REDACTED

INTERIM EARLY ACTION RECORD OF DECISION

LCP CHEMICALS SUPERFUND SITE
OPERABLE UNIT 2 – SITE GROUNDWATER AND CELL BUILDING AREA SOIL

BRUNSWICK, GLYNN COUNTY, GEORGIA
EPA ID GAD099303182

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA, GEORGIA

MARCH 2025

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (Continued)

Section **Page**

TABLE OF CONTENTS (Continued)

Section **Page**

TABLE OF CONTENTS (Continued)

Section **Page**

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

°	Degrees
%	Percent
ARARs	Applicable or Relevant and Appropriate Requirements
BGS	below ground surface
BLSE	below land surface elevation
CBP	Caustic Brine Pool
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Chemical of Concern
COPCs	Chemicals of Potential Concern
CSF	cancer slope factor
CSM	Conceptual Site Model
CVOCs	chlorinated volatile organic compounds
DCE	Dichloroethene
DoR	Division of Remediation
DPT	Direct Push Technology
EPA	Environmental Protection Agency
EPCs	Exposure point concentrations
ESI	Expanded Site Investigation
°F	degrees Fahrenheit
FLIR	Forward Looking Infrared
FS	Feasibility Study
ft	foot or feet
ft^2/day	square feet per day
GAC	granular activated carbon
GAEPD	Georgia Environmental Protection Division
gpm	gallons per minute
HHRA	Human Health Risk Assessment
IEAROD	Interim Early Action Record of Decision
IC	Institutional Control
ISCO	in situ chemical oxidation

LEAF	Leaching Environmental Assessment Framework
MCL	Maximum Contaminant Level
µg/L	microgram per liter
NCP	National Contingency Plan
ORD	Office of Research and Development
O&M	operation and maintenance
PA	Preliminary Assessment
PCE	Tetrachloroethene or Perchloroethene
POTW	publicly owned treatment works
RA	Remedial Action
RAO	Remedial Action Objective
RfC	reference concentration
RfD	reference dose
RG	Remedial Goal
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act of 1986
SI	Site Inspection
Site	LCP Chemicals Superfund Site
SVE	Soil Vapor Extraction
TCA	Trichloroethane
TCE	Trichloroethene
TDEC	Tennessee Department of Environment and Conservation
TN	Tennessee
UCL	upper confidence limit
URF	unit risk factor
USGS	United States Geological Survey
Versar	Versar, Inc.
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

PART 1: DELCARATION

1.0 SITE NAME AND LOCATION

The LCP Chemicals Superfund Site is located in Brunswick, Georgia (GA). The Site's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number is: GAD099303182. The Site was listed on the National Priorities List in 1996.

The Site is currently divided into operable units (OUs). The marshland portion of the Site is designated as OU1; Site-wide groundwater and all soil beneath the former cell building area (CBA) are designated as OU2; and the upland portion of the Site (excluding the CBA) is designated as OU3.

The EPA has already selected the remedy for OU1. OU1 included excavation and dredging of contaminated marsh sediments, placement of a thin layer cap, and long-term monitoring of the salt marsh. This remedial action was completed in 2024 and is in the monitoring stage.

The second operable unit (OU2), the subject of this Interim Early Action Record of Decision (IEAROD), addresses mercury contamination in the subsurface under the former Cell Building Area (CBA). Elemental mercury exists in the subsurface of the CBA. Ingestion of water extracted from this aquifer poses a current and potential risk to human health because the EPA's acceptable risk range is exceeded, and concentrations of contaminants are greater than the maximum contaminant levels for drinking water (as specified in the Safe Drinking Water Act). This IEAROD for the second operable unit presents a response action for this Site and addresses a principal threat at the Site through the treatment of mercury source material in the aquifer. The remaining contaminants will be addressed in a later ROD for OU2.

The third operable unit (the Uplands) was determined to require no additional action as the previous removal actions had addressed the contamination in soil to a level that is protective of the current use of the Site as an industrial area. An additional risk assessment demonstrated that OU3 was also appropriate to use as a recreational area for redevelopment purposes.

2.0 STATEMENT OF BASIS AND PURPOSE

This decision document presents the interim early action remedy for the LCP Chemicals Superfund Site, OU2, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. Section 9601 et seq., and, to the extent practicable, the National Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300.

This decision is based on the Administrative Record for the Site and represents the interim early action selected for the LCP Chemicals Superfund Site, OU2. The decision for an early action is needed to address the mercury in the subsurface of the source area of the former Cell Building Area as a continuing source of groundwater contamination before addressing the remainder of the contamination in the subsurface of the Site. It is also considered an interim action as it is not the final action to be taken to address OU2 and is not intended to restore groundwater to attain drinking water levels. The State of GA, as represented by the Georgia Environmental Protection Division (GAEPD), is the support agency. In accordance with 40 C.F.R. § 300.430, GAEPD has provided input during the Remedial Investigation (RI)/Focused Feasibility Study (FFS) and decision-making process. The State of GA concurs with the Selected Remedy.

3.0 ASSESSMENT OF THE SITE

The response action selected in this interim early action record of decision (IEAROD) is necessary to protect public health, or welfare, or the environment, from actual or threatened releases of hazardous substances from the Site, which may present an imminent and substantial endangerment to public health, or welfare, or the environment. The remedy will address the mercury in the subsurface of the source area of the former cell building area as a continuing source.

4.0 DESCRIPTION OF SELECTED REMEDY

The EPA's Selected Remedy is In situ Chemical Sequestration (ICS) (a form of chemical treatment), Improvement and Maintenance of the Existing Soil Dermal Cover, and Institutional Controls (in the form of the existing Environmental Covenant and Zoning restrictions). As detailed in the Proposed Plan (PP), this alternative has been modified from the FFS as sitewide groundwater monitoring, including sampling for Monitored Natural Attenuation (MNA) parameters, is now planned to be conducted pursuant to the 1995 Administrative Order by Consent (AOC) for Remedial Investigation/Feasibility Study and is not part of the selected remedy. The selected remedy is an interim early action to address mercury in the subsurface beneath the former Cell Building Area (CBA) in OU2 which acts as a source of groundwater contamination. OU1 (the salt marsh) has already been addressed in a previous remedy selection and the remedial action has been implemented. OU1 is now in the monitoring phase for the remedy. OU3 was addressed by earlier removal actions and a subsequent No Further Action ROD. OU2 will require a final ROD in the future to fully address all contaminants of concern (COC) in groundwater.

The primary components of the selected remedy include:

- Implementing *in situ* chemical sequestration (ICS) (a form of chemical treatment).
- Improving and maintaining the soil dermal cover that exists across the CBA.
- Maintain institutional controls (ICs) (in the form of the existing environmental covenant and zoning restrictions).

This alternative consists of the improvement and maintenance of the existing soil dermal cover over all portions of contaminated soil in the CBA to minimize water infiltration (by being graded to promote runoff) and limiting inadvertent human intrusion activities. The cover will be sloped, where possible, to facilitate drainage and would be constructed to a uniform thickness of at least 24 inches (2 feet). The cover does not meet landfill final cover requirements and is not intended to prevent leaching of COCs into groundwater.

The NCP establishes an expectation that the EPA will use treatment to address the principal threats posed at a site wherever practicable (Section 300.430[a][1][iii][A]). Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Mercury (Hg) is present at the LCP Site in multiple forms: an elemental state (Hg0) of metallic mercury observed as discrete "beads" in the subsurface, in a state where it has formed compounds (usually salts) in the soil and aquifer matrix, and in a dissolved state in groundwater. Prior to finalizing the soil cover, in situ chemical sequestration (ICS) (a form of chemical treatment) using polysulfides and/or other amendments as appropriate, would be applied to the subsurface prior to finalizing the soil cover to convert elemental mercury (Hg0) to a form of mercuric sulfide and to minimize the dissolution of mercury. Other existing forms of mercury in the subsurface treatment area would also be addressed and converted to insoluble and less mobile forms of mercuric sulfide. This remedy is selected because it will achieve substantial risk reduction by both treating the source materials (namely subsurface mercury contamination) constituting principal threats at the Site and providing safe management of remaining material. This combination reduces risk sooner and takes less time to implement than the other alternatives.

Although it was stated in the EPA's approval of the FFS that evaluation of MNA through periodic groundwater monitoring (including MNA parameters) would be a component of the alternatives evaluated for this Proposed Plan, the EPA has since requested that the Potentially Responsible Parties (PRPs) implement periodic groundwater monitoring as soon as possible to provide information for the evaluation of a final remedy that addresses all COCs in groundwater. The EPA requested the monitoring include collection parameters to evaluate MNA, therefore, MNA is no longer included in the alternatives described in the proposed plan. The existing ICs would continue to be maintained to control use of the area. In addition, an RI soil sample indicated elemental mercury within the CBA just north of the former Cell Building foundation footprint. The area will be resampled and if confirmed will be removed and disposed of off-site or will be treated in place.

5.0 STATUTORY DETERMINATIONS

This interim early action is protective of human health and the environment in the short term and is intended to provide adequate protection until a final ROD is signed. It also complies with Federal and State environmental requirements that are applicable or relevant and appropriate for this limited-scope action and is cost-effective. Although this interim early action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable (CERCLA § 121(b)), and the regulatory requirements of the NCP, this interim early action does utilize treatment to address subsurface mercury contamination that is considered principal threat waste and thus supports that statutory mandate. This interim remedy meets the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, however this action is not the final remedy for the Site, and the statutory preference may also be addressed by the final response action. Subsequent actions are planned to fully address the threats posed by conditions at this Site.

Because this remedy will result in hazardous substances remaining on-site above health-based levels that would allow unlimited use and unrestricted exposure, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the Remedial Action. A five-year review pursuant to CERCLA § 121(c) is already triggered for the Site based on the already implemented Remedial Action for OU1 and hazardous substances remaining on-site above health-based levels. Because this is an interim early action ROD, review of this Site and remedy will be ongoing as the EPA continues to develop remedial alternatives for a final OU2 remedy at the Site.

6.0 DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary Section of this IEAROD. Additional information can be found in the Administrative Record file for this Site.

- Current and reasonably anticipated future land use assumptions (Section 6);
- COCs and their respective concentrations (Section 7);
- Baseline risk represented by the COCs (Section 7);
- How source materials constituting principal threats are addressed (Section 11);
- Cleanup levels established for COCs and the basis for these levels (Section 12);
- Potential land use that will be available at the Site as a result of the Selected Remedy (Section 12);
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 10); and
- Key factors that led to selecting the remedy (Section 13).

7.0 AUTHORIZING SIGNATURE

This IEAROD documents the interim early action remedy to address contaminated groundwater at the Site. This remedy was selected by the EPA with the concurrence of GAEPD. The Director of the Superfund Division in EPA, Region 4, has been delegated the authority to approve and sign this IEAROD.

CAROLINE FREEMAN Digitally signed by CAROLINE FREEMAN
Date: 2025.03.28 15:12:08 -04'00'

Caroline Y. Freeman, Director Date
Superfund & Emergency Management Division

PART 2: DECISION SUMMARY

This Decision Summary provides a description of the site-specific factors and analyses that led to the selection of the interim early action remedy for the LCP Superfund Site, OU2. It includes background information about the Site, the nature and extent of contamination found at the Site, the assessment of human health and environmental risks posed by the contaminants at the Site, the identification and evaluation of remedial action (RA) alternatives for the Site, and the selection of a remedy that will address risks posed by the contamination at the Site.

