REMEDIAL ACTION WORK PLAN

FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, TAYLOR COUNTY, WEST VIRGINIA
VRP PROJECT #20019

Prepared For:

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LIST OF ACRONYMS AND ABBREVIATIONS

bgs – below ground surface
CEC – Civil & Environmental Consultants, Inc.
COC – Contaminants of Concern
CORE – CORE Environmental
DAF – Dilution Attenuation Factor
ELCR – Estimated Lifetime Cancer Risk
ESA – Environmental Site Assessment
EPC – Exposure Point Concentration
HI – Hazard Index
LUC – Land Use Covenant
mg/Kg – milligrams per kilograms
MNA – Monitored Natural Attenuation
PAHs – Polycyclic Aromatic Hydrocarbons
QA/QC – Quality Assurance/Quality Control
RAR – Risk Assessment Report
RAWP – Remedial Action Work Plan
SAR – Site Assessment Report
SAWP – Sampling and Analysis Work Plan
Site – Former Carr China Manufacturing Facility
STTWA – Save the Tygart Watershed Association
SVOC – Semi-Volatile Organic Compound
TAL – Target Analyte List
USEPA – United States Environmental Protection Agency
VOC – Volatile Organic Compound
VRA – Voluntary Remediation Agreement
VRP – Voluntary Remediation Program

VRRR – Voluntary Remediation & Redevelopment Rule
WVDEP – West Virginia Department of Environmental Protection
XRF – X-Ray Fluorescence Instrument

1.0 INTRODUCTION

Civil & Environmental Consultants, Inc. (CEC) has prepared this Remedial Action Work Plan (RAWP) for the Former Carr China Manufacturing Facility located at 230 Newcome Avenue, Grafton, Taylor County, West Virginia (Site). This RAWP was prepared on behalf of the Save the Tygart Watershed Association, Inc. (STTWA), who was awarded a $240,000 Brownfields Cleanup Grant from the United States Environmental Protection Agency (USEPA) on September 17, 2019 (Grant #96371501).

This RAWP has been prepared to address potential unacceptable risks related to soil and groundater and to satisfy the RAWP requirements of the Voluntary Remediation and Redevelopment Rule (VRRR) Title 60, Series 3. The Site location is shown on Figure 1, and the layout of the Site is shown on Figure 2.

1.1 VOLUNTARY REMEDIATION PROGRAM PROCESS TO DATE

The STTWA filed an application to enter the Site into the West Virginia Voluntary Remediation Program (VRP) on May 29, 2020. The West Virginia Department of Environmental Protection (WVDEP) accepted the application on June 12, 2020. The STTWA and WVDEP entered into a Voluntary Remediation Agreement under the VRP on August 5, 2020. The Site has been assigned VRP Project #20019.

Previous investigations, including a Phase I Environmental Site Assessment (ESA) conducted in 2018 and a Phase II ESA conducted in 2019, were conducted at the Site prior to entry into the VRP. Accordingly, a supplemental Site Assessment Work Plan (SAWP) was prepared under the VRP to address data gaps identified for the Site. WVDEP approved the Supplemental SAWP via letter dated August 31, 2020. Supplemental site investigation activities were conducted in September/October 2020, and a Site Assessment Report (SAR) was submitted to WVDEP on December 10, 2020. WVDEP provided comments on the SAR via letter dated January 7, 2021, and a revised SAR addressing these comments was prepared and submitted on January 19, 2021. WVDEP approved the revised SAR via letter dated January 25, 2021.

Based on recommendations in the approved SAR, a Human Health and Ecological Risk Assessment Report (RAR) was prepared to evaluate potential human health risks associated with Contaminants of Concern (COCs) identified in site soils, groundwater, and offsite sediment under current and future land use scenarios. The RAR was submitted to WVDEP on March 16, 2021. WVDEP provided comments on the RAR via letter dated April 14, 2021, and a revised RAR addressing these comments was prepared and submitted on April 28, 2021. WVDEP approved the revised RAR via letter dated May 3, 2021.

In addition to the report approvals described above, STTWA, WVDEP, and CEC have participated in two (2) conference calls to develop the strategy and approach for moving forward through the VRP for the Site. The first call was on March 4, 2021 in which the strategy for monitored natural attenuation was discussed and agreed upon. This conversation is described in more detail in Section 6.3. The second was on April 7, 2022 in which the approach for delineating the proposed soil cover areas was discussed. This conversation is described in more detail in Section 6.2.

1.2 SITE DESCRIPTION AND INTENDED USE

The Former Carr China Manufacturing Facility is located at 230 Newcome Avenue, in Grafton, Taylor County, West Virginia. A Site Location Map is provided as Figure 1. The Site consists of four (4) adjacent tax parcels covering approximately 7.39 acres and situated along the south bank of the Tygart Valley River (i.e., Tax Parcel IDs 07-7-81, 07-7-82, 07-7-83, and 07-7-84). The Site is located approximately 0.6-mile downstream of the Tygart Lake and Tygart River Dam. The Tygart Lake is the location of a surface water intake for the Taylor County Public Service District drinking water. Access to the largest parcel (i.e., 07-7-82) is currently restricted via a chain-link fence; however, other areas of the Site, including the riverbank and western wooded areas, are readily accessible by pedestrians. Surrounding land use includes residential properties to the east, a former railroad bed, then residential properties to the south, a Taylor County Public Service District wastewater pump station to the west, and the Tygart Valley River to the north. A Site Layout Map showing the Site and parcel boundaries is provided as Figure 2.

1.3 SITE OPERATIONAL AND REMEDIATION HISTORY

The Site was the location of the Carr China Manufacturing facility and was used for the production of hotel/restaurant dinnerware from 1916 through 1952. Throughout this period of operation, contamination occurred from chemicals used to glaze and manufacture china, as well as from discarded damaged china throughout the property. Specifically, lead compounds were used in the china glazing process and various metal salts were used as coloring agents. Off-spec and damaged china containing these heavy metals was discarded on the property surrounding the manufacturing building, down the riverbank, and into the adjacent Tygart Valley River. The facility has remained vacant since the china manufacturing operations ceased in 1952. A fire occurred at the site in 1966, which burned the majority of the Site's infrastructure to the ground leaving debris and rubble strewn about the Site.

From 2008 through 2010, USEPA conducted a removal action including the removal and disposal of 12,000 tons of soil/china debris and removal of most of the facility's remaining infrastructure. As part of this removal action, soil caps were installed in two (2) areas of the Site. One (1) of these areas included the eastern parcel of the Site where approximately 18 inches of lead contaminated soil in excess of 1,000 mg/Kg was excavated. In August 2010, an x-ray fluorescence instrument (XRF) was used to screen the base of the excavated areas in the eastern portion of the Site. Specifically, 30 locations were screened based on an approximate 25-foot grid. Of the 30 locations, lead was determined to be in excess of 1,000 mg/kg in 21 of the locations. Ten (10) of the 30 screened locations contained lead in excess of 2,000 mg/kg up to a maximum of 4,215 mg/kg. Accordingly, geotextile fabric was placed across the excavated area, and the area was backfilled with 2 feet of clean soil. The approximate aerial extent of this soil capped area is shown on Figure 3. The second capped area includes the eastern bank of the unnamed tributary and the southern bank of the Tygart Valley River. Significant amounts of china debris were found along these banks, estimated at a thickness of greater than 16 feet in some areas. These entire banks were excavated at varying depths ranging from 2 to 6 feet, then the entire area was re-graded and sloped to enable stabilization by compacting the debris. Restoration of the riverbanks was completed by compacting the china debris, covering the debris with geotextile fabric, backfilled, jute matting, and then seeding the areas. The approximate aerial extent of the soil capped area is shown on Figure 3. Finally, two (2) areas were identified on the main parcel of the Site where USEPA encapsulated china debris in concrete. These areas are depicted on Figure 3. Photographs from the USEPA remediation are provided in Appendix A.

2.0 SITE ASSESSMENT SUMMARY

The investigation of the Site included sampling and analysis of surface and subsurface soil, groundwater, and sediment to evaluate the potential for releases of hazardous constituents to the environment. Investigation activities were conducted as part of a 2019 Phase II ESA conducted by CORE Environmental (CORE), and a supplemental investigation conducted by CEC in September 2020.

The 2019 CORE Phase II included the following assessment activities:

- Screening surface soil at 133 locations across the Site using an XRF;
- Advancing 27 direct-push soil borings and 11 hand auger soil borings at locations determined based on the results of the XRF screening, in the proximity of the former AST locations, and along the southern property boundary in proximity to the former railroad;
- Collecting 38 surface soil samples [plus four (4) duplicates] and 27 subsurface soil samples [plus four (4) duplicates] for analysis of Volatile Organic Compounds (VOCs) (Method 8260B), Semi-Volatile Organic Compounds (SVOCs) (Method 8270D SIM), Target Analyze List (TAL) metals (Method 6010C), and mercury (Method 7471B);
- Installing 11 temporary groundwater monitoring wells (TW-1 through TW-11) to a depth of approximately 20 feet, and collecting one (1) round of groundwater samples for analysis of VOCs (Method 8260B), SVOCs (Method 8270D SIM), TAL metals (Method 6010C/6020B), and mercury (Method 7470A); and
- Installing six (6) permanent groundwater monitoring wells (MW-1 through MW-6) to depths ranging from 15 to 20 feet below ground surface (bgs), and collecting one (1) round of groundwater samples for analysis of TAL metals (Method 6010C/6020B) and mercury (Method 7470A).

The 2020 CEC supplemental investigation included the following assessment activities:

- Collecting a second round of groundwater samples from the six (6) permanent groundwater monitoring wells (MW-1 through MW-6) plus one (1) duplicate and Quality Assurance/Quality Control (QA/QC) samples on September 1, 2020 for analysis of polycyclic aromatic hydrocarbons (PAHs) [Method 8270E Low Level (LL)] and dissolved TAL metals and mercury (Methods 6020B and 7470A).
- Collecting six (6) sediment samples [plus one (1) duplicate sample and QA/QC samples] for analysis of PAHs at locations SD-04 and SD-05 only (Method 8270E LL) and TAL metals (Methods 6020B and 7471A).

A detailed description of the Site assessment, including sampling locations, sample analyses, and analytical results, was presented in the approved SAR, dated January 19, 2021 (CEC, 2021a). Based on the results of the Site assessment, a Human Health and Ecological RAR was prepared as discussed in Section 3.0.

2.1 GROUNDWATER MIGRATION TO SURFACE WATER

A detailed evaluation of the potential groundwater migration to surface water was presented in Section 2.5 of the approved SAR (CEC, 2021a). Specifically, in order to evaluate groundwater migration to the surface water of the Tygart Valley River, dilution attenuation factors (DAFs) specific to human health and to ecological receptors were calculated in accordance with Appendix B, Section B.2.1 and B.2.2, respectively, of the revised WVDEP Technical Guidance Manual (June 2020).

Based on the DAF-adjusted screening evaluation, none of the detected concentrations in groundwater exceed either a human health or ecological WQS. Therefore, the groundwater migration to surface water pathway was demonstrated to be an incomplete pathway for the Site for both human and ecological receptors.

2.2 ECOLOGICAL DE MINIMIS SCREENING EVALUATION

A De Minimis ecological screening evaluation was presented in Section 8.0 of the approved SAR (CEC, 2021a). Specifically, WVDEP provides a "Checklist to Determine Applicable Remediation Standards, Part 1: Ecological Standards" to aid in completion of the ecological screening. Based on the responses in the completed checklist, Site constituents do not pose a significant ecological risk, and no further ecological evaluation was warranted. Therefore, no further evaluation of ecological receptors was conducted as part of the Human Health and Ecological RAR.

3.0 RISK ASSESSMENT SUMMARY

Using the data generated throughout the Site assessment activities discussed in Section 2.0, a Human Health and Ecological RAR was prepared and submitted to WVDEP on March 16, 2021. In response to WVDEP comments, a revised RAR was prepared and submitted to WVDEP on April 28, 2021 and subsequently approved via letter dated May 3, 2021. The following sections provide a summary of the approved RAR.

3.1 IDENTIFICATION OF CONTAMINANTS OF CONCERN

Section 2 of the approved RAR included a data evaluation to identify a media-specific list of contaminants of concern (COC) that would be retained for further evaluation in the assessment. Specifically, 1) detected constituent concentrations in on-site soil were compared to the residential and industrial VRP De Minimis Standards for direct contact with soil or West Virginia 90th percentile background values (if higher); 2) detected constituents in groundwater were compared to the groundwater VRP De Minimis Standards; 3) detected constituents in sediment were compared to the WVDEP residential VRP De Minimis Standards for direct contact with soil or West Virginia 90th percentile background values (if higher); 4) detected constituent concentrations in groundwater were compared to the USEPA residential Vapor Intrusion Screening Levels; and 5) detected constituent concentrations in groundwater were compared to the DAF-adjusted West Virginia Surface Water Quality Standards to evaluate potential impacts for groundwater migrating to the Tygart River (see previous discussion in Section 2.1). Based on this screening evaluation, the following COCs were identified for further evaluation in the risk assessment:

- **Surface Soil – Direct Contact (Residential):** arsenic, lead, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene;
- **Surface Soil – Direct Contact (Industrial):** lead and mercury;

- **Subsurface Soil – Direct Contact (Residential):** lead, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene;
- **Subsurface Soil – Direct Contact (Industrial):** lead and mercury;
- **Groundwater – Direct Contact:** benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, cobalt, lead, manganese, and vanadium;
- **Groundwater – Vapor Intrusion (Residential):** none;
- **Groundwater – Migration to Surface Water (Human Health):** none;
- **Groundwater – Migration to Surface Water (Ecological):** none; and
- **Sediment – Direct Contact**: benzo(a)pyrene.

These COCs were carried through to the quantitative risk calculations. The De Minimis standards were updated in December 2021, after approval of the Human Health and Ecological RAR. Accordingly, the site analytical results for soil and groundwater were re-screened using the 12/2/2021 De Minimis Values. This updated screening is presented in Table 1 for surface soil, Table 2 for subsurface soil, and Table 3 for groundwater. Based on the updated screening, the following revised list of COC are identified for soil and groundwater at the Site:

- **Surface Soil – Direct Contact (Residential):** arsenic, lead, manganese, mercury, and benzo(a)pyrene;
- **Surface Soil – Direct Contact (Industrial):** lead and mercury;
- **Subsurface Soil – Direct Contact (Residential):** lead, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene;
- **Subsurface Soil – Direct Contact (Industrial):** lead and mercury; and
- **Groundwater – Direct Contact:** benzo(b)fluoranthene, cobalt, lead, and manganese.

This revised list of COC does not impact the results of the risk assessment.

3.2 QUANTITATIVE RISK CALCULATIONS

The RAR included a quantitative evaluation of a future outdoor maintenance worker (commercial) potentially exposed to surface soil and sediment, a future construction worker potentially exposed to shallow soil from 0 to 10 feet bgs, a future adult recreational receptor potentially exposed to soil and sediment, and a future child recreational receptor potentially exposed to soil and sediment. Potential pathways associated with residential use of the Site and the use of Site groundwater were excluded from the quantitative risk evaluation since a Land Use Covenant (LUC) will be implemented for the Facility that prohibits residential use and future use of groundwater. Additionally, potential vapor intrusion and migration to surface water pathways were excluded based on the results of the screening evaluation in which no COCs were identified.

The results of the quantitative risk assessment are summarized as follows:

- For a future outdoor maintenance worker potentially exposed to surface soil and sediment, the noncancer HI is $7x10^{-2}$, which is below the WVDEP benchmark of 1 and the potential ELCR is $6x10^{-8}$, which is below the WVDEP benchmark of $1x10^{-5}$;
- For a future construction worker potentially exposed to shallow soil from 0 to 10 feet bgs, the noncancer HI is $4x10^{-1}$, which is below the WVDEP benchmark of 1 and the potential ELCR is $5x10^{-8}$, which is below the WVDEP benchmark of $1x10^{-5}$;
- For a lifetime recreator exposed to surface soil (i.e., the sum of the individual age range calculations from 0 up to 26 years), the noncancer HI is 9×10^{-1}, which is below the WVDEP benchmark of 1 and the potential ELCR is 2×10^{-6}, which slightly exceeds the WVDEP benchmark of 1×10^{-6}. This result is driven by incidental ingestion of benzo(a)pyrene in surface soil; and
- For a lifetime recreator exposed to sediment (i.e., the sum of the individual age range calculations from 0 up to 26 years), the noncancer HI is 6×10^{-4}, which is below the WVDEP benchmark of 1 and the potential ELCR is $4x10^{-8}$, which is below the WVDEP benchmark of $1x10^{-6}$.

Based on the results presented above, unacceptable risks were identified for a lifetime recreational receptor potentially exposed to benzo(a)pyrene in surface soil. Mitigation of surface soil samples SS-2-CORE and SS-3-CORE would be sufficient to reduce these potential risks to acceptable levels.

It is emphasized that the risk scenario evaluated assumed Site-wide use (i.e., data across the entire Site were combined to calculate EPCs). However, the Site characterization identified the following locations in surface and shallow subsurface soil where concentrations of lead or mercury exceeded the industrial De Minimis Values:

Sample Location	Lead Concentration [(1)] (mg/Kg)
SS-3-CORE (0-2 feet)	1250
SS-14-CORE (0-4 feet)	1410
SB-14-CORE (4-6 feet)	1030

(1) Lead concentration exceeds the industrial De Minimis value of 800 mg/Kg.

Sample Location	Mercury Concentration [(1)] (mg/Kg)
SS-4-CORE (0-2 feet)	40.3
SB-4-CORE (4-6 feet)	5.38

(1) Mercury concentration exceeds the Industrial De Minimis value of 3.1 mg/Kg.

These locations are considered potential “hotspots” that would require further risk evaluation or mitigation such as capping or removal if future use of the Site included the potential for receptors to spend concentrated time in these areas. Since the future site redevelopment includes recreational use and it is not feasible to estimate or determine where recreators may spend their time at the Site, capping and/or removal of these locations is recommended in conjunction with the site redevelopment plans to minimize the potential for future unacceptable exposure.

Finally, the RAR included a risk evaluation of a construction worker conducting a localized construction project wholly in the vicinity of the hot spots identified above with the following results:

- For a construction worker potentially exposed to a lead concentration of 1,410 mg/Kg at surface soil sample location SS-14-CORE over a 15-day construction project (assumes a lead hot spot area of approximately 100 feet by 100 feet as delineated by the 2019 XRF investigation), the potential adult blood lead 95^{th} percentile concentration is 3.99 ug/dL, which is below the WVDEP acceptable benchmark of 5 ug/dL;
- For a construction worker potentially exposed to a lead concentration of 1,250 mg/Kg at surface soil sample location SS-3-CORE over a 15-day construction project (assumes a lead hot spot area of approximately 100 feet by 100 feet as delineated by the 2019 XRF investigation), the potential adult blood lead 95^{th} percentile concentration is 3.72 ug/dL, which is below the WVDEP acceptable benchmark of 5 ug/dL; and
- For a construction worker potentially exposed to a mercury concentration of 40.3 mg/Kg at surface soil sample location SS-4-CORE over a five (5)-day construction project (assumes a mercury hot spot area of approximately 5,000 square feet as delineated by the 2019 XRF investigation), the noncancer HI is $5x10^{-1}$, which is below the WVDEP benchmark of 1 and the potential ELCR is $4x10^{-8}$, which is below the WVDEP benchmark of $1x10^{-5}$.

Accordingly, no mitigation measures are warranted for construction workers potentially exposed to hot spots during a focused construction project.

3.3 FINAL EXPOSURE PATHWAYS REQUIRING REMEDIATION

Based on the results of the approved RAR, the following exposure scenarios require additional measures to prevent, reduce, or eliminate potential future unacceptable exposure:

- **Residential Use of the Site:** As presented in Tables 1 and 2, arsenic, lead, manganese, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were detected in soil at concentrations that exceed the residential soil De Minimis Standards, indicating the potential for unacceptable human health risk under a hypothetical future residential Site use scenario. Therefore, a LUC will be required that prevents future residential use of the entire Site;

- **Potable use of Groundwater:** As presented in Table 3, benzo(b)fluoranthene, cobalt, lead, and manganese were detected in Site groundwater at concentrations that exceed the Groundwater De Minimis Values. Therefore, a Land Use Covenant (LUC) will be required to prevent future use of groundwater;
- **Recreational Use of the Site:** The ELCR for a lifetime recreational receptor associated with exposure to surface soil at the Site is 2 x 10^{-6}, which slightly exceeds the Site's acceptable risk benchmark of 1 x 10-6 driven by incidental ingestion of benzo(a)pyrene. Mitigation of surface soil samples SS-2-CORE and SS-3-CORE would be sufficient to reduce these potential risks to acceptable levels. Additionally, as described above, several hot spot locations were identified where concentrations of lead or mercury exceed the industrial De Minimis Values. Specifically, lead at sample locations SS-3-CORE (0-2 feet), SS-14-CORE (0-4 feet), and SB-14-CORE (4-6 feet) and mercury at locations SS-4-CORE (0-2 feet) and SB-4-CORE (4-6 feet). Accordingly, these locations will require remediation to prevent potential unacceptable exposure for future recreational users of the Site. As described later in this report, the proposed remediation is installation of a soil cover over these locations.
- **Excavation at the Site:** The risk assessment did not identify potential unacceptable exposure to future construction workers conducting excavation projects at the Site. However, as part of the previous remedial action conducted by USEPA from 2008 through 2010, there were several areas across the Site where lead-impacted china debris was capped or encapsulated (refer to discussion in Section 1.3). Figure 3 shows the approximate extent of these areas, although the exact limits of buried china debris are not known. Therefore, an institutional control mandating that specific health and safety procedures be followed to prevent potential exposure during excavation at the Site will be required Site-wide.

Additionally, groundwater will also require a remedy, such as monitored natural attenuation (MNA), to address constituents detected in on-site groundwater at concentrations that exceed the West Virginia De Minimis values under the Groundwater Protection Act.

4.0 REMEDIATION STANDARDS

4.1 HUMAN HEALTH STANDARDS

The table below provides a summary of the remediation measures that will be implemented for the Site to meet the VRP Site-Specific Standard for human health.

Media	Potential Receptor	Remediation Measure to Attain Site-Specific Human Health Standard
Surface and Subsurface Soil	Future Resident	Administrative Control - LUC that prohibits residential use of the property.
Surface Soil	Future Adult and Child Recreator	Remediation required for future recreational use of the Site including covering lead and mercury hot spots and sample locations driving unacceptable risks.
Surface Soil	Future Outdoor (Maintenance) Worker	Calculated risks are below WVDEP's acceptable benchmarks. No remediation required.
Surface and Subsurface Soil	Construction Worker	Administrative Control – LUC that requires health and safety protocols be implemented to minimize exposure to china debris during excavation or earth disturbance activities.
Indoor Air	Indoor Worker	The vapor intrusion to indoor air pathway is incomplete for the Site. No remediation required.
On-Site Groundwater	On-Site Potable Groundwater Users	Administrative Control - LUC that prohibits groundwater use at the property. Additionally, MNA is required under the Groundwater Protection Act to ensure that concentrations of COCs in Site groundwater are declining/stable.
Groundwater Migration to Surface Water	Recreational Receptors	The groundwater migration to surface water pathway is incomplete for the Site. No remediation required.
Sediment	Recreational Receptors	Calculated risks are below WVDEP's acceptable benchmarks. No remediation required.

4.2 ECOLOGICAL STANDARDS

The De Minimis Ecological Standard is met for the Site as based on the De Minimis Ecological Screening Evaluation discussed in Section 2.2.

5.0 REMEDIAL ALTERNATIVES EVALUATION

In accordance with Section 9.8.a of the VRRR, the selected remedy should be evaluated using the following criteria:

- The effectiveness of the remedy in protecting human health and the environment;
- The reliability of the remedial action in achieving the standards over the long-term;
- Short-term risks to the affected community, those engaged in the remedial action effort, and to the environment posed by the implementation of the remedial action;
- The acceptability of the remedial action to the affected community;
- The implementability and technical practicability of the remedial action from an engineering perspective;
- Meets protectiveness goals at lowest cost; and
- Considers net environmental benefits of the remedial action.

Each criterion is discussed below for the proposed remedy of institutional controls (Section 5.1) and soil cover (Section 5.2).

5.1 INSTITUTIONAL CONTROLS

Effectiveness

The proposed remedy of institutional controls will minimize the potential for future unacceptable exposures for identified receptors. Therefore, this remedy is effective in protecting human health and the environment.

Long-Term Reliability

The long-term effectiveness of the institutional controls will require continued monitoring to ensure that restrictions remain in place. Accordingly, annual monitoring to ensure long-term effectiveness will be required as part of the LUC.

Short-Term Risks

Since the proposed remedy of institutional controls does not involve active remediation or Site disturbance, there are no obvious short-term risks to the affected community.

Acceptability

Although the local community has not been significantly involved with the VRP program at the Site to date, they would likely approve of the proposed remedy because the abandoned property will be put back into productive use.

Implementability

The institutional controls are relatively easy to implement, although will require annual inspections and reporting to WVDEP.

Cost

The proposed remedy was selected as a cost-effective approach for addressing potential risks associated with the Site relative to other remedial options.

Net Environmental Benefits

The net environmental benefits include reducing unacceptable risks.

5.2 SOIL COVER

Surface soil sample locations driving unacceptable risks for future recreational receptors, and related hot spots will be mitigated via installation of a soil cover over these locations.

Effectiveness

The proposed remedy of placing a soil cover over identified lead and mercury hot spots and sample locations driving unacceptable risks will minimize the potential for future unacceptable exposures for identified receptors. Therefore, this remedy is effective in protecting human health and the environment.

Long-Term Reliability

The long-term effectiveness of the proposed remedy will require ongoing monitoring to ensure that the soil cover remains in place and restricts direct contact with underlying soil. Accordingly, annual inspection of the soil cover to ensure long-term effectiveness will be required as part of the LUC.

Short-Term Risks

The short term risks associated with placing the soil cover are small. During implementation, workers will wear personal protective equipment to prevent direct contact with soils and the ground surface will be wetted prior to and during excavation to minimize the potential for airborne dust and associated inhalation risks to workers and surrounding residents.

Acceptability

Although the local community has not been significantly involved with the VRP program at the Site to date, they would likely approve of the proposed remedy because the abandoned property will be put back into productive use.

Implementability

The soil cover installation will be relatively easy to implement, given that the Site is currently vacant and undeveloped and given that there are no issues with heavy equipment accessing the

Site and the remediation area. Annual inspections and reporting to WVDEP will also be easy to implement.

Cost

The proposed remedy was selected as a cost-effective approach for addressing potential risks associated with the Site relative to other remedial options.

Net Environmental Benefits

The net environmental benefits include reducing unacceptable risks.

5.3 MONITORED NATURAL ATTENUATION

In accordance with Section 9.9 of the VRRR, the applicability of MNA as an element of the remedy should be evaluated using the following criteria:

- The COCs have the capacity to degrade or attenuate under Site-specific conditions;
- The contaminant plume in groundwater or soil volume is not increasing in size;
- All sources of contamination and free product have been controlled or removed, where practicable;
- The time and direction of contaminant travel can be predicted with reasonable certainty;
- The contaminant migration will not result in the violation of applicable groundwater standards at any existing or reasonably foreseeable receptor;
- If contaminants have migrated onto adjacent properties, the owner must demonstrate that such properties are served by a public water supply or that such properties have consented in writing to allow contaminant migration onto their property;
- A groundwater discharge to a surface water body will not result in contaminant concentrations at the sediment/water interface that result in violations to the surface water standards;

- A groundwater monitoring program will be in place to sufficiently track contaminant degradation and attenuation within and downgradient of the plume and to detect contaminant and contaminant byproducts prior to their reaching any existing or foreseeable receptor;
- All necessary access agreements needed to monitor groundwater quality have been or can be obtained; and
- The proposed corrective action plan would be consistent with all other environmental laws.

Each of these criterion is discussed below for the proposed MNA remedy.

Capacity to Degrade or Attenuate

COCs in groundwater include benzo(b)fluoranthene, cobalt, lead, and manganese. Benzo(b)fluoranthene is an organic constituent that is subject to biological degradation, abiotic degradation, sorption, dispersion, and volatilization. Cobalt, lead, and manganese are metals that are subject to sorption and dispersion.

Sources of Contamination Controlled

Of the six (6) on-site monitoring wells, only MW-3 had concentrations of benzo(b)fluoranthene that exceeded the groundwater De Minimis Values. Potential sources of benzo(b)fluoranthene include historic operations and a fire that occurred at the Site in 1966, which burned the majority of the Site's infrastructure to the ground leaving debris and rubble strewn about the Site. However, given the low concentrations that have been detected, the source is not believed to be significant.

Cobalt and lead are likely associated with the former glazing operations and discarded damaged china that was strewn across the property. Specifically, lead compounds were used in the china glazing process and various metal salts were used as coloring agents. As described in Section 1.3, from 2008 through 2010, USEPA conducted a removal action including the removal and disposal of 12,000 tons of soil/china debris and removal of most of the facility's remaining infrastructure.

