Construction		
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Working Weeks (EW) (wk/yr)	50	50	
Exposure Duration (ED) (yr)	1	1	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.3	0.3	
Soil Ingestion Rate (IR) (mg/day)	330	330	

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#2 Trail - Greenway User & Construction Worker excluding Background

Exposure Parameter	Defau	lt Value	Site Specific Value	Justification
		Jser Defined	l Child	
		Trespasser		
Lifetime (LT) (years)	70	NA	70	
Averaging Time (AT) (days/yr)	365	NA	365	
Body Weight (BW) (kg)	15	NA	15	
Exposure Duration 0-2 (ED) (yr)	2	NA	2	
Exposure Duration 2-6 (ED) (yr)	4	NA	4	
Exposure Frequency (EF) (d/yr)	195	NA	52	Based on 98th pecrentile of trail user polling data
Exposure Time (ET) (hr)	2	NA	0.5	Based on 98th pecrentile of trail user polling data
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365	
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	0.5	Based on 98th pecrentile of trail user polling data
Water Event Frequency (EV) (events/day)	1	NA	1	
	Ţ	Jser Defined	l Adult	
	Recreator	Trespasser		
Lifetime (LT) (years)	70	70	70	
Body Weight (BW) (kg)	80	45	80	
Exposure Duration 6-16 (ED) (yr)	10	10	10	
Exposure Duration 16-26 (ED) (yr)	10	0	10	
Exposure Frequency (EF) (d/yr)	195	90	364	Based on 98th pecrentile of trail user polling data
Exposure Time (ET) (hr)	2	2	1	Based on 98th pecrentile of trail user polling data
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	200	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652	
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	1	Based on 98th pecrentile of trail user polling data
Water Event Frequency (EV) (events/day)	1	1	1	

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#2 Trail - Greenway User & Construction Worker excluding Background

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from all soil samples collected within the exposure unit, exlcuding background concentrations

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Concentra (mg/kg	ation	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
14.5	;	SED-13	7440-38-2	Arsenic, Inorganic			mg/kg										
958		SED-13	7440-39-3	Barium			mg/kg										
1.56	i	SED-13	7440-41-7	Beryllium and compounds			mg/kg										
3.07	'	SED-13	7782-49-2	Selenium			mg/kg										
125		SED-13	7440-24-6	Strontium, Stable			mg/kg										

Risk for Individual Pathways

Output Form 1A

Version Date: June 2021

**Basis:** May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

Exposure Unit ID: EU#2 Trail - Greenway User & Construction Worker excluding Background

DIRI	ECT CONTACT SOIL AND WATE	R CALCULATO	RS			
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?		
Resident	Soil	NC	NC	NC		
Resident	Groundwater Use*	NC	NC	NC		
Non-Residential Worker	Soil	NC	NC	NC		
Non-Residential Worker	Groundwater Use*	NC	NC	NC		
Construction Worker	Soil	8.1E-07	3.9E-01	NO		
Dagrantar/Traspassar	Soil	8.0E-06	7.5E-02	NO		
Recreator/Trespasser	Surface Water*	NC	NC	NC		
	VAPOR INTRUSION CALCU	LATORS				
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?		
	Groundwater to Indoor Air	NC	NC	NC		
Resident	Soil Gas to Indoor Air	NC	NC	NC		
	Indoor Air	NC	NC	NC		
	Groundwater to Indoor Air	NC	NC	NC		
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC		
	Indoor Air	NC	NC	NC		
	CONTAMINANT MIGRATION CA	LCULATORS				
Pathway	Source	Target Rec	eptor Concentratio	ns Exceeded?		
Groundwater	Source Soil	Exceedence of	2L at Receptor?	NC		
Groundwater	Source Groundwater	Exceedence of	Exceedence of 2L at Receptor? NC			
Surface Water	Source Soil	Exceedence of 2B at Receptor? NC				
Surface water	Source Groundwater	Exceedence of	2B at Receptor?	NC		

## Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based closure.
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

DEQ Risk Calculator - Direct Contact - Construction Worker Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table

Site ID: BPN 21061-17-060
Exposure Unit ID: EU#2 Trail - Greenway User & Construction Worker excluding Background

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 800 mg/kg for commercial/industrial soil.

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	14.5	14.5	14.5	5.3E-07	8.4E-08	1.9E-07	8.0E-07	8.5E-02	1.4E-02	2.2E-01	3.2E-01
7440-39-3	Barium	958	958	958					1.4E-02		4.3E-02	5.7E-02
7440-41-7	Beryllium and compounds	1.56	1.56	1.56			1.2E-08	1.2E-08	9.2E-04		1.8E-02	1.8E-02
7782-49-2	Selenium	3.07	3.07	3.07					1.8E-03		3.4E-05	1.8E-03
7440-24-6	Strontium, Stable	125	125	125					1.8E-04			1.8E-04

Cumulative:

8.1E-07

3.9E-01

Output Form 2E

DEQ Risk Calculator - Direct Contact - Recreator/Trespasser Soil

Version Date: June 2021

Basis: May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

Exposure Unit ID: EU#2 Trail - Greenway User & Construction Worker excluding Background

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 400 mg/kg for residential soil.