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The LCP Chemicals Superfund Site is located in Brunswick, Georgia (GA). The Site's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number is: GAD099303182. The EPA is the lead agency for oversight of the Site. The Environmental Protection Division of the Georgia Department of Natural Resources is the support agency for oversight. The Site is a former industrial facility and is being addressed by a group of Potentially Responsible Parties (PRPs) under the oversight of the EPA. The PRPs provide the funding to address the Site under the terms of enforceable agreements with the EPA. The Site occupies approximately 813 acres immediately northwest of the City of Brunswick, Glynn County, Georgia (Figure 1-1). Tidal marshland comprises about 670+ acres of the original property. The primary upland area (where manufacturing operations at the LCP facility occurred), is located on 133.5 acres of upland area, east of the marsh and bordered by county operations to the north, Ross Road to the east, the Turtle River and associated marshes to the west, and Brunswick Cellulose to the south. OU2 consists of contaminated groundwater beneath the Site and soil beneath the former chlor-alkali CBA.

A boundary survey of the original Site (with full title search) was completed by EMC Engineering Inc. in 2007. The original boundary is provided in Figure 1-2. Three sub parcels of the Site have since been purchased. The former Salt Dock was sold to Georgia Pacific (now Brunswick Cellulose). In 2012, Glynn County purchased a portion of the uplands area of the Site for the development of a county detention center (Figure 1-2). Lastly, a small track of land centrally located at the north end of the uplands was purchased from Georgia Power to consolidate the Site.

Industrial development of the Site began approximately 100 years ago in 1919 and continued until 1994. The Site features and infrastructure that evolved over this period to support each successive industrial activity overlap. Associated with each historical operation were numerous processes that generated various waste material or liquids that, in some instances, were released to the surface or groundwater.

2.0 SITE HISTORY AND ENFORCEMENT ACTIONS

2.1 SITE OPERATIONAL HISOTRY

A history of Site operations and contamination (focusing on groundwater) is presented under three subsections: *Refinery and Power Generation Operations (1919-1955), Past Manufacturing*

(1941-1955), and *Chlor-Alkali Operations (1955-1994)*. This remedy will address an area impacted by mercury released by the chlor-alkali operations.

2.1.1 Refinery and Power Generation Operations (1919-1955)

Atlantic Richfield Company (ARCO) operated the Site as a petroleum refinery from 1919 to the early 1930s. At one time, over 100 process and storage tanks were present on the Arco facility with operations spanning much of the Site. Georgia Power Company purchased portions of the Site in 1937, 1942, and 1950. Power plant operations were generally centered on the upland portion of the Site (Refer to Figures 2-1 and 2-2).

Areas of operation by Arco and Georgia Power Company that reasonably contributed to groundwater contamination include what are referred to as the North and South Removal Areas, North and South Separators, and Bunker “C” Tank Area. Petroleum process sludges were buried in portions of the former Brunswick-Altamaha Canal. Much of the Site is also characterized by a petroleum hydrocarbon smear zone, which is the weathered remnants of petroleum products released in portions of the upland during this time period.

2.1.2 Paint and Varnish Manufacturing (1941-1955)

The Dixie Paint and Varnish Company (O’Brien) operated a paint and varnish manufacturing facility at the Site from 1941 to 1955 on a portion of the property south of the Georgia Power Company parcel (Figure 2-3). No information on the process operations and practices of the paint and varnish manufacturing facility is available.

Records of disposal for the Dixie Paint and Varnish Company are not available. Disposal of coatings products (i.e., paint) is inferred from the nature of soil and waste removed from a Former Facility Disposal Area during a 1994-1997 uplands soil removal action. Based on this, the disposal of coatings products is an unknown but a probable contributing factor to Site soil and groundwater contamination.

2.1.3 Chlor-Alkali Operations (1955-1994)

In 1955, after acquiring almost all the land constituting what is now known to be the Site, Allied Chemical and Dye Corporation (Allied, now Honeywell) established and operated a chlor-alkali facility on a portion of the Site, principally for production of caustic solution, chlorine gas, and hydrogen gas. The chlor-alkali facility operated using a mercury cell process, which involves passing a concentrated brine solution between stationary graphite or metal anode and a flowing mercury cathode to produce chlorine gas, sodium hydroxide (the caustic solution), and hydrogen gas. Sodium hypochlorite (bleach) was also produced in a secondary reaction. For a time, the graphite anodes were impregnated with the polychlorinated biphenyl (PCB) Aroclor 1268 to extend their use. The former chlor-alkali manufacturing operation was centered south of B-Street. Two sister buildings at this location designated Cell Building 1 (north building) and Cell Building 2 (south building) each contained an independent mercury cell process supported by a salt purification plant and additional on-site holding tanks for process liquids.

LCP Chemicals, Inc. (LCP) purchased the property and the chlor-alkali plant from Allied in 1979. The chlor-alkali process continued with modification. Part of the modification included the production of hydrochloric acid by reacting chlorine and hydrogen. LCP's operations ended on February 2, 1994.

Historical release of mercury is attributed to the loss of liquid mercury during system operation (i.e., leaks and spills) and to a lesser extent as dissolved mercury in caustic releases. Leaks and spills also occurred for liquid caustic, sodium chloride brine, and bleach. In addition, the chlor-alkali operations were supported by several on-site lagoons or impoundments used to hold manufacturing waste process liquids. The impoundments were unlined and included linear sections of the former excavated Altamaha Canal that historically traversed the western half of the Site (Refer to Figure 2-4). Some of these same impoundments were also used for former refinery disposal operations. The impoundment liquids/waste provided a secondary pathway to release constituents to groundwater. There were also wastewater discharges containing mercury prior to the Clean Water Act.

2.2 REGULATORY AND INVESTIGATION HISTORY

2.2.1 OU2 Site-Wide Groundwater Regulatory Background

The first OU2 Remedial Investigation (RI) Report was completed in September 1997 following two years of site characterization and monitoring (GeoSyntec, 1997). A comprehensive supplemental site characterization phase was completed in 2001-2 with results presented in the Groundwater RI Addendum Report, Revision 1 (GeoSyntec, 2002) submitted to the EPA on January 16, 2002.

Following submission of the Addendum Report, the focus shifted to the other Site OUs. During this period the potentially responsible parties (PRPs) continued to implement both voluntary and EPA-requested groundwater monitoring that spanned 18 years, substantially improving the understanding of the groundwater condition and fate and transport of constituents. Several targeted OU2 studies were performed during this time including assessment of potential petroleum product as a light nonaqueous phase liquid (LNAPL), assessment of chromium oxidation state, and assessment of groundwater flux to the marsh.

On January 26, 2017, the EPA issued a request to resume the characterization of OU2 to support the preparation of the OU2 RI. The request included the preparation of a work plan for sampling all the groundwater monitoring wells at the Site. A work plan for this scope of work was approved by the EPA on August 7, 2017 and sampling was performed in September 2017. On October 4, 2017, the EPA issued a second request to complete further characterization of OU2, involving two primary components: (i) additional subsurface characterization of the CBA, and (ii) groundwater sampling in a portion of the Site-wide monitoring well network within and downgradient of the CBA. The EPA approved the work plan for the CBA on March 6, 2018, and work commenced later in 2018.

In a meeting convened on November 13, 2019, the EPA requested the PRPs submit a Site Characterization Summary Report (SCSR) providing a summary of groundwater investigations and data collected from these work scopes, and including all OU2 investigations completed since the mid-1990s. The SCSR was submitted to the EPA on January 31, 2019. On July 9, 2020, the EPA provided comments on the SCSR including a request to perform additional targeted groundwater sampling to address specific data gaps. The PRPs agreed to perform the additional sampling and addressed the EPA's comments in a letter dated July 20, 2020, and submitted a revised SCSR on July 22, 2020 (EPS, 2020). In the PRPs response, the PRPs further agreed to address EPA comments beyond the scope of the SCSR (i.e., interpretation and modeling-based requests) in the subsequent RI Report. The SCSR was approved by the EPA in a letter dated August 14, 2020 (EPA, 2020).

Meetings convened in June 2022 with the EPA resulted in the concept of an Interim Early Action for the CBA portion of the Site, to be evaluated and implemented on a more expedited timeline relative to Site-wide groundwater.

The FFS supported the Proposed Plan that proceeded the IEAROD and was supported with the following technical documents:

- Site Characterization Summary Report, Revision 1, dated July 2020 (EPS, 2020);
- Remedial Investigation Report1, Revision 2, dated September 2022 (Montrose, 2022a);
- CBA FFS Technical Memorandum #1, Remedial Action Objectives dated September 19, 2022 (Montrose, 2022b); and
- CBA FFS Technical Memorandum #2, Technology Screening, dated October 31, 2022 (Montrose, 2022c).

2.2.2 OU2 Cell Building Area Investigation History

2.2.2.1 General Characterization of the CBA Footprint

The CBA footprint has been characterized in multiple episodes extending back to the 1994-1997 removal response action. The initial characterization of the shallow CBA soil in 1994 included soil borings spanning the CBA footprint followed by targeted test pits in areas of cell building subsidence in 1996. Each event assessed for metals, volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and PCBs. Soil testing results are provided in Tables 2-1a through 2-1e for the various analytical parameter groups. The deeper CBA condition was investigated with continuous soil coring (14 locations) and cone penetrometer testing (44 locations) to evaluate for the presence of elemental mercury (Hg^0) and characterize the CBA hydrogeologic properties. More recently, continuous soil coring was complete in 2018 (18 locations) and 2019 (59 locations within and adjacent to the CBA to support the Phase 4 CO_2 sparge design) to delineate historical Hg^0 observations. The 2018 soil coring also evaluated for target analyte metals (TAL) (including Hg) and PAHs to supplement past soil sampling across the CBA (Tables 2-2a through 2-2c). Lastly, in 2021 the surface soil beneath the CBA soil dermal cover was assessed at 12 locations for VOCs, PAHs, TAL metals including mercury, and PCBs (Tables 2-3a through 2-3d).

2.2.2.2 Characterization Studies Specific to Elemental Mercury

Both cell buildings exhibited significant subsidence during the operational period owing to caustic releases weakening the structural integrity of the Satilla sands (partial dissolution of quartz grains within the sandy matrix). This condition facilitated the vertical spread of Hg^0 into the Satilla, with Hg^0 observed in the Satilla to a depth of 50 ft below ground surface (bgs). The vertical spread of Hg^0 was also likely facilitated by the vibratory effects of structural pile driving in the late 1980s to stabilize the cell buildings.

Multiple episodes of subsurface investigations were performed to assess and delineate the conditions across the CBA and in the subsurface beneath the cell buildings.

In October 1994, 55 shallow soil borings (to a depth of approximately 5 ft bgs) were advanced with a hand auger across the CBA. Each soil boring was visually assessed for the presence of Hg^0 and one to three soil samples were collected for testing. The location of each hand auger boring is provided in Figure 2-5. Soil boring samples were tested for metals, VOCs, PAHs, and PCBs.

In 1996, seven test pits were excavated in the CBA in areas of greatest subsidence, five in Cell Building 1 and two in Cell Building 2 (Figure 2-5). The purpose of each test pit was to examine for the potential presence of a layer accumulation of Hg^0 beneath the cell building concrete slabs. No layer of Hg^0 was observed underlying the concrete floor slab in any of the test pits (note the shallow depth to groundwater indicated in the inset photograph). Soil samples were collected for testing for Hg, lead, VOCs, PAHs, and PCBs.

Borings with continuous soil core collected through the Satilla were performed in the CBA for the purpose of identifying the presence of Hg^0. In total 14 continuous soil cores (locations SB-471 through SB-484) were collected during this event (Figure 2-5).

In November-December 2018, 18 additional soil borings were completed with continuous soil coring from the ground surface to the base of the Satilla Formation within the CBA and one location north of the CBA (as shown in Figure 2-5). Each core was examined under magnification for the presence of Hg^0. Portions of each core were systematically sampled at a vertical interval of generally 4 ft, resulting in up to 15 soil samples per boring for the purpose of quantifying the saturated soil Hg concentration. Another element of this program was the collection of soil samples for chemical analysis involving TAL metals (including Hg) and PAHs to supplement past soil sampling across the CBA. Soil cores were examined for PAH indicators including visual observation for discoloration or staining, identification of odor, and use of ultraviolet light scanning for identifying the presence of petroleum; soil samples were collected for PAH analysis where PAH indicators were observed (whether above or below the water table), including depths up to 16 ft bgs.