Additionally, USEPA capped any remaining areas of china debris that were left onsite. Therefore, potential sources of lead and cobalt contamination in groundwater have been controlled.

No specific sources of manganese were identified during the Site investigation. Manganese concentrations are likely related to regional background and associated with mining operations in the area.

The groundwater analytical results are presented in Table 3 along with a comparison to the current De Minimis values.

Contaminant Plume is Stable

Groundwater analytical results for the identified COC are discussed below:

- **PAHs**: Only one (1) round of sampling was conducted for PAHs as part of the Site characterization. Of the six (6) on-site monitoring wells, benzo(b)fluoranthene was only detected in MW-3 during this event. Additional monitoring is proposed as described in Section 6.3 to determine whether a PAH plume actually exists at the Site and if so, its overall stability.
- **Cobalt** was detected in each of the six (6) on-site monitoring wells, however, only exceeds the De Minimis value in wells MW-4, MW-5, and MW-6 suggesting the cobalt plume is limited to the upgradient and eastern portions of the Site. Cobalt detections in downgrading wells MW-1, MW-2, and MW-3 did not exceed the De Minimis value. Additional monitoring is proposed as described in Section 6.3 to determine plume stability.
- **Lead** was detected in each of the six (6) on-site monitoring wells with the exception of MW-4. Of these detections, only the second round of sampling at MW-1 exceeded the De Minimis value. Additional monitoring is proposed as described in Section 6.3 to determine whether a lead plume actually exists at the Site and if so, its overall stability.
- **Manganese** was detected in each of the six (6) monitoring wells across the site during both sampling events and exceeds the De Minimis value in wells MW-2, MW-4, MW-5

and MW-6. On-site sources of manganese are unknown. Manganese concentrations could be related to regional background and associated with mining operations in the area. Additional monitoring is proposed as described in Section 6.3 to determine whether a manganese plume actually exists at the Site and if so, its overall stability.

Predictable Time/Direction of Contaminant Migration

Groundwater at the Site flows to the north toward the Tygart Valley River, which is a principal tributary of the Monongahela River. The surface water flow rate in the Tygart Valley River in the vicinity of the Site is controlled by the release of water from Tygart Lake within Tygart Lake State Park located approximately 0.6-mile upstream of the Site. Depth to water measurements collected from the six (6) on-site monitoring wells (MW-1 through MW-6) on September 1, 2020 were used to prepare the groundwater elevation contour map included as Figure 4.

No Violation of Applicable Standards

Groundwater at the Site is not currently used as a potable water source and future use will be prohibited via a LUC. As described above, groundwater at the Site flows toward the Tygart Valley River, which is immediately adjacent to the Site to the north. Accordingly, existing and reasonably foreseeable receptors that could be potentially exposed to Site groundwater are limited to surface water receptors. Potential impacts to surface water are discussed below.

Migration onto Adjacent Property

The Site is bordered to the north by the Tygart Valley River. Accordingly, existing and reasonably foreseeable receptors that could be potentially exposed to Site groundwater are limited to surface water receptors. Potential impacts to surface water are discussed below.

Impacts to Surface Water

A detailed evaluation of the potential groundwater migration to surface water was presented in Section 2.5 of the approved SAR (CEC, 2021a). Specifically, in order to evaluate groundwater migration to the surface water of the Tygart Valley River, DAFs specific to human health and to ecological receptors were calculated in accordance with Section B.2.1 and B.2.2, respectively, of the revised WVDEP Technical Guidance Manual (June 2020).

Based on the DAF-adjusted screening evaluation, none of the detected concentrations in groundwater exceed either a human health or ecological WQS. Therefore, the groundwater migration to surface water pathway was demonstrated to be an incomplete pathway for the Site for both human and ecological receptors.

Groundwater Monitoring Program

A groundwater monitoring program has been developed to demonstrate the contaminant plume is stable or declining. The proposed plan is presented in Section 6.3.

Agreements for Monitoring Program

The monitoring wells to be included in the monitoring program are all on the Site; therefore, no agreements are needed.

Consistent with Environmental Laws

The monitoring program does not violate any state or federal environmental laws or regulations.

5.4 UNCERTAINTY AND RISK

Uncertainties are inherent in every environmental assessment due to the potential for variability between data points (e.g., soil samples). Because the selection and implementation of a remedy are based on the environmental assessment results, those uncertainties carry over to the selected remedy.

The remedies proposed in this RAWP were designed to minimize uncertainty and associated risk to the extent practical. The residential land use restriction, groundwater use restriction, and the requirement to implement health and safety procedures contained in the LUC will be implemented Site-wide. Finally, annual inspections and reporting will ensure that the selected remedies remain effective in the future.

6.0 STATEMENT OF WORK TO ACCOMPLISH REMEDIATION

Institutional and engineering controls and will be used as the final remedy to protect human health and the environment. Additionally, annual inspections and reporting will be implemented to ensure the controls remain effective in the future. These measures are described in more detail below.

6.1 INSTITUTIONAL CONTROLS

An LUC will be recorded in the Taylor County Clerk's Office that contains specific requirements that must be followed by the current and any future property owners to protect against the potential risks described in Section 3.2. The draft LUC is presented in Appendix B.

6.1.1 Potable Use of Groundwater

As described in Section 5.3, the groundwater COC identified for the Site include benzo(b)fluoranthene, cobalt, lead, and manganese. Therefore, the LUC prohibits the use or extraction of groundwater for any purpose, except for groundwater monitoring and/or remediation.

6.1.2 Residential Land Use

Arsenic, lead, manganese, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were detected in soil at concentrations that exceed the residential soil De Minimis Standards, indicating the potential for unacceptable human health risk under a hypothetical future residential Site use scenario. Therefore, the LUC prohibits residential use, as defined by W. Va. Code § 22-22-2(bb), including, but not limited to, schools, day care centers, nursing homes, or other residential-style facilities or recreational areas.

6.1.3 Excavation at the Site

The risk assessment did not identify potential unacceptable exposure to future construction workers conducting excavation projects at the Site. However, as part of the previous remedial action conducted by USEPA from 2008 through 2010, there were several areas across the Site where lead-impacted china debris was capped or encapsulated (refer to discussion in Section 1.3). Figure 3 shows the approximate extent of these areas, although the exact limits of buried china debris are not known. Therefore, the LUC contains language requiring that specific health and safety procedures be implemented Site-Wide during excavation to prevent potential exposure.

6.2 SOIL COVER

As described in Section 3.3, the ELCR for a lifetime recreational receptor associated with exposure to surface soil at the site is 2×10^{-6}, which slightly exceeds the Site's acceptable risk benchmark of 1×10^{-6}. This result is driven by incidental ingestion of benzo(a)pyrene. Mitigation of surface soil samples SS-2-CORE and SS-3-CORE would be sufficient to reduce these potential risks to acceptable levels. Documentation of the post-mitigation risks with SS-2-CORE and SS-3-CORE removed from the surface soil dataset is provided in Appendix C. Additionally, several hot spot locations were identified where concentrations of lead or mercury exceed the industrial De Minimis Values. Specifically, lead at sample locations SS-3-CORE (0-2 feet), SS-14-CORE (0-4 feet), and SB-14-CORE (4-6 feet) and mercury at locations SS-4-CORE (0-2 feet) and SB-4-CORE (4-6 feet). Accordingly, these locations will also require a cover to prevent potential unacceptable exposure for future recreational users of the Site.

In order to mitigate these locations, STTWA will install a 12-inch soil cover over sample locations SS-2-CORE, SS-3-CORE, SS-14-CORE/SB-14-CORE, and SS-4-CORE/SB-4-CORE. The 12-inch soil cover will serve as a direct contact cover preventing exposure to the identified areas of contaminated soil described above. The areas requiring the soil cover are shown on Figure 3 and can be grouped into a lead remediation area (which also includes the samples requiring mitigation for PAHs) and a mercury remediation area. As discussed and agreed upon during a conference call on April 7, 2022 between STTWA, WVDEP, and CEC, the aerial extent of the soil cover areas were determined using XRF data collected as part of the CORE's 2019 investigation. Specifically, as described in Section 2, CORE screened surface soil at 133 locations across the Site using an XRF. Screening was conducted for arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury. For the lead remediation area, the XRF sample locations and results in the vicinity of sample locations SS-3-CORE and SS-14-CORE/SB-14-CORE, are shown on Figure 3 and Table 4. The aerial extent of the lead soil cover was determined by extending the cover outward from each of the sampling locations to the nearest XRF location with acceptable results. For lead, an acceptable XRF concentration was determined to be 200 mg/Kg or below (as discussed and agreed upon with WVDEP during a conference call on April 7, 2022).

For mercury, of the 42 surface and 31 subsurface samples collected at the Site, only sample SS-4-CORE/SB-4(4-6)-CORE had a mercury concentration that exceeded the residential De Minimis value. None of the XRF results for mercury in the vicinity of sample SS-4-CORE/SB-4(4-6)-CORE had detectable concentration of mercury. Therefore, similar to lead, the mercury remediation area was determined by extending the cover outward to the nearest XRF location with an acceptable mercury concentration. The mercury remediation area is shown on Figure 3 with XRF results summarized in Table 4.

The cover will be installed in accordance with the Default Soil Cover requirements detailed in Appendix F of the WVDEP Technical Guidance Manual (June 2020), which is included in Appendix D. Specifically, the requirements described in Section F.2.1 will be followed. The source of borrow material will be determined as part of the contractor selection process once the RAWP is approved. If the identified borrow source is from an area that has previously been used for commercial, agricultural, or industrial purposes, the material will be tested for potential contaminants prior to being used. STTWA will consult with the OER WVDEP project manager if borrow source testing is needed.

As part of the final remedy, the soil cover will be maintained into the future to prevent future receptors from unacceptable exposure. Accordingly, a description of the soil cover (i.e., Engineering Control) is included in the LUC along with a requirement that the cover be maintained. The Draft LUC is provided as Appendix B. The LUC will be recorded in the Taylor County Clerk's Office upon WVDEP approval of the RAWP and implementation of the remedy.

6.3 NATURAL ATTENUATION MONITORING AND REPORTING

The proposed monitoring plan is intended to meet the requirements of Section 5.1.4.4 of the VRP Guidance Manual dated June 2020. The work performed under this plan will be in general accordance with the SAWP for the Site that was approved by WVDEP on August 31, 2020. Specifics regarding sampling procedures, analytical methods, detection limits, sample identification, and health and safety procedures can be found in the approved SAWP.

Six (6) additional rounds of groundwater samples will be collected from monitoring wells MW-1 through MW-6 to supplement the two (2) rounds of samples that were collected in January 2019 and September 2020 [for a total of eight (8) rounds as required under Section 5.1.4.4 of the VRP Guidance Manual]. Table 3 presents the groundwater analytical results for the Site along with a comparison to the most recent De Minimis value updated in December 2021. As indicated in Table 3, the following COC have been identified in groundwater at the Site:

- MW-1: lead;
- MW-2: manganese;
- MW-3: benzo(b)fluoranthene;
- MW-4: cobalt and manganese;
- MW-5: cobalt and manganese; and
- MW-6: cobalt and manganese.

Mr. Curtis Phillips and Dr. Ross Brittain of WVDEP and Ms. Elizabeth Stas of CEC participated in a conference call on March 4, 2021 to discuss the approach for MNA sampling and the groundwater remedy at the Site. During the March 4, 2021 call, the team discussed monitoring each well for the COC that were exceeded in that particular well, plus any additional COC that were identified upgradient. Accordingly, the follow monitoring approach was developed for the Site:

- Downgradient well MW-1: cobalt, manganese, and lead;
- MW-3: benzo(b)fluoranthene;
- Upgradient/side gradient well MW-4: cobalt; and
- Upgradient/side gradient wells MW-5 and MW-6: cobalt and manganese.

In addition to the site COC, each well will be sampled for the following MNA indicator parameters: conductivity, dissolved oxygen, nitrate, ferrous iron, sulfate, methane, alkalinity, oxidation reduction potential (ORP), and pH. Field duplicate samples are not required for MNA monitoring. Analytical methods and sampling methodologies will be consistent with the previous September 2020 sampling event and sample will be analyzed by a WV certified laboratory. An additional six (6) rounds of samples will be conducted. For any given well/constituent, if four (4) rounds of consecutive sampling indicate no exceedances of the De Minimis values, monitoring may cease at that location.

A report summarizing the sampling results will be submitted to the WVDEP prior to December 31 each year. The report will include charts and graphs of the complete dataset (2019 and each subsequent year's results) to evaluate concentration trends for each COC.

6.4 LUC ANNUAL INSPECTIONS AND REPORTING

The property owner shall conduct inspections of the property to monitor compliance with the LUC at least once per year within 60 days of the anniversary date of the LUC. These inspections will include an evaluation to confirm that residential use of the property is not occurring, groundwater is not being used, and that excavation activities are being conducted in accordance with appropriate health and safety and soil management protocols.

The annual inspections will also include observation of the soil cover and USEPA cap and encapsulation areas. Signs of movement in slope areas (e.g., exposure of the underlying geotextile fabric in upslope areas or significant vegetation or trees breaching the cover areas) or settlement in the flat areas (depressions, potholes, etc.) will be noted. If such conditions are noted, they will be repaired within 30 days by regrading and/or placing additional soil such that the 12-inch cover thickness is maintained.

The annual inspections (and cover repairs if performed) will be recorded on the Annual LUC Inspection Form that is included along with the draft LUC provided in Appendix B. The owner shall submit the completed form electronically to DEPOERFileCopy@WV.Gov or in hardcopy format to:

West Virginia Department of Environmental Protection
Office of Environmental Remediation
Attn: LUC Inspections
601 57th Street SE
Charleston, West Virginia 25304

6.5 IMPLEMENTATION SCHEDULE

The anticipated schedule for implementing this RAWP is as follows:

- April 2021 – CEC conducted the third round of MNA monitoring;
- June 2022 – Stantec (under contract with WVDEP) conducted the fourth round of MNA monitoring;
- September 2022 – WVDEP approves RAWP;
- Third Quarter 2022 – Stantec conducts fifth round of MNA monitoring;
- Fourth Quarter 2022 - Stantec conducts sixth round of MNA monitoring and prepares and submits annual MNA Report for 2022;
- Fourth Quarter 2022 – STTWA implements soil cover remediation activities;
- Fourth Quarter 2022 – WVDEP approves LUC and STTWA files LUC at Tayler County Courthouse;
- First Quarter 2023 – Stantec conducts seventh round of MNA monitoring;
- First Quarter 2023 – STTWA submits RAC Report;
- First Quarter 2023 – WVDEP approves RAC Report;

- Second Quarter 2023 - Stantec conducts eighth round of MNA monitoring and prepares and submits annual MNA Report for 2023;
- Second Quarter 2023 – STTWA submits Final Report and Certificate of Completion request;
- Second Quarter 2023 – WVDEP approves Final Report;
- Third Quarter 2023 – WVDEP issues Certificate of Completion; and
- December 2023 and each year thereafter – LUC annual inspection (within 60 days of LUC anniversary date).

7.0 REFERENCES

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West Virginia Department of Health and Human Resources (WVDHHR; 2009). Health Consultation. Carr China Site – Carr China Drive and Pottery Lane – Grafton, Taylor County, West Virginia. EPA Facility ID WVN000306608. August 31, 2009.

TABLES

TABLE 1
SURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Constituent	CAS No.	Screening Criteria[1]: WVDEP De Minimis Value for Residential Soil	Screening Criteria[1]: *WVDEP De Minimis Value for Industrial Soil*	Sample Information[2]: SS-1-CORE Investigation 1/14/2019 0-2 ft. bgs	Duplicate-1 (Duplicate of SS-1-CORE) Duplicate 1/14/2019 0-2 ft. bgs	SS-2-CORE Investigation 1/14/2019 0-2 ft. bgs	SS-3-CORE Investigation 1/14/2019 0-2 ft. bgs	SS-4-CORE Investigation 1/14/2019 0-2 ft. bgs	SS-5-CORE Investigation 1/14/2019 0-2 ft. bgs	SS-6-CORE Investigation 1/15/2019 1-2 ft. bgs	Duplicate-2 (Duplicate of SS-6-CORE) Duplicate 1/15/2019 1-2 ft. bgs	SS-7-CORE Investigation 1/15/2019 0-4 ft. bgs
Metals (mg/kg)												
Aluminum	7429-90-5	77000	1000000	5200	5330	10800	5100	10700	11100	6350	6360	7800
Antimony	7440-36-0	31	470	< 2	< 2	< 2.04	< 2.02	< 2.02	< 2	< 2	< 2	< 2.08
Arsenic[1]	7440-38-2	*13.1*	30	2.96 J	2.48 J	2.89 J	7.43	12.6	13.7	6.68	7.13	< 2.08 *
Barium	7440-39-3	15000	220000	48.2	47.8	69.2	74.1	283	116	22	23.9	58.6
Beryllium	7440-41-7	160	2300	0.455 J	0.435 J	0.857	0.338 J	0.919	0.87	0.385 J	0.4 J	0.661
Cadmium	7440-43-9	37	530	0.315 J	0.295 J	0.673 J	1.43	0.939 J	0.735 J	0.48 J	0.245 J	0.5 J
Chromium[1]	16065-83-1	120000	1000000	8.07	7.21	17.5	7.44	17.5	17.2	9.38	9.62	13.7
Cobalt	7440-48-4	23	350	7.07	6.04	13.5	9.2	16.3	14.5	10	8.16	12.5
Copper	7440-50-8	3100	47000	10.3	8.79	24.2	95.8	36.7	36.1	13.2	15.7	29.8
Lead	7439-92-1	400	800	20.1	23.1	29.3	***1250***	38.6	18	10.5	11.3	165
Manganese	7439-96-5	1800	26000	281	250	529	280	1950	540	264	187	201
Nickel	7440-02-0	1500	22000	9.57	8.83	25.1	7.67	37.2	30.6	11.6	11.7	17.2
Selenium	7782-49-2	390	5800	< 3	< 3	< 3.06	< 3.03	< 3.03	< 3	< 3	< 3	< 3.12
Silver	7440-22-4	390	5800	0.44 J	< 0.35	< 0.357	< 0.354	< 0.354	< 0.35	< 0.35	< 0.35	< 0.365
Thallium	7440-28-0	0.78	12	< 2 *	< 2 *	< 2.04 *	< 2.02 *	< 2.02 *	< 2 *	< 2 *	< 2 *	< 2.08 *
Vanadium	7440-62-2	460	8400	11	9.2	20.4	11.3	18.7	17.4	13.8	14.8	12.7
Zinc	7440-66-6	23000	350000	37.5	35.3	74.4	172	108	78.8	34.4	37	75
Mercury	7439-97-6	3.1	3.1	0.038 J	0.036 J	0.074 J	0.063 J	***40.3***	0.763	0.044 J	0.043 J	0.025 J
SVOCs (mg/kg)												
Acenaphthene	83-32-9	4100	47000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Acenaphthylene	208-96-8	4200	51000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Anthracene	120-12-7	23000	350000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Benzo[a]anthracene	56-55-3	1.5	320	0.121 J	0.122 J	0.125 J	0.222 J	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Benzo[a]pyrene	50-32-8	0.11	21	0.121 J	0.104 J	0.127 J	0.301 J	< 0.067 *	< 0.067 *	< 0.067 *	< 0.066 *	< 0.067 *
Benzo[b]fluoranthene	205-99-2	1.1	210	0.179 J	0.175 J	0.184 J	0.403	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Benzo[g,h,i]perylene	191-24-2	1800	23000	0.088 J	0.087 J	0.086 J	0.302 J	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Benzo[k]fluoranthene	207-08-9	11	2100	< 0.067	< 0.067	0.073 J	0.132 J	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Chrysene	218-01-9	110	21000	0.14 J	0.133 J	0.138 J	0.25 J	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Dibenz(a,h)anthracene	53-70-3	0.11	21	< 0.067 *	< 0.067 *	< 0.067 *	< 0.067 *	< 0.067 *	< 0.067 *	< 0.067 *	< 0.066 *	< 0.067 *
Fluoranthene	206-44-0	2400	30000	0.265 J	0.2 J	0.216 J	0.484	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Fluorene	86-73-7	2900	37000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Indeno[1,2,3-cd]pyrene	193-39-5	1.1	210	0.101 J	0.101 J	0.101 J	0.318 J	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Naphthalene	91-20-3	2.4	110	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Phenanthrene	67580	23000	350000	< 0.067	< 0.067	< 0.067	0.186 J	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
Pyrene	129-00-0	2300	34000	0.22 J	0.212 J	0.178 J	0.386	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067
VOCs (mg/Kg)												
Acetone	67-64-1	61000	110000	0.0831	0.094	0.0152 J	0.061	< 0.01	0.0305	0.0354	< 0.0113	0.0391
Benzene	71-43-2	1.2	54	< 0.001	< 0.000964	< 0.000964	< 0.000977	0.00297	0.00287	< 0.000951	< 0.00104	0.00176 J
Carbon disulfide	75-15-0	740	740	< 0.0072	< 0.00692	< 0.00692	< 0.00702	0.123	0.0786	< 0.00683	< 0.00748	< 0.00775
Ethylbenzene	100-41-4	6.2	270	< 0.00137	< 0.00131	< 0.00131	< 0.00133	< 0.00126	< 0.00124	< 0.0013	< 0.00142	< 0.00147
2-Hexanone[1]	591-78-6	3400	3400	< 0.0155	< 0.0149	< 0.0149	< 0.0151	< 0.0143	< 0.0141	< 0.0147	< 0.0161	< 0.0167
4-Methyl-2-pentanone	108-10-1	3400	3400	< 0.0113	< 0.0109	< 0.0109	< 0.011	< 0.0104	< 0.0103	< 0.0107	< 0.0117	< 0.0122
MTBE	1634-04-4	50	2200	< 0.0065	< 0.00625	< 0.00625	< 0.00633	< 0.006	< 0.00592	< 0.00617	< 0.00675	< 0.007
Toluene	108-88-3	820	820	< 0.00136	< 0.00131	0.00151 J	< 0.00133	0.00184 J	0.00199 J	< 0.00129	< 0.00141	< 0.00146
1,2,4-Trimethylbenzene	95-63-6	220	220	< 0.00142	< 0.00136	< 0.00136	< 0.00138	< 0.00131	< 0.00129	< 0.00135	< 0.00147	< 0.00153
o-Xylene[1]	1330-20-7	260	260	< 0.00125	< 0.0012	< 0.0012	< 0.00121	< 0.00115	< 0.00113	< 0.00118	< 0.00129	< 0.00134
m,p-Xylene[1]	1330-20-7	260	260	< 0.00265	< 0.00254	< 0.00254	< 0.00258	< 0.00244	< 0.00241	< 0.00251	< 0.00275	< 0.00285

TABLE 1
SURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

		Screening Criteria[1]		Sample Information[2]								
Constituent	**CAS No.**	**WVDEP De Minimis Value for Residential Soil**	***WVDEP De Minimis Value for Industrial Soil***	**SS-8-CORE** Investigation 1/15/2019 0-4 ft. bgs	**SS-9-CORE** Investigation 1/15/2019 0-4 ft. bgs	**SS-10-CORE** Investigation 1/15/2019 0-4 ft. bgs	**SS-11-CORE** Investigation 1/15/2019 1.5-2 ft. bgs	**SS-12-CORE** Investigation 1/16/2019 1-2 ft. bgs	**Duplicate-1 (Duplicate of SS-12-CORE)** Duplicate 1/16/2019 1-2 ft. bgs	**SS-13-CORE** Investigation 1/16/2019 0-4 ft. bgs	**SS-14-CORE** Investigation 1/16/2019 0-4 ft. bgs	**SS-15-CORE** Investigation 1/16/2019 0-2 ft. bgs
Metals (mg/kg)												
Aluminum	7429-90-5	77000	1000000	5040	10100	10000	4900	5560	7580	6090	3390	6920
Antimony	7440-36-0	31	470	< 2	< 2.04	< 2.06	< 2	< 2.06	< 2	< 2	< 2.02	< 2
Arsenic[1]	7440-38-2	*13.1*	30	2.16 J	2.45 J	< 2.06 *	4.63 J	4.26 J	4.45 J	3.26 J	< 2.02 *	< 2 *
Barium	7440-39-3	15000	220000	28.1	66.5	60.8	75.5	31.4	60.2	55.8	33.7	52.8
Beryllium	7440-41-7	160	2300	0.31 J	0.648	0.784	0.485 J	0.418 J	0.71	0.405 J	0.303 J	0.505
Cadmium	7440-43-9	37	530	1.42	0.842 J	1.05	0.36 J	< 0.206	< 0.2	< 0.2	0.273 J	< 0.2
Chromium[1]	16065-83-1	120000	1000000	5.78	16.3	17.2	6.24	6.83	6.82	7.34	4.59 J	11.5
Cobalt	7440-48-4	23	350	5.98	14.6	13.2	3.49 J	5.66	5.64	5.68	3.93 J	8.12
Copper	7440-50-8	3100	47000	18.5	24	31.3	16.1	10.4	10.6	11	12.1	13.5
Lead	7439-92-1	400	800	***962***	***934***	79.2	18.1	8.79	8.56	12.9	***1410***	8.96
Manganese	7439-96-5	1800	26000	129	474	532	136	276	630	292	143	291
Nickel	7440-02-0	1500	22000	7.37	22.1	23.5	8.81	6.89	6.64	8.46	5.57	16
Selenium	7782-49-2	390	5800	< 3	< 3.06	< 3.09	< 3	< 3.09	< 3	< 3	< 3.03	< 3
Silver	7440-22-4	390	5800	< 0.35	< 0.357	< 0.361	10.4	< 0.361	< 0.35	< 0.35	< 0.354	< 0.35
Thallium	7440-28-0	0.78	12	< 2 *	< 2.04 *	< 2.06 *	< 2 *	< 2.06 *	< 2 *	< 2 *	< 2.02 *	< 2 *
Vanadium	7440-62-2	460	8400	16.1	16.4	21.7	9.37	10.3	10.8	10.6	7.67	11.7
Zinc	7440-66-6	23000	350000	254	94.7	114	33.9	32.8	33.5	31.1	234	45.7
Mercury	7439-97-6	3.1	3.1	0.045 J	0.025 J	0.02 J	0.026 J	0.023 J	0.026 J	0.026 J	0.067 J	< 0.02
SVOCs (mg/kg)												
Acenaphthene	83-32-9	4100	47000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.066
Acenaphthylene	208-96-8	4200	51000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.066
Anthracene	120-12-7	23000	350000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.066
Benzo[a]anthracene	56-55-3	1.5	320	0.223 J	0.318 J	< 0.067	0.268 J	< 0.067	< 0.066	0.094 J	0.079 J	< 0.066
Benzo[a]pyrene	50-32-8	0.11	21	0.175 J	0.281 J	< 0.067 *	0.251 J	< 0.067 *	< 0.066 *	0.117 J	0.098 J	0.091 J
Benzo[b]fluoranthene	205-99-2	1.1	210	0.24 J	0.433	< 0.067	0.421	< 0.067	< 0.066	0.17 J	0.142 J	0.096 J
Benzo[g,h,i]perylene	191-24-2	1800	23000	0.104 J	0.175 J	< 0.067	0.206 J	< 0.067	< 0.066	0.113 J	0.088 J	< 0.066
Benzo[k]fluoranthene	207-08-9	11	2100	0.09 J	0.12 J	< 0.067	0.149 J	< 0.067	< 0.066	< 0.067	< 0.066	< 0.066
Chrysene	218-01-9	110	21000	0.188 J	0.263 J	< 0.067	0.309 J	< 0.067	< 0.066	0.108 J	0.091 J	< 0.066
Dibenz(a,h)anthracene	53-70-3	0.11	21	< 0.067	< 0.067 *	< 0.067 *	< 0.067 *	< 0.067 *	< 0.066 *	< 0.067 *	< 0.066 *	< 0.066 *
Fluoranthene	206-44-0	2400	30000	0.451	0.518	< 0.067	0.308 J	< 0.067	< 0.066	0.147 J	0.199 J	0.071 J
Fluorene	86-73-7	2900	37000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.066
Indeno[1,2,3-cd]pyrene	193-39-5	1.1	210	0.126 J	0.213 J	< 0.067	0.205 J	< 0.067	< 0.066	0.124 J	0.093 J	< 0.066
Naphthalene	91-20-3	2.4	110	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.066
Phenanthrene	67580	23000	350000	0.177 J	0.145 J	< 0.067	0.15 J	< 0.067	< 0.066	< 0.067	< 0.066	< 0.066
Pyrene	129-00-0	2300	34000	0.354	0.443	< 0.067	0.299 J	< 0.067	< 0.066	0.117 J	0.167 J	< 0.066
VOCs (mg/Kg)												
Acetone	67-64-1	61000	110000	0.0199 J	0.0811	< 0.0103	< 0.0124	< 0.011	< 0.0122	0.0345	0.0418	0.0326 J
Benzene	71-43-2	1.2	54	< 0.0009	< 0.00107	< 0.000951	< 0.00114	< 0.00102	< 0.00113	< 0.00109	< 0.00121	0.00327 J
Carbon disulfide	75-15-0	740	740	< 0.00646	0.0167	0.0156	< 0.00822	< 0.00729	0.0238	< 0.00785	< 0.00868	0.0244
Ethylbenzene	100-41-4	6.2	270	< 0.00123	< 0.00145	< 0.0013	< 0.00156	< 0.00138	< 0.00154	< 0.00149	< 0.00165	0.00165
2-Hexanone[1]	591-78-6	3400	3400	< 0.0139	0.0227 J	< 0.0147	< 0.0177	< 0.0157	< 0.0175	< 0.0169	< 0.0187	< 0.0187
4-Methyl-2-pentanone	108-10-1	3400	3400	< 0.0101	0.0237 J	< 0.0107	< 0.0129	< 0.0115	< 0.0128	< 0.0123	< 0.0136	< 0.0136
MTBE	1634-04-4	50	2200	< 0.00583	< 0.00692	< 0.00617	< 0.00742	< 0.00658	< 0.00733	< 0.00708	< 0.00783	< 0.00783
Toluene	108-88-3	820	820	< 0.00122	< 0.00145	0.00156 J	< 0.00155	< 0.00138	< 0.00153	< 0.00148	< 0.00164	0.00225 J
1,2,4-Trimethylbenzene	95-63-6	220	220	< 0.00127	< 0.00151	< 0.00135	< 0.00162	< 0.00144	< 0.0016	< 0.00155	< 0.00171	< 0.00171
o-Xylene[1]	1330-20-7	260	260	< 0.00112	< 0.00133	< 0.00118	< 0.00142	< 0.00126	< 0.00141	< 0.00136	< 0.0015	< 0.0015
m,p-Xylene[1]	1330-20-7	260	260	< 0.00238	< 0.00282	0.00251	< 0.00302	< 0.00268	< 0.00299	< 0.00288	< 0.00319	< 0.00319