Receptor Type: Greenway user

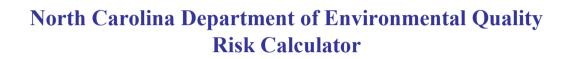
												Calculated
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation	Calculated	Ingestion	Dermal	Inhalation	Non-
CAS#	Chemical Name:	Concentration	Concentration	Concentration	Carcinogenic	Carcinogenic	Carcinogenic	Carcinogenic	Hazard	Hazard	Hazard	Carcinogenic
		(mg/kg)	(mg/kg)	(mg/kg)*	Risk	Risk	Risk	Risk	Quotient	Quotient	Quotient	Hazard
												Quotient
7440-38-2	Arsenic, Inorganic	14.5	14.5	14.5	6.8E-06	1.2E-06	1.6E-11	8.0E-06	5.5E-02	7.6E-03	6.8E-07	6.3E-02
7440-39-3	Barium	958	958	958					9.1E-03		1.3E-06	9.1E-03
7440-41-7	Beryllium and compounds	1.56	1.56	1.56			9.7E-13	9.7E-13	1.5E-03		5.5E-08	1.5E-03
7782-49-2	Selenium	3.07	3.07	3.07					1.2E-03		1.1E-10	1.2E-03
7440-24-6	Strontium, Stable	125	125	125					4.0E-04			4.0E-04

Cumulative:

8.0E-06

7.5E-02

Output Form 2F



Version Date:	June 2021
Basis:	May 2021 EPA RSL Table
Site Name:	828 MLK Jr. Blvd Property
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina
DEQ Section:	Brownfields Program
Site ID:	BPN 21061-17-060
Exposure Unit ID:	EU#2 Creek - Greenway User exlcuding Background
Submittal Date:	
Duamanad Dva	Hart & Hickman, PC
Prepared By:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina
Reviewed By:	

	TOC
2021	
PA RSL Table	
EU#2 Creek - Greenway User exlcuding Background	
Description	Check box
	if included
1 1	
· · ·	<u> </u>
	✓
-	
	✓
	✓
Indoor Air Exposure Point Concentration Table	
DATA OUTPUT SHEETS	
Output Section 1 - Summary Output for All Calculators	
Risk for Individual Pathways	<b>V</b>
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Output Section 2 - Direct Contact Soil and Groundwater Calculators	
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1 5	
	EU#2 Creek - Greenway User exlcuding Background  Description  DATA INPUT SHEETS  Input Section 1 - Exposure Pathways & Parameters  Complete Exposure Pathways Exposure Factors and Target Risks Contaminant Migration Parameters  Sample Statistics  Input Section 2 - Exposure Point Concentrations  Soil Exposure Point Concentration Table Groundwater Exposure Point Concentration Table Surface Water Exposure Point Concentration Table Groundwater Exposure Point Concentration Table Indoor Air Exposure Point Concentration Table Indoor Air Exposure Point Concentration Table  DATA OUTPUT SHEETS  Output Section 1 - Summary Output for All Calculators  Risk for Individual Pathways Sitewide Risk  Output Section 2 - Direct Contact Soil and Groundwater Calculators  Resident Soil Resident Groundwater Use Non-Residential Worker Soil Non-Residential Worker Groundwater Use Construction Worker Soil Recreator/Trespasser Surface Water  Output Section 3 - Vapor Intrusion Calculators  Resident Groundwater to Indoor Air Resident Soil Gas to Indoor Air Resident Soil Gas to Indoor Air Resident Soil Gas to Indoor Air Residential Worker Groundwater to Indoor Air Non-Residential Worker Forward Mode Groundwater to Groundwater - Backward Mode

Complete Exposure Pathways Input Form 1								
Version Date: June 2021 Basis: May 2021 EPA RSL T	'able							
Site ID: BPN 21061-17-060								
Exposure Unit ID: EU#2 Cre	eek - Greenway User exlcuding Backgro	und						
Note: Risk output will only be calculated for complete exposure pathways.								
Receptor	Pathway	Check box if pathway complete						
DIRECT CON	TACT SOIL AND WATER PATHWAYS							
Resident	Soil							
Resident	Groundwater Use							
Non-Residential Worker	Soil							
Non-Residential Worker	Groundwater Use							
Construction Worker	Construction Worker Soil							
Recreator/Trespasser	Soil	<b>✓</b>						
Recreator/Trespasser	Surface Water	<b>✓</b>						
VAP	OR INTRUSION PATHWAYS							
	Groundwater to Indoor Air							
Resident	Soil Gas to Indoor Air							
	Indoor Air							
	Groundwater to Indoor Air							
Non-Residential Worker	Soil Gas to Indoor Air							
	Indoor Air							
CONTAMINANT MIGRATION PATHWAYS								
Groundwater	Source Soil							
Groundwater	Source Groundwater							
Surface Water	Source Soil							
Surface water	Source Groundwater							

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#2 Creek - Greenway User exlcuding Background

Exposure Parameter	Default Value	Site Specific Value	Justification
	Genera		
Target Cancer Risk (individual)	1.0E-06	1.0E-06	
Target Cancer Risk (cumulative)	1.0E-04	1.0E-04	
Target Hazard Index (individual)	2.0E-01	2.0E-01	
Target Hazard Index (cumulative)	1.0E+00	1.0E+00	
I :f-t: (I T) ()	Residential 70	70	
Lifetime (LT) (years)	15	15	
Body Weight (BW) (kg)	6	6	
Exposure Duration (ED) (yr)	350	350	
Exposure Frequency (EF) (d/yr) Exposure Time (ET) (hr)	24	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	2373	
<u> </u>	0.2		
Soil Adherence Factor (AF) (mg/cm²)	200	0.2	
Soil Ingestion Rate (IRS) (mg/day)	6365	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	0.78	6365	
Water Exposure Time (ET ) (hr/event)	0.78	0.78	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.34	0.54	
Water Event Frequency (EV) (events/day)	Residential	Adult	
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	20	20	
Exposure Frequency (EF) (d/yr)	350	350	
Exposure Time (ET) (hr)	24	24	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	2.5	2.5	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71	
Water Event Frequency (EV) (events/day)	1	1	
water 2 vent 1 requestey (2 v) (events aug)	Non-Residentia	•	
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Exposure Duration (ED) (yr)	25	25	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.12	0.12	
Soil Ingestion Rate (IR) (mg/day)	100	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	
Water Ingestion Rate (IRW) (L/d)	0.83	0.83	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67	
Water Event Frequency (EV) (events/day)	1	1	
* * * / \$ */	Construction		
Lifetime (LT) (years)	70	70	
Body Weight (BW) (kg)	80	80	
Working Weeks (EW) (wk/yr)	50	50	
Exposure Duration (ED) (yr)	1	1	
Exposure Frequency (EF) (d/yr)	250	250	
Exposure Time (ET) (hr)	8	8	
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527	
Soil Adherence Factor (AF) (mg/cm²)	0.3	0.3	
Soil Ingestion Rate (IR) (mg/day)	330	330	