In March-April 2019, the final phase (Phase 4) of the caustic brine pool (CBP) response action was initiated with the installation of 59 CO_2 sparge wells across a portion of the CBA (Figure 2-5). The drilling was performed using sonic methods with an inner core barrel to collect continuous soil cores, providing additional coverage for the assessment and delineation of Hg^0 in the subsurface. The CBP response action is described in Section 2.3.

In August 2021, 12 locations along the periphery of the CBA were sampled to address a data gap regarding the characterization of surficial soil, i.e., the top 2 ft of the soil horizon (Figure 2-5). The investigation involved the use of a hand spade to excavate a shallow pit to allow for visual identification of the interface between the clean soil cover and the underlying original surface soil. The underlying native material in the top 2 ft of the soil column was collected accordingly. The testing involved analysis for VOCs, PAHs, TAL metals including Hg, and PCBs.

2.2.2.3 Cell Building Area Mercury Vapor Assessment

In July 2022, Montrose conducted testing of vapor emissions assessment in the CBA to evaluate the efficacy of the soil cover in preventing the atmospheric release of potential emissions from the Hg^0 condition beneath portions of the former cell buildings. The Hg vapor assessment involved measuring Hg vapor concentrations using a high sensitivity 915+ Portable Hg Vapor Analyzer (by Lumex®; herein referred to as the "Lumex-RA 915+"). The Lumex-RA 915+ allows real-time (continuous) mercury vapor level readings with an analytical detection limit of 0.5 nanograms per cubic meter (ng/m^3) (lower than project-appropriate, risk-based screening levels providing a conservative method of screening analyses), and provides 10-second rolling averages.

The study followed a systematic sampling design across the CBA at 50-foot centers (as shown in Figure 2-6) (FFS Figure 3-2b) with a triad of measurements collected at each monitoring station, including: measurement of ambient air from the breathing zone (i.e., approximately five feet above ground surface); measurement of ambient air adjacent to the ground surface; and measurement of soil gas within the soil cover. Measurements were also collected at a background location selected as the administrative building along the eastern property boundary (Figure 2-6). Hg^0 vapor concentrations in soil gas, at the ground surface, and in ambient air (i.e., the breathing zone) are presented in Table 2-4.

2.3 PREVIOUS RESPONSE ACTIONS

2.3.1 Upland Response Action of 1994-1997

Between 1994 and 1997, a removal response action was performed on the upland portion of the Site addressing process waste disposal areas and contaminated soil areas. This work was conducted by the PRPs under EPA oversight and approval under the terms of a removal order. The removal action included the excavation of approximately 167,000 cubic yards of contaminated soil and industrial process waste removed. Clean backfill was used to restore grade and promote positive drainage to limit ponding and infiltration of rainwater and surface water across the property.

In the CBA, all above-grade structures were razed. The concrete floor slabs of each of the two cell buildings were left intact to serve as a barrier to underlying soils containing beads of Hg^0. A soil cover of approximately 2-feet in thickness was placed across the CBA to further provide for a dermal contact barrier and to mitigate potential Hg vapor emissions from the building slab.

2.3.2 Caustic Brine Pool Response Action (2013-2019)

The term CBP was used to describe a condition of altered groundwater geochemistry due to co-located operational releases of caustic liquid and brine. A portion of the CBP condition was within the CBA footprint.

In 2006, the EPA redirected activity under the terms of an Administrative Settlement Agreement and Order on Consent for Removal Action specific to the CBA which encompassed the former mercury cell process operations and associated release of CBA process liquids, most notably the co-located release of sodium hydroxide (caustic soda) and brine solutions which resulted in the “body” of groundwater referred to as the CBP (EPA, 2006). The 2006 ASAOC required Honeywell to take corrective action to reduce the pH of the CBP to below 10.5 and reduce the specific gravity of the CBP.

Following a Proof of Process pilot test in 2012, four phases of CBP treatment with in situ CO_2 sparging occurred (November 2013 – August 2019). Phases 1 through 3 targeted the CBP condition outside the footprint of the CBA, whereas Phase 4 targeted the CBA. The injection of CO_2 achieved the two principal objectives of the governing administrative order: (i) a reduction in groundwater pH to below 10.5, and (ii), a reduction in the groundwater specific gravity. Both goals have been met as reported in the *CO_2 Sparging Phase 4 Full-Scale Implementation and Monitoring Report* (Mutch Associates, 2020). An additional added benefit resulting from the lowering of the groundwater pH was a corresponding reduction in certain dissolved-phase metal concentrations including mercury. The results of groundwater monitoring did not indicate a rebound in dissolved phase metal concentrations.

3.0 COMMUNITY PARTICIPATION

The public participation requirements in CERCLA and the NCP were met in the remedy selection process. NCP Section 300.430(f)(3) establishes a number of public participation activities that the lead agency must conduct throughout this process. Site documents including the RI Report, FFS Report, and Proposed Plan and other pertinent documents for the LCP Superfund Site, OU2, were made available to the public on July 5, 2024, in the Administrative Record file repositories. The Administrative Record repositories are located at the EPA Region 4 Superfund Records Center (61 Forsyth Street, Atlanta, GA 30303), and at the local repository located at the Three Rivers Regional Library System (formerly Brunswick-Glynn County Library System) located at 208 Gloucester Street in Brunswick, GA 31520. The Administrative Record was also made available online at the EPA website for the LCP Superfund Site. A Notice of Availability was published in the Brunswick News on July 5, 2024.

The EPA has worked closely with community members and other stakeholders throughout the development of the remedial investigation, focused feasibility study, and Interim Early Action Proposed Plan for OU2. Community participation played an essential role in the development of the Interim Early Action Proposed Plan and ROD for OU2 at the Site. During the investigation of the site and the development of the RI Report, FFS Report, and Proposed Plan, the EPA has engaged with the public and multiple stakeholders many times over the years. The EPA has an active community engagement effort in the Brunswick area. In addition to holding open information sessions during the RI, the EPA held sessions during the RI (including participation in the National Remedy Review Board process), at the start and conclusion of the FFS and received input from the community regarding the alternatives being evaluated and the planned path of action for the Site. The EPA held information sessions for multiple NPL sites in Brunswick including LCP OU2 in 2022 and 2023 and participated as a guest on Zoom calls with the community and non-governmental organizations updating the community on the progress at the site, the Superfund process, and receiving input from the community.

The original public comment period was held from July 5, 2024, to August 5, 2024. During that comment period the EPA received stakeholder requests for an extension and extended the comment period for an additional 30 days to September 5, 2024. The EPA hosted informal information sessions mid-morning and mid-afternoon on July 16 and 17, 2024 at the Glynn County Library for community engagement regarding the Proposed Plan which were attended by many community members for one-on-one interaction with the EPA RPMs, Community Involvement Coordinator (CIC), GAEPD, and technical experts from Region 4 and the Office of Research and Development (ORD). The EPA held a public meeting to present the Proposed Plan and preferred alternative to stakeholders and receive public comment directly on July 18, 2024, at Zion Rock Baptist Church, (a local congregation at 3200 Gordon Street in Brunswick very close to the Site) during the original public comment period. During the meeting the EPA presented a description of the interim early action Preferred Alternative and other alternatives in the Proposed Plan, a schedule for remedy implementation, and invited nearby residents and interested parties to comment and ask questions of EPA staff. Approximately 20 people attended the meeting. The comments received during the meeting and the responses provided by the EPA are summarized in the Responsiveness Summary (Appendix A). In addition, the official court recorder transcript of the public meeting is attached to this IEAROD as Appendix B. The EPA received many individual comment submissions about the Interim Early Action Proposed Plan during the extended comment period from July 5, 2024, through September 5, 2024. The EPA also met with local elected officials from the City of Brunswick and Glynn County multiple times for updates and information sharing during the RI/FFS and Proposed Plan stage. Due to the request for an extension for public comment, the EPA hosted an additional informal information session on Thursday, August 29, 2024, at Howard Coffin Park located at 1402 Sonny Miller Way in Brunswick, GA (located near the local community housing areas) between 11:00 am and 1:00 pm for an opportunity to speak one-on-one with EPA representatives. That evening starting at 5:30 pm, the EPA re-presented the Proposed Plan and held an open informal discussion with community members. Approximately 20 people also attended the informal Proposed Plan meeting. Combined, the EPA estimates 100 stakeholders interacted with the EPA directly during 3 information sessions and 2 meetings during the extended 60-day public comment period.

The EPA responses to written comments received during the public comment period is included in the Responsiveness Summary, Part 3 of this IEAROD.

4.0 SCOPE AND ROLE OF THE RESPONSE ACTION

The interim early action remedy for OU2 is being selected to address the immediate threat of human health exposure to mercury contaminated CBA soil and groundwater and treat and minimize additional leaching of contaminants to groundwater and the possibility of vapor intrusion at the Site. Minimizing additional releases of subsurface mercury into groundwater is consistent with the overall remedial goal of improving groundwater at the Site. Additional actions may be warranted to further treat groundwater contamination as part of a final remedy for OU2.

The interim early response action will be conducted under the Superfund remedial program and will be conducted by the PRPs with EPA oversight. The interim early action will neither be inconsistent with, nor preclude implementation of the final remedy. The Selected Remedy is intended to attain RAOs and cleanup levels, and this interim early action will allow the EPA to issue the final ROD at a later time. The overall site cleanup plan is well developed at the LCP Brunswick NPL Site.

• Past removal actions successfully addressed mass contamination at the site before and directly after the NPL listing with contaminated building debris, soil, and sediment being removed from the site. An additional removal action injected carbon dioxide into the subsurface to neutralize the extremely high pH groundwater. These actions worked well with the investigations for OU1 (the salt marsh), OU2 (the former CBA and site-wide groundwater) and OU3 (the uplands) which have resulted in remedial decisions for those OUs.

• Past response actions include the above-described removal actions and the OU1 excavation and dredging of the salt marsh. In addition to the **activities proposed in this IEAROD to address mercury,** the future response plans for the site include monitoring of the salt marsh, continuing ICs, additional groundwater sampling and characterization and a final remedy for the site-wide groundwater.

• As this is an IEAROD, the OU response action of addressing mercury in the source area will be consistent with the final action selected to address contamination in site-wide groundwater.

As with many Superfund sites, the problems at the LCP Brunswick NPL Site are complex. As a result, the EPA organized the work into three operable units (OUs):

- Operable Unit 1: The Salt Marsh
- Operable Unit 2: The former Cell Building Area and Site-Wide Groundwater
- Operable Unit 3: The Uplands

The EPA has already implemented the remedy for OU 1, which included excavation and dredging of contaminated marsh sediments, placement of a thin layer cap, and long-term monitoring of the salt marsh. This remedial action has been completed and is in the monitoring stage.

The second operable unit, the subject of this IEAROD, addresses mercury contamination in the subsurface under the former Cell Building Area. Elemental mercury exists in the subsurface of the CBA. Ingestion of water extracted from this aquifer poses a current and potential risk to human health because the EPA's acceptable risk range is exceeded, and concentrations of contaminants are greater than the maximum contaminant levels for drinking water (as specified in the Safe Drinking Water Act). This IEAROD for the second operable unit presents a response action for this site and addresses a principal threat at the site through the treatment of mercury source material in the aquifer. The remaining contaminants will be addressed in a later ROD for OU2.

The third operable unit (the Uplands) was determined to require no additional action as the previous removal actions had addressed the contamination in soil to a level that is protective of the current use of the site as an industrial area. An additional risk assessment demonstrated that OU3 was also appropriate to use as a recreational area for redevelopment purposes.

The final ROD must satisfy the following:

- provide long-term protection of human health and the environment;

- comply with Applicable or Relevant and Appropriate Requirements;
- fully address the principal threats posed by the Site; and
- address the statutory preference for treatment that reduces the toxicity, mobility, or volume of wastes.