TABLE 1
SURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Constituent	CAS No.	Screening Criteria[1]: WVDEP De Minimis Value for Residential Soil	Screening Criteria[1]: *WVDEP De Minimis Value for Industrial Soil*	Sample Information[2]: SS-16-CORE Investigation 1/16/2019 0-2 ft. bgs	SS-17-CORE Investigation 1/16/2019 0-2 ft. bgs	SS-18-CORE Investigation 1/16/2019 0-2 ft. bgs	SS-19-CORE Investigation 1/16/2019 0-4 ft. bgs	SS-20-CORE Investigation 1/16/2019 0-2 ft. bgs	SS-21-CORE Investigation 1/16/2019 1-2 ft. bgs	SS-22-CORE Investigation 1/16/2019 0-2 ft. bgs	SS-23-CORE Investigation 1/17/2019 0-4 ft. bgs
Metals (mg/kg)											
Aluminum	7429-90-5	77000	1000000	12300	12200	12600	12400	6790	5640	5140	3470
Antimony	7440-36-0	31	470	< 2.06	< 2.04	< 2.02	< 2.04	< 2.08	< 2	< 2.02	< 2.04
Arsenic[1]	7440-38-2	*13.1*	30	< 2.06 *	11.5	10.4	14.2	2.9 J	4.1 J	< 2.02 *	4.91 J
Barium	7440-39-3	15000	220000	82.2	189	198	147	27.2	23	59.8	32.7
Beryllium	7440-41-7	160	2300	0.948	0.934	0.96	1.12	0.349 J	0.33 J	0.389 J	0.24 J
Cadmium	7440-43-9	37	530	< 0.206	0.352 J	0.384 J	0.332 J	< 0.208	< 0.2	0.313 J	0.408 J
Chromium[1]	16065-83-1	120000	1000000	19.1	17.2	18.5	17.7	8.93	7.49	5.04 J	13.5
Cobalt	7440-48-4	23	350	15	16	15.4	16.1	6.42	7.66	4.48 J	3.62
Copper	7440-50-8	3100	47000	25.7	36.5	37.5	39.2	11	12.8	8.6	8.96
Lead	7439-92-1	400	800	14.7	18.9	16.9	19.2	9.65	13.3	87.9	40.7
Manganese	7439-96-5	1800	26000	553	886	683	1090	204	218	247	202
Nickel	7440-02-0	1500	22000	26.8	32.7	32.1	37.5	7.86	8.57	5.86	5.65
Selenium	7782-49-2	390	5800	< 3.09	< 3.06	< 3.03	< 3.06	< 3.12	< 3	< 3.03	< 3.06
Silver	7440-22-4	390	5800	< 0.361	< 0.357	< 0.354	< 0.357	< 0.365	< 0.35	< 0.354	< 0.357
Thallium	7440-28-0	0.78	12	< 2.06 *	< 2.04 *	< 2.02 *	< 2.04 *	< 2.08 *	< 2 *	< 2.02 *	< 2.04 *
Vanadium	7440-62-2	460	8400	21	18.1	19.1	17.7	13.3	10.8	7.62	7.28
Zinc	7440-66-6	23000	350000	68.6	74.8	77.9	77.3	33.9	29.5	97.1	33.5
Mercury	7439-97-6	3.1	3.1	< 0.02	0.045 J	0.047 J	0.05 J	0.037 J	0.031 J	0.033 J	0.049 J
SVOCs (mg/kg)											
Acenaphthene	83-32-9	4100	47000	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Acenaphthylene	208-96-8	4200	51000	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Anthracene	120-12-7	23000	350000	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Benzo[a]anthracene	56-55-3	1.5	320	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Benzo[a]pyrene	50-32-8	0.11	21	< 0.067 *	< 0.067 *	< 0.067 *	< 0.066 *	< 0.067 *	< 0.066 *	< 0.067 *	< 0.066 *
Benzo[b]fluoranthene	205-99-2	1.1	210	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Benzo[g,h,i]perylene	191-24-2	1800	23000	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Benzo[k]fluoranthene	207-08-9	11	2100	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Chrysene	218-01-9	110	21000	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Dibenz(a,h)anthracene	53-70-3	0.11	21	< 0.067 *	< 0.067 *	< 0.067 *	< 0.066 *	< 0.067 *	< 0.066 *	< 0.067 *	< 0.066 *
Fluoranthene	206-44-0	2400	30000	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Fluorene	86-73-7	2900	37000	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Indeno[1,2,3-cd]pyrene	193-39-5	1.1	210	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Naphthalene	91-20-3	2.4	110	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Phenanthrene	67580	23000	350000	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
Pyrene	129-00-0	2300	34000	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066
VOCs (mg/Kg)											
Acetone	67-64-1	61000	110000	0.0285	< 0.0111	< 0.01	< 0.0117	< 0.0104	< 0.01	0.158	0.372
Benzene	71-43-2	1.2	54	< 0.000861	< 0.00103	< 0.000925	< 0.00108	0.00526	< 0.000925	< 0.00116	< 0.0018
Carbon disulfide	75-15-0	740	740	0.0149	0.0549	0.0477	< 0.00775	0.0727	< 0.00665	< 0.00831	< 0.0129
Ethylbenzene	100-41-4	6.2	270	< 0.00117	< 0.0014	< 0.00126	< 0.00147	< 0.00131	< 0.00126	< 0.00158	< 0.00245
2-Hexanone[1]	591-78-6	3400	3400	< 0.0133	< 0.0159	< 0.0143	< 0.0167	< 0.0149	< 0.0143	< 0.0179	< 0.0278
4-Methyl-2-pentanone	108-10-1	3400	3400	< 0.00971	< 0.0116	< 0.0104	< 0.0122	< 0.0109	< 0.0104	< 0.013	< 0.0203
MTBE	1634-04-4	50	2200	< 0.00558	< 0.00667	< 0.006	< 0.007	< 0.00625	< 0.006	< 0.0075	< 0.0117
Toluene	108-88-3	820	820	< 0.00117	0.0046	< 0.00126	< 0.00146	0.0029 J	< 0.00126	0.0032 J	0.00582
1,2,4-Trimethylbenzene	95-63-6	220	220	< 0.00122	< 0.00145	< 0.00131	< 0.00153	< 0.00136	< 0.00131	< 0.00164	< 0.00255
o-Xylene[1]	1330-20-7	260	260	< 0.00107	< 0.00128	< 0.00115	< 0.00134	< 0.0012	< 0.00115	< 0.00144	< 0.00224
m,p-Xylene[1]	1330-20-7	260	260	< 0.00227	< 0.00271	< 0.00244	< 0.00285	< 0.00254	< 0.00244	< 0.00305	< 0.00475

TABLE 1
SURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Constituent	CAS No.	Screening Criteria[1] WVDEP De Minimis Value for Residential Soil	Screening Criteria[1] *WVDEP De Minimis Value for Industrial Soil*	Sample Information[2] Duplicate-1 (Duplicate of SS-23-CORE) Duplicate 1/17/2019 0-4 ft. bgs	SS-24-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-25-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-26-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-27-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-28-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-29-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-30-CORE Investigation 1/17/2019 0-4 ft. bgs
Metals (mg/kg)											
Aluminum	7429-90-5	77000	1000000	2570	5320	5190	4760	5590	11200	6940	9530
Antimony	7440-36-0	31	470	< 2.06	< 2	< 2	< 2	< 2.04	< 2.08	< 2.02	< 2
Arsenic[1]	7440-38-2	13.1	30	4.82 J	3.89 J	4.18 J	4.83 J	4.14 J	4.24 J	6.89	3.38 J
Barium	7440-39-3	15000	220000	25.1	38.6	52.3	64.4	189	90.3	48.1	66
Beryllium	7440-41-7	160	2300	0.191 J	0.47 J	0.853	0.715	0.709	1.05	0.53	0.625
Cadmium	7440-43-9	37	530	0.278	0.52 J	0.565 J	0.565 J	0.694 J	0.995 J	0.672 J	0.485 J
Chromium[1]	16065-83-1	120000	1000000	10.8	11.7	8.02	8.75	9.23	18.3	11.2	11.6
Cobalt	7440-48-4	23	350	2.74 J	7.24	15.9	14.2	11.2	16.2	9.37	10.4
Copper	7440-50-8	3100	47000	6.18	18.3	23.6	20.8	18.7	30.2	19.7	12.4
Lead	7439-92-1	400	800	28.1	15.1	45	26.2	26.5	17.1	20.2	10.3
Manganese	7439-96-5	1800	26000	141	157	534	427	580	731	332	339
Nickel	7440-02-0	1500	22000	4.54 J	11.8	14.3	10.4	14.7	29.6	12.2	12.5
Selenium	7782-49-2	390	5800	< 3.09	< 3	< 3	< 3	< 3.06	< 3.12	< 3.03	< 3
Silver	7440-22-4	390	5800	< 0.361	< 0.35	< 0.35	< 0.35	< 0.357	< 0.365	< 0.354	< 0.35
Thallium	7440-28-0	0.78	12	< 2.06	< 2 *	< 2 *	< 2 *	< 2.04 *	< 2.08 *	< 2.02 *	< 2 *
Vanadium	7440-62-2	460	8400	5.8	11.1	7.33	7.94	8.38	14	12.6	14.4
Zinc	7440-66-6	23000	350000	28.5	37.5	74.8	49.1	67.5	65.5	39.3	39.5
Mercury	7439-97-6	3.1	3.1	0.044 J	0.135	0.074 J	0.086 J	0.063 J	0.023 J	0.144	0.025 J
SVOCs (mg/kg)											
Acenaphthene	83-32-9	4100	47000	< 0.067	< 0.066	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067
Acenaphthylene	208-96-8	4200	51000	< 0.067	< 0.066	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067
Anthracene	120-12-7	23000	350000	< 0.067	< 0.066	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067
Benzo[a]anthracene	56-55-3	1.5	320	< 0.067	0.099 J	< 0.066	0.074 J	0.436	< 0.067	< 0.066	< 0.067
Benzo[a]pyrene	50-32-8	0.11	21	< 0.067 *	0.085 J	< 0.066 *	0.074 J	0.434	< 0.067 *	< 0.066 *	< 0.067 *
Benzo[b]fluoranthene	205-99-2	1.1	210	< 0.067	0.094 J	< 0.066	0.112 J	0.63	< 0.067	< 0.066	< 0.067
Benzo[g,h,i]perylene	191-24-2	1800	23000	< 0.067	< 0.066	< 0.066	< 0.067	0.313 J	< 0.067	< 0.066	< 0.067
Benzo[k]fluoranthene	207-08-9	11	2100	< 0.067	< 0.066	< 0.066	< 0.067	0.175 J	< 0.067	< 0.066	< 0.067
Chrysene	218-01-9	110	21000	< 0.067	0.115 J	< 0.066	0.092 J	0.498	< 0.067	< 0.066	< 0.067
Dibenz(a,h)anthracene	53-70-3	0.11	21	< 0.067 *	< 0.066 *	< 0.066 *	< 0.067 *	0.076 J	< 0.067 *	< 0.066 *	< 0.067 *
Fluoranthene	206-44-0	2400	30000	< 0.067	0.12 J	< 0.066	0.154 J	0.83	< 0.067	< 0.066	< 0.067
Fluorene	86-73-7	2900	37000	< 0.067	< 0.066	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067
Indeno[1,2,3-cd]pyrene	193-39-5	1.1	210	< 0.067	< 0.066	< 0.066	< 0.067	0.341	< 0.067	< 0.066	< 0.067
Naphthalene	91-20-3	2.4	110	< 0.067	< 0.066	< 0.066	< 0.067	< 0.066	< 0.067	< 0.066	< 0.067
Phenanthrene	67580	23000	350000	< 0.067	< 0.066	< 0.066	< 0.067	0.229 J	< 0.067	< 0.066	< 0.067
Pyrene	129-00-0	2300	34000	< 0.067	0.178 J	< 0.066	0.125 J	0.703	< 0.067	< 0.066	< 0.067
VOCs (mg/Kg)											
Acetone	67-64-1	61000	110000	0.372	< 0.0108	< 0.0118	0.0963	0.13	< 0.0108	0.0473	< 0.0107
Benzene	71-43-2	1.2	54	< 0.00132	< 0.001	< 0.00109	< 0.00108	< 0.00113	< 0.001	< 0.000977	< 0.000989
Carbon disulfide	75-15-0	740	740	< 0.00951	< 0.0072	< 0.00785	< 0.00775	< 0.00812	0.0459	< 0.00702	< 0.00711
Ethylbenzene	100-41-4	6.2	270	< 0.00181	< 0.00137	< 0.00149	< 0.00147	< 0.00154	< 0.00137	< 0.00133	< 0.00135
2-Hexanone[1]	591-78-6	3400	3400	< 0.0205	< 0.0155	< 0.0169	< 0.0167	< 0.0175	< 0.0155	< 0.0151	< 0.0153
4-Methyl-2-pentanone	108-10-1	3400	3400	< 0.0149	< 0.0113	< 0.0123	< 0.0122	< 0.0128	< 0.0113	< 0.011	< 0.0112
MTBE	1634-04-4	50	2200	< 0.00859	< 0.0065	< 0.00708	< 0.007	< 0.00733	< 0.0065	< 0.00633	< 0.00642
Toluene	108-88-3	820	820	0.00452	< 0.00136	< 0.00148	< 0.00146	0.0029 J	< 0.00136	< 0.00133	< 0.00134
1,2,4-Trimethylbenzene	95-63-6	220	220	< 0.00187	< 0.00142	< 0.00155	< 0.00153	< 0.0016	< 0.00142	< 0.00138	< 0.0014
o-Xylene[1]	1330-20-7	260	260	< 0.00165	< 0.00125	< 0.00136	< 0.00134	< 0.00141	< 0.00125	< 0.00121	< 0.00123
m,p-Xylene[1]	1330-20-7	260	260	< 0.00349	< 0.00265	< 0.00288	< 0.00285	< 0.00299	< 0.00265	< 0.00258	< 0.00261

TABLE 1
SURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Constituent	CAS No.	Screening Criteria[1] WVDEP De Minimis Value for Residential Soil	*WVDEP De Minimis Value for Industrial Soil*	Sample Information[2] SS-31-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-32-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-33-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-34-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-35-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-36-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-37-CORE Investigation 1/17/2019 0-2 ft. bgs	SS-38-CORE Investigation 1/17/2019 0-2 ft. bgs
Metals (mg/kg)											
Aluminum	7429-90-5	77000	1000000	2430	3680	4130	6890	5940	5970	5690	4460
Antimony	7440-36-0	31	470	< 2	< 2	< 2	< 2.04	< 2	< 2.04	< 2	< 2.08
Arsenic[1]	7440-38-2	*13.1*	30	< 2 *	< 2 *	< 2 *	7.15	5.58	12.4	7.02	2.76 J
Barium	7440-39-3	15000	220000	31.9	26.3	49	75.7	81.2	277	49	42.2
Beryllium	7440-41-7	160	2300	0.33 J	0.335 J	0.285 J	0.556	0.585	0.827	0.485 J	0.49 J
Cadmium	7440-43-9	37	530	0.26 J	0.285 J	0.31 J	0.856 J	0.785 J	1.22	0.72 J	0.443 J
Chromium[1]	16065-83-1	120000	1000000	3.72 J	4.82 J	6.48	14.6	10.2	11.1	10.5	8.89
Cobalt	7440-48-4	23	350	3.31 J	4.33 J	6.54	9.94	8.76	11.6	9.32	6.15
Copper	7440-50-8	3100	47000	5.05	5.75	8.67	40.4	34.4	41.9	21.5	14.3
Lead	7439-92-1	400	800	8.41	8.01	6.98	58.4	51.8	63.7	34	21.6
Manganese	7439-96-5	1800	26000	179	176	278	378	410	534	332	90.8
Nickel	7440-02-0	1500	22000	6.85	5.24	6.19	11.5	11.3	23.4	12.1	11.1
Selenium	7782-49-2	390	5800	< 3	< 3	< 3	< 3.06	< 3	< 3.06	< 3	< 3.12
Silver	7440-22-4	390	5800	< 0.35	< 0.35	< 0.35	< 0.357	< 0.35	< 0.357	< 0.35	< 0.365
Thallium	7440-28-0	0.78	12	< 2 *	< 2 *	< 2 *	< 2.04 *	< 2 *	< 2.04 *	< 2 *	< 2.08
Vanadium	7440-62-2	460	8400	4.02 J	5.25	6.31	13.9	10.3	8.26	11.4	9.54
Zinc	7440-66-6	23000	350000	19.5	21.2	24.9	55.9	64.9	117	60.5	43.3
Mercury	7439-97-6	3.1	3.1	0.035 J	0.031 J	0.023 J	0.113	0.065	0.084 J	0.085 J	0.055 J
SVOCs (mg/kg)											
Acenaphthene	83-32-9	4100	47000	< 0.066	< 0.067	< 0.067	< 0.066	< 0.066	< 0.067	< 0.067	< 0.066
Acenaphthylene	208-96-8	4200	51000	< 0.066	< 0.067	< 0.067	0.147 J	0.162 J	< 0.067	< 0.067	< 0.066
Anthracene	120-12-7	23000	350000	< 0.066	< 0.067	< 0.067	0.149 J	0.113 J	< 0.067	< 0.067	< 0.066
Benzo[a]anthracene	56-55-3	1.5	320	< 0.066	< 0.067	< 0.067	0.246 J	0.387	0.09 J	< 0.067	< 0.066
Benzo[a]pyrene	50-32-8	0.11	21	< 0.066 *	< 0.067 *	< 0.067 *	0.215 J	0.362	0.073 J	< 0.067 *	< 0.066 *
Benzo[b]fluoranthene	205-99-2	1.1	210	< 0.066	< 0.067	< 0.067	0.655	0.561	0.099 J	< 0.067	< 0.066
Benzo[g,h,i]perylene	191-24-2	1800	23000	< 0.066	< 0.067	< 0.067	0.318 J	0.284 J	< 0.067	< 0.067	< 0.066
Benzo[k]fluoranthene	207-08-9	11	2100	< 0.066	< 0.067	< 0.067	0.149 J	0.134 J	< 0.067	< 0.067	< 0.066
Chrysene	218-01-9	110	21000	< 0.066	< 0.067	< 0.067	0.353	0.472	0.099 J	< 0.067	< 0.066
Dibenz(a,h)anthracene	53-70-3	0.11	21	< 0.066 *	< 0.067 *	< 0.067 *	0.097 J	0.078 J	< 0.067 *	< 0.067 *	< 0.066 *
Fluoranthene	206-44-0	2400	30000	< 0.066	< 0.067	< 0.067	0.292 J	0.45	< 0.067	< 0.067	< 0.066
Fluorene	86-73-7	2900	37000	< 0.066	< 0.067	< 0.067	< 0.066	< 0.066	< 0.067	< 0.067	< 0.066
Indeno[1,2,3-cd]pyrene	193-39-5	1.1	210	< 0.066	< 0.067	< 0.067	0.383	0.299 J	< 0.067	< 0.067	< 0.066
Naphthalene	91-20-3	2.4	110	< 0.066	< 0.067	< 0.067	0.137 J	0.095 J	< 0.067	< 0.067	< 0.066
Phenanthrene	67580	23000	350000	< 0.066	< 0.067	< 0.067	0.145 J	0.228 J	< 0.067	< 0.067	< 0.066
Pyrene	129-00-0	2300	34000	< 0.066	< 0.067	< 0.067	0.393	0.679	0.146 J	< 0.067	0.099 J
VOCs (mg/Kg)											
Acetone	67-64-1	61000	110000	0.0827	0.0954	0.0909	0.0808	0.0752	0.0648	0.0619	0.0962
Benzene	71-43-2	1.2	54	< 0.00122	< 0.00128	< 0.0012	< 0.00128	< 0.00127	0.0102	< 0.00118	< 0.00103
Carbon disulfide	75-15-0	740	740	< 0.00877	< 0.00923	< 0.00859	< 0.00923	< 0.00914	< 0.00905	< 0.00849	< 0.00739
Ethylbenzene	100-41-4	6.2	270	< 0.00167	< 0.00175	< 0.00163	< 0.00175	< 0.00174	< 0.00172	< 0.00161	< 0.0014
2-Hexanone[1]	591-78-6	3400	3400	< 0.0189	< 0.0199	< 0.0185	< 0.0199	< 0.0197	< 0.0195	< 0.0183	< 0.0159
4-Methyl-2-pentanone	108-10-1	3400	3400	< 0.0138	< 0.0145	< 0.0135	< 0.0145	< 0.0144	< 0.0142	< 0.0133	< 0.0116
MTBE	1634-04-4	50	2200	< 0.00792	< 0.00834	< 0.00775	< 0.00834	< 0.00825	< 0.00817	< 0.00767	< 0.00667
Toluene	108-88-3	820	820	< 0.00166	< 0.00174	< 0.00162	< 0.00174	< 0.00173	0.00636	< 0.0016	< 0.0014
1,2,4-Trimethylbenzene	95-63-6	220	220	< 0.00173	< 0.00182	< 0.00169	< 0.00182	< 0.0018	< 0.00191	< 0.00167	< 0.00145
o-Xylene[1]	1330-20-7	260	260	< 0.00152	< 0.0016	< 0.00149	< 0.0016	< 0.00158	< 0.00157	< 0.00147	< 0.00128
m,p-Xylene[1]	1330-20-7	260	260	< 0.00322	< 0.00339	< 0.00316	< 0.00339	< 0.00336	< 0.00333	< 0.00312	< 0.00271

TABLE 1
SURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Notes:

1- Screening criteria are the De Minimis Values from West Virginia 60CSR9 (Effective December 2, 2021). Double dashes indicate that a De Minimis Value is not available for a given constituent. Notes regarding specific values for various chemicals (e.g., surrogates used, effects basis, etc.) are as follows:

The residential screening criteria for arsenic is based on the 90th percentile background concentrations in West Virginia soils published by USGS (2013).
Screening criteria for chromium are based on the screening criteria for chromium (III).
Screening criteria for m,p-xylene and o-xylene are based on the screening criteria for total xylenes.
Screening criteria for 2-Hexanone are based on the screening criteria for 4-Methyl-2-pentanone.

2- General sample information provided in column headings includes sample identification number. sampling date, and depth interval sampled. Table qualifier codes are as foll

J Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the reported concentration is an approximate value.
* The laboratory Method Detection Limit exceeds one or more Screening Criteria for the associated analyte.

Other Notes:
NA Not Analyzed
Shading indicates an exceedance of the Residential De Minimis value.
Bold italics numbers indicate an exceedance of the Industrial Soil De Minimis Value.

TABLE 2
SUBSURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Constituent	CAS No.	Screening Criteria[(1)] WVDEP De Minimis Value for Residential Soil	*WVDEP De Minimis Value for Industrial Soil*	Sample Information[(2)] SB-1-CORE Investigation 01/14/19 12-13 ft. bgs	Duplicate-2 (Duplicate of SB-1-CORE) Duplicate 01/14/19 12-13 ft. bgs	SB-3-CORE Investigation 01/14/19 4-6 ft. bgs	SB-4-CORE Investigation 01/14/19 4-6 ft. bgs	SB-5-CORE Investigation 01/14/19 4-6 ft. bgs	SB-6-CORE Investigation 01/15/19 4-6 ft. bgs	Duplicate-3 (Duplicate of SB-6-CORE) Duplicate 01/15/19 4-6 ft. bgs	SB-7-CORE Investigation 01/15/19 10-12 ft. bgs	SB-11-CORE Investigation 01/15/19 8-10 ft. bgs
Metals (mg/Kg)												
Aluminum	7429-90-5	77000	1000000	3700	3080	4890	6730	6300	5260	5600	5640	4260
Antimony	7440-36-0	31	470	< 2.02	< 2.02	< 2.04	< 2.02	< 2	< 2.06	< 2.02	< 2.08	< 2
Arsenic[(1)]	7440-38-2	*13.1*	30	2.65 J	2.19 J	5.94	6.01	7.89	5.38	7.36	3.43 J	2.8 J
Barium	7440-39-3	15000	220000	26.2	18.5	26	41.9	34.1	24.3	28.2	34.6	24.5
Beryllium	7440-41-7	160	2300	0.343 J	0.273 J	0.383 J	0.404 J	0.485 J	0.356 J	0.384 J	0.396 J	0.35 J
Cadmium	7440-43-9	37	530	0.227 J	0.313 J	0.454 J	0.495 J	0.54 J	0.402 J	0.308 J	0.349 J	0.245 J
Chromium[(1)]	16065-83-1	120000	1000000	7.99	5.88	7.9	9.71	11.4	8.56	9.26	8.03	6.88
Cobalt	7440-48-4	23	350	4.63 J	4.3 J	5.65	9.09	12.8	5.93	13	6.61	6.29
Copper	7440-50-8	3100	47000	7.13	6.69	17.3	13.8	16.6	14.6	18.2	10.6	8.24
Lead	7439-92-1	400	800	6.36	5.12	31.4	35.7	11.4	8.11	11.9	20	6.61
Manganese	7439-96-5	1800	26000	290	300	160	175	261	175	547	201	212
Nickel	7440-02-0	1500	22000	5.79	5.39	9.18	10.2	13.6	10.7	11.5	8.02	6.66
Selenium	7782-49-2	390	5800	< 3.03	< 3.03	< 3.06	< 3.03	< 3	< 3.09	< 3.03	< 3.12	< 3
Silver	7440-22-4	390	5800	< 0.354	< 0.354	< 0.357	< 0.354	< 0.35	< 0.361	< 0.354	< 0.365	< 0.35
Thallium	7440-28-0	0.78	12	< 2.02 *	< 2.02 *	< 2.04 *	< 2.02 *	< 2 *	< 2.06 *	< 2.02 *	< 2.08 *	< 2 *
Vanadium[(1)]	7440-62-2	460	8400	7.43	6.86	11.5	14.3	13.8	11.7	14.7	12	9.28
Zinc	7440-66-6	23000	350000	23.1	21.2	37.8	47.6	42.6	30.4	34.2	33.7	23.8
Mercury	7439-97-6	3.1	3.1	0.025 J	0.02 J	0.033 J	***5.38***	0.055 J	0.046 J	0.025 J	0.035 J	0.028 J
SVOCs (mg/Kg)												
Acenaphthene	83-32-9	4100	47000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Acenaphthylene	208-96-8	4200	51000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Anthracene	120-12-7	23000	350000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Benzo[a]anthracene	56-55-3	1.5	320	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Benzo[a]pyrene	50-32-8	0.11	21	< 0.067 *	< 0.067 *	< 0.067 *	< 0.067 *	< 0.066 *	< 0.067 *	< 0.067 *	< 0.067 *	< 0.067 *
Benzo[b]fluoranthene	205-99-2	1.1	210	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Benzo[g,h,i]perylene	191-24-2	1800	23000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Benzo[k]fluoranthene	207-08-9	11	2100	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Chrysene	218-01-9	110	21000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Dibenz(a,h)anthracene	53-70-3	0.11	21	< 0.067 *	< 0.067 *	< 0.067 *	< 0.067 *	< 0.066 *	< 0.067 *	< 0.067 *	< 0.067 *	< 0.067 *
Fluoranthene	206-44-0	2400	30000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Fluorene	86-73-7	2900	37000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Indeno[1,2,3-cd]pyrene	193-39-5	1.1	210	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Naphthalene	91-20-3	2.4	110	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Phenanthrene	67580	23000	350000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
Pyrene	129-00-0	2300	34000	< 0.067	< 0.067	< 0.067	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067
VOCs (mg/Kg)												
Acetone	67-64-1	61000	110000	0.0962	0.0481	0.0208 J	0.0238 J	0.0322	0.036	< 0.0111	0.0513	0.0319
Benzene	71-43-2	1.2	54	< 0.000925	< 0.001	< 0.000925	< 0.000989	< 0.00102	< 0.000964	< 0.00103	< 0.000938	< 0.000964
Carbon disulfide	75-15-0	740	740	< 0.00665	< 0.0072	< 0.00665	< 0.00711	< 0.00729	< 0.00692	< 0.00739	< 0.00674	< 0.00692
Ethylbenzene	100-41-4	6.2	270	< 0.00126	< 0.00137	< 0.00126	< 0.00135	< 0.00138	< 0.00131	< 0.0014	< 0.00128	< 0.00131
2-Hexanone[(1)]	591-78-6	3400	3400	< 0.0143	< 0.0155	< 0.0143	< 0.0153	< 0.0157	< 0.0149	< 0.0159	< 0.0145	< 0.0149
4-Methyl-2-pentanone	108-10-1	3400	3400	< 0.0104	< 0.0113	< 0.0104	< 0.0112	< 0.0115	< 0.0109	< 0.0116	< 0.0106	< 0.0109
MTBE	1634-04-4	50	2200	< 0.006	< 0.0065	< 0.006	< 0.00642	< 0.00658	< 0.00625	< 0.00667	< 0.00608	< 0.00625
Toluene	108-88-3	820	820	< 0.00126	< 0.00136	< 0.00126	< 0.00134	< 0.00138	< 0.00131	< 0.0014	< 0.00127	< 0.00131
1,2,4-Trimethylbenzene	95-63-6	220	220	< 0.00131	< 0.00142	< 0.00131	< 0.0014	< 0.00144	< 0.00136	< 0.00145	< 0.00133	0.00243 J
o-Xylene[(1)]	1330-20-7	260	260	< 0.00115	< 0.00125	< 0.00115	< 0.00123	< 0.00126	< 0.0012	< 0.00128	< 0.00117	< 0.0012
m,p-Xylene[(1)]	1330-20-7	260	260	< 0.00244	< 0.00265	< 0.00244	< 0.00261	< 0.00268	< 0.00254	< 0.00271	< 0.00248	0.00355 J