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#2 Creek - Greenway User exlcuding Background

Exposure Parameter	Default Value		Site Specific Value	Justification
	l Child			
		Trespasser		
Lifetime (LT) (years)	70	NA	70	
Averaging Time (AT) (days/yr)	365	NA	365	
Body Weight (BW) (kg)	15	NA	15	
Exposure Duration 0-2 (ED) (yr)	2	NA	2	
Exposure Duration 2-6 (ED) (yr)	4	NA	4	
Exposure Frequency (EF) (d/yr)	195	NA	52	Based on 98th percentile tail use polling data
Exposure Time (ET) (hr)	2	NA	0.5	Based on 98th percentile tail use polling data
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365	
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	0.5	Based on 98th percentile tail use polling data
Water Event Frequency (EV) (events/day)	1	NA	1	
		Jser Defined	l Adult	
	Recreator	Trespasser		<u></u>
Lifetime (LT) (years)	70	70	70	
Body Weight (BW) (kg)	80	45	80	
Exposure Duration 6-16 (ED) (yr)	10	10	10	
Exposure Duration 16-26 (ED) (yr)	10	0	10	
Exposure Frequency (EF) (d/yr)	195	90	364	Based on 98th percentile tail use polling data
Exposure Time (ET) (hr)	2	2	1	Based on 98th percentile tail use polling data
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	200	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652	
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	1	Based on 98th percentile tail use polling data
Water Event Frequency (EV) (events/day)	1	1	1	

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#2 Creek - Greenway User exlcuding Background

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from sediment samples collected at the site during the most recent sampling event, excluding background levels.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (mg/kg)	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
20.2	SED-3	7440-50-8	Copper			mg/kg										
0.008	SED-4	7439-97-6	~Mercury (elemental)			mg/kg										
10.5	SED-4	7440-02-0	Nickel Soluble Salts			mg/kg										
30.7	SED-4	7440-24-6	Strontium, Stable			mg/kg										

Risk for Individual Pathways	Output Form 1A
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Version Date: June 2021

**Basis:** May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

Exposure Unit ID: EU#2 Creek - Greenway User exlcuding Background

DIR	ECT CONTACT SOIL AND WATER	R CALCULATO	)RS					
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?				
Resident	Soil	NC	NC	NC				
Resident	Groundwater Use*	NC	NC	NC				
Non-Residential Worker	Soil	NC	NC	NC				
Non-Residential Worker	Groundwater Use*	NC	NC	NC				
Construction Worker	Soil	NC	NC	NC				
Dogranton/Traspasson	Soil	7.1E-13	2.1E-03	NO				
Recreator/Trespasser	Surface Water*	3.2E-07	1.7E-02	NO				
	VAPOR INTRUSION CALCULATORS							
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?				
	Groundwater to Indoor Air	NC	NC	NC				
Resident	Soil Gas to Indoor Air	NC	NC	NC				
	Indoor Air	NC	NC	NC				
	Groundwater to Indoor Air	NC	NC	NC				
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC				
	Indoor Air	NC	NC	NC				
	CONTAMINANT MIGRATION CA	LCULATORS						
Pathway	Source Target Receptor Concentrations Exceeded?							
Groundwater	Source Soil	Exceedence of 2L at Receptor? NC						
Giouilawatei	Source Groundwater	Exceedence of 2L at Receptor?		NC				
Surface Water	Source Soil	Exceedence of 2B at Receptor? NC						
Surface water	Source Groundwater	Exceedence of	2B at Receptor?	NC				

## Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based closure.
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

DEQ Risk Calculator - Direct Contact - Recreator/Trespasser Soil
Version Date: June 2021
Basis: May 2021 EPA RSL Table
Site ID: BPN 21061-17-060
Exposure Unit ID: EU#2 Creek - Greenway User exlcuding Background

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 400 mg/kg for residential soil.

Receptor Type: Greenway user

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-50-8	Copper	20.2	20.2	20.2					9.6E-04			9.6E-04
7439-97-6	~Mercury (elemental)	0.008	0.008	0.008							3.0E-05	3.0E-05
7440-02-0	Nickel Soluble Salts	10.5	10.5	10.5			7.1E-13	7.1E-13	1.0E-03		8.2E-08	1.0E-03
7440-24-6	Strontium, Stable	30.7	30.7	30.7					9.7E-05			9.7E-05

Cumulative:

7.1E-13

2.1E-03

Output Form 2F

DEQ Risk Calculator - Direct Contact - Recreator/Trespasser Surface Water	Output Form 2G
Version Date: June 2021	
Rasis: May 2021 FPA RSI Tabla	

Basis: May 2021 EFA RSL Table
Site ID: BPN 21061-17-060
Exposure Unit ID: EU#2 Creek - Greenway User execuding Background

Receptor Type: Greenway user

CAS#	Chemical Name:	Ingestion Concentration (ug/L)	Dermal Concentration (ug/L)	Ingestion Carcinogenic Risk	Dermal Contact Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Contact Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	0.45	0.45	2.7E-07	4.5E-08	3.2E-07	1.8E-03	3.7E-04	2.2E-03
7440-39-3	Barium		32.1				2.0E-04	5.6E-04	7.6E-04
16065-83-1	Chromium(III), Insoluble Salts	0.73	0.73				6.0E-07	9.2E-06	9.8E-06
7440-48-4	Cobalt	0.36	0.36				1.5E-03	1.2E-04	1.6E-03
7440-50-8	Copper	3.2	3.2				9.8E-05	2.0E-05	1.2E-04
7439-96-5	7439-96-5 Manganese (Non-diet)		37.4				1.9E-03	9.5E-03	1.1E-02
7440-02-0 Nickel Soluble Salts		0.62	0.62				3.8E-05	3.8E-05	7.6E-05
7782-49-2	82-49-2 Selenium		0.12				2.9E-05	5.9E-06	3.5E-05
7440-24-6	Strontium, Stable	110	110				2.3E-04	4.5E-05	2.7E-04