5.0 SITE CHARACTERISTICS

5.1 CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) describes the contaminant source(s), contaminant release and transport mechanisms, exposure media, exposure routes, and the potentially exposed human populations. The primary objective of the CSM is to identify the complete and incomplete exposure pathways. A complete pathway has all of the components listed above, whereas an incomplete pathway is missing one or more of the components. Figures 5-1 and 5-2 present the CSM for human exposures at the Site to groundwater and CBA soil, respectively.

Potentially complete exposure pathways examined include:

- Ingestion of surface and mixed (surface and subsurface) soil and groundwater;
- Dermal contact with surface and mixed (surface and subsurface) soil and groundwater;
- Inhalation of Hg^0 vapor from surface and mixed (surface and subsurface) soil and groundwater
- Inhalation of Hg^0 vapor from groundwater vapor intrusion; and
- Inhalation of fugitive dust from surface and mixed (surface and subsurface) soil.

Potential media/receptors for the Site include:

- Groundwater - Potential receptors are current/future Site workers, future construction workers, and hypothetical future residents.
- Indoor air - Potential receptors are current/future commercial/industrial workers and hypothetical future residents.
- Surface soil - Potential receptors are current/future Site workers, current/future trespassers, and hypothetical future residents.
- Mixed (surface and subsurface) soil - Potential receptors are future construction workers.

5.2 OVERVIEW OF THE SITE

The following sections present Site-specific information on the physical and anthropological conditions that exist at and near the Site. Climate is a factor in determining the amount of rainfall and evaporation, which ultimately drives the amount of infiltration into the subsurface. The geologic and hydrogeologic conditions near the Site play a major role in determining the nature, extent, fate, and transport of the subsurface contamination. Demographics and land use help in understanding which populations and receptors may be at risk.

5.2.1 Site Topography and Surface Water

Site topography is characterized by subtle relief with highest elevations adjacent to Ross Road, typically near 15 ft above mean sea level (ft-amsl), on the eastern border of the property, sloping to the west along a fairly constant grade to an elevation of approximately 4 ft-amsl at the edge of the marsh over a lateral distance of approximately 1,500 ft.

Local alterations were made to the Site topography as a result of the removal action demolition, excavation, and backfilling activities. Site-wide surface grading was completed in June 1997 as the final element of the removal action in the upland area. The design plan for the surface-water drainage is described in the document Surface Water Management Plan Former LCP Chemicals Site, Brunswick, Georgia, (GeoSyntec, 1997b). Current topography subdivides the Site into six surface-water drainage areas (Figure 5-3). The surface-water flow in the central area of the Site is directed along a constructed discharge channel along B Street. Drainage north of B-Street occurs as gentle sheet flow toward the marsh. The southern area of the Site contains a ditch constructed to direct runoff to the marsh.

5.2.2 Climate and Meteorology

Comparisons of rainfall records from the Site and records of groundwater level fluctuations in the upper surficial aquifer beneath the Site show that in most instances groundwater levels respond almost immediately (i.e., in less than an hour) to appreciable rainfall events. Commonly, the rise in groundwater level resulting from a particular rainfall event will peak out in 11 to 12 hours or less and start a decline at a rate one-half to one-quarter or less of the rate of rise. With sustained rainfall, the water table can rise to the ground surface elevation across much of the Site.

Average annual precipitation for the Brunswick area is 49.6 inches based on the data recorded by the National Oceanic and Atmospheric Administration National Centers for Environmental Information. This is based on the weather records for the 30-year period of 1981 – 2010. Rainfall events in the Brunswick area vary throughout the year. Maximum rainfall, mainly from thunderstorms, occurs in the summer and autumn seasons.

5.2.3 Regional Geology and Hydrogeology

The Site is underlaid by the Satilla Formation, which is Holocene to Pliocene in age and occurs in the approximately upper 50-ft of the stratigraphic section. The Satilla is followed by the Ebenezer Formation Upper Miocene in age. This unit represents the Water-table Zone aquifer. Underlying is the Ebenezer Formation replacing the Coosawhatchie designation in recent reporting of Georgia Geological Survey Information Circulars, publications by the U.S. Geological Survey, and reporting by engineering consultants (Steele and McDowell, 1998; Leeth, 1999; Weems and Edwards, 2001; Gill, 2001; Radtke, 2001; Clarke, 2003; Cherry et al., 2011; Gill et al., 2011). A key change involves raising the rank of the Ebenezer Member of the Coosawhatchie Formation to Formation status (Weems and Edwards, 2001). The top of the Ebenezer Formation is marked by a layer of cemented sandstone (Ebenezer Member #5) which serves as a semi-confining layer. Five Members comprise the Ebenezer and collectively are referred to as the Surficial Confined Water-bearing Zone. The Middle Miocene in Brunswick represent a regional confining layer under the nomenclature Berryville Clay, occurring from approximately 175 – 255 ft bgs. Deeper in the stratigraphic section occurs the Upper and Lower Brunswick Aquifers of Middle to Lower Miocene age, separated by a separating confining unit (Parachucla Formation). The Upper Floridan Aquifer occurs from approximately 500 – 1000 ft bgs at the Site.

Groundwater data from beneath the variably cemented sandstone layer indicates some amount of hydraulic connection to the Ebenezer Members #4/#3 described in the RI Report as the Coosawhatchie A/B unit). This zone is monitored by the network of "D" vertical monitoring wells and the "HW" horizontal monitoring wells on the Site. A marlstone (Fuller's earth) confining layer is located beneath this zone, at a depth of approximately 100 ft-bgs and approximately 30-ft thick (described in the 1997 RI Report as the Coosawhatchie C unit). The Ebenezer Member #1 waterbearing zone (approximately 50-ft thick) is the lowermost portion of the Surficial Aquifer, known as the "Rock Aquifer" and is a water supply source for domestic households within the county where public water is not served. A generalized profile of the hydrogeologic setting is provided in Figure 5-4.

5.2.4 Site-Specific Geology

The Upper Satilla sand member is typically very well sorted (i.e., uniform grain size with little fines) and consists of very fine to medium grain quartz sand characteristic of a historical shoreline deposit. The Upper Satilla ranges in thickness from 30 to 40 ft over most of the Site but becomes thinner in regions near the marsh edge. The Upper Satilla sand gradually and cyclically courses in depth, with the upper part of the unit tending to be very fine-grained, whereas the basal part tends to be medium to coarse-grained. Discontinuous thin beds and laminations of silty clay are present in some places in the Formation. These beds commonly contain an abundance of organic material in the form of molluscan fecal pellets and fine plant debris. The silty beds are consistent with ripple-fill lamination found in a coastal beach environment.

The Lower Satilla member is a complex lithologic sequence with considerable lateral and vertical variability. Lithologies range from massive, high plasticity clay to silty clayey sands to fairly clean coarse sand with shells. The Lower Satilla member varies irregularly in thickness, ranging from around 12-14 ft thick in the northeastern part of the Site to around 2 to 4 ft thick in the southeastern part of the Site.

The base of the Lower Satilla member typically consists of a bioturbated mixture of sand, silts, and clay with oyster shells. Overlying the basal bed is clay, sand or vertically stratified sand and clay. The clay in the Lower Satilla member ranges from massive, high plasticity clay to interlaminated sequences of sand, silt, and clay. In some areas, and across the southwest portion of the Site, the clay is absent altogether. The Lower Satilla member is interpreted to have been deposited in an estuarine setting.

The top of the Ebenezer Formation (Member #5 - Variably Cemented Sandstone) is identified by a variably cemented sandstone layer encountered at a depth of approximately 50 ft-bgs. The sandstone is strongly to weakly cemented and contains a matrix of silica, dolomite, and phosphate cements. The variably cemented sandstone was encountered in every soil boring drilled to sufficient depth on Site. The thickness of the sandstone varies but typically ranges from

5 ft to 15 ft thick. The sandstone is considered a semi-confining unit based upon petrographic testing, pumping test response, and chemical concentration profiles between wells screened above and below the unit.

The Ebenezer #3/#4 (formerly Coosawhatchie A/B) consists primarily of medium gray sand with lesser amounts of greenish-gray silt. The sand is typically fine to medium-grained, slightly silty, and well sorted. The total thickness of the #3 Member ranges from approximately 16 to 24 ft. The deeper Ebenezer #4 Member ranges from approximately 18 to 37 ft thick and consists of two coarsening downward sequences. The sequences consist of medium dark gray clayey sand and silt overlying fine to medium sand, overlying sandy and clayey gravel.

The Ebenezer #2 (formerly Coosawhatchie C) is a semi-confining unit which consists of grayish green dolomitic marlstone and gravelly fuller's earth (smectitic) clay. This member is estimated to be approximately 30 ft thick.

The Ebenezer #1 (formerly Coosawhatchie D) consists of medium to coarse sand and is estimated to be approximately 50 ft thick. Most of the shallow potable wells completed in the Brunswick and Blythe Island areas are completed in this unit and the unit is a confined aquifer (i.e., Rock Aquifer).

5.2.5 Site-Specific Hydrogeology

The Upper Satilla setting exhibits a high hydraulic conductivity. In general, the top and bottom regions of the Upper Satilla exhibit higher hydraulic conductivities than the middle part, which tends to contain a greater level of fines resulting in lower hydraulic conductivity values in comparison to well-sorted sand above and below. The hydraulic conductivity calculated from the slug testing ranges from $3x10^{-2}$ centimeters per second (cm/s) to $8x10^{-4}$ cm/s and the typical hydraulic conductivity for the upper portion of the Satilla is $1x10^{-2}$ cm/s.

The Lower Satilla exhibits a wide range of hydraulic conductivities due to the variable composition of the member. The hydraulic conductivity was measured at discrete points within the massive clay via pore-pressure dissipation test methods with the Cone Penetrometer Testing (CPT). The pore-pressure method measurements of the clay were within a narrow interval of 9 x 10^{-6} cm/s to $1x10^{-7}$ cm/s. The supporting data was provided in the 1997 RI Report (GeoSyntec, 1997a). The hydraulic conductivity of the Lower Satilla sands ranges from $1x10^{-2}$ cm/s to $1x10^{-3}$ cm/s, with an average of $9x10^{-3}$ cm/s.

The hydraulic conductivity of the Ebenezer #3 Member was assessed at MW-108D and was calculated to be $4x10^{-3}$ cm/s. Two wells screened in the Ebenezer #4 Member were assessed with a hydraulic conductivity of $1x10^{-2}$ cm/s (MW-358D) and $2x10^{-3}$ cm/s (MW-352D). Lower hydraulic conductivity values are reasonably expected throughout the Ebenezer #4 Member where clayey sands and silt are present, regions in which wells were not screened to ensure adequate groundwater for sampling and testing.

Potentiometric surface maps for the Satilla Formation and Ebenezer Formation are provided in Figure 5-5 and Figure 5-6, respectively. The groundwater elevation data for the Satilla Formation (Figure 5-5) was collected during the Site-wide groundwater monitoring event performed in 2017. The groundwater elevation data for the Ebenezer Formation (Figure 5-6) was collected in

2020 as requested by the EPA following review of the SCSR. Consistent with historical groundwater evaluations, groundwater flow in the Satilla Formation and Ebenezer Formation is generally to the west. The hydraulic gradient in the Satilla Formation is approximately 0.004 ft/ft and the hydraulic gradient in the Ebenezer Formation is approximately 0.003 ft/ft.

The majority of the flux discharge from the Upper Satilla occurs to Purvis Creek, with lesser discharge to the marsh at seepage areas near the marsh-upland border. These seeps have been observed during conditions of high-water table (i.e., after major rainfall events). The seepage of groundwater at the marsh-upland border and overall marsh was evaluated in two studies during the course of the RI. The first study evaluated groundwater quality in the near-surface marsh clay with lysimeters. The second study completed a marsh-wide thermographic analysis of potential groundwater seepage points followed by targeted deployment of porewater peepers to assess near surface groundwater quality.