TABLE 2
SUBSURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Constituent	CAS No.	Screening Criteria[(1)]		Sample Information[(2)]								
		WVDEP De Minimis Value for Residential Soil	*WVDEP De Minimis Value for Industrial Soil*	SB-12-CORE Investigation 01/16/19 4-5 ft. bgs	Duplicate-2 (Duplicate of SB-12-CORE) Duplicate 01/16/19 4-5 ft. bgs	SB-13-CORE Investigation 01/16/19 4-5 ft. bgs	SB-14-CORE Investigation 01/16/19 4-5 ft. bgs	SB-15-CORE Investigation 01/16/19 4-5 ft. bgs	SB-16-CORE Investigation 01/16/19 2-4 ft. bgs	SB-17-CORE Investigation 01/16/19 2-4 ft. bgs	SB-18-CORE Investigation 01/16/19 2-4 ft. bgs	SB-19-CORE Investigation 01/16/19 4-5 ft. bgs
Metals (mg/Kg)												
Aluminum	7429-90-5	77000	1000000	7430	5340	1610	3110	5240	4890	6220	10900	5470
Antimony	7440-36-0	31	470	< 2	< 2	< 2.02	< 2	< 2.02	< 2	< 2	< 2.08	< 2.04
Arsenic[(1)]	7440-38-2	*13.1*	30	2.22 J	3.46 J	3.51 J	< 2	< 2.02	< 2	< 2	10	2.68 J
Barium	7440-39-3	15000	220000	2.91	28.3	61.5	35.6	36.5	44.7	77.8	88	68.4
Beryllium	7440-41-7	160	2300	0.405 J	0.385 J	0.424 J	0.195 J	0.242 J	0.37 J	0.52	0.594	0.383 J
Cadmium	7440-43-9	37	530	< 0.2	< 0.2	0.288 J	0.25 J	< 0.202	0.405 J	< 0.2	0.51 J	0.403 J
Chromium[(1)]	16065-83-1	120000	1000000	9.73	10.5	6.76	8.24	5.63	6.61	6.08	16.3	8.62
Cobalt	7440-48-4	23	350	4.47 J	6.02	5.54	3.48 J	5.43	5.54	5.57	10.8	7.01
Copper	7440-50-8	3100	47000	12.7	13.3	9.9	9.04	10.2	18.2	7.78	44.3	20.4
Lead	7439-92-1	400	800	7.6	8.86	17.3	***1030***	742	81	5.94	135	189
Manganese	7439-96-5	1800	26000	130	183	299	199	142	229	173	555	346
Nickel	7440-02-0	1500	22000	6.64	7.26	7.96	4.57 J	4.99	7.54	8.22	21.6	9.18
Selenium	7782-49-2	390	5800	< 3	< 3	< 3.03	< 3	< 3.03	< 3	< 3	< 3.13	< 3.06
Silver	7440-22-4	390	5800	< 0.35	< 0.35	< 0.354	< 0.35	< 0.354	< 0.35	< 0.35	< 0.365	< 0.357
Thallium	7440-28-0	0.78	12	< 2 *	< 2 *	< 2.02 *	< 2 *	< 2.02 *	< 2 *	< 2 *	< 2.08 *	< 2.04 *
Vanadium[(1)]	7440-62-2	460	8400	14	13.7	9.02	6.87	13.3	9.41	8.97	26	12.5
Zinc	7440-66-6	23000	350000	30.8	32.6	29.1	145	67.4	138	31.9	136	146
Mercury	7439-97-6	3.1	3.1	0.037 J	0.038 J	0.027 J	0.044 J	0.026 J	0.023 J	0.023 J	0.079 J	0.482
SVOCs (mg/Kg)												
Acenaphthene	83-32-9	4100	47000	< 0.066	< 0.067	< 0.066	< 0.067	0.208 J	< 0.067	< 0.067	< 0.067	< 0.067
Acenaphthylene	208-96-8	4200	51000	< 0.066	< 0.067	< 0.066	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067
Anthracene	120-12-7	23000	350000	< 0.066	< 0.067	< 0.066	< 0.067	0.545	< 0.067	< 0.067	< 0.067	< 0.067
Benzo[a]anthracene	56-55-3	1.5	320	< 0.066	< 0.067	< 0.066	0.204 J	2.09	0.37	< 0.067	< 0.067	< 0.067
Benzo[a]pyrene	50-32-8	0.11	21	< 0.066 *	< 0.067 *	< 0.066 *	0.264 J	1.67	0.34	< 0.067 *	< 0.067 *	< 0.067 *
Benzo[b]fluoranthene	205-99-2	1.1	210	< 0.066	< 0.067	< 0.066	0.369	2.34	0.504	< 0.067	< 0.067	< 0.067
Benzo[g,h,i]perylene	191-24-2	1800	23000	< 0.066	< 0.067	< 0.066	0.25 J	0.956	0.208 J	< 0.067	< 0.067	< 0.067
Benzo[k]fluoranthene	207-08-9	11	2100	< 0.066	< 0.067	< 0.066	0.124 J	0.829	0.144 J	< 0.067	< 0.067	< 0.067
Chrysene	218-01-9	110	21000	< 0.066	< 0.067	< 0.066	0.268 J	1.95	0.348	< 0.067	< 0.067	< 0.067
Dibenz(a,h)anthracene	53-70-3	0.11	21	< 0.066 *	< 0.067 *	< 0.066 *	< 0.067 *	0.286 J	< 0.067	< 0.067 *	< 0.067 *	< 0.067 *
Fluoranthene	206-44-0	2400	30000	< 0.066	< 0.067	< 0.066	0.547	5.16	0.645	< 0.067	< 0.067	< 0.067
Fluorene	86-73-7	2900	37000	< 0.066	< 0.067	< 0.066	< 0.067	0.144 J	< 0.067	< 0.067	< 0.067	< 0.067
Indeno[1,2,3-cd]pyrene	193-39-5	1.1	210	< 0.066	< 0.067	< 0.066	0.266 J	1.21	0.26 J	< 0.067	< 0.067	< 0.067
Naphthalene	91-20-3	2.4	110	< 0.066	< 0.067	< 0.066	< 0.067	0.074 J	< 0.067	< 0.067	< 0.067	< 0.067
Phenanthrene	67580	23000	350000	< 0.066	< 0.067	< 0.066	0.299 J	2.19	0.199 J	< 0.067	< 0.067	< 0.067
Pyrene	129-00-0	2300	34000	< 0.066	< 0.067	< 0.066	0.457	3	0.51	< 0.067	< 0.067	< 0.067
VOCs (mg/Kg)												
Acetone	67-64-1	61000	110000	< 0.0113	< 0.0107	< 0.0122	< 0.0129	< 0.0107	0.164	0.0585	< 0.0107	< 0.0126
Benzene	71-43-2	1.2	54	< 0.00104	< 0.000989	0.00356	< 0.0012	< 0.000989	< 0.00127	< 0.00102	0.00379	< 0.00117
Carbon disulfide	75-15-0	740	740	0.042	0.026	< 0.00812	< 0.00859	< 0.00711	< 0.00914	< 0.00729	0.0304	< 0.0084
Ethylbenzene	100-41-4	6.2	270	< 0.00142	< 0.00135	< 0.00154	< 0.00163	< 0.00135	< 0.00174	< 0.00138	< 0.00135	< 0.0016
2-Hexanone[(1)]	591-78-6	3400	3400	< 0.0161	< 0.0153	< 0.0175	0.0185	< 0.0153	< 0.0197	< 0.0157	< 0.0153	< 0.0181
4-Methyl-2-pentanone	108-10-1	3400	3400	< 0.0117	< 0.0112	< 0.0128	< 0.0135	< 0.0112	< 0.0144	< 0.0115	< 0.0112	< 0.0132
MTBE	1634-04-4	50	2200	< 0.00675	< 0.00642	< 0.00733	< 0.00775	< 0.00642	< 0.00825	< 0.00658	< 0.00642	< 0.00758
Toluene	108-88-3	820	820	< 0.00141	< 0.00134	0.00228 J	< 0.00162	< 0.00134	0.00368 J	< 0.00138	0.00204 J	< 0.00159
1,2,4-Trimethylbenzene	95-63-6	220	220	0.00311 J	< 0.0014	< 0.0016	< 0.00169	< 0.0014	< 0.0018	< 0.00144	< 0.0014	< 0.00165
o-Xylene[(1)]	1330-20-7	260	260	< 0.00129	< 0.00123	< 0.00141	< 0.00149	< 0.00123	< 0.00158	< 0.00126	< 0.00123	< 0.00145
m,p-Xylene[(1)]	1330-20-7	260	260	< 0.00275	< 0.00261	< 0.00299	< 0.00316	< 0.00261	< 0.00336	< 0.00268	< 0.00261	< 0.00309

TABLE 2
SUBSURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Constituent	CAS No.	Screening Criteria[(1)]		Sample Information[(2)]								
		WVDEP De Minimis Value for Residential Soil	*WVDEP De Minimis Value for Industrial Soil*	SB-20-CORE Investigation 01/16/19 4-5 ft. bgs	SB-21-CORE Investigation 01/16/19 4-5 ft. bgs	SB-22-CORE Investigation 01/16/19 2-4 ft. bgs	SB-23-CORE Investigation 01/17/19 4-5 ft. bgs	Duplicate-2 (Duplicate of SB-23-CORE) Duplicate 01/17/19 4-5 ft. bgs	SB-24-CORE Investigation 01/17/19 4-5 ft. bgs	SB-26-CORE Investigation 01/17/19 4-5 ft. bgs	SB-27-CORE Investigation 01/17/19 2-4 ft. bgs	SB-29-CORE Investigation 01/17/19 4-5 ft. bgs
Metals (mg/Kg)												
Aluminum	7429-90-5	77000	1000000	6340	5550	5800	8240	8660	5090	3780	4790	7740
Antimony	7440-36-0	31	470	< 2.06	< 2.04	< 2.06	< 2.02	< 2	< 2	< 2.08	< 2.04	< 2.02
Arsenic[(1)]	7440-38-2	*13.1*	30	4.51 J	5.2	2.79 J	5.32	5.18	5.54	2.31 J	2.57 J	4.89 J
Barium	7440-39-3	15000	220000	24.2	23.8	31.1	38.9	48.4	36.4	46.3	111	53.9
Beryllium	7440-41-7	160	2300	0.366 J	0.362 J	0.464 J	0.47 J	0.475 J	0.465 J	0.453 J	0.577	0.51
Cadmium	7440-43-9	37	530	< 0.206	0.23 J	0.325 J	0.601 J	0.685 J	0.55 J	0.365 J	0.469 J	0.465 J
Chromium[(1)]	16065-83-1	120000	1000000	8.92	8.11	8.81	11.1	11.3	11.5	10.1	8.47	11
Cobalt	7440-48-4	23	350	6.51	8.05	7.52	6.99	5.78	7.31	8.55	9.16	9.63
Copper	7440-50-8	3100	47000	12.6	13.5	14.1	17.4	23.4	16.9	9.949	11.9	15.4
Lead	7439-92-1	400	800	8.47	8.37	9.27	12.2	14.4	15.2	9.35	11.7	13.7
Manganese	7439-96-5	1800	26000	251	271	298	123	107	147	323	442	211
Nickel	7440-02-0	1500	22000	8.02	9.2	7.72	12.7	12.1	12.1	10.9	11.7	11.6
Selenium	7782-49-2	390	5800	< 3.09	< 3.06	< 3.09	< 3.03	< 3	< 3	< 3.12	< 3.06	< 3.03
Silver	7440-22-4	390	5800	< 0.361	< 0.357	< 0.361	< 0.354	< 0.35	< 0.35	< 0.365	< 0.357	< 0.354
Thallium	7440-28-0	0.78	12	< 2.06 *	< 2.04 *	< 2.06 *	< 2.02 *	< 2 *	< 2 *	< 2.08 *	< 2.04 *	< 2.02 *
Vanadium[(1)]	7440-62-2	460	8400	13.9	12.3	12.3	13.6	13.8	9.7	5.77	7.24	13.4
Zinc	7440-66-6	23000	350000	30.2	31.9	148	39.2	38.6	37.9	42.8	37.6	35.2
Mercury	7439-97-6	3.1	3.1	0.034 J	0.025 J	0.033 J	0.046 J	0.046 J	0.02 J	0.031 J	0.032 J	0.053 J
SVOCs (mg/Kg)												
Acenaphthene	83-32-9	4100	47000	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	< 0.066	< 0.066
Acenaphthylene	208-96-8	4200	51000	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	< 0.066	< 0.066
Anthracene	120-12-7	23000	350000	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	< 0.066	< 0.066
Benzo[a]anthracene	56-55-3	1.5	320	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	0.172 J	< 0.066
Benzo[a]pyrene	50-32-8	0.11	21	< 0.067 *	< 0.067 *	< 0.066 *	< 0.066 *	< 0.066 *	< 0.066 *	< 0.067 *	0.184 J	< 0.066 *
Benzo[b]fluoranthene	205-99-2	1.1	210	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	0.271 J	< 0.066
Benzo[g,h,i]perylene	191-24-2	1800	23000	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	0.145 J	< 0.066
Benzo[k]fluoranthene	207-08-9	11	2100	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	0.08 J	< 0.066
Chrysene	218-01-9	110	21000	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	0.195 J	< 0.066
Dibenz(a,h)anthracene	53-70-3	0.11	21	< 0.067 *	< 0.067 *	< 0.066 *	< 0.066 *	< 0.066 *	< 0.066 *	< 0.067 *	< 0.066 *	< 0.066 *
Fluoranthene	206-44-0	2400	30000	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	0.293 J	< 0.066
Fluorene	86-73-7	2900	37000	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	< 0.066	< 0.066
Indeno[1,2,3-cd]pyrene	193-39-5	1.1	210	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	0.152 J	< 0.066
Naphthalene	91-20-3	2.4	110	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	< 0.066	< 0.066
Phenanthrene	67580	23000	350000	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	< 0.066	< 0.066
Pyrene	129-00-0	2300	34000	< 0.067	< 0.067	< 0.066	< 0.066	< 0.066	< 0.066	< 0.067	0.248 J	< 0.066
VOCs (mg/Kg)												
Acetone	67-64-1	61000	110000	0.0479	< 0.0104	0.0552	< 0.0106	0.0321	< 0.0114	0.0732	< 0.0115	< 0.0104
Benzene	71-43-2	1.2	54	< 0.00102	< 0.000964	< 0.000964	< 0.000977	< 0.00103	< 0.00105	< 0.00121	< 0.00107	< 0.000964
Carbon disulfide	75-15-0	740	740	< 0.00729	< 0.00692	< 0.00692	< 0.00702	< 0.00739	< 0.00757	< 0.00868	< 0.00766	< 0.00692
Ethylbenzene	100-41-4	6.2	270	< 0.00138	< 0.00131	< 0.00131	< 0.00133	< 0.0014	< 0.00144	< 0.00165	< 0.00145	< 0.00131
2-Hexanone[(1)]	591-78-6	3400	3400	< 0.0157	< 0.0149	< 0.0149	< 0.0151	< 0.0159	< 0.0163	< 0.0187	< 0.0165	< 0.0149
4-Methyl-2-pentanone	108-10-1	3400	3400	< 0.0115	< 0.0109	< 0.0109	< 0.011	< 0.0116	< 0.0119	< 0.0136	< 0.012	< 0.0109
MTBE	1634-04-4	50	2200	< 0.00658	< 0.00625	< 0.00625	< 0.00633	< 0.00667	< 0.00683	< 0.00783	< 0.00692	< 0.00625
Toluene	108-88-3	820	820	< 0.00138	< 0.00131	< 0.00131	< 0.00133	< 0.0014	< 0.00143	< 0.00164	0.00219 J	< 0.00131
1,2,4-Trimethylbenzene	95-63-6	220	220	< 0.00144	< 0.00136	< 0.00136	< 0.00138	< 0.00145	< 0.00149	< 0.00171	< 0.00151	< 0.00136
o-Xylene[(1)]	1330-20-7	260	260	< 0.00126	< 0.0012	< 0.0012	< 0.00121	< 0.00128	< 0.00131	< 0.0015	< 0.00133	< 0.0012
m,p-Xylene[(1)]	1330-20-7	260	260	< 0.00268	< 0.00254	< 0.00254	< 0.00258	< 0.00271	< 0.00278	< 0.00319	< 0.00282	< 0.00254

TABLE 2
SUBSURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

		Screening Criteria(1)		Sample Information(2)		
Constituent	**CAS No.**	**WVDEP De Minimis Value for Residential Soil**	***WVDEP De Minimis Value for Industrial Soil***	**SB-30-CORE Investigation 01/17/19 2-4 ft. bgs**	**SB-31-CORE Investigation 01/17/19 4-5 ft. bgs**	**SB-32-CORE Investigation 01/17/19 4-5 ft. bgs**
Metals (mg/Kg)						
Aluminum	7429-90-5	77000	1000000	7930	3480	5780
Antimony	7440-36-0	31	470	< 2	< 2	< 2.02
Arsenic(1)	7440-38-2	*13.1*	30	4.65 J	2.87 J	2.2 J
Barium	7440-39-3	15000	220000	45.7	26.8	30.8
Beryllium	7440-41-7	160	2300	0.495 J	0.38 J	0.475 J
Cadmium	7440-43-9	37	530	0.52 J	0.22 J	0.414 J
Chromium(1)	16065-83-1	120000	1000000	12.1	6.98	8.41
Cobalt	7440-48-4	23	350	8.54	6.34	8.84
Copper	7440-50-8	3100	47000	15.5	7.6	11
Lead	7439-92-1	400	800	11.6	6.12	8.82
Manganese	7439-96-5	1800	26000	251	179	290
Nickel	7440-02-0	1500	22000	12	6.92	8.21
Selenium	7782-49-2	390	5800	< 3	< 3	< 3.03
Silver	7440-22-4	390	5800	< 0.35	< 0.35	< 0.354
Thallium	7440-28-0	0.78	12	< 2 *	< 2 *	< 2.02 *
Vanadium(1)	7440-62-2	460	8400	13.9	6.56	9.34
Zinc	7440-66-6	23000	350000	36.3	21	28.5
Mercury	7439-97-6	3.1	3.1	0.033 J	0.023 J	0.028 J
SVOCs (mg/Kg)						
Acenaphthene	83-32-9	4100	47000	< 0.066	< 0.067	< 0.066
Acenaphthylene	208-96-8	4200	51000	< 0.066	< 0.067	< 0.066
Anthracene	120-12-7	23000	350000	< 0.066	< 0.067	< 0.066
Benzo[a]anthracene	56-55-3	1.5	320	< 0.066	< 0.067	< 0.066
Benzo[a]pyrene	50-32-8	0.11	21	< 0.066 *	< 0.067 *	< 0.066 *
Benzo[b]fluoranthene	205-99-2	1.1	210	< 0.066	< 0.067	< 0.066
Benzo[g,h,i]perylene	191-24-2	1800	23000	< 0.066	< 0.067	< 0.066
Benzo[k]fluoranthene	207-08-9	11	2100	< 0.066	< 0.067	< 0.066
Chrysene	218-01-9	110	21000	< 0.066	< 0.067	< 0.066
Dibenz(a,h)anthracene	53-70-3	0.11	21	< 0.066 *	< 0.067 *	< 0.066 *
Fluoranthene	206-44-0	2400	30000	< 0.066	< 0.067	< 0.066
Fluorene	86-73-7	2900	37000	< 0.066	< 0.067	< 0.066
Indeno[1,2,3-cd]pyrene	193-39-5	1.1	210	< 0.066	< 0.067	< 0.066
Naphthalene	91-20-3	2.4	110	< 0.066	< 0.067	< 0.066
Phenanthrene	67580	23000	350000	< 0.066	< 0.067	< 0.066
Pyrene	129-00-0	2300	34000	< 0.066	< 0.067	< 0.066
VOCs (mg/Kg)						
Acetone	67-64-1	61000	110000	0.108	< 0.0133	< 0.0108
Benzene	71-43-2	1.2	54	< 0.00102	< 0.00123	< 0.001
Carbon disulfide	75-15-0	740	740	< 0.00729	< 0.00886	< 0.0072
Ethylbenzene	100-41-4	6.2	270	< 0.00138	< 0.00168	< 0.00137
2-Hexanone(1)	591-78-6	3400	3400	< 0.0157	< 0.0191	< 0.0155
4-Methyl-2-pentanone	108-10-1	3400	3400	< 0.0115	< 0.0139	< 0.0113
MTBE	1634-04-4	50	2200	< 0.00658	< 0.008	< 0.0065
Toluene	108-88-3	820	820	< 0.00138	< 0.00167	< 0.00136
1,2,4-Trimethylbenzene	95-63-6	220	220	< 0.00144	< 0.00175	< 0.00142
o-Xylene(1)	1330-20-7	260	260	< 0.00126	< 0.00153	< 0.00125
m,p-Xylene(1)	1330-20-7	260	260	< 0.00268	< 0.00326	< 0.00265

TABLE 2
SUBSURFACE SOIL ANALTYICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Notes:

1- Screening criteria are the De Minimis Values from West Virginia 60CSR9 (Effective December 2, 2021). Double dashes indicate that a De Minimis Value is not available for a given constituent. Notes regarding specific values for various chemicals (e.g., surrogates used, effects basis, etc.) are as follows:

The residential screening criteria for arsenic is based on the 90th percentile background concentrations in West Virginia soils published by USGS (2013).
Screening criteria for chromium are based on the screening criteria for chromium (III).
Screening criteria for m,p-xylene and o-xylene are based on the screening criteria for total xylenes.
Screening criteria for 2-Hexanone are based on the screening criteria for 4-Methyl-2-pentanone.

2- General sample information provided in column headings includes sample identification number. sampling date, and depth interval sampled. Table qualifier codes are as follows:
J Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the reported concentration is an approximate value.
* The laboratory Method Detection Limit exceeds one or more Screening Criteria for the associated analyte.

Other Notes:
NA Not Analyzed
Shading indicates an exceedance of the Residential De Minimis value.
Bold italics numbers indicate an exceedance of the Industrial Soil De Minimis Value.

TABLE 3
GROUNDWATER ANALYTICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

		Screening Criteria[1]	Sample Information[2]														
		WVDEP De Minimis Value for Groundwater	MW-1		MW-2		MW-3			MW-4			MW-5		MW-6		
Constituent	CAS No.		1/28/2019	9/1/2020	1/28/2019	9/1/2020	1/28/2019	9/1/2020	Dup-1 9/1/2020 Duplicate	1/28/2019	FD-1 1/28/2019 Duplicate 1/28/2019	9/1/2020	1/28/2019	9/1/2020	1/28/2019	9/1/2020	9/1/2020 WVDEP Split Sample
PAHs (µg/L)																	
Acenaphthene	83-32-9	240	NA	< 0.06	NA	< 0.06	NA	< 0.06	< 0.06	NA	NA	< 0.06	NA	< 0.06	NA	< 0.063	< 0.033
Acenaphthylene	208-96-8	240	NA	< 0.06	NA	< 0.06	NA	< 0.06	< 0.06	NA	NA	< 0.06	NA	< 0.06	NA	< 0.063	< 0.049
Anthracene	120-12-7	1800	NA	< 0.045	NA	< 0.045	NA	< 0.045	< 0.045	NA	NA	< 0.045	NA	< 0.045	NA	< 0.047	< 0.03
Benzo[a]anthracene	56-55-3	0.03	NA	< 0.069	NA	< 0.069	NA	< 0.069	< 0.069	NA	NA	< 0.069	NA	< 0.069	NA	< 0.072	< 0.024
Benzo[a]pyrene	50-32-8	0.2	NA	< 0.049	NA	< 0.049	NA	< 0.049	< 0.049	NA	NA	< 0.049	NA	< 0.049	NA	< 0.051	< 0.039
Benzo[b]fluoranthene	205-99-2	0.25	NA	< 0.09	NA	< 0.09	NA	0.26	< 0.09	NA	NA	< 0.09	NA	< 0.09	NA	< 0.093	< 0.042
Benzo[g,h,i]perylene	191-24-2	600	NA	< 0.064	NA	< 0.064	NA	< 0.064	< 0.064	NA	NA	< 0.064	NA	< 0.064	NA	< 0.066	< 0.036
Benzo[k]fluoranthene	207-08-9	2.5	NA	< 0.081	NA	< 0.081	NA	0.2	< 0.081	NA	NA	< 0.081	NA	< 0.081	NA	< 0.085	< 0.045
Chrysene	218-01-9	25	NA	< 0.075	NA	< 0.075	NA	0.18	< 0.075	NA	NA	< 0.075	NA	< 0.075	NA	< 0.078	< 0.033
Dibenz(a,h)anthracene	53-70-3	0.025	NA	< 0.067	NA	< 0.067	NA	< 0.067	< 0.067	NA	NA	< 0.067	NA	< 0.067	NA	< 0.069	< 0.036
Fluoranthene	206-44-0	800	NA	< 0.056	NA	0.07 J	NA	< 0.056	< 0.056	NA	NA	< 0.056	NA	< 0.056	NA	< 0.058	< 0.029
Fluorene	86-73-7	150	NA	< 0.064	NA	< 0.064	NA	< 0.064	< 0.064	NA	NA	< 0.064	NA	< 0.18 UJ	NA	< 0.066	< 0.033
Indeno[1,2,3-cd]pyrene	193-39-5	0.25	NA	< 0.079	NA	< 0.079	NA	0.15 J	< 0.079	NA	NA	< 0.079	NA	< 0.079	NA	< 0.082	< 0.033
Naphthalene	91-20-3	0.12	NA	< 0.055	NA	< 0.055	NA	< 0.055	< 0.055	NA	NA	< 0.055	NA	< 0.055 UJ	NA	< 0.057	< 0.036
Phenanthrene	85-01-8	1700	NA	0.053 J	NA	0.1 J	NA	0.064 J	0.058 J	NA	NA	0.065 J	NA	0.06 J	NA	< 0.053	< 0.038
Pyrene	129-00-0	79	NA	< 0.05	NA	0.073 J	NA	< 0.05	< 0.05	NA	NA	< 0.05	NA	< 0.05	NA	< 0.052	< 0.029
Metals, Dissolved (µg/L)																	
Aluminum	7429-90-5	20000	7 J	< 30 U	7 J	< 30 U	9 J	< 30 U	34	< 6	< 6	< 30 U	16 J	350	546	430	420
Antimony	7440-36-0	6	4.9	1.7 J	1 J	0.41 J	0.6 J	< 0.38	< 0.38	< 0.3	< 0.3	< 0.38	< 0.3	< 0.38	< 0.3	< 0.38	< 0.22
Arsenic	7440-38-2	10	< 1	0.5 J	< 1	1.1	< 1	< 0.31	< 0.31	< 1	< 1	1.3	< 1	< 0.31	< 1	0.41 J	< 0.88
Barium	7440-39-3	2000	55.2	87	78.4	100	52.2	87	86	40.5	39.8	65	29.5	43	31.2	21	23
Beryllium	7440-41-7	4	< 0.2	< 0.18	< 0.2	< 0.18	< 0.2	< 0.18	< 0.18	< 0.2	< 0.2	< 0.18	< 0.2	1.9	0.8 J	0.78 J	0.78
Cadmium	7440-43-9	5	< 0.2	0.42 J	< 0.2	< 0.22	< 0.2	< 0.22	< 0.22	< 0.2	< 0.2	< 0.22	< 0.2	0.64 J	1.6	1	1
Calcium	7440-70-2	- -	NA	41000	NA	80000	NA	24000	24000	NA	NA	98000	NA	22000	NA	43000	42800
Chromium[1]	16065-83-1	22000	< 1	< 1.5	< 1	< 1.5	< 1	< 1.5	< 1.5	< 1	< 1	< 1.5	< 1	< 1.5	< 1	< 1.5	< 0.9
Cobalt	7440-48-4	6	< 1	0.9	1.7 J	1.9	3.3 J	0.22 J	0.24 J	7.6	7.7	14	7.2	66	65.6	31	32
Copper	7440-50-8	1300	1.6 J	1.1 J	1.2 J	< 0.63	< 1	1.2 J	< 0.63	< 1	< 1	< 0.63	< 1	< 0.63	23.2	< 0.63	< 1
Iron	7439-89-6	14000	NA	< 20	NA	6100	NA	< 20	< 20	NA	NA	8100	NA	670	NA	180	180
Lead	7439-92-1	15	12.5	51	2.7	0.42 J	2.3	0.54 J	0.41 J	< 0.2	< 0.2	< 0.13	< 0.2	0.9 J	7.1	1	0.98
Magnesium	7439-95-4	- -	NA	3100	NA	6800	NA	1700	1600	NA	NA	11000	NA	8700	NA	10000	10300
Manganese	7439-96-5	430	32 J	34	274	470	92 J	4.8 J	5.9	629	610	260	173	870	3810	1900	1900
Mercury	7439-97-6	2	< 0.1	< 0.13	< 0.1	< 0.13	< 0.1	< 0.13	< 0.13	< 0.1	< 0.1	< 0.13	< 0.1	< 0.13	< 0.1	< 0.13	< 0.25
Nickel	7440-02-0	390	< 2	0.8 J	2.1 J	1.5	3.1 J	0.41 J	0.62 J	5.2 J	5.3 J	5.9	5.3 J	54	10.7	5	6
Potassium	7440-09-7	- -	NA	4400	NA	3400	NA	1100	1000	NA	NA	2700	NA	1900	NA	800	800
Selenium	7782-49-2	50	< 4	2.5 J	< 4	< 1.5	< 4	< 1.5	< 1.5	< 4	< 4	< 1.5	< 4	< 1.5	< 4	1.7 J	< 0.86
Silver	7440-22-4	94	< 1	< 0.18	< 1	< 0.18	< 1	< 0.18	< 0.18	< 1	< 1	< 0.18	< 1	< 0.18	< 1	< 0.18	< 0.87
Sodium	7440-23-5	- -	NA	3900	NA	5700	NA	710	720	NA	NA	16000	NA	7700	NA	9800	9800
Thallium	7440-28-0	2	< 0.2	< 0.15	< 0.2	< 0.15	< 0.2	< 0.15	< 0.15	< 0.2	< 0.2	< 0.15	< 0.2	< 0.15	< 0.2	0.17 J	< 0.17
Vanadium	7440-62-2	150	1.9 J	< 0.99	< 1	< 0.99	< 1	< 0.99	< 0.99	< 1	< 1	< 0.99	< 1	< 0.99	< 1	< 0.99	< 1.1
Zinc	7440-66-6	6000	8.3 J	29	11.8	11	4.9 J	< 5 U	< 3.2	6.5 J	7.8 J	13	8.6 J	99	86.8	36	39