Cumulative: 3.2E-07

1.7E-02



Version Date:	June 2021
Basis:	May 2021 EPA RSL Table
Site Name:	828 MLK Jr. Blvd Property
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina
DEQ Section:	Brownfields Program
Site ID:	BPN 21061-17-060
Exposure Unit ID:	EU#3 - Resident, Non-Residential Worker, & Greenway User excludign
Submittal Date:	
Duananad Dvu	Hart & Hickman, PC
Prepared By:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina
Reviewed By:	

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Input Form 1A	Complete Exposure Pathways	<u> </u>
Input Form 1B	Exposure Factors and Target Risks	<u> </u>
Input Form 1C	Contaminant Migration Parameters	
Input Form 1D	Sample Statistics	
I 2.A	Input Section 2 - Exposure Point Concentrations	
Input Form 2A Input Form 2B	Soil Exposure Point Concentration Table Groundwater Exposure Point Concentration Table	✓ □
Input Form 2C	Surface Water Exposure Point Concentration Table	
Input Form 2D	Soil Gas Exposure Point Concentration Table	
Input Form 2E	Indoor Air Exposure Point Concentration Table	
p.w.1 01111 225	DATA OUTPUT SHEETS	
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Output Form 1A	Risk for Individual Pathways	7
Output Form 1B	Sitewide Risk	
	Output Section 2 - Direct Contact Soil and Groundwater Calculators	
Output Form 2A	Resident Soil	<
	Resident Groundwater Use	
	Non-Residential Worker Soil	<b>V</b>
	Non-Residential Worker Groundwater Use	
	Construction Worker Soil	
	Recreator/Trespasser Soil	✓
Output Form 2G	Recreator/Trespasser Surface Water	
	Output Section 3 - Vapor Intrusion Calculators	
	Resident Groundwater to Indoor Air	
	Resident Soil Gas to Indoor Air	
	Resident Indoor Air	
	Non-Residential Worker Groundwater to Indoor Air	
•	Non-Residential Worker Soil Gas to Indoor Air	
Output Form 3F	Non-Residential Worker Indoor Air  Output Section 4 - Contaminant Migration Worksheets	
Output Forms 4A	Soil to Groundwater - Forward Mode	
	Groundwater - Forward Mode  Groundwater to Groundwater - Forward Mode	
	Soil to Surface Water - Forward Mode	
	Groundwater to Surface Water - Forward Mode	
Output Form 4E	Soil to Groundwater - Backward Mode	
Output Form 4F		
*	Soil to Surface Water - Backward Mode	
	Groundwater to Surface Water - Rackward Mode	

Complete Exposure Pathways		Input Form 1A							
Version Date: June 2021 Basis: May 2021 EPA RSL Table									
Site ID: BPN 21061-17-060									
Exposure Unit ID: EU#3 - Resident, Non-Residential Worker, & Greenway User exc									
Note: Risk output will only be calculated for complete exposure pathways.									
Receptor	Pathway	Check box if pathway complete							
DIRECT CON	TACT SOIL AND WATER PATHWAYS								
Resident	Soil	<b>✓</b>							
Resident	Groundwater Use								
Non-Residential Worker	Soil	<b>✓</b>							
NON-RESIDENTIAL WORKS	Groundwater Use								
Construction Worker	Soil								
D - amoston/Twogmaggar	Soil	<b>V</b>							
Recreator/Trespasser	Surface Water								
VAP	OR INTRUSION PATHWAYS								
	Groundwater to Indoor Air								
Resident	Soil Gas to Indoor Air								
	Indoor Air								
	Groundwater to Indoor Air								
Non-Residential Worker	Soil Gas to Indoor Air								
	Indoor Air								
CONTAM	IINANT MIGRATION PATHWAYS								
Groundwater	Source Soil								
Giounawaiti	Source Groundwater								
Surface Water	Source Soil								
Surface water	Source Groundwater								

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#3 - Resident, Non-Residential Worker, & Greenway User excludign Background

	D.C. IVVI	Site Specific	T							
Exposure Parameter	Default Value	Value	Justification							
	Genera	al								
Target Cancer Risk (individual)	1.0E-06	1.0E-06								
Target Cancer Risk (cumulative)	1.0E-04	1.0E-04								
Target Hazard Index (individual)	2.0E-01	2.0E-01								
Target Hazard Index (cumulative)	1.0E+00	1.0E+00								
Residential Child										
Lifetime (LT) (years)	70	70								
Body Weight (BW) (kg)	15	15								
Exposure Duration (ED) (yr)	6	6								
Exposure Frequency (EF) (d/yr)	350	350								
Exposure Time (ET) (hr)	24	24								
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	2373								
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	0.2								
Soil Ingestion Rate (IRS) (mg/day)	200	200								
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	6365	6365								
Water Ingestion Rate (IRW) (L/d)	0.78	0.78								
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.54	0.54								
Water Event Frequency (EV) (events/day)	1	1								
	Residential									
Lifetime (LT) (years)	70	70								
Body Weight (BW) (kg)	80	80								
Exposure Duration (ED) (yr)	20	20								
Exposure Frequency (EF) (d/yr)	350	350								
Exposure Time (ET) (hr)	24	24								
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032								
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.07								
Soil Ingestion Rate (IRS) (mg/day)	100	100								
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652								
Water Ingestion Rate (IRW) (L/d)	2.5	2.5								
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71								
Water Event Frequency (EV) (events/day)	1	1								
	Non-Residentia	ıl Worker								
Lifetime (LT) (years)	70	70								
Body Weight (BW) (kg)	80	80								
Exposure Duration (ED) (yr)	25	25								
Exposure Frequency (EF) (d/yr)	250	250								
Exposure Time (ET) (hr)	8	8								
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527								
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.12	0.12								
Soil Ingestion Rate (IR) (mg/day)	100	100								
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652								
Water Ingestion Rate (IRW) (L/d)	0.83	0.83								
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67								
Water Event Frequency (EV) (events/day)	1	1								
	Construction									
Lifetime (LT) (years)	70	70								
Body Weight (BW) (kg)	80	80								
Working Weeks (EW) (wk/yr)	50	50								
Exposure Duration (ED) (yr)	1	1								
Exposure Frequency (EF) (d/yr)	250	250								
Exposure Time (ET) (hr)	8	8								
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527								
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.3	0.3								
Soil Ingestion Rate (IR) (mg/day)	330	330								