Six water supply wells were installed for production water in support of past manufacturing operations. Water-supply wells No. 1 through No. 4 were completed in 1919 and wells No. 5 and No. 6 were completed in 1956. The wells were completed as steel cased through the Miocene-age sedimentary sequence (typical depth of 500 ft) with an open hole in the Upper Floridan aquifer system to total depths ranging between 800 and 1,026 ft below ground level. Wells No. 1, 3, 5 and 6 were plugged in 1995 and wells No. 2 and 4 remain but are not in current operation with activity to close the wells in progress.

In the preparation for abandonment, each production well was sampled to assess for potential contamination of the deep Floridan aquifer. The results of the analyses indicated that no LCP Site related contaminants were present in the groundwater as presented in the Water-Supply Wells No. 1, 3, 5, and 6 Permanent Abandonment Report (GeoSyntec, 1995).

5.2.6 Demographics

The Site is located in Brunswick, Glynn County, GA. According to U.S. Census Bureau data, the town of Brunswick had an estimated population of 15,159 in 2022. The population of Brunswick decreased 1.1% from 2010 to 2020. The estimated population density of Brunswick in 2020 was 891 persons per square mile. In 2020, the racial makeup of the town was 32.3% White, 61.5% African American, 0.4% Native Hawaiian and Pacific Islander, 0.8% Asian, 2.4% from other races, and 2.6% from two or more races. Hispanic or Latino of any race was 7.3% of the population. There were 6,317 households with 2.32 persons per household. In the town the population was spread out with 22.9% under the age of 18, 59.3% from 19 to 44, and 17.8% were 65 years of age or older. For every 100 females there were 80.5 males (Census Bureau, 2023.)

5.3 NATURE AND EXTENT OF CONTAMINATION

5.3.1 Nature and Extent of Groundwater Contamination

Groundwater data from the most recent sampling events in 2017, 2018, 2019, and 2020 was evaluated to select constituents to capture the current nature and extent of the groundwater condition. A Site-wide groundwater sampling event was performed in 2017 with more targeted sampling (generally in the CBA study area) in 2018, 2019, and 2020 to assess changes resulting from the carbon dioxide (CO_2) sparging treatment and to address EPA identified data gaps. Tables 5.1 through 5.3 provide the summary statistics used to select constituents for this purpose for groundwater metals, VOCs, and SVOCs, respectively. All groundwater data is provided in Appendix I of the RI Report (Montrose, 2022a).

A discussion of the nature and extent of groundwater COCs requires reference to the CBP as the occurrence and profile of many COC are inherently linked to the unique geochemical setting that developed following the release of caustic and brine. The release of caustic and brine solutions resulting in the CBP is marked by several direct indicators including pH, sodium, and chloride. The evaluation of the CBP and its progression since the inception of the RI characterization is summarized herein based on changes in these three parameters.

Benzene, toluene, ethylbenzene, and xylenes (BTEX), and benzene-based compounds (a benzene ring with methylated or small carbon chain functional groups) are the most frequently detected VOCs in groundwater and account for nine of the top ten detected VOCs. Chlorinated carbon compounds are less frequently detected and tend to occur in fewer Site monitoring wells. Of the VOCs detected from 2017 to 2020, only two VOCs report an exceedance of a groundwater standard in >10% of groundwater samples: benzene and chlorobenzene. In general, with only a few exceptions, VOCs are detected more frequently in the shallower depths of the Satilla Formation, and most VOCs exhibit a non-detect concentration below the variably cemented sandstone layer. However, trace levels of BTEX and benzene-based compounds are detected in the deeper wells below the variably cemented sandstone layer with more miscible VOCs (toluene, carbon disulfide, acetone) exhibiting a higher frequency of detection at depth. Further detail on the detections and distribution of VOCs is provided in the OU2 RI Report.

PAHs are detected across all interval depths in the Satilla. The higher concentrations of PAHs occur in wells located along or near the marsh-upland border near known petroleum sources associated with the former canal and west of the CBA which was also characterized by a weathered petroleum smear zone (refinery operations occurred across the CBA footprint). Of the PAHs detected from 2017 to 2020, three constituents exceed a groundwater benchmark in >10% of groundwater samples: benzo(a)anthracene, naphthalene, and 1-methylnaphthalene. Further detail on the detections and distribution of these three PAHs is provided in the OU2 RI Report.

In contrast to organic constituents, where exceedances of groundwater benchmarks tend to occur most frequently in the shallower aquifer settings and decrease with depth, metal constituents tend to occur with a greater frequency above groundwater benchmarks in the Middle and Lower Satilla settings. This dissimilarity in distribution between organic and metal constituents is attributed to the constituent source, fate, and transport properties. The source of the metals requires consideration of anthropogenic and geologic origins, although the detection of metals in groundwater from potential geologic origins is influenced by the chemical properties of past caustic and brine releases and the lingering effects following CO_2 treatment of the high pH condition. Metals directly related to former industrial operations include mercury (chlor-alkali operations), lead (refinery operations), and vanadium (refinery operations). Most of the other metals are found in trace quantities in heavy minerals and silicates (arsenic, chromium, iron and titanium oxides, iron sulfides, and silicates), which are common along the Georgia coast and locally make up as much as a few percent of the surficial aquifer sand. The presence of the naturally occurring heavy minerals in the aquifer matrix is confirmed based on the spectroscopic investigations summarized in the OU2 RI Report.

The evaluation of groundwater metals data from 2017 to 2020 identified ten metals that exceed a groundwater benchmark in >10% of groundwater samples. The spatial distribution and condition of seven of the ten metals are presented in the OU2 RI Report and include arsenic, beryllium, chromium, lead, mercury, selenium, and vanadium. The remaining three metals, aluminum, iron, and manganese are major components of the natural aquifer matrix and are not examined.

5.3.2 Nature and Extent of CBA Shallow Unsaturated Soil Contamination

Between 1994 and 1995, two investigations performed as part of the upland removal response action targeted shallow soil across the footprint of the CBA (prior to subsequent placement of the soil cover). The investigations (Figure 2-5 and Tables 2-1a through Table 2-1e) included the collection of shallow soil with a hand auger, either in the soil adjacent to each cell building or beneath the building after coring through the concrete foundation slabs (Montrose, 2022a). Soil samples were tested for metals, VOCs, PAHs, and PCBs. In 1995, the soil study was expanded to include mechanical excavation (i.e., test pits) in areas of interest to allow for a more thorough assessment of the sub-foundation soil condition. The test pit program included a visual assessment of the soil for Hg^0 and analytical testing for mercury, lead, VOCs, PAHs, and PCBs.

The soil cover thickness was evaluated as part of an OU2 RI data gaps review, specifically to identify portions of the CBA where the cover thickness was less than 2 ft bgs in order to facilitate additional surface soil (i.e., upper 2 ft) sampling to support the HHRA. The soil cover thickness was determined by comparison of 1994 topographic surface mapping (pre-cover) to 2006 light detection and ranging (LiDAR) topographic mapping (post-cover), generating an interpolated digital terrain map of the CBA. Soil cover thickness is generally 1.5 to 2+ ft across the majority of the CBA – peripheral areas are less thick, and these areas were targeted for the HHRA shallow soil sampling.

In 2020, Montrose (a contractor for the PRPs) began the process of developing the framework for the CBA soil risk assessment. In the framework development phase and discussion with the EPA, a data gap was determined regarding the characterization of surficial soil (i.e., the top 2 ft of the soil horizon) due to the existence of the soil cover across most of the CBA. In response, the 2021 CBA surface soil assessment was completed. The 2021 surface soil assessment targeted the original surface soil beneath the imported soil cover (i.e., sampling generally performed in the 1.5-2 ft-bgs interval). The native soil samples were analyzed for VOCs, PAHs, target analyte list (TAL) metals including Hg, and PCBs.

Surface soil VOCs were generally non-detect except for trace level toluene. Several PAHs were detected in the surface soil layer with a greater frequency of detection and higher concentration generally along the northern extent of the CBA. PCBs were detected in all samples with the highest detections occurring along the southern extent of the study area (Montrose, 2022a). No consistent patterns are noted for the metals, but the mercury profile is generally consistent with the PCB profile (i.e., highest detections are co-located).

5.3.3 Nature and Extent of CBA Shallow Saturated Soil Contamination

An added element of the 2018 CBA characterization work was sampling and testing of soil across the CBA beneath the cell building slabs (in the saturated zone). Most of the soil boring locations across the CBA identified a hydrocarbon smear zone laterally continuous across much of the CBA and vertically to a depth of approximately 15 ft bgs, a condition confirmed by the PAH testing. The most commonly detected and highest concentrations of PAHs were naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene, and this PAH soil condition is reflected in Site groundwater west of the CBA. Sample depths varied from 4 to 16 ft bgs (all below the water table). No PAHs exceeded the industrial screening level for soil, indicative of a highly weathered residual hydrocarbon (refining operations ceased more than 70 years ago). A summary of the PAH testing data is provided in Table 2-2b.

5.3.4 Mercury Release and Extent in the Subsurface

The release of caustic brine altered the geochemistry of the groundwater as well as the solid mineral phases of the Satilla formation. The primary impact of the caustic brine release was the increase in pH (up to ~14) and sodium concentrations in groundwater. At elevated pH conditions, the dissolution of the silica matrix of the Satilla Formation is greatly enhanced, as are other mineral phases, resulting in a remarkable increase in dissolved silica content and silica colloid formation in groundwater not observed under most natural conditions. A consequence of the enhanced silica solubility and mineral breakdown at the caustic release area was a weakening of the load-bearing capacity of the underlying soil causing subsidence beneath the former cell buildings. The subsidence caused the concrete foundations and ground-level trough system, designed to channel and collect process fluids including Hg^0, to pitch and crack, thus allowing a pathway for spilled caustic and Hg^0 to penetrate the Satilla Formation.

Both cell buildings required the retrofit installation of structural support pilings in the later 1980s and pouring of a second layer of slab foundation. The process of pile driving into the subsurface may have further facilitated transport of the Hg^0 to greater depths due to vibration and piling-induced scrape channels during installation.

The combination of the 1997 and 2018 CBA soil core programs fully delineated the Hg^0 extent in the Satilla Formation. The assessment of Hg^0 was performed primarily through visual assessment (i.e., presence of beads of Hg^0) but included laboratory testing for mercury concentration in soil (Tables 2-1a, 2-2a, and 2-3d). The soil core borings revealed Hg^0 to be present as small discrete droplets observed in the vicinity of the subsidence area beneath Cell Building 1 and at shallow depths along the southern side of Cell Building 2. In the subsidence area, discrete droplets of Hg^0 were observed to a depth of 50 ft bgs.

In all assessments, Hg^0 has been observed as small discrete droplets in the soil matrix and ranged from 20 micrometers to 2 millimeters in size (see inset), and no pooled Hg^0 was observed in the subsurface soil matrix. (Note that accumulations of recoverable Hg^0 were present between the concrete slabs of Cell Building 1. The recoverable Hg^0 was removed during the Cell Building decommissioning.) The Hg^0 droplets were not uniformly distributed across the depth of the Satilla but were found as droplets occurring in the aquifer sands at the interface of well sorted sand lenses perched atop a layer of low permeability clay or silt. No Hg^0 beads were observed in tighter clay layers.

The distribution of Hg^0 droplets was described as Hg^0 bead stringers that were typically less than 1 inch thick but sometimes ranged up to 3 inches thick.

The discrete droplets of Hg^0 entrained in the sands are unlikely to undergo further vertical transport with current site conditions and use. The cohesive nature of the Hg^0 beads would also slow or retard permeation of Hg^0 through the sandstone. However, changes in site use could impact these conditions and facilitate transport if the beads are not addressed.