TABLE 3
GROUNDWATER ANALYTICAL RESULTS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Notes:

1- Screening criteria are the De Minimis Values from Table 60-3B of the West Virginia Voluntary Remediation and Redevelopment Rule. Effective December 2, 2021. Double dashes indicate that a De Minimis Value is not available for a given constituent. Notes regarding specific values for various chemicals (e.g., surrogates used, effects basis, etc.) are as follows:

Screening criteria for chromium are based on the screening criteria for chromium (III).

2- General sample information provided in column headings includes sample identification number and sampling date. Table qualifier codes are as follows:

- J Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the reported concentration is an approximate value.
- * The laboratory Method Detection Limit exceeds one or more Screening Criteria for the associated analyte.
- ^ ICV, CCV, ICB, CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC is outside acceptance limits.
- FL MS and/or MSD recovery below control limits.

Other Notes:

NA Not Analyzed

Shading indicates an exceedance of the Groundwater De Minimis Value.

Red text reflects changes made to the dataset as a result of the validation process.

TABLE 4
SUMMARY OF XRF RESULTS - REMEDIATION AREAS
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST
VRP PROJECT #20019

CORE 2019 XRF Sampling Point	Lead Concentration (mg/Kg)	Mercury Concentration (mg/Kg)
019	12.3 +/- 1.9	Not Detected
020	11.7 +/- 1.6	Not Detected
021	12.2 +/- 1.7	Not Detected
022	24.7 +/- 2	Not Detected
023	30.9 +/- 1.8	Not Detected
024	9.8 +/- 1.4	Not Detected
039	14.1 +/- 1.5	Not Detected
040	16.3 +/- 1.9	Not Detected
041	8.4 +/- 2	Not Detected
042	206 +/- 5	Not Detected
043	608 +/- 7	Not Detected
044	12.3 +/- 1.7	Not Detected
059	34 +/- 3	Not Detected
060	111 +/- 4	Not Detected
061	76 +/- 4	Not Detected
062	15 +/- 2	Not Detected
063	13 +/- 1.9	Not Detected
064	35 +/- 2	Not Detected
081	38 +/- 3	Not Detected
082	641 +/- 9	Not Detected
083	17.9 +/- 1.9	Not Detected
101	88 +/- 3	Not Detected
102	8 +/- 2	Not Detected
103	12 +/- 2	Not Detected
100	8.1 +/- 1.5	Not Detected
120	8.4 +/- 1.2	Not Detected
121	68 +/- 3	Not Detected
132	14.6 +/- 1.5	Not Detected

FIGURES

SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
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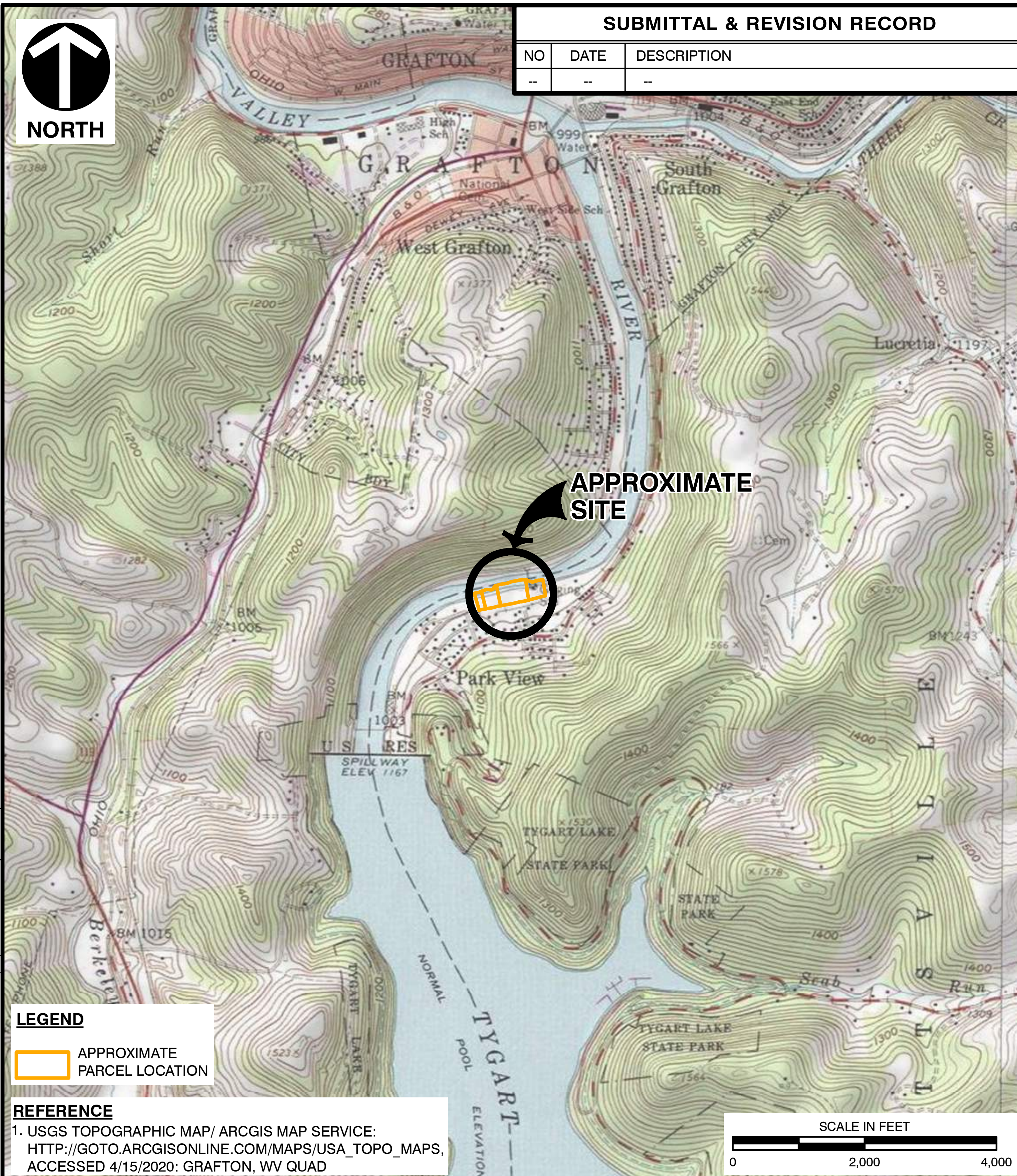

LEGEND

APPROXIMATE PARCEL LOCATION

REFERENCE

1. USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE: HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS, ACCESSED 4/15/2020: GRAFTON, WV QUAD

SCALE IN FEET
0 2,000 4,000

CEC
Civil & Environmental Consultants, Inc.
4350 Northern Pike, Suite 141 - Monroeville, PA 15146
724-327-5200 · 800-899-3610
www.cecinc.com

SAVE THE TYGART WATERSHED ASSOCIATION, INC.
FORMER CARR CHINA MANUFACTURING FACILITY
230 NEWCOME AVENUE
GRAFTON WEST VIRGINIA

SITE LOCATION MAP

DRAWN BY:	KMC	CHECKED BY:	TEA	APPROVED BY:	DNO*	FIGURE NO:	1
DATE:	04/15/2020	SCALE:	1 " = 2,000 '	PROJECT NO:	194-569		

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SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
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LEGEND

MONITORING WELL

APPROXIMATE TAX PARCEL BOUNDARY

7-7-83 PARCEL ID NUMBER

REFERENCE

1. WVGIS LEAF OFF MOSAIC, 2018.

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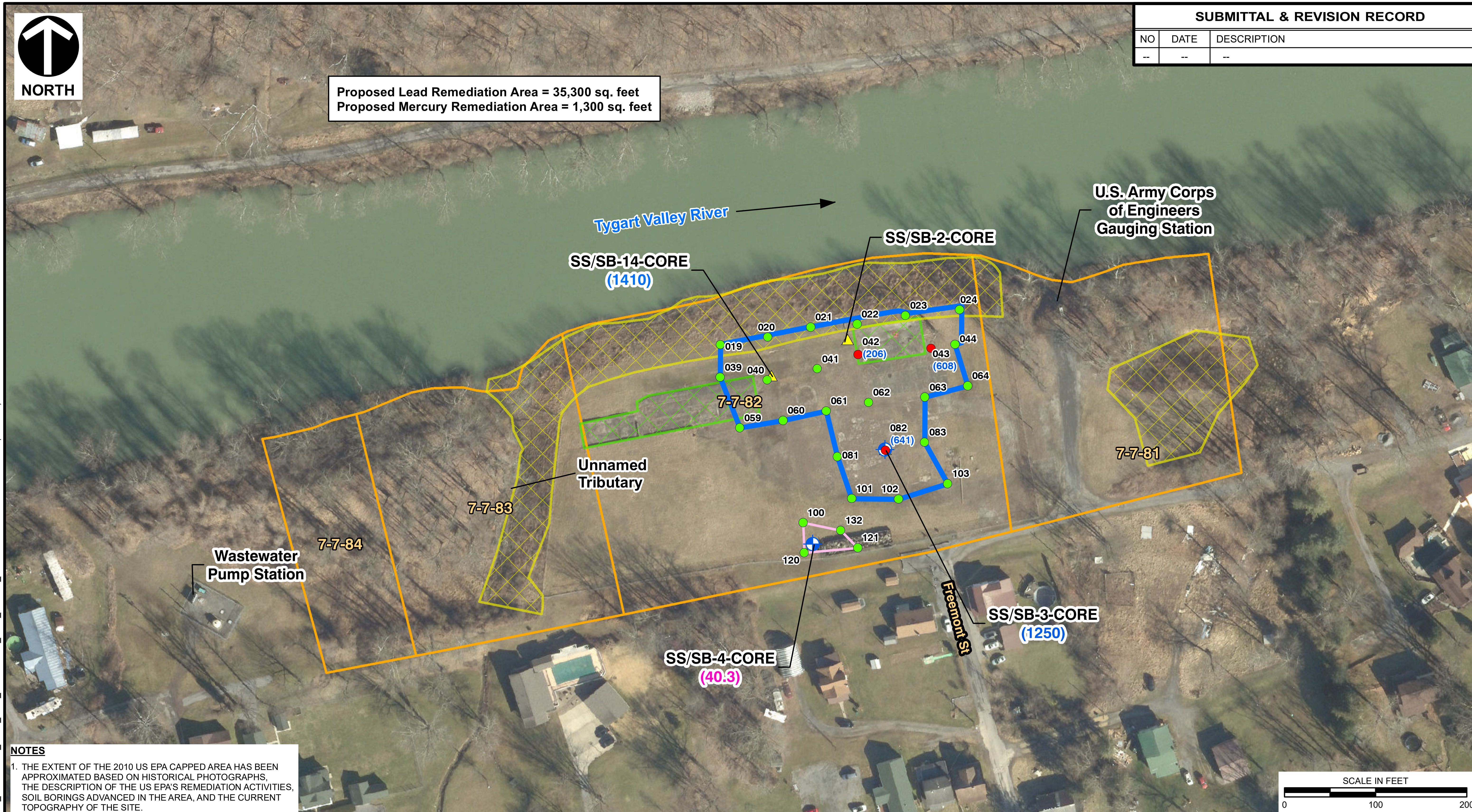
FORMER CARR CHINA MANUFACTURING FACILITY
230 NEWCOME AVENUE
GRAFTON, WEST VIRGINIA

SITE LAYOUT

DRAWN BY:	KMC	CHECKED BY:	EAS	APPROVED BY:	DNO*	FIGURE NO:	2
DATE:	03/16/2021	SCALE:	1 " = 80 '	PROJECT NO:	194-569		



SUBMITTAL & REVISION RECORD		
NO	DATE	DESCRIPTION
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NOTES

1. THE EXTENT OF THE 2010 US EPA CAPPED AREA HAS BEEN APPROXIMATED BASED ON HISTORICAL PHOTOGRAPHS, THE DESCRIPTION OF THE US EPA'S REMEDIATION ACTIVITIES, SOIL BORINGS ADVANCED IN THE AREA, AND THE CURRENT TOPOGRAPHY OF THE SITE.

LEGEND

- XRF BELOW WVDEP DE MINIMIS RESIDENTIAL STANDARDS
- XRF EXCEEDS WVDEP DE MINIMIS RESIDENTIAL STANDARDS
- SOIL BORING/MONITORING WELL LOCATION
- SURFACE SOIL SAMPLING LOCATION
- 7-7-83 PARCEL ID NUMBER
- PROPOSED MERCURY REMEDIATION AREA
- PROPOSED LEAD REMEDIATION AREA
- ESTIMATED EXTENT OF USEPA 2010 CAPPED AREAS
- ESTIMATED EXTENT OF USEPA 2010 CONCRETE ENCAPULATED CHINA DEBRIS
- APPROXIMATE TAX PARCEL BOUNDARY
- (40.3) MECURY CONCENTRATION IN SURFACE SOIL mg/Kg
- (641) LEAD CONCENTRATION IN SURFACE SOIL mg/Kg

REFERENCE

1. WVGIS LEAF OFF MOSAIC, 2018.

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GRAFTON, WEST VIRGINIA

PROPOSED SOIL COVER AREAS

DRAWN BY: KMC	CHECKED BY: EAS	APPROVED BY: DNO*	FIGURE NO: 3
DATE: 08/18/2022	SCALE: 1 " = 100 '	PROJECT NO: 194-569	* Hand signature on file

P:\2019\194-569\-GIS\Maps\EN03_Task_005\194569_EN03_FIG3_PROPOSED_SOIL_COVER_AREAS.mxd 7/28/2022 11:35 AM (kcolaizzi)

SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
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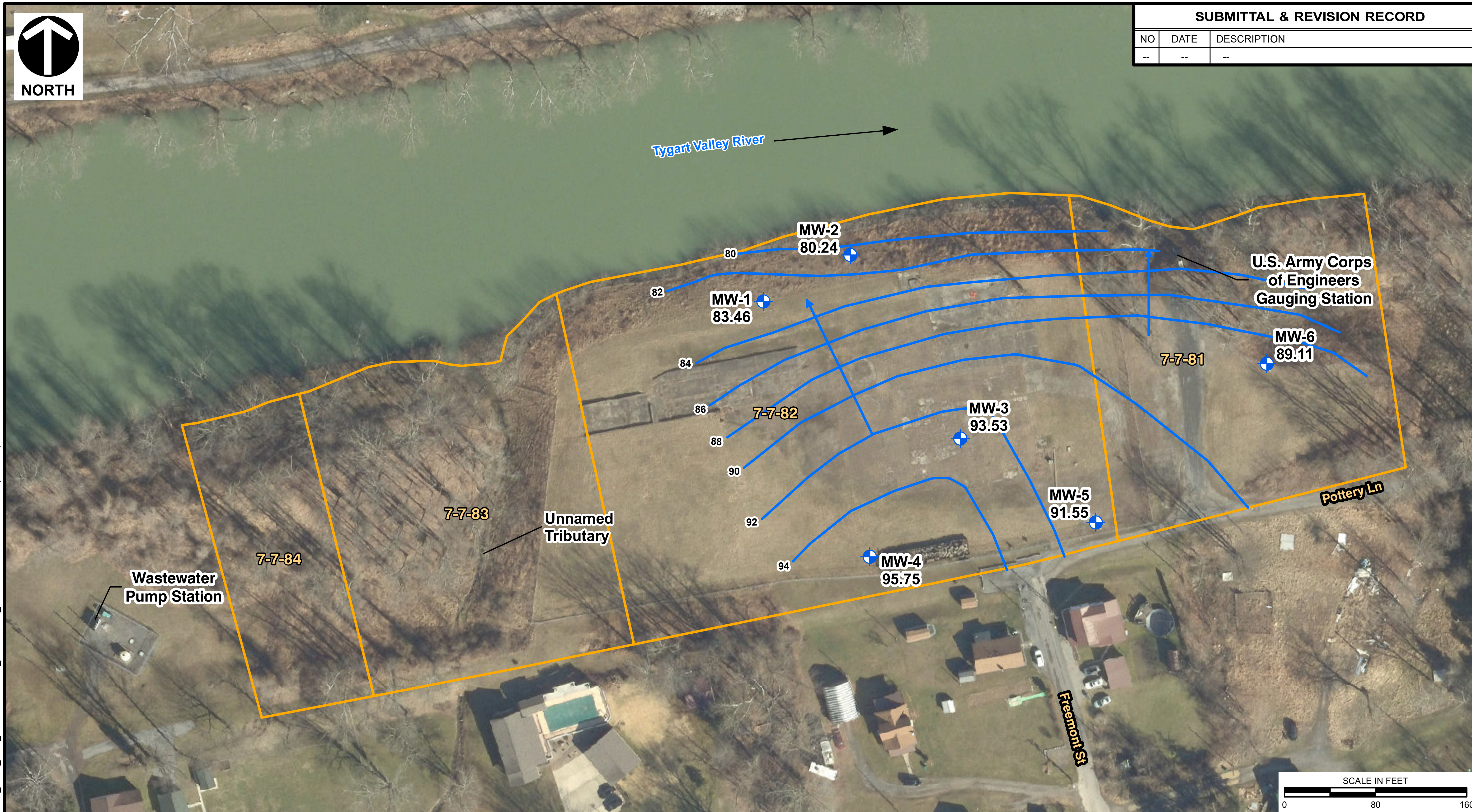

LEGEND

GROUNDWATER CONTOUR

MONITORING WELL

83.46 WATER ELEVATION MEASURED ON 9/1/20

APPROXIMATE TAX PARCEL BOUNDARY

7-7-83 PARCEL ID NUMBER

REFERENCE

1. WVGIS LEAF OFF MOSAIC, 2018.

NOTES

1. WELL ELEVATIONS BASED ON SURVEY USING BENCHMARK OF 100.00 FT AMSL (MW-4).

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GRAFTON, WEST VIRGINIA

GROUNDWATER ELEVATION CONTOUR MAP

DRAWN BY: JDM	CHECKED BY: TAW	APPROVED BY: DNO*	FIGURE NO: 4
DATE: 08/18/2022	SCALE: 1 " = 80 '	PROJECT NO: 194-569	* Hand signature on file

P:\2019\194-569\-GIS\Maps\EN01\194569_EN01_FIG4_GROUNDWATER_ELEVATION_MAP.mxd 8/18/2022 10:43 AM (kcolaizzi)

APPENDIX A

USEPA REMEDIATION PHOTOGRAPHS

APPENDIX A

PHOTOS OF USEPA REMEDIATION ACITVITIES CONDUCTED IN 2009 AND 2010

Source: https://response.epa.gov/site/site_profile.aspx?site_id=4151

CONCRETE ENCAPUSULATION AREAS

ERRS encapsulate lead-contaminated debris

Cement-encapsulated area

APPENDIX A

PHOTOS OF USEPA REMEDIATION ACITVITIES CONDUCTED IN 2009 AND 2010

Source: https://response.epa.gov/site/site_profile.aspx?site_id=4151

ERRS encapsulate the remaining exposed lead-contaminated materials with concrete.

ERRS prepare to use cement to encapsulate exposed materials in the western area of the site

APPENDIX A

PHOTOS OF USEPA REMEDIATION ACITVITIES CONDUCTED IN 2009 AND 2010

Source: https://response.epa.gov/site/site_profile.aspx?site_id=4151

ERRS encapsulate exposed lead-contaminated materials.

Cement-encapsulated areas

APPENDIX A

PHOTOS OF USEPA REMEDIATION ACITVITIES CONDUCTED IN 2009 AND 2010

Source: https://response.epa.gov/site/site_profile.aspx?site_id=4151

EXCAVATION AND CAPPING IN THE EASTERN PORTION OF THE SITE

ERRS backfill the eastern area of the Site

Eastern area of the Site; completion of the Removal Action.

APPENDIX A

PHOTOS OF USEPA REMEDIATION ACITVITIES CONDUCTED IN 2009 AND 2010

Source: https://response.epa.gov/site/site_profile.aspx?site_id=4151

EXCAVATION AND CAPPING ALONG THE BANKS OF THE UNNAMED TRIBUTARY AND THE TYGART RIVER

ʒS excavate lead-contaminated soils along the western bank of the western area of the Site. ERRS placed silt fence and rip-rap along the runoff area.

ERRS remove vegetation and debris from the river bank.

APPENDIX A

PHOTOS OF USEPA REMEDIATION ACITVITIES CONDUCTED IN 2009 AND 2010

Source: https://response.epa.gov/site/site_profile.aspx?site_id=4151

ERRS utilize excavators with mechanical thumbs, along with a rock box, to place rip-rap along the river's edge

START conducts XRF screening for lead concentrations that remain in the site materials

APPENDIX A

PHOTOS OF USEPA REMEDIATION ACITVITIES CONDUCTED IN 2009 AND 2010

Source: https://response.epa.gov/site/site_profile.aspx?site_id=4151

Site as seen from across the river.

Site as seen from across river

APPENDIX A

PHOTOS OF USEPA REMEDIATION ACITVITIES CONDUCTED IN 2009 AND 2010

Source: https://response.epa.gov/site/site_profile.aspx?site_id=4151

River bank of the Site, covered with geotextile fabric and backfill.

Northern area of the Site, along the bank of the Tygart Valley River

APPENDIX A

PHOTOS OF USEPA REMEDIATION ACITVITIES CONDUCTED IN 2009 AND 2010

Source: https://response.epa.gov/site/site_profile.aspx?site_id=4151

Completion of fence construction along the Western area of the Site.

View of the northern area of the Western Site, along the Tygart Valley River.

APPENDIX A

PHOTOS OF USEPA REMEDIATION ACITVITIES CONDUCTED IN 2009 AND 2010

Source: https://response.epa.gov/site/site_profile.aspx?site_id=4151

View of the northern area of the Western Site, along the Tygart Valley River.

APPENDIX B

DRAFT LAND USE COVENANT

LAND USE COVENANT

This is an environmental covenant executed pursuant to the Voluntary Remediation and Redevelopment Act, W. Va. Code § 22-22, and the Uniform Environmental Covenants Act, W. Va. Code § 22-22B, to restrict the activities on, and uses of, the following described property:

Street Address:	230 Newcome Avenue
City:	Grafton
County:	Taylor County
Tax District (as applicable):	7 - Knottsville
Tax Map:	7
Tax Parcel(s):	81, 82, 83, and 84
Deed Book(s):	361
Page No(s).:	207
Acres:	1.4, 3.75, 1.57, and 0.67

A map is attached as Exhibit A indicating the areas to which specific activity and use limitations and/or engineering controls apply.

The subject property has been remediated in accordance with the Voluntary Remediation and Redevelopment Act, W. Va. Code § 22-22. Non-residential exposure assumptions were used to comply with the site-specific remediation standard. A table of contaminants of concern is provided as Exhibit B.

The following activities on and uses of the above described property may result in excessive human exposure or in the release of a contaminant that was contained as part of the remedial action related to this covenant. Therefore, the following activities on and uses of the real property are prohibited:

1. Residential land use, as defined by the Voluntary Remediation and Redevelopment Rule (60CSR3), Section 2.40, including, but not limited to, schools, day care centers, nursing homes, or other residential-style facilities. Recreational areas are specifically permitted, as determined by a site-specific risk assessment conducted for the property.

2. Use or extraction of groundwater for any purpose, except for groundwater monitoring and/or remediation.

3. Excavation, drilling, or penetration of the ground surface, unless the following requirements are met:

   a. The activity is conducted by persons qualified and knowledgeable about releases and exposures to contaminants known to exist at the site.

b. The work is performed in accordance with applicable health and safety laws and regulations and a Soil Management Plan developed by a West Virginia Licensed Remediation Specialist or similarly qualified individual.

c. The disturbed area is restored in a manner which assures that an equivalent amount of exposure control is achieved at the conclusion of the work.

d. The owner of the real property provides written notice to the West Virginia Department of Environmental Protection (WVDEP) of the intent to conduct such work no less than five (5) days prior to beginning unless a waiver is granted by the WVDEP.

e. At the request of the WVDEP, the owner of the real property provides written evidence (including laboratory analytical data) showing the affected area continues to meet the remediation standard following completion of the work.

The following engineering control(s) (depicted on Exhibit A) have been installed at the property as a part of the remedy and is/are necessary to attain the designated remediation standard and shall be operated and maintained as necessary to protect the functional integrity:

Engineering Control 1: An approximate 12 to 24-inch vegetated soil cap covering areas of contaminated soil designated as “USEPA Soil Cap” on Exhibit A. A geotextile fabric demarcation barrier exists between the soil cover and the underlying contaminated soil.

Engineering Control 2: Areas of concrete encapsulated china debris designated as “Concrete Encapsulation Areas” on Exhibit A.

Engineering Control 3: An approximate 12-inch vegetated soil cap covering areas of contaminated soil designated as” VRP Soil Cover” on Exhibit A. An orange plastic mesh demarcation barrier exists between the soil cover and the underlying contaminated soil.