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

# Exposure Unit ID: EU#3 - Resident, Non-Residential Worker, & Greenway User excludign Background

Exposure Parameter	Default Value		Site Specific Value	Justification
		Jser Defined	d Child	
		Trespasser		
Lifetime (LT) (years)	70	NA	70	
Averaging Time (AT) (days/yr)	365	NA	365	
Body Weight (BW) (kg)	15	NA	15	
Exposure Duration 0-2 (ED) (yr)	2	NA	2	
Exposure Duration 2-6 (ED) (yr)	4	NA	4	
Exposure Frequency (EF) (d/yr)	195	NA	52	Based on 98% percentile of trail users
Exposure Time (ET) (hr)	2	NA	0.5	Based on 98% percentile of trail users
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2	
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365	
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	0.5	Based on 98% percentile of trail users
Water Event Frequency (EV) (events/day)	1	NA	1	
		Jser Defined	l Adult	
	Recreator	Trespasser		
Lifetime (LT) (years)	70	70	70	
Body Weight (BW) (kg)	80	45	80	
Exposure Duration 6-16 (ED) (yr)	10	10	10	
Exposure Duration 16-26 (ED) (yr)	10	0	10	
Exposure Frequency (EF) (d/yr)	195	90	364	Based on 98% percentile of trail users
Exposure Time (ET) (hr)	2	2	1	Based on 98% percentile of trail users
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032	
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07	
Soil Ingestion Rate (IRS) (mg/day)	100	200	100	
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652	
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985	
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	1	Based on 98% percentile of trail users
Water Event Frequency (EV) (events/day)	1	1	1	

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#3 - Resident, Non-Residential Worker, & Greenway User excludign Background

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from samples collected from shallow (0-2 ft) soil within the exposure unit, excluding background levels.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Poi Concentratio (mg/kg)		CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
60.3	HH-10	7440-38-2	Arsenic, Inorganic			mg/kg										
3260	HH-11	7440-39-3	Barium			mg/kg										
5.9	HH-11	7440-41-7	Beryllium and compounds			mg/kg										
0.43	HH-11	7439-97-6	~Mercury (elemental)			mg/kg										
23.5	HH-11	7440-02-0	Nickel Soluble Salts			mg/kg										
9.05	HH-11	7782-49-2	Selenium			mg/kg										
269	HH-10	7440-24-6	Strontium, Stable			mg/kg										

Risk for Individual Pathways

Output Form 1A

Version Date: June 2021

**Basis:** May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

Exposure Unit ID: EU#3 - Resident, Non-Residential Worker, & Greenway User excludign Background

DIRE	CCT CONTACT SOIL AND WATE	R CALCULATO	RS						
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?					
Resident	Soil	8.9E-05	2.1E+00	YES					
Resident	Groundwater Use*	NC	NC	NC					
Non-Residential Worker	Soil	2.0E-05	1.5E-01	NO					
Non-Residential worker	Groundwater Use*	NC	NC	NC					
Construction Worker	Soil	NC	NC	NC					
Recreator/Trespasser	Soil	3.3E-05	3.1E-01	NO					
Recleator/Trespasser	Surface Water*	NC	NC	NC					
VAPOR INTRUSION CALCULATORS									
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?					
	Groundwater to Indoor Air	NC	NC	NC					
Resident	Soil Gas to Indoor Air	NC	NC	NC					
	Indoor Air	NC	NC	NC					
	Groundwater to Indoor Air	NC	NC	NC					
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC					
	Indoor Air	NC	NC	NC					
	CONTAMINANT MIGRATION CA	LCULATORS							
Pathway	Source	Target Rec	eptor Concentratio	ons Exceeded?					
Groundwater	Source Soil	Exceedence of	2L at Receptor?	NC					
Groundwater	Source Groundwater	Exceedence of	Exceedence of 2L at Receptor?						
Surface Water	Source Soil	Exceedence of 2B at Receptor?		NC					
Surface water	Source Groundwater	Exceedence of	Exceedence of 2B at Receptor?						

## Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based closure.
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

Output Form 2A

2.1E+00

DEQ Risk Calculator - Direct Contact - Resident Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

#### Exposure Unit ID: EU#3 - Resident, Non-Residential Worker, & Greenway User excludign Background

\* - Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

\*\* - Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 400 mg/kg for residential soil.

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk*	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient*	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	60.3	60.3	60.3	7.8E-05	1.1E-05	1.6E-09	8.9E-05	1.5E+00	1.8E-01	6.5E-05	1.7E+00
7440-39-3	Barium	3260	3260	3260					2.1E-01		1.1E-04	2.1E-01
7440-41-7	Beryllium and compounds	5.9	5.9	5.9			8.5E-11	8.5E-11	3.8E-02		4.8E-06	3.8E-02
7439-97-6	~Mercury (elemental)	0.43	0.43	0.43							3.7E-02	3.7E-02
7440-02-0	Nickel Soluble Salts	23.5	23.5	23.5			3.7E-11	3.7E-11	1.5E-02		4.2E-06	1.5E-02
7782-49-2	Selenium	9.05	9.05	9.05					2.3E-02		7.3E-09	2.3E-02
7440-24-6	Strontium, Stable	269	269	269					5.7E-03			5.7E-03

Cumulative: 8.9E-05

North Carolina DEQ Risk Calculator

DEQ Risk Calculator - Direct Contact - Non-Residential Worker Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Output Form 2C

#### Exposure Unit ID: EU#3 - Resident, Non-Residential Worker, & Greenway User excludign Background

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 800 mg/kg for commercial/industrial soil.