The distribution of Hg^0 in the CBA is shown in plain view on Figures 5-7a and 5-7b (total distribution in 5-7a and by depth in 5-7b). Observation of Hg^0 outside the footprint of the building (i.e., north of Cell Building 1) and away from the former piling activity found the Hg^0 to be limited to the top few feet of the soil column.

5.3.5 Cell Building Area Mercury Vapor Assessment

In July 2022, testing of vapor emissions assessment in the CBA was conducted to evaluate the efficacy of the soil cover in preventing the atmospheric release of potential emissions from the Hg^0 condition beneath portions of the former cell buildings.

The study followed a systematic sampling design across the CBA at 50-foot centers with a triad of measurements collected at each monitoring station, including: measurement of ambient air from the breathing zone (i.e., approximately five feet above ground surface); measurement of ambient air adjacent to the ground surface; and measurement of soil gas within the soil cover. Measurements were also collected at a background location selected as the administrative building along the eastern property boundary. Hg^0 vapor concentrations in soil gas, at the ground surface, and in ambient air (i.e., the breathing zone) are presented in the FFS Report and were found to not present a health risk concern under current conditions.

5.3.6 Contaminant Origin, Fate, and Transport

The occurrence and distribution of contaminants in groundwater is usually approached from a direct anthropogenic cause-and-effect dynamic, i.e., the release of a contaminant results in contamination by that contaminant. This describes the occurrence of several Site COCs that are associated with specific historical operations. Examples of Site-specific constituents that have a known association with specific historical operations include mercury from the chlor-alkali operation and petroleum hydrocarbons, lead, and perhaps vanadium from the past refinement of crude oil. Other Site COCs have an unknown anthropogenic source but correlate spatially with past Site operations or the historical release of process fluids, such as the caustic brine and likely releases of mercury through the cracks in building foundations as a result of subsidence, most notably metals in the CBP or near process waste disposal areas. These other COCs, based on their physical-chemical properties, are interpreted herein as a probable secondary effect caused by the Site's substantially altered geochemical setting brought about by the historical release of process fluids.

Prior to the Site's release of process fluids and the formation of the highly altered geochemical setting termed the CBP, the Satilla and Ebenezer Formation likely exhibited circumneutral to slightly acidic groundwater (based on samples from the Site's eastern most (i.e., up-gradient) monitoring wells) and an elevated total dissolved ion content typical for the coastal marsh-upland setting.

The release of the brine and caustic destabilized the aquifer's baseline condition and geochemistry resulting in a physical-chemical redistribution of metals and ions (including any released metals from historical operations) that resulted in the contaminated condition discovered and evaluated during the early RI phases of the mid-1990s. Mercury and other metals transport are facilitated by the solubilized organic matter and potentially by silica colloids within the CBP, but upon exiting the CBP in a dissolved state in the groundwater, several metals (e.g., mercury and arsenic) exhibit a stark concentration break, indicating adsorption and precipitation pathways are attenuating their condition more so than other metals. The sharp concentration break near the marsh-upland border is reasonably facilitated by the formation of insoluble metal sulfides, mercuric sulfide (HgS) and arsenic sulfides. The thermodynamic modeling of phases in the OU2 RI Report found the mercury and arsenic sulfides to be the most oversaturated phases in former CBP-impacted groundwater as the pH condition is moderated. Localized depletion in sulfide at the caustic brine pool margin provides an additional line of evidence supporting this conclusion. Figure 5-8 depicts the last dissolved mercury concentration profile in the Upper and Lower Satilla in 2012 prior to commencing CO_2 sparging and the most recent data set for dissolved sulfide.

The recent CO_2 sparging treatment has neutralized the CBP and moderated the geochemical setting, initiating a second redistribution of metals and other dissolved constituents. The overall impact of the redistribution has been for metals and some other dissolved constituents to return to their natural state and precipitate out of the groundwater to bind with aquifer solids or saturated soil. The return of the groundwater to more natural and neutral pH levels indicates these constituents will remain permanently in a solid form as long as the groundwater in the aquifer continues to be in the natural neutral pH state and will not contribute to the groundwater contamination. The redistribution for some constituents following the CO_2 sparging treatment has been rather rapid (e.g., mercury) while others have displayed a more gradual to limited improvement in the couple of years since completion of the treatment. The fate of specific COCs with respect to changes in groundwater chemistry following the CO_2 sparging treatment and natural recovery processes is discussed further in the OU2 RI Report.

5.3.7 Principal CSM Features in FFS Technology Screening Process

The CBA setting and its physical attributes associated with past industrial development are pivotal in the FFS technology screening process. Therefore, for the FFS remedial technology evaluation, key features of the CSM were worth reinforcing. The key features recognized as influential in the CBA technology screening process included:

- Hg^0 is present in the subsurface as discrete beads;
- Site groundwater exhibits a low redox condition (reducing state) and circumneutral pH, an environment under which Hg^0 is generally stable and exhibits a solubility of around 50 μg/L or less;
- The Hg^0 occurs at depths up to 50 ft, confined vertically by the cemented sandstone layer at the top of the Ebenezer;
- A dense network of subsurface steel pilings span the Satilla aquifer where Hg^0 is present;
- A soil cover encompasses the CBA which effectively mitigates Hg vapor emission;
- The coastal plain sedimentary deposits of the Site are for practical purposes fully saturated to within a couple of feet of the ground surface. Therefore, any subsurface work must account for potential complications due to the saturated nature of the setting and substantial dewatering, treatment, and disposal concerns; and
- Site-specific work demonstrates the sedimentary deposits are unstable when disturbed, exhibiting a flowing-sand property.

These factors placed additional emphasis on the technical implementability of each remedial technology considered in the FFS.

6.0 CURRENT AND POTENTIAL FUTURE LAND USES

The city of Brunswick covers approximately 17.1 square miles. Current land use near the Site is as follows:

- The area west and northwest of the LCP site is undeveloped and does not contain residences due to unusable, tidally influenced, marshlands.
- The northern and eastern portion of the one-half mile radius contains a mixture of industrial and residential use.

- The area southeast of the LCP site is the most densely populated area but is served by the City of Brunswick Water Department.

Anticipated future land use surrounding the Site is expected to remain the same as it is currently (a mix of industrial/commercial/government use). There is a Site redevelopment plan for a potential golf course. The land planned to be included in this potential redevelopment includes the high-ground land owned by Honeywell (approximately 87 acres) and a portion (11 acres) of the 33 acres of the Site purchased by Glynn County in 2012, for a total of approximately 98 acres. The redevelopment plan includes restoring the front administration building and converting the remaining land to a golf course and maintenance structure(s). The potential redevelopment would include the CBA (approximately 6 acres), which is covered with clean imported fill soil to maintain an exposure buffer to the building slab. The overall size of the property would support development of a 9-hole course.

6.1 GROUNDWATER AND SURFACE WATER USES

The Turtle River, Purvis Creek and associated marshes are located immediately west of the Site (Figure 6-1). Purvis Creek and associated streams within OU1 are considered Coastal and Marine Estuarine Waters and under the Georgia Water Use Classifications at O.G.C.A. Chapter 391-3-6-.03(14) include the following use Classifications: Recreation, Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life and Coastal Fishing. The marshes in this area were designated as OU1. From November 2022 to December 2023, an RA was conducted that consisted of dredging, thin-layer cover placement, and re-vegetation. The surface water dioxin toxicity equivalence concentrations and Aroclor-1268 concentrations that were detected prior to the OU1 RA are shown on Table 6-1.

A water well survey was completed in 1995 by the EPA that included the upland area surrounding the Site and Blythe Island across the Turtle River from the Site (EPA, 1995). The nearest residential water wells are located approximately 0.5 mile to the north of the Site, side-gradient to the local area groundwater flow direction (see Figure 6-2) and understood to be installed in the Rock Aquifer (underlying the Surficial Aquifer). The EPA sampled the wells to the north. Prior sampling of local residential water supply wells by the EPA (during the removal action) also showed all results meet health-based criteria (*e.g.,* federal drinking water maximum contaminant levels) and exhibited no indication of Site-related influence (a conclusion reached by the EPA on-scene coordinators who oversaw the sampling activity). Figure 6-2 shows industrial and city/county water supply wells in the area, all of which draw from much deeper aquifers separated by multiple regional confining layers from the Surficial Aquifer of the Site. Under the EPA's groundwater classification guidelines, groundwater at the Site would qualify as Class IIA (current drinking water source) and Class IIB (potential source of drinking water). The State of Georgia's aquifer classification also identifies the groundwater at the Site as a drinking water source.

7.0 SUMMARY OF SITE RISKS

The response action selected in this interim early action ROD is necessary to protect public health and the environment from actual or threatened releases of hazardous substances, contamination and pollutants into the environment. The interim early action remedy was selected to address the immediate threat of human exposure to mercury contaminated CBA subsurface soil and groundwater, to minimize additional releases and leaching of mercury to groundwater, and to prevent the possibility of vapor intrusion.

The baseline risk assessment conducted during the RI included evaluation of risks to human health from Site-related contamination (an ecological risk assessment has not been conducted). The baseline risk assessment estimates the risk the Site poses if no action is taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the RA.

7.1 HUMAN HEALTH RISK ASSESSMENT

Preparation of a Human Health Risk Assessment (HHRA) is required by the NCP, which states that the lead agency for a Superfund site shall conduct a site-specific HHRA as part of the RI process (40 CFR §300.430(d) *Remedial investigation*). The risk assessment estimates what risks the site poses if no action were taken at the site. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the RA. The site-specific HHRA, which evaluated the potential health risks associated with exposure to contaminants, was conducted to estimate the cancer risks and non-cancer health hazards associated with the current and assumed future exposures to contaminants at the LCP Superfund Site, OU2.

For the purpose of the OU2 HHRA, the soil in the CBA is evaluated as one exposure unit (EU) that encompasses the area in and around the CBA that was excluded from the OU3 HHRA. The majority of the soil cover area of the CBA is currently partitioned as a fenced unit within the Site. The CBA EU is approximately 6 acres.

The following sections summarize the components of the HHRA with respect to the basic steps in the Superfund Risk Assessment process: 1) Data Collection and Analysis (Contaminants of Concern); 2) Exposure Assessment; 3) Toxicity Assessment; and 4) Risk Characterization. The quantitative HHRA was conducted using chemical concentrations detected in soil (surface soil and aggregate soil), groundwater, and indoor air samples.

A supplemental HHRA was performed for the proposed golf course redevelopment (Montrose, 2023). The results of this supplemental HHRA are also described. Two evaluations are presented in supplemental HHRA: (1) the entire redevelopment area (the Site inclusive of the CBA), and (2) a separate evaluation for the CBA proper (for sake of completeness in the assessment). These exposure areas are shown in Figure 7-1.

7.1.1 Data Collection and Analysis (Contaminants of Concern)

Chemicals of Potential Concern (COPCs) are a subset of all chemicals positively identified at the Site. The risks associated with the COPCs are expected to be more significant than the risks associated with other less toxic, less prevalent, or less concentrated chemicals at the Site that do not exceed screening levels and, therefore, are not evaluated quantitatively. The process of determining the COPCs included a detailed evaluation of the analytical data, a careful analysis of the sources of contamination and areas that the sources impact, and a review of Site characteristics.

7.1.1.1 Groundwater COPCs

The COPC screening process followed EPA Region 4 guidance and the HHRA conducted for OU3 using the EPA Regional Screening Levels (RSLs) for residential setting, where RSLs were set at the lower of a 1 x 10^{-6} risk for carcinogenic compounds and a target hazard quotient (HQ) of 0.1 for non-carcinogens (EPA, 2021a). For the vapor intrusion screening, residential target groundwater concentrations from the EPA's Vapor Intrusion Screening Level (VISL) Calculator were used based on an HQ of 0.1 and cancer risk of 1 x 10^{-6}. The VISL Calculator is a tool developed by the EPA for determining risk-based screening level concentrations for indoor (i.e., ambient) air and "near-source" soil gas concentrations (EPA, 2022a). The VISL calculator uses the same database of toxicity values, chemical parameters, and inhalation exposure equations as the RSLs for Chemical Contaminants at Superfund Sites (EPA, 2022b).