Current owner(s) of record of the property, and associated contact information:

Save the Tygart Watershed Association, Inc.
Attn.: Dr. Kelley Flaherty
P.O Box 164
Grafton, WV 26354

Any person, including a person that owns an interest in the real property, the state or federal agency determining or approving the environmental response project pursuant to which an environmental covenant is created, or a municipality or other unit of local government may be a holder of an environmental covenant. The following are all holders of this covenant:

Save the Tygart Watershed Association, Inc.
Owner
P.O. Box 164
Grafton, WV 26354

The owner(s) of the property shall provide written notice to the WVDEP within ten (10) days following transfer of a specified interest in the property subject to this covenant, changes in use of the property, or applications for building permits or proposals for any site work affecting the contamination on the property. Any notice regarding transfer of a specified interest in the property subject to this covenant shall include the name, address, and contact information for the new owner.

The owner(s) shall conduct annual inspections of the property no more than sixty (60) days before or after the anniversary date of this document in accordance with the Land Use Covenant Inspection Form provided as Exhibit D to monitor compliance with this Land Use Covenant and shall submit the signed form to the WVDEP headquarters within thirty (30) days of the inspection.

This covenant relieves the applicant and subsequent successors and assigns from all civil liability to the State as provided under W. Va. Code § 22-22 and shall remain in effect so long as the property complies with the applicable standards in effect at the time this covenant was issued.

This covenant shall not be amended, modified, or terminated except by written instrument executed in accordance with W. Va. Code § 22-22B-10, by and between the owner at the time of the proposed amendment, modification, or termination; the WVDEP; and the holders of this covenant. Within five (5) days of executing an amendment, modification, or termination of this Land Use Covenant, the owner shall record such amendment, modification, or termination with the Clerk of the County Commission, and within five (5) days thereafter, the owner shall provide a true copy of the recorded amendment, modification, or termination to the WVDEP.

The administrative record for the environmental response project reflected in this covenant is maintained at the WVDEP headquarters, and is entitled:

Former Carr China Manufacturing Facility, VRP #20019

The WVDEP is granted full right of access to the property for the purpose of implementation or enforcement of this covenant.

All restrictions and other requirements described in this covenant shall run with the land and shall be binding upon all holders and their grantees, lessees, authorized agents, employees, or persons acting under their direction or control.

[SIGNATURES APPEAR ON THE FOLLOWING PAGES]

IN WITNESS WHEREOF, the following holders have executed this covenant on the dates indicated.

Save the Tygart Watershed Association, Inc.

Printed Name: Dr. Kelley Flaherty
Title: Executive Director

____ __________________
Signature Date

I, ______________________________, a Notary Public in and for the County of ________________________, State of _________________________, do hereby certify that the holder(s) whose name is/names are signed above, this day executed this document in my presence or this day acknowledged same to be true act and deed of said holder(s).

Given under my hand this the ______ day of ___________________, 20____.
My commission expires ____.

____
Notary Public

West Virginia Department of Environmental Protection

Printed Name: Robert Rice

Title: Director, Division of Land Restoration

______________________________ ______________

Signature Date

I, ______________________________, a Notary Public in and for the County of ________________________, State of ________________________, do hereby certify that ________________________, whose name is signed above as the representative of the agency, this day executed this document in my presence or this day acknowledged same to be true act and deed of said holder(s).

Given under my hand this the ______ day of ___________________, 20____.
My commission expires ____.

____

Notary Public

The Clerk will return the recorded document to:

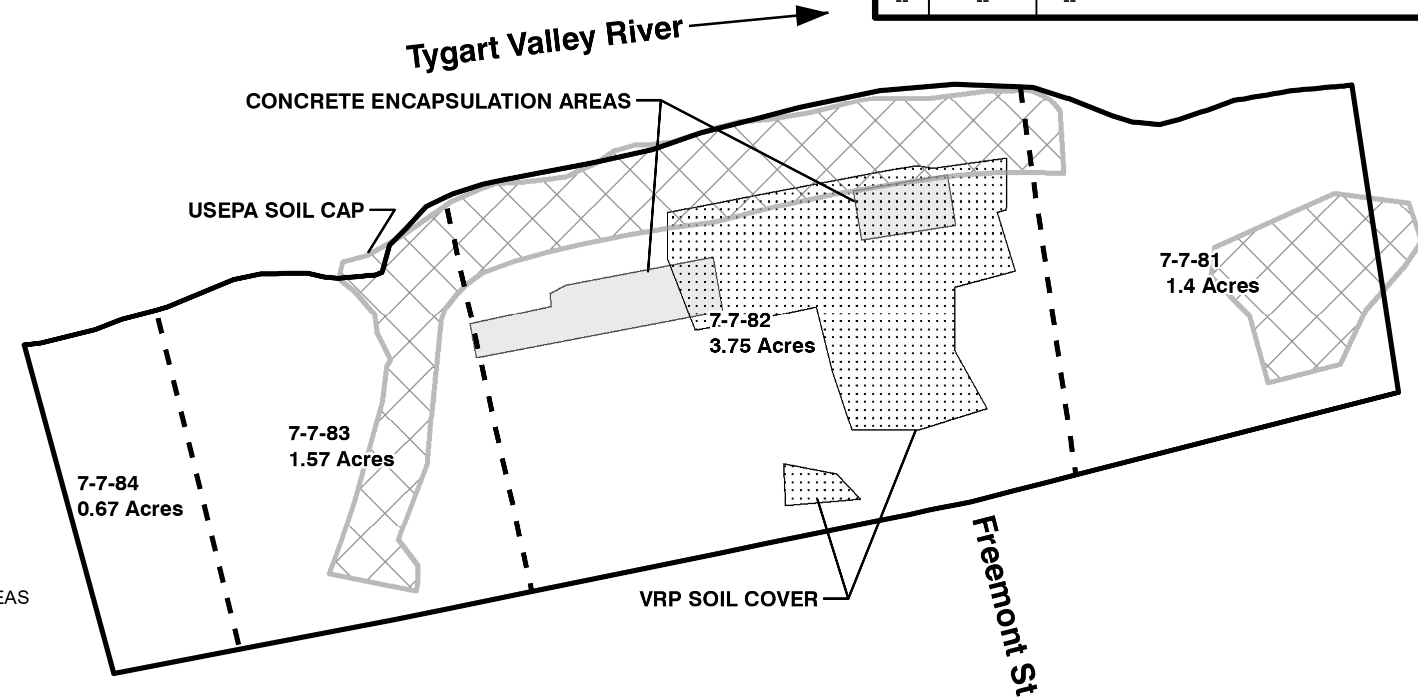
Office of Environmental Remediation
West Virginia Department of Environmental Protection
601 57th Street SE
Charleston, WV 25304

P:\2019\194-569\-GIS\Maps\EN03_Task_005\194569_EN03_EXHIBIT_A_SITE_MAP_SHOWING_ACTIVITY_AND_USE_LIMITATIONS.mxd 8/18/2022 9:31 AM (kcolaizzi)

NORTH

SUBMITTAL & REVISION RECORD

NO	DATE	DESCRIPTION
--	--	--



LEGEND

USEPA SOIL CAP

VRP SOIL COVER

CONCRETE ENCAPSULATED AREAS

VRP SITE BOUNDARY

TAX PARCEL BOUNDARY

7-7-84 PARCEL ID NUMBER

NOTES

1. PARCEL BOUNDARIES AND ACREAGES OBTAINED FROM TAYLOR COUNTY TAX ASSESSOR WEBSITE.
2. USE RESTRICTIONS LISTED IN THE LAND USE COVENANT APPLY ACROSS THE ENTIRE VRP SITE.
3. THE EXTENT OF THE 2010 US EPA CAPPED AREA HAS BEEN APPROXIMATED BASED ON HISTORICAL PHOTOGRAPHS, THE DESCRIPTION OF THE US EPA'S REMEDIATION ACTIVITIES, SOIL BORINGS ADVANCED IN THE AREA, AND THE CURRENT TOPOGRAPHY OF THE SITE.

SCALE IN FEET

0 150 300

REFERENCE

1. PARCEL BOUNDARIES OBTAINED FROM COUNTY TAX ASSESSOR WEBSITE. BOUNDARIES AND COORDINATES ARE APPROXIMATE ONLY.

Civil & Environmental Consultants, Inc.
4350 Northern Pike, Suite 141 - Monroeville, PA 15146
724-327-5200 · 800-899-3610
www.cecinc.com

SAVE THE TYGART WATERSHED ASSOCIATION, INC.
FORMER CARR CHINA MANUFACTURING FACILITY
230 NEWCOME AVENUE
GRAFTON, WEST VIRGINIA

SITE MAP SHOWING ACTIVITY AND USE LIMITATIONS

DRAWN BY: KMC	CHECKED BY: EAS	APPROVED BY: DNO*	FIGURE NO:	Exhibit A
DATE: 08/05/2022	SCALE: 1 " = 150 '	PROJECT NO: 194-569.005	* Hand signature on file	

EXHIBIT B

CONTAMINANTS OF CONCERN
Former Carr China Manufacturing Facility – Grafton, West Virginia
VRP# 20019

Media	Contaminants of Concern
Surface Soil	Arsenic Lead Manganese Mercury Benzo[a]pyrene
Subsurface Soil	Lead Mercury Benzo[a]anthracene Benzo[a]pyrene Benzo[b]fluoranthene Dibenz(a,h)anthracene Indeno[1,2,3-cd]pyrene
Groundwater	Benzo[b]fluoranthene Cobalt Lead Manganese

Land Use Covenant Inspection Form

The property owner is responsible for conducting annual inspections of the site and submitting this form to WVDEP no more than sixty (60) days before or after the anniversary date of the LUC recording. The person conducting the inspection should refer to the recorded LUC for details, including a map of the affected property and descriptions of the activity and use limitations and engineering controls.

Environmental Response Project Description

Site Description

Site ID Number	Site Name	County
20019	Former Carr China Manufacturing Facility	Taylor

Address	City	State	Zip Code
230 Newcome Avenue	Grafton	WV	26354

Property Owner on Land Use Covenant

Property Owner Name
Save the Tygart Watershed Association

Address	City	State	Zip Code
P.O Box 164	Grafton	WV	26354

Annual Inspection – Records

Current Property Owner

Has property ownership transferred since LUC recording?
☐ No: *If contact information has not changed, skip to "Current Site Use."*
☐ Yes: *Provide new property owner contact information below.*

Property Owner Name

Address	City	State	Zip Code

Phone	Email

Current Site Use

Land Use (check all that apply)
☐ Agricultural ☐ Commercial ☐ Industrial ☐ Recreational ☐ Residential ☐ School ☐ Vacant ☐ Other

Provide brief description of current site use (including names of businesses located on property).

Annual Inspection – Property Observations

Activity and Use Limitations

The following activities on and uses of the property may result in excessive human exposure or in the release of a contaminant that was contained as part of the remedial action. Inspect the site to determine if any of the prohibited activities and uses listed below have occurred in the past year.

Activity and Use Limitation	Occurred in past year?	If "yes", describe:
Residential Use	☐ No ☐ Yes	
Groundwater Use	☐ No ☐ Yes	
Excavation/Drilling	☐ No ☐ Yes	
Other AUL	☐ No ☐ Yes	
Other AUL	☐ No ☐ Yes	

Engineering Controls

The following engineering controls have been installed at the property as a part of the remedy and are necessary to attain the designated remediation standard. They should be operated and maintained as necessary to protect their functional integrity. Inspect the site to determine if the engineering controls listed below are intact, functioning correctly, and being maintained as necessary.

Engineering Control	Still intact and effective?	If "no", describe:
USEPA Soil Cap Areas	☐ Yes ☐ No	
USEPA Concrete Encapsulation Areas	☐ Yes ☐ No	
VRP Soil Cover	☐ Yes ☐ No	
Other Engineering Control	☐ Yes ☐ No	
Other Engineering Control	☐ Yes ☐ No	

Annual Inspection – Notes, Comments, or Concerns

Person Conducting Inspection

Contact Information

Inspector Name	Relationship to Property		
Mailing Address	City	State	Zip Code
Phone	Email		

Statement of Affirmation

I affirm that the information provided in this Land Use Covenant Inspection Form, to the best of my knowledge and belief, is true, complete, and accurate.

Signature ______________________ Date ______________________

Return completed and signed form, in addition to any attachments, electronically to DEPOERFileCopy@wv.gov, or mail to:

West Virginia Department of Environmental Protection
Office of Environmental Remediation
Attn.: LUC Inspections
601 57th Street SE
Charleston, WV 25304

APPENDIX C

POST-MITIGATION RISK CALCULATIONS

TABLE C-1
EXPOSURE POINT CONCENTRATIONS FOR SOIL - REMEDIATED SCENARIO
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Contaminants of Concern	Number of Samples (1)	Number of Detected Results	Maximum Detected Concentration (mg/Kg)	Upper Confidence Limit (2) (mg/Kg)	Exposure Point Concentration (3) (mg/Kg)
Surface Soil					
Mercury	40	38	40.3	5.46	5.46
Benzo[a]anthracene	40	13	0.44	0.14	0.14
Benzo[a]pyrene	40	14	0.43	0.13	0.13
Benzo[b]fluoranthene	40	14	0.66	0.20	0.20
Dibenz(a,h)anthracene	40	3	0.10	0.069	0.069
Indeno[1,2,3-cd]pyrene	40	10	0.38	0.12	0.12

Notes:

[1] The surface soil dataset includes samples collected from 0 and 2 feet bgs, excluding samples SS-2-CORE and SS-3-CORE, which will be covered with a soil cap. Duplicate and parent samples are maintained as two distinct samples.

[2] Upper Confidence Limits (UCLs) were calculated using the USEPA ProUCL software. The ProUCL statistical output is provided in Appendix B.

[3] The Exposure Point Concentration (EPC) is the lower of the maximum detected concentration or the UCL.

TABLE C-2
SUMMARY OF RISK CHARACTERIZATION
FORMER CARR CHINA MANUFACTURING FACILITY - GRAFTON, WEST VIRGINIA
VRP PROJECT #20019

Receptor	**Exposure Pathways**	**Noncancer Hazard Index**	**Theoretical Excess Lifetime Cancer Risk**
Future Adult (Age 16-26) Recreational	Incidental Ingestion of Surface Soil		
Receptor	Dermal Contact with Surface Soil		
	Inhalation of Volatile and Particulate Emissions from Surface Soil	1E-01	5E-08
Future Adult (Age 6-16) Recreational	Incidental Ingestion of Surface Soil		
Receptor	Dermal Contact with Surface Soil		
	Inhalation of Volatile and Particulate Emissions from Surface Soil	1E-01	1E-07
Future Child (Age 2-6) Recreational	Incidental Ingestion of Surface Soil		
Receptor	Dermal Contact with Surface Soil		
	Inhalation of Volatile and Particulate Emissions from Surface Soil	4E-01	5E-07
Future Child (Age 0-2) Recreational	Incidental Ingestion of Surface Soil		
Receptor	Dermal Contact with Surface Soil		
	Inhalation of Volatile and Particulate Emissions from Surface Soil	4E-01	8E-07
	Lifetime Resident	1E+00	1E-06

Notes:

Appendix C presents a detailed breakdown of the risk calculations by pathway and constituent.

Shaded values exceed the WVDEP excess lifetime cancer risk of 1 x 10^{-5} for nonresidential receptors or 1 x 10^{-6} for recreational receptors.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.17/21/2022 4:09:37 PM
From File	SurfSoilProUCL - Remediated.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Mercury

General Statistics			
Total Number of Observations	40	Number of Distinct Observations	29
Number of Detects	38	Number of Non-Detects	2
Number of Distinct Detects	29	Number of Distinct Non-Detects	1
Minimum Detect	0.02	Minimum Non-Detect	0.02
Maximum Detect	40.3	Maximum Non-Detect	0.02
Variance Detects	42.61	Percent Non-Detects	5%
Mean Detects	1.129	SD Detects	6.527
Median Detects	0.044	CV Detects	5.784
Skewness Detects	6.161	Kurtosis Detects	37.97
Mean of Logged Detects	-2.877	SD of Logged Detects	1.296
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.173	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.938	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.507	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.142	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.073	KM Standard Error of Mean	1.007
KM SD	6.282	95% KM (BCA) UCL	3.078
95% KM (t) UCL	2.769	95% KM (Percentile Bootstrap) UCL	3.081
95% KM (z) UCL	2.729	95% KM Bootstrap t UCL	232.9
90% KM Chebyshev UCL	4.093	95% KM Chebyshev UCL	5.461
97.5% KM Chebyshev UCL	7.36	99% KM Chebyshev UCL	11.09
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	11.41	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.889	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.472	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.158	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.239	k star (bias corrected MLE)	0.237
Theta hat (MLE)	4.727	Theta star (bias corrected MLE)	4.753
nu hat (MLE)	18.14	nu star (bias corrected)	18.04
Mean (detects)	1.129		

	A–E	F	G–K	L
51				
52	**Gamma ROS Statistics using Imputed Non-Detects**			
53	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
56	This is especially true when the sample size is small.			
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
58	Minimum	0.01	Mean	1.073
59	Maximum	40.3	Median	0.0435
60	SD	6.363	CV	5.932
61	k hat (MLE)	0.236	k star (bias corrected MLE)	0.235
62	Theta hat (MLE)	4.539	Theta star (bias corrected MLE)	4.559
63	nu hat (MLE)	18.91	nu star (bias corrected)	18.82
64	Adjusted Level of Significance (β)	0.044		
65	Approximate Chi Square Value (18.82, α)	9.986	Adjusted Chi Square Value (18.82, β)	9.745
66	95% Gamma Approximate UCL (use when n>=50)	2.021	95% Gamma Adjusted UCL (use when n<50)	2.072
67				
68	**Estimates of Gamma Parameters using KM Estimates**			
69	Mean (KM)	1.073	SD (KM)	6.282
70	Variance (KM)	39.47	SE of Mean (KM)	1.007
71	k hat (KM)	0.0292	k star (KM)	0.0437
72	nu hat (KM)	2.334	nu star (KM)	3.492
73	theta hat (KM)	36.78	theta star (KM)	24.58
74	80% gamma percentile (KM)	0.0864	90% gamma percentile (KM)	1.348
75	95% gamma percentile (KM)	5.391	99% gamma percentile (KM)	24.58
76				
77	**Gamma Kaplan-Meier (KM) Statistics**			
78	Approximate Chi Square Value (3.49, α)	0.532	Adjusted Chi Square Value (3.49, β)	0.494
79	95% Gamma Approximate KM-UCL (use when n>=50)	7.043	95% Gamma Adjusted KM-UCL (use when n<50)	7.591
80	95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
81				
82	**Lognormal GOF Test on Detected Observations Only**			
83	Shapiro Wilk Test Statistic	0.602	**Shapiro Wilk GOF Test**	
84	5% Shapiro Wilk Critical Value	0.938	Detected Data Not Lognormal at 5% Significance Level	
85	Lilliefors Test Statistic	0.24	**Lilliefors GOF Test**	
86	5% Lilliefors Critical Value	0.142	Detected Data Not Lognormal at 5% Significance Level	
87	**Detected Data Not Lognormal at 5% Significance Level**			
88				
89	**Lognormal ROS Statistics Using Imputed Non-Detects**			
90	Mean in Original Scale	1.072	Mean in Log Scale	-2.997
91	SD in Original Scale	6.363	SD in Log Scale	1.371
92	95% t UCL (assumes normality of ROS data)	2.767	95% Percentile Bootstrap UCL	3.082
93	95% BCA Bootstrap UCL	5.083	95% Bootstrap t UCL	220.3
94	95% H-UCL (Log ROS)	0.24		
95				
96	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**			
97	KM Mean (logged)	-2.928	KM Geo Mean	0.0535
98	KM SD (logged)	1.267	95% Critical H Value (KM-Log)	2.736
99	KM Standard Error of Mean (logged)	0.203	95% H-UCL (KM -Log)	0.208
100	KM SD (logged)	1.267	95% Critical H Value (KM-Log)	2.736

	A	B	C	D	E	F	G	H	I	J	K	L
101			KM Standard Error of Mean (logged)			0.203						
102												
103	DL/2 Statistics											
104	DL/2 Normal						DL/2 Log-Transformed					
105			Mean in Original Scale			1.073					Mean in Log Scale	-2.963
106			SD in Original Scale			6.363					SD in Log Scale	1.319
107			95% t UCL (Assumes normality)			2.768					95% H-Stat UCL	0.223
108	DL/2 is not a recommended method, provided for comparisons and historical reasons											
109												
110	Nonparametric Distribution Free UCL Statistics											
111	Data do not follow a Discernible Distribution at 5% Significance Level											
112												
113	Suggested UCL to Use											
114			95% KM (Chebyshev) UCL			5.461						
115												
116	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
117	Recommendations are based upon data size, data distribution, and skewness.											
118	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
119	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
120												
121	Benzo[a]anthracene											
122												
123	General Statistics											
124			Total Number of Observations			40					Number of Distinct Observations	15
125			Number of Detects			13					Number of Non-Detects	27
126			Number of Distinct Detects			13					Number of Distinct Non-Detects	2
127			Minimum Detect			0.074					Minimum Non-Detect	0.066
128			Maximum Detect			0.436					Maximum Non-Detect	0.067
129			Variance Detects			0.0157					Percent Non-Detects	67.5%
130			Mean Detects			0.197					SD Detects	0.125
131			Median Detects			0.122					CV Detects	0.637
132			Skewness Detects			0.769					Kurtosis Detects	-0.754
133			Mean of Logged Detects			-1.814					SD of Logged Detects	0.639
134												
135	Normal GOF Test on Detects Only											
136			Shapiro Wilk Test Statistic			0.862	Shapiro Wilk GOF Test					
137			5% Shapiro Wilk Critical Value			0.866	Detected Data Not Normal at 5% Significance Level					
138			Lilliefors Test Statistic			0.263	Lilliefors GOF Test					
139			5% Lilliefors Critical Value			0.234	Detected Data Not Normal at 5% Significance Level					
140	Detected Data Not Normal at 5% Significance Level											
141												
142	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
143			KM Mean			0.108					KM Standard Error of Mean	0.0151
144			KM SD			0.0919					95% KM (BCA) UCL	0.135
145			95% KM (t) UCL			0.134					95% KM (Percentile Bootstrap) UCL	0.134
146			95% KM (z) UCL			0.133					95% KM Bootstrap t UCL	0.142
147			90% KM Chebyshev UCL			0.154					95% KM Chebyshev UCL	0.174
148			97.5% KM Chebyshev UCL			0.203					99% KM Chebyshev UCL	0.259
149												
150	Gamma GOF Tests on Detected Observations Only											

	A	B	C	D	E	F	G	H	I	J	K	L
151					A-D Test Statistic	0.654	**Anderson-Darling GOF Test**					
152					5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level					
153					K-S Test Statistic	0.242	**Kolmogorov-Smirnov GOF**					
154					5% K-S Critical Value	0.238	Detected Data Not Gamma Distributed at 5% Significance Level					
155	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
156												
157	**Gamma Statistics on Detected Data Only**											
158					k hat (MLE)	2.811					k star (bias corrected MLE)	2.213
159					Theta hat (MLE)	0.07					Theta star (bias corrected MLE)	0.0889
160					nu hat (MLE)	73.08					nu star (bias corrected)	57.55
161					Mean (detects)	0.197						
162												
163	**Gamma ROS Statistics using Imputed Non-Detects**											
164	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
165	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
166	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
167	This is especially true when the sample size is small.											
168	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
169					Minimum	0.01					Mean	0.071
170					Maximum	0.436					Median	0.01
171					SD	0.112					CV	1.584
172					k hat (MLE)	0.598					k star (bias corrected MLE)	0.57
173					Theta hat (MLE)	0.119					Theta star (bias corrected MLE)	0.124
174					nu hat (MLE)	47.86					nu star (bias corrected)	45.6
175					Adjusted Level of Significance (β)	0.044						
176					Approximate Chi Square Value (45.60, α)	31.11					Adjusted Chi Square Value (45.60, β)	30.66
177					95% Gamma Approximate UCL (use when n>=50)	0.104					95% Gamma Adjusted UCL (use when n<50)	0.106
178												
179	**Estimates of Gamma Parameters using KM Estimates**											
180					Mean (KM)	0.108					SD (KM)	0.0919
181					Variance (KM)	0.00845					SE of Mean (KM)	0.0151
182					k hat (KM)	1.393					k star (KM)	1.305
183					nu hat (KM)	111.4					nu star (KM)	104.4
184					theta hat (KM)	0.0779					theta star (KM)	0.0831
185					80% gamma percentile (KM)	0.17					90% gamma percentile (KM)	0.234
186					95% gamma percentile (KM)	0.296					99% gamma percentile (KM)	0.438
187												
188	**Gamma Kaplan-Meier (KM) Statistics**											
189					Approximate Chi Square Value (104.39, α)	81.81					Adjusted Chi Square Value (104.39, β)	81.06
190					95% Gamma Approximate KM-UCL (use when n>=50)	0.138					95% Gamma Adjusted KM-UCL (use when n<50)	0.14
191												
192	**Lognormal GOF Test on Detected Observations Only**											
193					Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk GOF Test**					
194					5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level					
195					Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**					
196					5% Lilliefors Critical Value	0.234	Detected Data appear Lognormal at 5% Significance Level					
197	**Detected Data appear Lognormal at 5% Significance Level**											
198												
199	**Lognormal ROS Statistics Using Imputed Non-Detects**											
200					Mean in Original Scale	0.0805					Mean in Log Scale	-3.281

	A–E	F	G–K	L
201	SD in Original Scale	0.108	SD in Log Scale	1.279
202	95% t UCL (assumes normality of ROS data)	0.109	95% Percentile Bootstrap UCL	0.11
203	95% BCA Bootstrap UCL	0.115	95% Bootstrap t UCL	0.118
204	95% H-UCL (Log ROS)	0.15		
205				
206	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**			
207	KM Mean (logged)	-2.424	KM Geo Mean	0.0885
208	KM SD (logged)	0.549	95% Critical H Value (KM-Log)	1.96
209	KM Standard Error of Mean (logged)	0.0904	95% H-UCL (KM -Log)	0.122
210	KM SD (logged)	0.549	95% Critical H Value (KM-Log)	1.96
211	KM Standard Error of Mean (logged)	0.0904		
212				
213	**DL/2 Statistics**			
214	**DL/2 Normal**		**DL/2 Log-Transformed**	
215	Mean in Original Scale	0.0864	Mean in Log Scale	-2.886
216	SD in Original Scale	0.104	SD in Log Scale	0.832
217	95% t UCL (Assumes normality)	0.114	95% H-Stat UCL	0.106
218	**DL/2 is not a recommended method, provided for comparisons and historical reasons**			
219				
220	**Nonparametric Distribution Free UCL Statistics**			
221	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**			
222				
223	**Suggested UCL to Use**			
224	95% KM Adjusted Gamma UCL	0.14	95% GROS Adjusted Gamma UCL	0.106
225				
226	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
227	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
228				
229	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
230	Recommendations are based upon data size, data distribution, and skewness.			
231	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
232	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
233				
234	**Benzo[a]pyrene**			
235				
236	**General Statistics**			
237	Total Number of Observations	40	Number of Distinct Observations	16
238	Number of Detects	14	Number of Non-Detects	26
239	Number of Distinct Detects	14	Number of Distinct Non-Detects	2
240	Minimum Detect	0.073	Minimum Non-Detect	0.066
241	Maximum Detect	0.434	Maximum Non-Detect	0.067
242	Variance Detects	0.0134	Percent Non-Detects	65%
243	Mean Detects	0.177	SD Detects	0.116
244	Median Detects	0.119	CV Detects	0.652
245	Skewness Detects	1.156	Kurtosis Detects	0.353
246	Mean of Logged Detects	-1.908	SD of Logged Detects	0.603
247				
248	**Normal GOF Test on Detects Only**			
249	Shapiro Wilk Test Statistic	0.84	**Shapiro Wilk GOF Test**	
250	5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level	