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	60.3	60.3	60.3	1.7E-05	3.5E-06	3.6E-10	2.0E-05	1.0E-01	2.2E-02	1.5E-05	1.3E-01
7440-39-3	Barium	3260	3260	3260					1.4E-02		2.5E-05	1.4E-02
7440-41-7	Beryllium and compounds	5.9	5.9	5.9			1.9E-11	1.9E-11	2.5E-03		1.1E-06	2.5E-03
7439-97-6	~Mercury (elemental)	0.43	0.43	0.43							8.9E-03	8.9E-03
7440-02-0	Nickel Soluble Salts	23.5	23.5	23.5			8.4E-12	8.4E-12	1.0E-03		1.0E-06	1.0E-03
7782-49-2	Selenium	9.05	9.05	9.05					1.5E-03		1.7E-09	1.5E-03
7440-24-6	Strontium, Stable	269	269	269					3.8E-04			3.8E-04

Cumulative:

2.0E-05

1.5E-01

DEQ Risk Calculator - Direct Contact - Recreator/Trespasser Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Output Form 2F

#### Exposure Unit ID: EU#3 - Resident, Non-Residential Worker, & Greenway User excludign Background

\* - Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

\*\* - Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 400 mg/kg for residential soil.

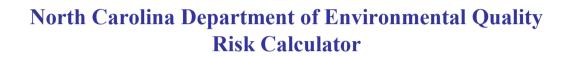
Receptor Type: Greenway User

CAS#	Chemical Name:	Ingestion Concentration (mg/kg)	Dermal Concentration (mg/kg)	Inhalation Concentration (mg/kg)*	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Calculated Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Calculated Non- Carcinogenic Hazard Quotient
7440-38-2	Arsenic, Inorganic	60.3	60.3	60.3	2.8E-05	5.1E-06	6.7E-11	3.3E-05	2.3E-01	3.2E-02	2.8E-06	2.6E-01
7440-39-3	Barium	3260	3260	3260					3.1E-02		4.6E-06	3.1E-02
7440-41-7	Beryllium and compounds	5.9	5.9	5.9			3.7E-12	3.7E-12	5.6E-03		2.1E-07	5.6E-03
7439-97-6	~Mercury (elemental)	0.43	0.43	0.43							1.6E-03	1.6E-03
7440-02-0	Nickel Soluble Salts	23.5	23.5	23.5			1.6E-12	1.6E-12	2.2E-03		1.8E-07	2.2E-03
7782-49-2	Selenium	9.05	9.05	9.05					3.4E-03		3.2E-10	3.4E-03
7440-24-6	Strontium, Stable	269	269	269					8.5E-04			8.5E-04

Cumulative:

3.3E-05

3.1E-01



Version Date:	June 2021
Basis:	May 2021 EPA RSL Table
Site Name:	828 MLK Jr. Blvd Property
Site Address:	828 MLK Jr Blvd, Chapel Hill, Orange County, North Carolina
DEQ Section:	Brownfields Program
Site ID:	BPN 21061-17-060
Exposure Unit ID:	EU#3 - Construction Worker excluding Background
Submittal Date:	
Prepared By:	Hart & Hickman, PC
r repared by:	3921 Sunset Ridge Rd, Suite 301, Raleigh, North Carolina
Reviewed By:	

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	DATA INPUT SHEETS						
	Input Section 1 - Exposure Pathways & Parameters						
Input Form 1A	Complete Exposure Pathways	<b>√</b>					
Input Form 1B	Exposure Factors and Target Risks	<b>V</b>					
Input Form 1C	Contaminant Migration Parameters						
Input Form 1D	Sample Statistics						
<u> </u>	Input Section 2 - Exposure Point Concentrations						
Input Form 2A	Soil Exposure Point Concentration Table	<b>V</b>					
Input Form 2B	Groundwater Exposure Point Concentration Table						
Input Form 2C	Surface Water Exposure Point Concentration Table						
Input Form 2D	Soil Gas Exposure Point Concentration Table						
Input Form 2E	Indoor Air Exposure Point Concentration Table						
Input Form 2E	DATA OUTPUT SHEETS						
	Output Section 1 - Summary Output for All Calculators						
Output Form 1A	Risk for Individual Pathways	<b>V</b>					
	•						
Output Form 1B							
0	Output Section 2 - Direct Contact Soil and Groundwater Calculators						
Output Form 2A		<u> </u>					
	Resident Groundwater Use	<u> </u>					
	Non-Residential Worker Soil	<u> </u>					
	Non-Residential Worker Groundwater Use						
	Construction Worker Soil	<u> </u>					
	Recreator/Trespasser Soil	<u> </u>					
Output Form 2G	Recreator/Trespasser Surface Water						
	Output Section 3 - Vapor Intrusion Calculators						
	Resident Groundwater to Indoor Air						
	Resident Soil Gas to Indoor Air						
Output Form 3C	Resident Indoor Air						
L	Non-Residential Worker Groundwater to Indoor Air						
Output Form 3E	Non-Residential Worker Soil Gas to Indoor Air						
Output Form 3F	Non-Residential Worker Indoor Air						
	Output Section 4 - Contaminant Migration Worksheets						
Output Form 4A	Soil to Groundwater - Forward Mode						
Output Form 4B	Groundwater to Groundwater - Forward Mode						
Output Form 4C	Soil to Surface Water - Forward Mode						
Output Form 4D	Groundwater to Surface Water - Forward Mode						
Output Form 4E	Soil to Groundwater - Backward Mode						
Output Form 4F	Groundwater to Groundwater - Backward Mode						
Output Form 4G	Soil to Surface Water - Backward Mode						
Output Form 4H	Groundwater to Surface Water - Backward Mode						