The determination of whether a constituent was a COPC was based upon the following criteria:

- Elimination of constituents for which the maximum detected concentration did not exceed the screening level;
- Elimination of essential human nutrients: calcium, chloride, iodine, magnesium, phosphorus, potassium and sodium; and
- Elimination of constituents that were detected in fewer than 5% of the samples, with the added provision that no more than 5% of the results for those constituents could have detection limits above the RSLs.

Chromium and mercury have different toxicity values and screening levels based on the form. Chromium is commonly found either in a trivalent or hexavalent state (Cr+6). Most analytical results are for total chromium and total mercury. Groundwater was analyzed in 2012 for Cr+6; thus, the groundwater COPC tables utilize the results for comparison to the Cr+6 RSL. Total mercury is compared to the RSL for mercuric chloride and other mercury salts. A summary of the groundwater COPCs is shown in Table 7-1.

The COPC screening was conducted using the 2017-2020 dataset described above, with preference to the most recent results. This was especially important in the CBP area where CO_2 treatments resulted in an improvement in the condition. For each well, it was determined (through database queries), the most recent time that each analyte was sampled. These most recent monitoring records for a given analyte in a given well were used for the COPC screening. Given the contrast in the groundwater condition between the Satilla Formation as compared to the Ebenezer Formation, the dataset was segregated accordingly for the COPC screening. The HHRA concluded the following for groundwater COPCs:

For the North Satilla Plume, petroleum hydrocarbons (naphthalene and isomers, benzene and isomers) and arsenic dominate the condition resulting from a smear zone, serving as a COPC source dating back to the early 1900s with a stable plume condition. This CSM supports the aggregation of data records across the recent set of sampling events (2017-2020).

The South Satilla Plume is primarily characterized by an altered geochemistry from former operational caustic releases enhancing solubility of metals. The enhanced metals condition has been under a state of general decline across the RI history, with some of the metals decline accelerated by the CO_2 treatments applied to neutralize the pH in groundwater. Thus, it is more appropriate to limit the temporal data set to the most recent sampling event in 2020, which targeted a large number of wells of interest from the Site Characterization Summary Report review. Of the 63 wells in this plume core, 27 were sampled in 2020.

For the South Ebenezer Plume, primary COPCs are comprised of caustic-mobilized metals with lesser petroleum hydrocarbons. COPC conditions are significantly lower than the Satilla and exhibited an increasing trend through earlier monitoring but reversing/stabilizing in the more recent period (2017-2020). CO_2 treatment of the overlying Satilla groundwater serves to address the source of the Ebenezer condition and longer term, the Ebenezer condition is expected to improve, thus use of the aggregated 2017-2020 data is conservative and appropriate. Each of the 7 wells in this plume core have been sampled multiple times since 2017.

7.1.1.2 CBA Soil COPCs

The COPC screening process followed the same process as used for Site-wide groundwater. As no chromium speciation has been conducted in the soil, the soil results for total chromium are compared to both trivalent and hexavalent chromium RSLs. In the surface soil COPC tables, total mercury is compared to the RSL for mercuric chloride and other mercury salts, which was consistent with the OU3 HHRA approach. For the mixed soil horizon, the total mercury results are compared to RSLs for both mercury salts and elemental mercury. A summary of the COPCs selected for the surface and mixed soil EUs is shown in Table 7-2.

7.1.2 Exposure Assessment

An exposure assessment identifies pathways where receptors may be exposed to Site contaminants, and estimates the frequency, duration, route, and magnitude of such exposures. Exposure assessment involves: 1) characterization of the physical setting of the area; 2) identification of potential receptors and exposure pathways; 3) identification of exposure point concentrations (EPCs) and doses; and 4) identification and discussion of uncertainties.

The foundation of an exposure assessment is the CSM (previously discussed in Section 5.1). The CSM integrates information on the potential chemical sources, release mechanisms, affected media, potential exposure pathways, and known receptors to identify complete exposure pathways. A pathway is considered complete if: 1) there is a source or chemical release from a source; 2) there is an exposure point where contact can occur; and 3) there is a route of exposure (oral, dermal, or inhalation) at the contact point through which the chemical may be taken into the body.

The exposure assessment describes current and future land use assumptions, selects exposure factors for potential receptors, discusses the mechanisms by which these receptors might potentially come in contact with COPCs in environmental media, and estimates the degree of contact between potential human receptors and these constituents. Exposure is defined for risk purposes as contact with constituents in environmental media at the outer boundaries of the body, such as the gastrointestinal tract (for ingestion route), skin (for the dermal route), and lung (for inhalation route). This information is integrated with estimates of EPCs and intake assumptions to estimate quantitatively the exposure or dose.

Some of the exposure assumptions (such as exposure frequencies) were selected to be consistent with the OU3 HHRA. However, the majority of the intake factors (such as body weight and ingestion rates) were updated to reflect default exposure factors currently used in the EPA risk assessment calculations.

7.1.2.1 Groundwater Exposure Assessment

The Site is zoned industrial. An EPA and GAEPD approved property deed restriction as part of a Unified Environmental Covenant (UEC) to ensure no future residential use of the property and to preclude use of Site groundwater has been recorded. For the sake of completeness and at the request of the EPA, the HHRA includes assessment of the shallow groundwater for its maximum beneficial use (i.e., as a source of residential drinking water for a hypothetical resident). Exposure of hypothetical residents to site groundwater is evaluated via ingestion, dermal and inhalation exposure routes.

Volatile constituents in groundwater can move through the subsurface and enter buildings (called vapor intrusion) or excavation areas, where they may be inhaled by receptors. The shallow groundwater (the Satilla Formation) was used to evaluate the potential for vapor intrusion. In the event that structures are built at the Site in the future, vapor intrusion is evaluated for the future Site workers and hypothetical residents using the EPA's VISL Calculator. The excavation worker scenario also includes evaluation of inhalation of vapors emanating from groundwater that might accumulate in a trench excavation.

The above scenarios are presented in the CSM for the Site groundwater (Figure 5-1). The CSM includes ingestion of groundwater, dermal contact with groundwater, and inhalation from groundwater use, as well as inhalation of vapors emanating from groundwater. Groundwater is evaluated as multiple EUs (South Satilla, North Satilla, and South Ebenezer).

7.1.2.2 CBA Soil Exposure Assessment

This HHRA evaluates the same five exposure scenarios used in the OU3 HHRA:
(1) industrial/commercial onsite worker (current/future scenario), (2) excavation worker (future scenario), (3) trespasser (current scenario), (4) trespasser (future scenario); and (5) hypothetical resident (future scenario).

Noted above, deed restrictions have been recorded prohibiting residential land use and use of Site groundwater. The majority of the CBA EU contains 2 ft or more of clean cover soil, thinning along the perimeter to 1ft or less. Accordingly, exposure to the CBA soil condition is realistically mostly limited to only the excavation worker and the onsite worker (pathways previously evaluated under the OU3 HHRA). The HHRA also assesses unrestricted use (i.e., trespasser and hypothetical resident exposure) per EPA Guidance (EPA, 2018). Figure 5-2 depicts the CSM for the CBA soil EU and includes ingestion, dermal contact, and inhalation (of fugitive dust and volatilized contamination).

7.1.2.3 Potential Recreational Redevelopment Exposure Assessment

During the development of the FFS, a recreational scenario exposure assessment was developed to evaluate the potential redevelopment of the site for the specific reuse of the site as a small training golf course. While a recreational redevelopment is not part of this IEAROD, it was part of the risk assessment process to evaluate the potential use in the future. It is expected that imported clean fill soil will be used to shape the golf course. However, as it is unknown how much fill will be placed where, this part of the risk evaluation is based on the current condition at the Site. If the potential recreational development is implemented, a Soil Management Plan will need to be developed for workers involved in the golf course construction as part of the UEC, where limited exposure may occur to subgrade soil. Potential exposure in the CBA including to mercury vapors was also evaluated.

Two types of receptors are considered: recreational user (i.e., adolescent golfer and adult golfer) and maintenance worker (i.e., groundskeeper). Other site workers would have lesser exposure than the groundskeeper; thus, there is no need to separately evaluate the lesser degree of exposure. It is assumed that these receptors are exposed via ingestion, inhalation and dermal contact.

7.1.2.4 Exposure Point Concentrations

The EPC is the representative concentration of a given COPC with which the receptor is potentially in contact. A representative COPC-specific EPC value is incorporated into the exposure assessment equations from which potential human exposures are calculated. The EPC is intended to be a conservative estimate of the average concentration at a given point in time (EPA, 2014).

The EPA guidance (EPA, 1992; 2002) indicates that the COPC-specific reasonable maximum exposure (RME) EPC shall be the lesser of either (i) the 95% upper confidence limit (UCL) of the arithmetic mean or (ii) the maximum detected concentration. The purpose for using the 95% UCL instead of the average concentration is to account for "the uncertainty associated with estimating the true average concentration at a site…[and] the 95% UCL provides reasonable confidence that the true site average will not be underestimated" (EPA, 1992). For groundwater, these values are also used to evaluate the central tendency exposure (CTE) exposure scenarios. A summary of the selected groundwater EPCs is presented in Table 7-3.

The following principles are used to determine the datasets used for soil EPC calculations:

- The depth intervals of interest for the CBA EU are the same as those that were used in the OU3 HHRA, namely surface soil (upper 2 ft) and mixed soil (upper 5 ft).
- The historical sampling depth (pre-1997) has been adjusted to account for the clean soil cover and concrete slabs.

The vast majority of the CBA EU is covered by a soil cover. Approximately 14% of the CBA EU (on the periphery) has less than one foot of cover soil. Accordingly, a receptor that encounters only surface soil (Site Worker, Trespasser, and Hypothetical Resident) in this EU with exposure across the entire EU would only encounter Site soil 14% of the time; thus, their total soil intake would be 14% of Site soil and 86% clean fill. Accordingly, the EPC for surface soil is adjusted by a Fraction Ingested (FI) term, as recommended by the EPA risk assessor. The selected soil EPCs are shown in Table 7-4. The maximum Hg^0 vapor concentrations are used as the EPCs (Table 2-4).

The sample results used for estimating exposure for the golf course redevelopment area incorporate sample locations included in the HHRAs for OU3 and the CBA. The sample results used for estimating exposure in the CBA evaluation are the same as that used in the HHRA for the CBA including the FI adjustment. Approximately 29 of the 98 acres is covered with more than one foot of clean soil. Accordingly, a receptor with exposure across the entire Site would encounter native Site soil 70% of the time; thus, their total soil intake would be 70% of native soil and 30% clean fill. Accordingly, the EPC for surface soil is adjusted by a FI value of 70%. The FI value used for the CBA is 14%, as previously described. The resulting EPCs used for the golf course redevelopment HHRA are shown in Table 7-5.

7.1.3 Toxicity Assessment

The toxicity assessment identifies the types of adverse health effects that a COPC may potentially cause and defines the relationship between the dose of a compound and the likelihood and magnitude of an adverse effect (response). Adverse effects are characterized by the EPA as carcinogenic and non-carcinogenic. Dose-response relationships are defined by the EPA for oral and inhalation exposures.

The dose-response assessment evaluates the available toxicity information, and quantitatively describes the relationship between the level of exposure (either from animal or human epidemiological studies), and the occurrence of an adverse health effect. This relationship is described by an oral cancer slope factor (CSF) or inhalation unit risk factor (IUR) for carcinogens, and an oral reference dose (RfD) or an inhalation reference concentration (RfC) for systemic toxicants, collectively called toxicity values.

A CSF or IUR is an indicator of the potency of a carcinogen (i.e., the greater the CSF/IUR, the more potent the carcinogen). An RfD is the dose at or below which adverse non-carcinogenic effects are not anticipated. These factors represent quantitative estimates of the relationship between the magnitude and types of exposures and the severity or probability of human health effects, and they are used to develop carcinogenic risks and noncarcinogenic hazards.