	A–E	F	G–K	L
251	Lilliefors Test Statistic	0.258	**Lilliefors GOF Test**	
252	5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level	
253	**Detected Data Not Normal at 5% Significance Level**			
254				
255	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**			
256	KM Mean	0.105	KM Standard Error of Mean	0.0139
257	KM SD	0.0846	95% KM (BCA) UCL	0.13
258	95% KM (t) UCL	0.128	95% KM (Percentile Bootstrap) UCL	0.129
259	95% KM (z) UCL	0.128	95% KM Bootstrap t UCL	0.14
260	90% KM Chebyshev UCL	0.147	95% KM Chebyshev UCL	0.165
261	97.5% KM Chebyshev UCL	0.192	99% KM Chebyshev UCL	0.243
262				
263	**Gamma GOF Tests on Detected Observations Only**			
264	A-D Test Statistic	0.635	**Anderson-Darling GOF Test**	
265	5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level	
266	K-S Test Statistic	0.234	**Kolmogorov-Smirnov GOF**	
267	5% K-S Critical Value	0.231	Detected Data Not Gamma Distributed at 5% Significance Level	
268	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**			
269				
270	**Gamma Statistics on Detected Data Only**			
271	k hat (MLE)	2.975	k star (bias corrected MLE)	2.385
272	Theta hat (MLE)	0.0596	Theta star (bias corrected MLE)	0.0743
273	nu hat (MLE)	83.29	nu star (bias corrected)	66.77
274	Mean (detects)	0.177		
275				
276	**Gamma ROS Statistics using Imputed Non-Detects**			
277	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
278	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
279	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
280	This is especially true when the sample size is small.			
281	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
282	Minimum	0.01	Mean	0.0687
283	Maximum	0.434	Median	0.01
284	SD	0.105	CV	1.524
285	k hat (MLE)	0.632	k star (bias corrected MLE)	0.601
286	Theta hat (MLE)	0.109	Theta star (bias corrected MLE)	0.114
287	nu hat (MLE)	50.55	nu star (bias corrected)	48.09
288	Adjusted Level of Significance (β)	0.044		
289	Approximate Chi Square Value (48.09, α)	33.17	Adjusted Chi Square Value (48.09, β)	32.71
290	95% Gamma Approximate UCL (use when n>=50)	0.0996	95% Gamma Adjusted UCL (use when n<50)	0.101
291				
292	**Estimates of Gamma Parameters using KM Estimates**			
293	Mean (KM)	0.105	SD (KM)	0.0846
294	Variance (KM)	0.00715	SE of Mean (KM)	0.0139
295	k hat (KM)	1.539	k star (KM)	1.44
296	nu hat (KM)	123.1	nu star (KM)	115.2
297	theta hat (KM)	0.0682	theta star (KM)	0.0729
298	80% gamma percentile (KM)	0.163	90% gamma percentile (KM)	0.221
299	95% gamma percentile (KM)	0.277	99% gamma percentile (KM)	0.404
300				

301	**Gamma Kaplan-Meier (KM) Statistics**			
302	Approximate Chi Square Value (115.21, α)	91.43	Adjusted Chi Square Value (115.21, β)	90.64
303	95% Gamma Approximate KM-UCL (use when n>=50)	0.132	95% Gamma Adjusted KM-UCL (use when n<50)	0.133
304				
305	**Lognormal GOF Test on Detected Observations Only**			
306	Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk GOF Test**	
307	5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
308	Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**	
309	5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	
310	**Detected Data appear Lognormal at 5% Significance Level**			
311				
312	**Lognormal ROS Statistics Using Imputed Non-Detects**			
313	Mean in Original Scale	0.0783	Mean in Log Scale	-3.217
314	SD in Original Scale	0.1	SD in Log Scale	1.195
315	95% t UCL (assumes normality of ROS data)	0.105	95% Percentile Bootstrap UCL	0.105
316	95% BCA Bootstrap UCL	0.11	95% Bootstrap t UCL	0.115
317	95% H-UCL (Log ROS)	0.136		
318				
319	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**			
320	KM Mean (logged)	-2.434	KM Geo Mean	0.0876
321	KM SD (logged)	0.517	95% Critical H Value (KM-Log)	1.934
322	KM Standard Error of Mean (logged)	0.0849	95% H-UCL (KM -Log)	0.118
323	KM SD (logged)	0.517	95% Critical H Value (KM-Log)	1.934
324	KM Standard Error of Mean (logged)	0.0849		
325				
326	**DL/2 Statistics**			
327	**DL/2 Normal**		**DL/2 Log-Transformed**	
328	Mean in Original Scale	0.0837	Mean in Log Scale	-2.879
329	SD in Original Scale	0.0963	SD in Log Scale	0.801
330	95% t UCL (Assumes normality)	0.109	95% H-Stat UCL	0.103
331	**DL/2 is not a recommended method, provided for comparisons and historical reasons**			
332				
333	**Nonparametric Distribution Free UCL Statistics**			
334	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**			
335				
336	**Suggested UCL to Use**			
337	95% KM Adjusted Gamma UCL	0.133	95% GROS Adjusted Gamma UCL	0.101
338				
339	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
340	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
341				
342	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
343	Recommendations are based upon data size, data distribution, and skewness.			
344	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
345	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
346				
347	**Benzo[b]fluoranthene**			
348				
349	**General Statistics**			
350	Total Number of Observations	40	Number of Distinct Observations	16

	A–E	F	G–K	L
351	Number of Detects	14	Number of Non-Detects	26
352	Number of Distinct Detects	14	Number of Distinct Non-Detects	2
353	Minimum Detect	0.094	Minimum Non-Detect	0.066
354	Maximum Detect	0.655	Maximum Non-Detect	0.067
355	Variance Detects	0.0437	Percent Non-Detects	65%
356	Mean Detects	0.286	SD Detects	0.209
357	Median Detects	0.177	CV Detects	0.73
358	Skewness Detects	0.825	Kurtosis Detects	-0.979
359	Mean of Logged Detects	-1.499	SD of Logged Detects	0.729
360				
361	**Normal GOF Test on Detects Only**			
362	Shapiro Wilk Test Statistic	0.821	**Shapiro Wilk GOF Test**	
363	5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level	
364	Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**	
365	5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level	
366	**Detected Data Not Normal at 5% Significance Level**			
367				
368	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**			
369	KM Mean	0.143	KM Standard Error of Mean	0.0261
370	KM SD	0.159	95% KM (BCA) UCL	0.189
371	95% KM (t) UCL	0.187	95% KM (Percentile Bootstrap) UCL	0.188
372	95% KM (z) UCL	0.186	95% KM Bootstrap t UCL	0.206
373	90% KM Chebyshev UCL	0.221	95% KM Chebyshev UCL	0.257
374	97.5% KM Chebyshev UCL	0.306	99% KM Chebyshev UCL	0.402
375				
376	**Gamma GOF Tests on Detected Observations Only**			
377	A-D Test Statistic	0.761	**Anderson-Darling GOF Test**	
378	5% A-D Critical Value	0.745	Detected Data Not Gamma Distributed at 5% Significance Level	
379	K-S Test Statistic	0.229	**Kolmogorov-Smirnov GOF**	
380	5% K-S Critical Value	0.231	Detected data appear Gamma Distributed at 5% Significance Level	
381	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**			
382				
383	**Gamma Statistics on Detected Data Only**			
384	k hat (MLE)	2.166	k star (bias corrected MLE)	1.75
385	Theta hat (MLE)	0.132	Theta star (bias corrected MLE)	0.164
386	nu hat (MLE)	60.65	nu star (bias corrected)	48.99
387	Mean (detects)	0.286		
388				
389	**Gamma ROS Statistics using Imputed Non-Detects**			
390	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
391	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
392	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
393	This is especially true when the sample size is small.			
394	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
395	Minimum	0.01	Mean	0.107
396	Maximum	0.655	Median	0.01
397	SD	0.18	CV	1.687
398	k hat (MLE)	0.497	k star (bias corrected MLE)	0.476
399	Theta hat (MLE)	0.215	Theta star (bias corrected MLE)	0.224
400	nu hat (MLE)	39.74	nu star (bias corrected)	38.09

	A	B	C	D	E	F	G	H	I	J	K	L
401	Adjusted Level of Significance (β)					0.044						
402	Approximate Chi Square Value (38.09, α)					24.96	Adjusted Chi Square Value (38.09, β)					24.56
403	95% Gamma Approximate UCL (use when n>=50)					0.163	95% Gamma Adjusted UCL (use when n<50)					0.165
404												
405	**Estimates of Gamma Parameters using KM Estimates**											
406	Mean (KM)					0.143	SD (KM)					0.159
407	Variance (KM)					0.0252	SE of Mean (KM)					0.0261
408	k hat (KM)					0.811	k star (KM)					0.767
409	nu hat (KM)					64.89	nu star (KM)					61.35
410	theta hat (KM)					0.176	theta star (KM)					0.187
411	80% gamma percentile (KM)					0.234	90% gamma percentile (KM)					0.351
412	95% gamma percentile (KM)					0.471	99% gamma percentile (KM)					0.755
413												
414	**Gamma Kaplan-Meier (KM) Statistics**											
415	Approximate Chi Square Value (61.35, α)					44.34	Adjusted Chi Square Value (61.35, β)					43.8
416	95% Gamma Approximate KM-UCL (use when n>=50)					0.198	95% Gamma Adjusted KM-UCL (use when n<50)					0.2
417												
418	**Lognormal GOF Test on Detected Observations Only**											
419	Shapiro Wilk Test Statistic					0.885	**Shapiro Wilk GOF Test**					
420	5% Shapiro Wilk Critical Value					0.874	Detected Data appear Lognormal at 5% Significance Level					
421	Lilliefors Test Statistic					0.191	**Lilliefors GOF Test**					
422	5% Lilliefors Critical Value					0.226	Detected Data appear Lognormal at 5% Significance Level					
423	**Detected Data appear Lognormal at 5% Significance Level**											
424												
425	**Lognormal ROS Statistics Using Imputed Non-Detects**											
426	Mean in Original Scale					0.119	Mean in Log Scale					-3.048
427	SD in Original Scale					0.174	SD in Log Scale					1.416
428	95% t UCL (assumes normality of ROS data)					0.165	95% Percentile Bootstrap UCL					0.167
429	95% BCA Bootstrap UCL					0.173	95% Bootstrap t UCL					0.182
430	95% H-UCL (Log ROS)					0.252						
431												
432	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
433	KM Mean (logged)					-2.292	KM Geo Mean					0.101
434	KM SD (logged)					0.715	95% Critical H Value (KM-Log)					2.105
435	KM Standard Error of Mean (logged)					0.117	95% H-UCL (KM -Log)					0.166
436	KM SD (logged)					0.715	95% Critical H Value (KM-Log)					2.105
437	KM Standard Error of Mean (logged)					0.117						
438												
439	**DL/2 Statistics**											
440	**DL/2 Normal**						**DL/2 Log-Transformed**					
441	Mean in Original Scale					0.122	Mean in Log Scale					-2.736
442	SD in Original Scale					0.172	SD in Log Scale					1.011
443	95% t UCL (Assumes normality)					0.168	95% H-Stat UCL					0.16
444	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
445												
446	**Nonparametric Distribution Free UCL Statistics**											
447	**Detected Data appear Approximate Gamma Distributed at 5% Significance Level**											
448												
449	**Suggested UCL to Use**											
450	95% KM Adjusted Gamma UCL					0.2	95% GROS Adjusted Gamma UCL					0.165

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

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

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

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

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

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

Dibenz(a,h)anthracene

General Statistics

Total Number of Observations	40	Number of Distinct Observations	5
Number of Detects	3	Number of Non-Detects	37
Number of Distinct Detects	3	Number of Distinct Non-Detects	2
Minimum Detect	0.076	Minimum Non-Detect	0.066
Maximum Detect	0.097	Maximum Non-Detect	0.067
Variance Detects	1.3433E-4	Percent Non-Detects	92.5%
Mean Detects	0.0837	SD Detects	0.0116
Median Detects	0.078	CV Detects	0.139
Skewness Detects	1.674	Kurtosis Detects	N/A
Mean of Logged Detects	-2.487	SD of Logged Detects	0.134

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.821	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.354	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

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

KM Mean	0.0673	KM Standard Error of Mean	0.00103
KM SD	0.00533	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0691	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.069	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0704	95% KM Chebyshev UCL	0.0718
97.5% KM Chebyshev UCL	0.0738	99% KM Chebyshev UCL	0.0776

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	81.83	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00102	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	491	nu star (bias corrected)	N/A
Mean (detects)	0.0837		

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.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.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0242
Maximum	0.097	Median	0.01
SD	0.0221	CV	0.914
k hat (MLE)	1.781	k star (bias corrected MLE)	1.665
Theta hat (MLE)	0.0136	Theta star (bias corrected MLE)	0.0145
nu hat (MLE)	142.5	nu star (bias corrected)	133.2
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (133.16, α)	107.5	Adjusted Chi Square Value (133.16, β)	106.6
95% Gamma Approximate UCL (use when n>=50)	0.03	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0673	SD (KM)	0.00533
Variance (KM)	2.8369E-5	SE of Mean (KM)	0.00103
k hat (KM)	159.8	k star (KM)	147.8
nu hat (KM)	12782	nu star (KM)	11825
theta hat (KM)	4.2138E-4	theta star (KM)	4.5549E-4
80% gamma percentile (KM)	0.0719	90% gamma percentile (KM)	0.0745
95% gamma percentile (KM)	0.0767	99% gamma percentile (KM)	0.0809

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (N/A, α)	11573	Adjusted Chi Square Value (N/A, β)	11563
95% Gamma Approximate KM-UCL (use when n>=50)	0.0688	95% Gamma Adjusted KM-UCL (use when n<50)	0.0688

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.829	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.35	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0367	Mean in Log Scale	-3.415
SD in Original Scale	0.0184	SD in Log Scale	0.471
95% t UCL (assumes normality of ROS data)	0.0416	95% Percentile Bootstrap UCL	0.0419
95% BCA Bootstrap UCL	0.0424	95% Bootstrap t UCL	0.0425
95% H-UCL (Log ROS)	0.0424		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-2.701	KM Geo Mean	0.0672
KM SD (logged)	0.0678	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0131	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0678	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0131		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0371	Mean in Log Scale	-3.333
SD in Original Scale	0.0137	SD in Log Scale	0.246
95% t UCL (Assumes normality)	0.0408	95% H-Stat UCL	0.0394

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0691		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Indeno[1,2,3-cd]pyrene

General Statistics

Total Number of Observations	40	Number of Distinct Observations	11
Number of Detects	10	Number of Non-Detects	30
Number of Distinct Detects	9	Number of Distinct Non-Detects	2
Minimum Detect	0.093	Minimum Non-Detect	0.066
Maximum Detect	0.383	Maximum Non-Detect	0.067
Variance Detects	0.0117	Percent Non-Detects	75%
Mean Detects	0.199	SD Detects	0.108
Median Detects	0.166	CV Detects	0.546
Skewness Detects	0.692	Kurtosis Detects	-1.118
Mean of Logged Detects	-1.749	SD of Logged Detects	0.542

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.862	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.249	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

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

KM Mean	0.0992	KM Standard Error of Mean	0.0128
KM SD	0.0771	95% KM (BCA) UCL	0.121
95% KM (t) UCL	0.121	95% KM (Percentile Bootstrap) UCL	0.12
95% KM (z) UCL	0.12	95% KM Bootstrap t UCL	0.128
90% KM Chebyshev UCL	0.138	95% KM Chebyshev UCL	0.155
97.5% KM Chebyshev UCL	0.179	99% KM Chebyshev UCL	0.227

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.552	**Anderson-Darling GOF Test**

	A–E	F	G–K	L
601	5% A-D Critical Value	0.73	Detected data appear Gamma Distributed at 5% Significance Level	
602	K-S Test Statistic	0.246	**Kolmogorov-Smirnov GOF**	
603	5% K-S Critical Value	0.268	Detected data appear Gamma Distributed at 5% Significance Level	
604	**Detected data appear Gamma Distributed at 5% Significance Level**			
605				
606	**Gamma Statistics on Detected Data Only**			
607	k hat (MLE)	3.922	k star (bias corrected MLE)	2.812
608	Theta hat (MLE)	0.0506	Theta star (bias corrected MLE)	0.0706
609	nu hat (MLE)	78.43	nu star (bias corrected)	56.23
610	Mean (detects)	0.199		
611				
612	**Gamma ROS Statistics using Imputed Non-Detects**			
613	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
614	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
615	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
616	This is especially true when the sample size is small.			
617	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
618	Minimum	0.01	Mean	0.0584
619	Maximum	0.383	Median	0.01
620	SD	0.0972	CV	1.666
621	k hat (MLE)	0.625	k star (bias corrected MLE)	0.595
622	Theta hat (MLE)	0.0934	Theta star (bias corrected MLE)	0.0981
623	nu hat (MLE)	50.02	nu star (bias corrected)	47.6
624	Adjusted Level of Significance (β)	0.044		
625	Approximate Chi Square Value (47.60, α)	32.77	Adjusted Chi Square Value (47.60, β)	32.3
626	95% Gamma Approximate UCL (use when n>=50)	0.0848	95% Gamma Adjusted UCL (use when n<50)	0.086
627				
628	**Estimates of Gamma Parameters using KM Estimates**			
629	Mean (KM)	0.0992	SD (KM)	0.0771
630	Variance (KM)	0.00594	SE of Mean (KM)	0.0128
631	k hat (KM)	1.656	k star (KM)	1.548
632	nu hat (KM)	132.4	nu star (KM)	123.8
633	theta hat (KM)	0.0599	theta star (KM)	0.064
634	80% gamma percentile (KM)	0.153	90% gamma percentile (KM)	0.205
635	95% gamma percentile (KM)	0.256	99% gamma percentile (KM)	0.369
636				
637	**Gamma Kaplan-Meier (KM) Statistics**			
638	Approximate Chi Square Value (123.85, α)	99.14	Adjusted Chi Square Value (123.85, β)	98.32
639	95% Gamma Approximate KM-UCL (use when n>=50)	0.124	95% Gamma Adjusted KM-UCL (use when n<50)	0.125
640				
641	**Lognormal GOF Test on Detected Observations Only**			
642	Shapiro Wilk Test Statistic	0.888	**Shapiro Wilk GOF Test**	
643	5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level	
644	Lilliefors Test Statistic	0.224	**Lilliefors GOF Test**	
645	5% Lilliefors Critical Value	0.262	Detected Data appear Lognormal at 5% Significance Level	
646	**Detected Data appear Lognormal at 5% Significance Level**			
647				
648	**Lognormal ROS Statistics Using Imputed Non-Detects**			
649	Mean in Original Scale	0.0707	Mean in Log Scale	-3.334
650	SD in Original Scale	0.0927	SD in Log Scale	1.201

	A	B	C	D	E	F	G	H	I	J	K	L
651	95% t UCL (assumes normality of ROS data)					0.0954	95% Percentile Bootstrap UCL					0.0962
652	95% BCA Bootstrap UCL					0.104	95% Bootstrap t UCL					0.104
653	95% H-UCL (Log ROS)					0.122						
654												
655	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
656	KM Mean (logged)					-2.476	KM Geo Mean					0.0841
657	KM SD (logged)					0.492	95% Critical H Value (KM-Log)					1.915
658	KM Standard Error of Mean (logged)					0.082	95% H-UCL (KM -Log)					0.11
659	KM SD (logged)					0.492	95% Critical H Value (KM-Log)					1.915
660	KM Standard Error of Mean (logged)					0.082						
661												
662	**DL/2 Statistics**											
663	**DL/2 Normal**						**DL/2 Log-Transformed**					
664	Mean in Original Scale					0.0746	Mean in Log Scale					-2.989
665	SD in Original Scale					0.0892	SD in Log Scale					0.77
666	95% t UCL (Assumes normality)					0.0984	95% H-Stat UCL					0.0884
667	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
668												
669	**Nonparametric Distribution Free UCL Statistics**											
670	**Detected Data appear Normal Distributed at 5% Significance Level**											
671												
672	**Suggested UCL to Use**											
673	95% KM (t) UCL					0.121						
674												
675	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
676	Recommendations are based upon data size, data distribution, and skewness.											
677	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
678	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
679												

TABLE C-4A
CONSTITUENT-SPECIFIC FACTORS
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

Contaminants of Concern	Constituent-Specific Information [1]										
	Soil EPC (mg/kg)	Soil VF (m^3/kg)	RBA (unitless)[2]	Dermal ABS (unitless)	Gastrointestinal Absorption Efficiency (unitless)	Oral RfD (mg/kg-day)	Derm RfD (mg/kg-day)	Inhal. RfC (mg/m^3)	Oral CSF $(mg/kg\text{-}day)^{-1}$	Derm CSF $(mg/kg\text{-}day)^{-1}$	IUR $(mg/m^3)^{-1}$
Benzo[a]anthracene	0.14		1	0.13	1	NA	NA	NA	1.0E-01	1.0E-01	6.0E-02
Benzo[a]pyrene	0.13		1	0.13	1	3.0E-04	3.0E-04	2.0E-06	1.0E+00	1.0E+00	6.0E-01
Benzo[b]fluoranthene	0.20		1	0.13	1	NA	NA	NA	1.0E-01	1.0E-01	6.0E-02
Dibenz(a,h)anthracene	0.069		1	0.13	1	NA	NA	NA	1.0E+00	1.0E+00	6.0E-01
Indeno[1,2,3-cd]pyrene	0.12		1	0.13	1	NA	NA	NA	1.0E-01	1.0E-01	6.0E-02
Cobalt			1		1	3.0E-04	3.0E-04	6.0E-06	NA	NA	9.0E+00
Manganese			1		0.04	2.4E-02	9.6E-04	5.0E-05	NA	NA	NA
Vanadium			1		0.026	9.0E-03	2.3E-04	7.0E-06	NA	NA	8.3E+00
Mercury	5.46	2.9E+04	1		1	1.6E-04	1.6E-04	3.0E-04	NA	NA	NA

Notes:

1 - The source of the constituent-specific information presented in this table is described in Sections 3 and 4 of the report text.

2 - Relative Bioavailability Factor (RBA) that accounts for the differences in the bioavailability of a contaminant between the medium of exposure (e.g., soil) and the media associated with the toxicity value (e.g., the arsenic RfD and CSF are derived from drinking water studies). Based on USEPA (2021a) RSL User's Guide.

NA - USEPA-derived toxicity values are not available for this particular exposure route or endpoint.

TABLE C-4B
HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
INCIDENTAL INGESTION AND DERMAL CONTACT WITH SOIL
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

		INPUT PARAMETERS					
		INGESTION			DERMAL CONTACT		
		CF	1E-06	kg/mg	CF	1E-06	kg/mg
MEDIUM:	**SOIL**	IR	100	mg/day	AF	0.07	mg/cm^2-event
RECEPTOR:	**FUTURE ADULT (AGE 16-26) RECREATOR**	EF	250	days/year	ABS	See Table E-3A	unitless
		ED	10	years	EF	250	days/year
		FI	1	unitless	ED	10	years
		BW	80	kg	EV	1	events/day
		AT_{nc}	3650	days	SA	6032	cm^2
		AT_c	25550	days	BW	80	kg
					AT_{nc}	3650	days
					AT_c	25550	days

	Ingestion Exposure				Direct Dermal Contact			
Contaminants of Concern	**Ingestion Intake Noncancer (mg/kg-day)**	**Ingestion Intake Cancer (mg/kg-day)**	**HQ**	**ELCR**	**Absorbed Dose Noncancer (mg/kg-day)**	**Absorbed Dose Cancer (mg/kg-day)**	**HQ**	**ELCR**
Benzo[a]anthracene	1.2E-07	1.7E-08	NA	2E-09	6.6E-08	9.4E-09	NA	9E-10
Benzo[a]pyrene	1.1E-07	1.6E-08	4E-04	2E-08	6.3E-08	8.9E-09	2E-04	9E-09
Benzo[b]fluoranthene	1.7E-07	2.4E-08	NA	2E-09	9.4E-08	1.3E-08	NA	1E-09
Dibenz(a,h)anthracene	5.9E-08	8.5E-09	NA	8E-09	3.2E-08	4.6E-09	NA	5E-09
Indeno[1,2,3-cd]pyrene	1.0E-07	1.5E-08	NA	1E-09	5.7E-08	8.1E-09	NA	8E-10
Cobalt	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Manganese	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Vanadium	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Mercury	4.7E-06	6.7E-07	3E-02	NA	0.0E+00	0.0E+00	0E+00	NA
TOTAL			**3E-02**	**3E-08**			**2E-04**	**2E-08**

TABLE C-4C
HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
INHALATION OF VOLATILE AND PARTICULATE EMISSIONS
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

		INPUT PARAMETERS					
		FUGITIVE DUST INHALATION			INHALATION - VOLATILE EMISSIONS		
		PEF	1.32E+09	m^3/kg			
MEDIUM:	**SOIL**	EF	250	days/year	EF	250	days/year
RECEPTOR:	**FUTURE ADULT (AGE 16-26) RECREATOR**	ED	10	years	ED	10	years
		ET	4	hours/day	ET	4	hours/day
		AT_{nc}	87600	hours	AT_{nc}	87600	hours
		AT_c	613200	hours	AT_c	613200	hours

	Fugitive Dust Exposure				Volatile Emissions Exposure			
Contaminants of Concern	**Inhalation EC Noncancer (mg/m^3)**	**Inhalation EC Cancer (mg/m^3)**	**HQ**	**ELCR**	**Inhalation EC Noncancer (mg/m^3)**	**Inhalation EC Cancer (mg/m^3)**	**HQ**	**ELCR**
Benzo[a]anthracene	1.2E-11	1.7E-12	NA	1E-13	NA	NA	NA	NA
Benzo[a]pyrene	1.2E-11	1.6E-12	6E-06	1E-12	NA	NA	NA	NA
Benzo[b]fluoranthene	1.7E-11	2.5E-12	NA	1E-13	NA	NA	NA	NA
Dibenz(a,h)anthracene	6.0E-12	8.6E-13	NA	5E-13	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	1.0E-11	1.5E-12	NA	9E-14	NA	NA	NA	NA
Cobalt	0.0E+00	0.0E+00	0E+00	0E+00	NA	NA	NA	NA
Manganese	0.0E+00	0.0E+00	0E+00	NA	NA	NA	NA	NA
Vanadium	0.0E+00	0.0E+00	0E+00	0E+00	NA	NA	NA	NA
Mercury	4.7E-10	6.8E-11	2E-06	NA	2.1E-05	3.1E-06	7E-02	NA
TOTAL			**7E-06**	**2E-12**			**7E-02**	**0E+00**

TABLE C-4D
SUMMARY OF HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
FUTURE ADULT (AGE 16-26) RECREATOR
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

	CONSTITUENT AND PATHWAY SPECIFIC HQS					CONSTITUENT AND PATHWAY SPECIFIC CANCER				
Contaminants of Concern	**Ingestion of Soil**	**Dermal Contact with Soil**	**Inhalation Particulates**	**Inhalation Volatiles (Soil)**	**TOTAL HAZARD INDEX**	**Ingestion of Soil**	**Dermal Contact with Soil**	**Inhalation Particulates**	**Inhalation Volatiles (Soil)**	**TOTAL CANCER RISK**
Benzo[a]anthracene	NA	NA	NA	NA	**0E+00**	2E-09	9E-10	1E-13	NA	**3E-09**
Benzo[a]pyrene	4E-04	2E-04	6E-06	NA	**6E-04**	2E-08	9E-09	1E-12	NA	**3E-08**
Benzo[b]fluoranthene	NA	NA	NA	NA	**0E+00**	2E-09	1E-09	1E-13	NA	**4E-09**
Dibenz(a,h)anthracene	NA	NA	NA	NA	**0E+00**	8E-09	5E-09	5E-13	NA	**1E-08**
Indeno[1,2,3-cd]pyrene	NA	NA	NA	NA	**0E+00**	1E-09	8E-10	9E-14	NA	**2E-09**
Cobalt	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	0E+00	NA	**0E+00**
Manganese	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	NA	NA	**0E+00**
Vanadium	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	0E+00	NA	**0E+00**
Mercury	3E-02	0E+00	2E-06	7E-02	**1E-01**	NA	NA	NA	NA	**0E+00**
TOTAL					**1E-01**					**5E-08**

TABLE C-5A
CONSTITUENT-SPECIFIC FACTORS
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

Contaminants of Concern	Constituent-Specific Information [1]										
	Soil EPC (mg/kg)	Soil VF (m^3/kg)	RBA (unitless) [2]	Dermal ABS (unitless)	Gastrointestinal Absorption Efficiency (unitless)	Oral RfD (mg/kg-day)	Derm RfD (mg/kg-day)	Inhal. RfC (mg/m^3)	Oral CSF $(mg/kg\text{-}day)^{-1}$	Derm CSF $(mg/kg\text{-}day)^{-1}$	IUR $(mg/m^3)^{-1}$
Benzo[a]anthracene	0.14		1	0.13	1	NA	NA	NA	*3.0E-01*	*3.0E-01*	*1.8E-01*
Benzo[a]pyrene	0.13		1	0.13	1	3.0E-04	3.0E-04	2.0E-06	*3.0E+00*	*3.0E+00*	*1.8E+00*
Benzo[b]fluoranthene	0.20		1	0.13	1	NA	NA	NA	*3.0E-01*	*3.0E-01*	*1.8E-01*
Dibenz(a,h)anthracene	0.069		1	0.13	1	NA	NA	NA	*3.0E+00*	*3.0E+00*	*1.8E+00*
Indeno[1,2,3-cd]pyrene	0.12		1	0.13	1	NA	NA	NA	*3.0E-01*	*3.0E-01*	*1.8E-01*
Cobalt			1		1	3.0E-04	3.0E-04	6.0E-06	NA	NA	9.0E+00
Manganese			1		0.04	2.4E-02	9.6E-04	5.0E-05	NA	NA	NA
Vanadium			1		0.026	9.0E-03	2.3E-04	7.0E-06	NA	NA	8.3E+00
Mercury	5.46	2.9E+04	1		1	1.6E-04	1.6E-04	3.0E-04	NA	NA	NA

Notes:

Red italics indicate the CSF/IUR has been increased by a factor of 3 to account for mutagenic modes of action.