Complete Exposure Pathways		Input Form 1A							
Version Date: June 2021 Basis: May 2021 EPA RSL T Site ID: BPN 21061-17-060	able								
	onstruction Worker excluding Rackgrou	und							
Exposure Unit ID: EU#3 - Construction Worker excluding Background  Note: Risk output will only be calculated for complete exposure pathways.									
Receptor	Check box if pathway complete								
DIRECT CON	TACT SOIL AND WATER PATHWAYS								
Resident	Soil								
Resident	Groundwater Use								
Non-Residential Worker	Soil								
Non-Residential Worker	Groundwater Use								
Construction Worker	Soil	<b>✓</b>							
Doorootor/Tragnagaar	Soil								
Recreator/Trespasser	Surface Water								
VAP	OR INTRUSION PATHWAYS								
	Groundwater to Indoor Air								
Resident	Soil Gas to Indoor Air								
	Indoor Air								
	Groundwater to Indoor Air								
Non-Residential Worker	Soil Gas to Indoor Air								
	Indoor Air								
CONTAM	IINANT MIGRATION PATHWAYS								
Groundwater	Source Soil								
Groundwater	Source Groundwater								
Surface Water	Source Soil								
Surface water	Source Groundwater								

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#3 - Construction Worker excluding Background

Exposure Parameter	Default Value	Site Specific Value	Justification								
General											
Target Cancer Risk (individual)	1.0E-06	1.0E-06									
Target Cancer Risk (cumulative)	1.0E-04	1.0E-04									
Target Hazard Index (individual)	2.0E-01	2.0E-01									
Target Hazard Index (cumulative)	1.0E+00	1.0E+00									
T'C' (TEN)	Residential Child										
	15										
Body Weight (BW) (kg)	6	15									
Exposure Duration (ED) (yr)	350	6									
Exposure Frequency (EF) (d/yr)	24	350									
Exposure Time (ET) (hr) Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm2)	2373	24									
1	0.2	2373									
Soil Adherence Factor (AF) (mg/cm²)		0.2									
Soil Ingestion Rate (IRS) (mg/day)	200 6365	200									
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm2)	0.78	6365									
Water Exposure Time (ET ) (hr/event)	0.78	0.78									
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.54	0.54									
Water Event Frequency (EV) (events/day)	Residential	A dult									
Lifatima (LT) (years)	Residential 70	Adult 70									
Lifetime (LT) (years) Body Weight (BW) (kg)	80	80									
Exposure Duration (ED) (yr)	20	20									
Exposure Duration (ED) (y1)  Exposure Frequency (EF) (d/yr)	350	350									
Exposure Time (ET) (hr)	24	24									
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032									
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.07									
Soil Ingestion Rate (IRS) (mg/day)	100	100									
1	19652	19652									
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )  Water Ingestion Rate (IRW) (L/d)	2.5	2.5									
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.71	0.71									
Water Event Frequency (EV) (events/day)	1	1									
water Event Frequency (EV) (events/day)	Non-Residentia	•									
Lifetime (LT) (years)	70	70									
Body Weight (BW) (kg)	80	80									
Exposure Duration (ED) (yr)	25	25									
Exposure Frequency (EF) (d/yr)	250	250									
Exposure Time (ET) (hr)	8	8									
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527									
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.12	0.12									
Soil Ingestion Rate (IR) (mg/day)	100	100									
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652									
Water Ingestion Rate (IRW) (L/d)	0.83	0.83									
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	0.67	0.67									
Water Event Frequency (EV) (events/day)	1	1									
1 7 ( -) ()	Construction										
Lifetime (LT) (years)	70	70									
Body Weight (BW) (kg)	80	80									
Working Weeks (EW) (wk/yr)	50	50									
Exposure Duration (ED) (yr)	1	1									
Exposure Frequency (EF) (d/yr)	250	250									
Exposure Time (ET) (hr)	8	8									
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	3527	3527									
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.3	0.3									
Soil Ingestion Rate (IR) (mg/day)	330	330									

Version Date: June 2021 Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#3 - Construction Worker excluding Background

Exposure Parameter	Defau	lt Value	Site Specific Value	Justification			
		Jser Defined	d Child				
	Recreator						
Lifetime (LT) (years)	70	NA	70				
Averaging Time (AT) (days/yr)	365	NA	365				
Body Weight (BW) (kg)	15	NA	15				
Exposure Duration 0-2 (ED) (yr)	2	NA	2				
Exposure Duration 2-6 (ED) (yr)	4	NA	4				
Exposure Frequency (EF) (d/yr)	195	NA	52	Based on 98th percentile of trail use polling data			
Exposure Time (ET) (hr)	2	NA	0.5	Based on 98th percentile of trail use polling data			
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	2373	NA	2373				
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	NA	0.2				
Soil Ingestion Rate (IRS) (mg/day)	200	NA	200				
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	6365	NA	6365				
Water Ingestion Rate (IRW) (L/hr)	0.124	NA	0.124				
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	NA	0.5	Based on 98th percentile of trail use polling data			
Water Event Frequency (EV) (events/day)	1	NA	1				
	J	Jser Defined	d Adult				
	Recreator	Trespasser		<u> </u>			
Lifetime (LT) (years)	70	70	70				
Body Weight (BW) (kg)	80	45	80				
Exposure Duration 6-16 (ED) (yr)	10	10	10				
Exposure Duration 16-26 (ED) (yr)	10	0	10				
Exposure Frequency (EF) (d/yr)	195	90	364	Based on 98th percentile of trail use polling data			
Exposure Time (ET) (hr)	2	2	1	Based on 98th percentile of trail use polling data			
Skin Surface Area - Soil Exposure (SA <sub>s</sub> ) (cm <sup>2</sup> )	6032	6032	6032				
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.07	0.2	0.07				
Soil Ingestion Rate (IRS) (mg/day)	100	200	100				
Skin Surface Area - Water Exposure (SA <sub>w</sub> ) (cm <sup>2</sup> )	19652	19652	19652				
Water Ingestion Rate (IRW) (L/hr)	0.0985	0.071	0.0985				
Water Exposure Time (ET <sub>event</sub> ) (hr/event)	2	2	1	Based on 98th percentile of trail use polling data			
Water Event Frequency (EV) (events/day)	1	1	1				

Exposure Point Concentrations Version Date: June 2021

Basis: May 2021 EPA RSL Table Site ID: BPN 21061-17-060

Exposure Unit ID: EU#3 - Construction Worker excluding Background

Soil Exposure Point Concentration Table

Description of Exposure Point Concentration Selection:

Maximum detected constituent concentrations from all samples collected within the exposure unit, excluding background levels.

NOTE: If the chemical list is changed from a prior calculator run, remember to select "See All Chemicals" on the data output sheet or newly added chemicals will not be included in risk calculations

Exposure Point Concentration (mg/kg)	Notes:	CAS Number	Chemical  For the chemicals highlighted in blue, data entry notes are provided in the PSRG Table link on the Main Menu	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value	Screening Toxicity Value (Screening Level) (n/c)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion
60.3	HH-10	7440-38-2	Arsenic, Inorganic			mg/kg										
3260	HH-11	7440-39-3	Barium			mg/kg										
5.9	HH-11	7440-41-7	Beryllium and compounds			mg/kg										
1480	Excavation H-4	7439-96-5	Manganese (Non-diet)			mg/kg										
0.43	HH-11	7439-97-6	~Mercury (elemental)			mg/kg										
23.5	HH-11	7440-02-0	Nickel Soluble Salts			mg/kg										
9.05	HH-11	7782-49-2	Selenium			mg/kg										
269	HH-10	7440-24-6	Strontium, Stable			mg/kg										

Risk for Individual Pathways

Output Form 1A

Version Date: June 2021

**Basis:** May 2021 EPA RSL Table

Site ID: BPN 21061-17-060

Exposure Unit ID: EU#3 - Construction Worker excluding Background

DIRI	ECT CONTACT SOIL AND WATE	R CALCULATO	PRS								
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?							
Resident	Soil	NC	NC	NC							
Resident	Groundwater Use*	NC	NC	NC							
Non-Residential Worker	Soil	NC	NC	NC							
Non-Residential Worker	Groundwater Use*	NC	NC	NC							
Construction Worker	Soil	3.4E-06	8.5E+00	YES							
Pageatar/Traspassar	Soil	NC	NC	NC							
Recreator/Trespasser	Surface Water*	NC	NC	NC							
VAPOR INTRUSION CALCULATORS											
Receptor	Pathway	Carcinogenic Risk	Hazard Index	Risk exceeded?							
	Groundwater to Indoor Air	NC	NC	NC							
Resident	Soil Gas to Indoor Air	NC	NC	NC							
	Indoor Air	NC	NC	NC							
	Groundwater to Indoor Air	NC	NC	NC							
Non-Residential Worker	Soil Gas to Indoor Air	NC	NC	NC							
	Indoor Air	NC	NC	NC							
	CONTAMINANT MIGRATION CA	ALCULATORS									
Pathway	Source	Target Rec	eptor Concentratio	ons Exceeded?							
Groundwater	Source Soil	Exceedence of	2L at Receptor?	NC							
Groundwater	Source Groundwater	Exceedence of	Exceedence of 2L at Receptor?								
Surface Water	Source Soil	Exceedence of	Exceedence of 2B at Receptor? NC								
Surface water	Source Groundwater	Exceedence of	Exceedence of 2B at Receptor? NC								

## Notes:

- 1. If lead concentrations were entered in the exposure point concentration tables, see the individual calculator sheets for lead concentrations in comparison to screening levels. Note that lead is not included in cumulative risk calculations.
- 2. \* = If concentrations in groundwater exceed the NC 2L Standards or IMAC, or concentrations in surface water exceed the NC 2B Standards, appropriate remediation and/or institutional control measures will be necessary to be eligible for a risk-based
- 3. NM = Not Modeled
- 4. NC = Pathway not calculated

DEQ Risk Calculator - Direct Contact - Construction Worker Soil Version Date: June 2021 Basis: May 2021 EPA RSL Table

Output Form 2E

Site ID: BPN 21061-17-060
Exposure Unit ID: EU#3 - Construction Worker excluding Background

- \* Note that inhalation on this calculator refers to outdoor inhalation of volatiles and particulates, not indoor inhalation associated with vapor intrusion.

  \*\* Note that the EPA has no consensus on reference dose or cancer slope factor values for lead, therefore it is not possible to calculate cancer risk or hazard quotient. Lead concentrations are compared to the EPA screening level of 800 mg/kg for commercial/industrial soil.

												Calculated
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation	Calculated	Ingestion	Dermal	Inhalation	Non-
CAS#	Chemical Name:	Concentration	Concentration	Concentration	Carcinogenic	Carcinogenic	Carcinogenic	Carcinogenic	Hazard	Hazard	Hazard	Carcinogenic
		(mg/kg)	(mg/kg)	(mg/kg)*	Risk	Risk	Risk	Risk	Quotient	Quotient	Quotient	Hazard
												Quotient
7440-38-2	Arsenic, Inorganic	60.3	60.3	60.3	2.2E-06	3.5E-07	8.0E-07	3.3E-06	3.6E-01	5.7E-02	9.0E-01	1.3E+00
7440-39-3	Barium	3260	3260	3260					4.8E-02		1.5E-01	1.9E-01
7440-41-7	Beryllium and compounds	5.9	5.9	5.9			4.4E-08	4.4E-08	3.5E-03		6.6E-02	7.0E-02
7439-96-5	Manganese (Non-diet)	1480	1480	1480					1.8E-01		6.6E+00	6.8E+00
7439-97-6	~Mercury (elemental)	0.43	0.43	0.43							4.4E-02	4.4E-02
7440-02-0	Nickel Soluble Salts	23.5	23.5	23.5			1.9E-08	1.9E-08	3.5E-03		2.6E-02	3.0E-02
7782-49-2	Selenium	9.05	9.05	9.05					5.3E-03		1.0E-04	5.4E-03
7440-24-6	Strontium, Stable	269	269	269					4.0E-04			4.0E-04

Cumulative:

3.4E-06

8.5E+00