1 - The source of the constituent-specific information presented in this table is described in Sections 3 and 4 of the report text.

2 - Relative Bioavailability Factor (RBA) that accounts for the differences in the bioavailability of a contaminant between the medium of exposure (e.g., soil) and the media associated with the toxicity value (e.g., the arsenic RfD and CSF are derived from drinking water studies). Based on USEPA (2021a) RSL User's Guide.

NA - USEPA-derived toxicity values are not available for this particular exposure route or endpoint.

TABLE C-5B
HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
INCIDENTAL INGESTION AND DERMAL CONTACT WITH SOIL
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

		INPUT PARAMETERS					
		INGESTION			DERMAL CONTACT		
		CF	1E-06	kg/mg	CF	1E-06	kg/mg
MEDIUM:	**SOIL**	IR	100	mg/day	AF	0.07	mg/cm^2-event
RECEPTOR:	**FUTURE ADULT (AGE 6-16) RECREATOR**	EF	250	days/year	ABS	See Table E-4A	unitless
		ED	10	years	EF	250	days/year
		FI	1	unitless	ED	10	years
		BW	80	kg	EV	1	events/day
		AT_{nc}	3650	days	SA	6032	cm^2
		AT_c	25550	days	BW	80	kg
					AT_{nc}	3650	days
					AT_c	25550	days

	Ingestion Exposure				Direct Dermal Contact			
Contaminants of Concern	**Ingestion Intake Noncancer (mg/kg-day)**	**Ingestion Intake Cancer (mg/kg-day)**	**HQ**	**ELCR**	**Absorbed Dose Noncancer (mg/kg-day)**	**Absorbed Dose Cancer (mg/kg-day)**	**HQ**	**ELCR**
Benzo[a]anthracene	1.2E-07	1.7E-08	NA	5E-09	6.6E-08	9.4E-09	NA	3E-09
Benzo[a]pyrene	1.1E-07	1.6E-08	4E-04	5E-08	6.3E-08	8.9E-09	2E-04	3E-08
Benzo[b]fluoranthene	1.7E-07	2.4E-08	NA	7E-09	9.4E-08	1.3E-08	NA	4E-09
Dibenz(a,h)anthracene	5.9E-08	8.5E-09	NA	3E-08	3.2E-08	4.6E-09	NA	1E-08
Indeno[1,2,3-cd]pyrene	1.0E-07	1.5E-08	NA	4E-09	5.7E-08	8.1E-09	NA	2E-09
Cobalt	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Manganese	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Vanadium	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Mercury	4.7E-06	6.7E-07	3E-02	NA	0.0E+00	0.0E+00	0E+00	NA
TOTAL			**3E-02**	**9E-08**			**2E-04**	**5E-08**

TABLE C-5C
HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
INHALATION OF VOLATILE AND PARTICULATE EMISSIONS
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

		INPUT PARAMETERS					
		FUGITIVE DUST INHALATION			INHALATION - VOLATILE EMISSIONS		
		PEF	1.32E+09	m^3/kg			
MEDIUM:	**SOIL**	EF	250	days/year	EF	250	days/year
RECEPTOR:	**FUTURE ADULT (AGE 6-16) RECREATOR**	ED	10	years	ED	10	years
		ET	4	hours/day	ET	4	hours/day
		AT_{nc}	87600	hours	AT_{nc}	87600	hours
		AT_c	613200	hours	AT_c	613200	hours

	Fugitive Dust Exposure				Volatile Emissions Exposure			
Contaminants of Concern	**Inhalation EC Noncancer (mg/m^3)**	**Inhalation EC Cancer (mg/m^3)**	**HQ**	**ELCR**	**Inhalation EC Noncancer (mg/m^3)**	**Inhalation EC Cancer (mg/m^3)**	**HQ**	**ELCR**
Benzo[a]anthracene	1.2E-11	1.7E-12	NA	3E-13	NA	NA	NA	NA
Benzo[a]pyrene	1.2E-11	1.6E-12	6E-06	3E-12	NA	NA	NA	NA
Benzo[b]fluoranthene	1.7E-11	2.5E-12	NA	4E-13	NA	NA	NA	NA
Dibenz(a,h)anthracene	6.0E-12	8.6E-13	NA	2E-12	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	1.0E-11	1.5E-12	NA	3E-13	NA	NA	NA	NA
Cobalt	0.0E+00	0.0E+00	0E+00	0E+00	NA	NA	NA	NA
Manganese	0.0E+00	0.0E+00	0E+00	NA	NA	NA	NA	NA
Vanadium	0.0E+00	0.0E+00	0E+00	0E+00	NA	NA	NA	NA
Mercury	4.7E-10	6.8E-11	2E-06	NA	2.1E-05	3.1E-06	7E-02	NA
TOTAL			**7E-06**	**6E-12**			**7E-02**	**0E+00**

TABLE C-5D
SUMMARY OF HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
FUTURE ADULT (AGE 6-16) RECREATOR
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

	CONSTITUENT AND PATHWAY SPECIFIC HQS					CONSTITUENT AND PATHWAY SPECIFIC CANCER				
Contaminants of Concern	**Ingestion of Soil**	**Dermal Contact with Soil**	**Inhalation Particulates**	**Inhalation Volatiles (Soil)**	**TOTAL HAZARD INDEX**	**Ingestion of Soil**	**Dermal Contact with Soil**	**Inhalation Particulates**	**Inhalation Volatiles (Soil)**	**TOTAL CANCER RISK**
Benzo[a]anthracene	NA	NA	NA	NA	**0E+00**	5E-09	3E-09	3E-13	NA	**8E-09**
Benzo[a]pyrene	4E-04	2E-04	6E-06	NA	**6E-04**	5E-08	3E-08	3E-12	NA	**8E-08**
Benzo[b]fluoranthene	NA	NA	NA	NA	**0E+00**	7E-09	4E-09	4E-13	NA	**1E-08**
Dibenz(a,h)anthracene	NA	NA	NA	NA	**0E+00**	3E-08	1E-08	2E-12	NA	**4E-08**
Indeno[1,2,3-cd]pyrene	NA	NA	NA	NA	**0E+00**	4E-09	2E-09	3E-13	NA	**7E-09**
Cobalt	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	0E+00	NA	**0E+00**
Manganese	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	NA	NA	**0E+00**
Vanadium	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	0E+00	NA	**0E+00**
Mercury	3E-02	0E+00	2E-06	7E-02	**1E-01**	NA	NA	NA	NA	**0E+00**
TOTAL					**1E-01**					**1E-07**

TABLE C-6A
CONSTITUENT-SPECIFIC FACTORS
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

	Constituent-Specific Information [1]										
Contaminants of Concern	**Soil EPC (mg/kg)**	**Soil VF (m^3/kg)**	**RBA (unitless)[2]**	**Dermal ABS (unitless)**	**Gastrointestinal Absorption Efficiency (unitless)**	**Oral RfD (mg/kg-day)**	**Derm RfD (mg/kg-day)**	**Inhal. RfC (mg/m^3)**	**Oral CSF $(mg/kg\text{-}day)^{-1}$**	**Derm CSF $(mg/kg\text{-}day)^{-1}$**	**IUR $(mg/m^3)^{-1}$**
Benzo[a]anthracene	0.14		1	0.13	1	NA	NA	NA	*3.0E-01*	*3.0E-01*	*1.8E-01*
Benzo[a]pyrene	0.13		1	0.13	1	3.0E-04	3.0E-04	2.0E-06	*3.0E+00*	*3.0E+00*	*1.8E+00*
Benzo[b]fluoranthene	0.20		1	0.13	1	NA	NA	NA	*3.0E-01*	*3.0E-01*	*1.8E-01*
Dibenz(a,h)anthracene	0.069		1	0.13	1	NA	NA	NA	*3.0E+00*	*3.0E+00*	*1.8E+00*
Indeno[1,2,3-cd]pyrene	0.12		1	0.13	1	NA	NA	NA	*3.0E-01*	*3.0E-01*	*1.8E-01*
Cobalt			1		1	3.0E-04	3.0E-04	6.0E-06	NA	NA	9.0E+00
Manganese			1		0.04	2.4E-02	9.6E-04	5.0E-05	NA	NA	NA
Vanadium			1		0.026	9.0E-03	2.3E-04	7.0E-06	NA	NA	8.3E+00
Mercury	5.46	2.9E+04	1		1	1.6E-04	1.6E-04	3.0E-04	NA	NA	NA

Notes:

Red italics indicate the CSF/IUR has been increased by a factor of 3 to account for mutagenic modes of action.

1 - The source of the constituent-specific information presented in this table is described in Sections 3 and 4 of the report text.

2 - Relative Bioavailability Factor (RBA) that accounts for the differences in the bioavailability of a contaminant between the medium of exposure (e.g., soil) and the media associated with the toxicity value (e.g., the arsenic RfD and CSF are derived from drinking water studies). Based on USEPA (2021a) RSL User's Guide.

NA - USEPA-derived toxicity values are not available for this particular exposure route or endpoint.

TABLE C-6B
HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
INCIDENTAL INGESTION AND DERMAL CONTACT WITH SOIL
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

		INPUT PARAMETERS					
		INGESTION			DERMAL CONTACT		
		CF	1E-06	kg/mg	CF	1E-06	kg/mg
MEDIUM:	**SOIL**	IR	200	mg/day	AF	0.2	mg/cm^2-event
RECEPTOR:	**FUTURE CHILD (AGE 2-6) RECREATOR**	EF	250	days/year	ABS	See Table E-5A	unitless
		ED	4	years	EF	250	days/year
		FI	1	unitless	ED	4	years
		BW	15	kg	EV	1	events/day
		AT_{nc}	1460	days	SA	2373	cm^2
		AT_c	25550	days	BW	15	kg
					AT_{nc}	1460	days
					AT_c	25550	days

	Ingestion Exposure				Direct Dermal Contact			
Contaminants of Concern	**Ingestion Intake Noncancer (mg/kg-day)**	**Ingestion Intake Cancer (mg/kg-day)**	**HQ**	**ELCR**	**Absorbed Dose Noncancer (mg/kg-day)**	**Absorbed Dose Cancer (mg/kg-day)**	**HQ**	**ELCR**
Benzo[a]anthracene	1.3E-06	7.3E-08	NA	2E-08	3.9E-07	2.3E-08	NA	7E-09
Benzo[a]pyrene	1.2E-06	6.9E-08	4E-03	2E-07	3.7E-07	2.1E-08	1E-03	6E-08
Benzo[b]fluoranthene	1.8E-06	1.0E-07	NA	3E-08	5.6E-07	3.2E-08	NA	1E-08
Dibenz(a,h)anthracene	6.3E-07	3.6E-08	NA	1E-07	1.9E-07	1.1E-08	NA	3E-08
Indeno[1,2,3-cd]pyrene	1.1E-06	6.3E-08	NA	2E-08	3.4E-07	1.9E-08	NA	6E-09
Cobalt	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Manganese	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Vanadium	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Mercury	5.0E-05	2.8E-06	3E-01	NA	0.0E+00	0.0E+00	0E+00	NA
TOTAL			**3E-01**	**4E-07**			**1E-03**	**1E-07**

TABLE C-6C
HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
INHALATION OF VOLATILE AND PARTICULATE EMISSIONS
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

		INPUT PARAMETERS					
		FUGITIVE DUST INHALATION			INHALATION - VOLATILE EMISSIONS		
		PEF	1.32E+09	m^3/kg			
MEDIUM:	**SOIL**	EF	250	days/year	EF	250	days/year
RECEPTOR:	**FUTURE CHILD (AGE 2-6) RECREATOR**	ED	4	years	ED	4	years
		ET	4	hours/day	ET	4	hours/day
		AT_{nc}	35040	hours	AT_{nc}	35040	hours
		AT_c	613200	hours	AT_c	613200	hours

	Fugitive Dust Exposure				Volatile Emissions Exposure			
Contaminants of Concern	**Inhalation EC Noncancer (mg/m^3)**	**Inhalation EC Cancer (mg/m^3)**	**HQ**	**ELCR**	**Inhalation EC Noncancer (mg/m^3)**	**Inhalation EC Cancer (mg/m^3)**	**HQ**	**ELCR**
Benzo[a]anthracene	1.2E-11	6.9E-13	NA	1E-13	NA	NA	NA	NA
Benzo[a]pyrene	1.2E-11	6.6E-13	6E-06	1E-12	NA	NA	NA	NA
Benzo[b]fluoranthene	1.7E-11	9.9E-13	NA	2E-13	NA	NA	NA	NA
Dibenz(a,h)anthracene	6.0E-12	3.4E-13	NA	6E-13	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	1.0E-11	6.0E-13	NA	1E-13	NA	NA	NA	NA
Cobalt	0.0E+00	0.0E+00	0E+00	0E+00	NA	NA	NA	NA
Manganese	0.0E+00	0.0E+00	0E+00	NA	NA	NA	NA	NA
Vanadium	0.0E+00	0.0E+00	0E+00	0E+00	NA	NA	NA	NA
Mercury	4.7E-10	2.7E-11	2E-06	NA	2.1E-05	1.2E-06	7E-02	NA
TOTAL			**7E-06**	**2E-12**			**7E-02**	**0E+00**

TABLE C-6D
SUMMARY OF HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
FUTURE CHILD (AGE 2-6) RECREATOR
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

	CONSTITUENT AND PATHWAY SPECIFIC HQS					CONSTITUENT AND PATHWAY SPECIFIC CANCER				
Contaminants of Concern	**Ingestion of Soil**	**Dermal Contact with Soil**	**Inhalation Particulates**	**Inhalation Volatiles (Soil)**	**TOTAL HAZARD INDEX**	**Ingestion of Soil**	**Dermal Contact with Soil**	**Inhalation Particulates**	**Inhalation Volatiles (Soil)**	**TOTAL CANCER RISK**
Benzo[a]anthracene	NA	NA	NA	NA	**0E+00**	2E-08	7E-09	1E-13	NA	**3E-08**
Benzo[a]pyrene	4E-03	1E-03	6E-06	NA	**5E-03**	2E-07	6E-08	1E-12	NA	**3E-07**
Benzo[b]fluoranthene	NA	NA	NA	NA	**0E+00**	3E-08	1E-08	2E-13	NA	**4E-08**
Dibenz(a,h)anthracene	NA	NA	NA	NA	**0E+00**	1E-07	3E-08	6E-13	NA	**1E-07**
Indeno[1,2,3-cd]pyrene	NA	NA	NA	NA	**0E+00**	2E-08	6E-09	1E-13	NA	**2E-08**
Cobalt	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	0E+00	NA	**0E+00**
Manganese	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	NA	NA	**0E+00**
Vanadium	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	0E+00	NA	**0E+00**
Mercury	3E-01	0E+00	2E-06	7E-02	**4E-01**	NA	NA	NA	NA	**0E+00**
TOTAL					**4E-01**					**5E-07**

TABLE C-7A
CONSTITUENT-SPECIFIC FACTORS
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

Contaminants of Concern	Constituent-Specific Information [1]										
	Soil EPC (mg/kg)	Soil VF (m^3/kg)	RBA (unitless)[2]	Dermal ABS (unitless)	Gastrointestinal Absorption Efficiency (unitless)	Oral RfD (mg/kg-day)	Derm RfD (mg/kg-day)	Inhal. RfC (mg/m^3)	Oral CSF $(mg/kg\text{-}day)^{-1}$	Derm CSF $(mg/kg\text{-}day)^{-1}$	IUR $(mg/m^3)^{-1}$
Benzo[a]anthracene	0.14		1	0.13	1	NA	NA	NA	*1.0E+00*	*1.0E+00*	*6.0E-01*
Benzo[a]pyrene	0.13		1	0.13	1	3.0E-04	3.0E-04	2.0E-06	*1.0E+01*	*1.0E+01*	*6.0E+00*
Benzo[b]fluoranthene	0.20		1	0.13	1	NA	NA	NA	*1.0E+00*	*1.0E+00*	*6.0E-01*
Dibenz(a,h)anthracene	0.069		1	0.13	1	NA	NA	NA	*1.0E+01*	*1.0E+01*	*6.0E+00*
Indeno[1,2,3-cd]pyrene	0.12		1	0.13	1	NA	NA	NA	*1.0E+00*	*1.0E+00*	*6.0E-01*
Cobalt			1		1	3.0E-04	3.0E-04	6.0E-06	NA	NA	9.0E+00
Manganese			1		0.04	2.4E-02	9.6E-04	5.0E-05	NA	NA	NA
Vanadium			1		0.026	9.0E-03	2.3E-04	7.0E-06	NA	NA	8.3E+00
Mercury	5.46	2.9E+04	1		1	1.6E-04	1.6E-04	3.0E-04	NA	NA	NA

Notes:

Red italics indicate the CSF/IUR has been increased by a factor of 10 to account for mutagenic modes of action.

1 - The source of the constituent-specific information presented in this table is described in Sections 3 and 4 of the report text.

2 - Relative Bioavailability Factor (RBA) that accounts for the differences in the bioavailability of a contaminant between the medium of exposure (e.g., soil) and the media associated with the toxicity value (e.g., the arsenic RfD and CSF are derived from drinking water studies). Based on USEPA (2021a) RSL User's Guide.

NA - USEPA-derived toxicity values are not available for this particular exposure route or endpoint.

TABLE C-7B
HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
INCIDENTAL INGESTION AND DERMAL CONTACT WITH SOIL
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

		INPUT PARAMETERS					
		INGESTION			DERMAL CONTACT		
		CF	1E-06	kg/mg	CF	1E-06	kg/mg
MEDIUM:	**SOIL**	IR	200	mg/day	AF	0.2	mg/cm^2-event
RECEPTOR:	**FUTURE CHILD (AGE 0-2) RECREATOR**	EF	250	days/year	ABS	See Table E-6A	unitless
		ED	2	years	EF	250	days/year
		FI	1	unitless	ED	2	years
		BW	15	kg	EV	1	events/day
		AT_{nc}	730	days	SA	2373	cm^2
		AT_c	25550	days	BW	15	kg
					AT_{nc}	730	days
					AT_c	25550	days

	Ingestion Exposure				Direct Dermal Contact			
Contaminants of Concern	**Ingestion Intake Noncancer (mg/kg-day)**	**Ingestion Intake Cancer (mg/kg-day)**	**HQ**	**ELCR**	**Absorbed Dose Noncancer (mg/kg-day)**	**Absorbed Dose Cancer (mg/kg-day)**	**HQ**	**ELCR**
Benzo[a]anthracene	1.3E-06	3.7E-08	NA	4E-08	3.9E-07	1.1E-08	NA	1E-08
Benzo[a]pyrene	1.2E-06	3.5E-08	4E-03	3E-07	3.7E-07	1.1E-08	1E-03	1E-07
Benzo[b]fluoranthene	1.8E-06	5.2E-08	NA	5E-08	5.6E-07	1.6E-08	NA	2E-08
Dibenz(a,h)anthracene	6.3E-07	1.8E-08	NA	2E-07	1.9E-07	5.6E-09	NA	6E-08
Indeno[1,2,3-cd]pyrene	1.1E-06	3.2E-08	NA	3E-08	3.4E-07	9.7E-09	NA	1E-08
Cobalt	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Manganese	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Vanadium	0.0E+00	0.0E+00	0E+00	NA	0.0E+00	0.0E+00	0E+00	NA
Mercury	5.0E-05	1.4E-06	3E-01	NA	0.0E+00	0.0E+00	0E+00	NA
TOTAL			**3E-01**	**6E-07**			**1E-03**	**2E-07**

TABLE C-7C
HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
INHALATION OF VOLATILE AND PARTICULATE EMISSIONS
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

		INPUT PARAMETERS					
		FUGITIVE DUST INHALATION			INHALATION - VOLATILE EMISSIONS		
		PEF	1.32E+09	m^3/kg			
MEDIUM:	**SOIL**	EF	250	days/year	EF	250	days/year
RECEPTOR:	**FUTURE CHILD (AGE 0-2) RECREATOR**	ED	2	years	ED	2	years
		ET	4	hours/day	ET	4	hours/day
		AT_{nc}	17520	hours	AT_{nc}	17520	hours
		AT_c	613200	hours	AT_c	613200	hours

	Fugitive Dust Exposure				Volatile Emissions Exposure			
Contaminants of Concern	**Inhalation EC Noncancer (mg/m^3)**	**Inhalation EC Cancer (mg/m^3)**	**HQ**	**ELCR**	**Inhalation EC Noncancer (mg/m^3)**	**Inhalation EC Cancer (mg/m^3)**	**HQ**	**ELCR**
Benzo[a]anthracene	1.2E-11	3.5E-13	NA	2E-13	NA	NA	NA	NA
Benzo[a]pyrene	1.2E-11	3.3E-13	6E-06	2E-12	NA	NA	NA	NA
Benzo[b]fluoranthene	1.7E-11	5.0E-13	NA	3E-13	NA	NA	NA	NA
Dibenz(a,h)anthracene	6.0E-12	1.7E-13	NA	1E-12	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	1.0E-11	3.0E-13	NA	2E-13	NA	NA	NA	NA
Cobalt	0.0E+00	0.0E+00	0E+00	0E+00	NA	NA	NA	NA
Manganese	0.0E+00	0.0E+00	0E+00	NA	NA	NA	NA	NA
Vanadium	0.0E+00	0.0E+00	0E+00	0E+00	NA	NA	NA	NA
Mercury	4.7E-10	1.4E-11	2E-06	NA	2.1E-05	6.1E-07	7E-02	NA
TOTAL			**7E-06**	**4E-12**			**7E-02**	**0E+00**

TABLE C-7D
SUMMARY OF HAZARD INDICES AND THEORETICAL EXCESS LIFETIME CANCER RISKS
FUTURE CHILD (AGE 0-2) RECREATOR
FORMER CARR CHINA MANUFACTURING FACILITY
GRAFTON, WEST VIRGINIA
VRP PROJECT # 20019

	CONSTITUENT AND PATHWAY SPECIFIC HQS					CONSTITUENT AND PATHWAY SPECIFIC CANCER				
Contaminants of Concern	Ingestion of Soil	Dermal Contact with Soil	Inhalation Particulates	Inhalation Volatiles (Soil)	TOTAL HAZARD INDEX	Ingestion of Soil	Dermal Contact with Soil	Inhalation Particulates	Inhalation Volatiles (Soil)	TOTAL CANCER RISK
Benzo[a]anthracene	NA	NA	NA	NA	**0E+00**	4E-08	1E-08	2E-13	NA	**5E-08**
Benzo[a]pyrene	4E-03	1E-03	6E-06	NA	**5E-03**	3E-07	1E-07	2E-12	NA	**5E-07**
Benzo[b]fluoranthene	NA	NA	NA	NA	**0E+00**	5E-08	2E-08	3E-13	NA	**7E-08**
Dibenz(a,h)anthracene	NA	NA	NA	NA	**0E+00**	2E-07	6E-08	1E-12	NA	**2E-07**
Indeno[1,2,3-cd]pyrene	NA	NA	NA	NA	**0E+00**	3E-08	1E-08	2E-13	NA	**4E-08**
Cobalt	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	0E+00	NA	**0E+00**
Manganese	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	NA	NA	**0E+00**
Vanadium	0E+00	0E+00	0E+00	NA	**0E+00**	NA	NA	0E+00	NA	**0E+00**
Mercury	3E-01	0E+00	2E-06	7E-02	**4E-01**	NA	NA	NA	NA	**0E+00**
TOTAL					**4E-01**					**8E-07**

APPENDIX D

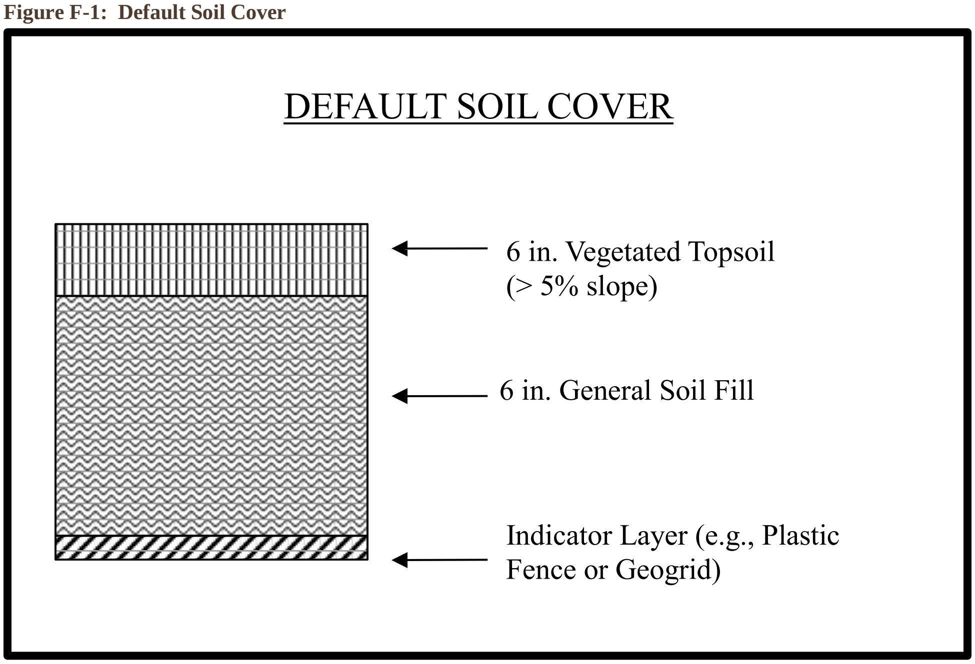
WVDEP CAP AND COVER GUIDANCE

F.2.1 Soil Covers

A soil cover is typically the least expensive and simplest method of preventing direct contact exposure to underlying contaminated media. At a minimum, a 1-foot thickness of clean soil must be used to prevent direct contact. Soil covers must also be vegetated and maintained to prevent growth of deep-rooted vegetation, erosion, and deterioration over time. Therefore, the upper 6 inches of material must consist of soil that is capable of supporting vegetation, and an appropriate seeding mixture must be provided to establish a healthy stand of grass. The lower layer should not be over-compacted such that the water-retaining capability of the subsoil is significantly reduced.

The slope of a soil cover must not be steeper than 2:1 (H:V), but preferably no steeper than 3:1 to minimize the potential for slope instability. Soil covers placed on relatively steep slopes must be designed with adequate erosion control measures to prevent damage to the cover. This may include erosion control mats (jute, straw, coconut fiber, etc.) or may require rigid armor products (e.g., Armor Flex) on long or particularly steep slopes with a high potential for damage from run-off. Conversely, soil covers must be graded to be free-draining and prevent ponding. Therefore, a minimum slope of 5% should be maintained for vegetated soil surfaces. Figure F-1 depicts a default soil cover that meets the minimum performance standards.

Figure F-1: Default Soil Cover



The LRS must ensure that all material used in cover and cap systems does not contain contaminants from the site or an off-site source. Borrow material should always be obtained from undeveloped areas that have not been previously used for commercial, agricultural, or industrial purposes. If it is necessary to use material from an area that may contain contamination, the materials must be tested for potential contaminants prior to being used. Analytical parameters will depend on the soil source and previous use, but will likely include VOCs, SVOCs, and RCRA 8 metals, at a minimum. The LRS must consult with the OER Project Manager to determine the number of samples and analytical parameters necessary to properly evaluate potentially impacted materials, and this information must be included in the RAWP. All materials used for covers must meet De Minimis Standards appropriate for the site use or natural background levels.

F.2.2 Other Unconsolidated Covers

As an alternative to using soil to prevent direct contact with contaminated media, other materials may be used to partially or completely replace the soil. For example, a layer of aggregate (crushed stone or gravel) may be specified as the surface layer where limited vehicle traffic is anticipated to occur on the cover. Another possible scenario might be the use of rubber chips, wood chips, bark chips, or other organic mulch in situations where the final use includes landscaping, such as in a park or commercial development. Where alternate surface materials are proposed, vegetation is not required. However, a plan for inspection and maintenance will be required to ensure that the surface materials are not damaged by pedestrian or vehicular traffic or erosion. In each case, it is the responsibility of the LRS to demonstrate that the proposed cover material will prevent direct contact with the underlying contaminants and will continue to function effectively in the post-remediation scenario.

Where materials of differing particle sizes are proposed to be placed in layers, an appropriately designed separation layer (e.g., geotextile fabric) must be installed to prevent materials of differing particle size from mixing or disintegrating into each other. In all cases where unconsolidated materials are proposed to prevent direct contact exposure, the thickness of the material must be adequate to reliably prevent exposure and to minimize long-term maintenance. If a thinner direct contact exposure cover is necessary or desired, the LRS must propose another material type (e.g., pavement cover). Covers comprised of unconsolidated materials must be graded to be free-draining. A minimum slope of 2% should be maintained for gravel surfaces. Minimum slope for other surfaces should be designed on a case-by-case basis. Figure F-2 depicts an alternate unconsolidated cover that meets the minimum performance standards.