The toxicity and chemical-specific parameters used in this HHRA are summarized in Table 7-6a. Table 7-6b shows the toxicity values and chemical-specific parameters applicable to the excavation worker. The toxicity and chemical-specific parameters applicable to the groundwater risk assessment include volatility and factors necessary for determining dermal absorption. These values are shown on Table 7-7.

The evaluation of potential risk associated with inorganic mercury in ingested groundwater applies the toxicity values for mercuric chloride and other mercury salts. The application of the toxicity values for mercury salts as opposed to Hg^0 is based on testing that indicated no dissolved Hg^0 except one trace detection. Additionally, the assessment of the site-specific mercury distribution showed for Hg^0, when present, a clear tendency to be associated with the aquifer matrix and not in the dissolved phase.

Chromium has not been speciated in soil samples; however, Cr+6 toxicity values are conservatively utilized in the risk calculations for chromium in soil. Risk calculations for the surface soil EU is based on mercury salts. However, as the mixed soil EU could potentially include the aquifer matrix, two sets of calculations are performed for mercury – one using toxicity values for mercury salts and a second using values for Hg^0.

The chemical-specific parameters applicable to the HHRA include volatilization factors (VF) necessary for determining COPC volatilization from soil and groundwater, particulate emission factors (PEF) necessary for determining COPC concentrations in fugitive airborne dust, and event factors necessary for determining dermal absorption. The VF and PEF values are shown on Tables 7-6a and 7-5b. The event factors are shown on Table 7-7. VF values used in this assessment were obtained from the same sources used for the RSL Tables (EPA, 2021a). For consistency with the OU3 HHRA, the same PEF value derived from EPA Guidance was used for most receptors in this assessment to estimate concentrations of COPCs in fugitive dust (EPA, 2002). Event factor values were obtained from two-compartment distributed model in the EPA Guidance (EPA, 2004).

Table 7-8 shows the toxicity values and other chemical-specific parameters used for the golf course redevelopment HHRA.

7.1.4 Risk Characterization

Excess cancer risk and non-cancer hazards were calculated for each exposure pathway and scenario by integrating the exposure doses calculated in the Exposure Assessment with the toxicity criteria determined in the Toxicity Assessment. Groundwater was evaluated for the Hypothetical Residential receptor (both a child and an adult) for three different EUs. The results are shown on Tables 7-9, Tables 7-10 and Tables 7-11 for the North Satilla, South Satilla and South Ebenezer EUs, respectively.

Shallow groundwater concentrations from the North Satilla and South Satilla EUs were used to assess whether there is a potential for vapor intrusion at the site to pose unacceptable health risks if at some point in the future buildings were constructed on-site. The COPCs that exceeded the residential target groundwater concentrations are shown in Table 7-12 where the EPCs for the South Satilla and North Satilla are compared to residential and commercial/Site VISL groundwater concentrations. No EPCs exceeded the residential-based screening criteria, indicating that the vapor intrusion exposure pathway is not likely to pose an unacceptable risk for future inhabitants of buildings at the Site.

Shallow groundwater concentrations from the Satilla EUs were considered to evaluate the potential for VOCs to be present within trench/excavations. The trench air concentrations were predicted using the EPCs for the Satilla EUs and the Virginia Department of Environmental Quality model for "groundwater less than or equal to 15 feet deep." With shallow groundwater, it is assumed that constituents would volatilize from groundwater pooling at the bottom of the trench. The calculations are shown in Table 7-13 and Table 7-14 for the North Satilla and South Satilla EUs, respectively.

CBA soil was evaluated for the Site Worker, Current and Future Trespasser and Hypothetical Residential receptor (both a child and an adult) for surface soil in the CBA. The results are shown on Table 7-15 through Table 7-19.

The preferred risk assessment approach for lead is the estimation of human blood lead concentrations associated with assumed exposure. Exposure of workers to lead and subsequent blood lead concentrations was estimated in the same way as it was for the OU3 HHRA - by use of the Adult Lead Methodology (ALM) developed by the EPA Technical Review Workgroup for Lead (EPA, 2003) and updated in 2017. The parameters utilized in the ALM model are presented in Table 7-20. The benchmark blood level determined to be protective of health was 10 micrograms lead per a deciliter of blood (µg/dL) (EPA, 2009). Using this benchmark, the ALM model predicts an average soil lead concentration in excess of 1,235 milligrams per kilogram (mg/kg) is required to exceed a 5% probability that fetal blood level surpass the 10 µg/dL benchmark. When a blood lead benchmark of 5 µg/dL is used, the soil lead PRG decreases to about 1,000 mg/kg. In comparison, the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) model for residential exposure derived an average soil lead concentration of 200 mg/kg to be protective of health based on a blood lead benchmark of 5 µg/dL. The arithmetic mean and 95% UCL for lead in the mixed soil are 69 mg/kg and 109 mg/kg. Both of these values are below the nonresidential and residential soil concentrations determined to be protective of human health (1000 and 200 mg/kg, respectively).

The potential recreational (golf course) redevelopment area risk was evaluated in two ways as a bounding exercise. The first was based on a FI of 1.0, which assumed that the receptors are exposed to all the native surface soil at the site. Using an FI of 1.0 was inherently conservative since much of the site has been covered with clean backfill, meaning much of the native soil is now covered by clean backfill, but was presented to be consistent with the OU3 risk assessment. The second evaluation accounted for clean backfill with the CBA FI adjustment. The results of the risk calculations for the redevelopment area incorporating the FI of 0.7 are shown in Table 7-21a and using an FI of 1.0 are shown in Table 7-21b. The results for the CBA are shown in Table 7-22.

7.1.5 Chemicals of Concern and Preliminary Remedial Goals

Health risk-based soil concentrations have been developed from the risk characterization model setup for each receptor for non-cancer effects and cancer endpoints for each of these COPCs. Consistent with EPA Region 4 guidance (EPA, 2018), Site-specific preliminary remedial goals (SSRGs) were calculated for each COPC identified as a chemical of concern (COC).

Receptor risk estimate summaries for groundwater and CBA soil are provided in Tables 7-23 and 7-24, respectively. Examination of Table 7-23 indicates that the hypothetical resident is the only receptor for which cancer risk estimates trigger development of SSRGs on one or more of the groundwater EUs. The non-cancer hazard estimates for the excavation worker, and hypothetical resident scenarios trigger the development of SSRGs in one or more of the groundwater EUs. Examination of Table 7-24 indicates that the hypothetical resident and excavation worker are the only receptors for which cancer risk estimates trigger development of SSRGs for the CBA soil EUs. The non-cancer hazard estimates for the excavation worker, hypothetical resident, and Site worker scenarios trigger the development of SSRGs in one or more of the soil EUs.

Consistent with EPA guidance, the SSRGs are calculated based on a progression of HQs and cancer risks (i.e., HQs of 0.1, 1.0, and 3.0, and a theoretical upper-bound cancer risk of 1×10^{-6}, 1×10^{-5}, and 1×10^{-4}) for individual COCs. The calculated groundwater SSRGs for these scenarios are provided in Table 7-25. The national primary drinking water Maximum Contaminant Levels (MCLs) which are considered potential chemical-specific ARARs for restoration of groundwater are also shown on Table 7-25. In instances where the risk based SSRG is below the MCL, the SSRG value is stricken as MCLs would likely be set as the cleanup level for groundwater in these instances. The calculated soil SSRGs are provided in Table 7-26.

7.1.6 Mercury Vapor Risk Characterization and Remedial Goals

Vapor intrusion risk was evaluated based on a comparison of Lumex-RA 915+ measurements to VISLs. VISLs for Hg^0 in ambient air and near-source soil gas protective of a commercial Site Worker receptor were computed using the inputs from the CBA HHBRA resulting in the following:

- Indoor Air 1,310 ng/m^3; and
- Sub-slab Air 43,800 ng/m^3.

The VISL Calculator was used based on the default assumption of "buildings with poured concrete foundations (e.g., basement or slab-on-grade foundations) that are susceptible to soil gas entry." It was not calculated based upon a specific building layout as no buildings exist in the CBA.

The Hg^0 vapor concentrations demonstrate the efficacy of the soil cover in mitigating Hg^0 vapor emissions and provide multiple lines of evidence indicating that the CBA does not pose unacceptable risk from assumed exposure to Hg^0 vapor:

- The data indicate the soil cover is adequately effective in mitigating the emission of Hg^0 vapor into the atmosphere. As illustrated in Figure 7-2, Hg^0 vapor concentrations at the ground surface (denoted by the smaller concentric circles) are uniformly low and within the range of background readings (see further below), compared to areas of more elevated Hg^0 levels in underlying soil gas (denoted by the larger concentric circles).
- Hg^0 vapor concentrations in the air adjacent to the ground surface and the breathing zone are below ambient air criteria (i.e., the indoor air VISL) and protective of the commercial Site worker. All the reported concentrations of Hg^0 in air are even below what would be health protective for a residential scenario.
- Hg^0 vapor concentrations in soil gas are below near-source soil gas criteria; as such, soil gas concentrations do not represent unacceptable risk from the vapor intrusion exposure pathway should a building be erected atop the CBA. While Hg^0 concentrations in ambient air do not necessarily predict the exact concentration that would result in the interior of a future building, the concentrations would be expected to be fairly similar. The vapor

concentrations detected in the shallow subsurface soil help to support the conclusion of no unacceptable health risks for any future building inhabitants based on both default and site-specific attenuation factors.

- Hg^0 vapor concentrations in ambient air adjacent to the ground surface and the breathing zone above the CBA are similar to the ambient background condition, while Hg^0 in soil gas within the CBA soil cover is elevated relative to background soil (as depicted in the following scatter and box-and-whisker diagrams).
- A correlation of Hg^0 vapor concentrations to the spatial distribution Hg^0 beads is not apparent in the data profile (Figure 7-2).

7.1.7 Potential Recreational Redevelopment Risk Characterization

The cancer risks for all receptors in both the potential redevelopment area and in the CBA alone are all below the EPA 10^{-4} threshold. Similarly, the hazard indices (HIs) for all receptors are all below the threshold of 1. It should be noted that if the potential future recreational redevelopment is a small training golf course, portions of the Site would need to be further covered in clean imported fill soil with the shaping of the terrain for the course, thus further reducing the risk that were estimated in the HHRA. Results of the risk assessment for use of the Site as a golf course support the conclusion that the Site is safe for this redevelopment consideration.

7.2 SUMMARY OF ECOLOGICAL SCREENING EVALUATION

An ecological risk assessment was conducted for OU3; however, the results are not pertinent as an ecological risk assessment is not warranted for OU2. There is no reasonable ecological exposure to the groundwater condition, and as for the CBA, the area is covered with clean fill soil to a thickness precluding ecological exposure. In addition, ecological impacts to the salt marsh from the site contaminants were assessed for OU1 and have been addressed in the RAs taken for OU1. Ecological impacts for OU3 were also assessed after the earlier removal actions and found to not warrant further action as noted in the earlier ROD for OU3.

8.0 REMEDIAL ACTION OBJECTIVES

RAOs are established to support the evaluation of remedial alternatives for areas with the potential for unacceptable risk as identified in the human health and ecological risk assessments. The RAOs are established by specifying contaminants and media of concern, potential exposure pathways, and remediation goals. The RAOs in the CBA FFS are focused on the prevention of exposure to Hg^0 and reducing the capacity of Hg^0 serving as a source of dissolved mercury to groundwater. Groundwater itself is being dealt with under the subsequent OU2 RI/FS process. Future RAOs developed for OU2 FS will include preventing migration of Hg^0 and other forms of mercury from source material to groundwater and already dissolved in groundwater above levels that are protective for beneficial use of the groundwater as a potential drinking water source.

The RAOs, as outlined in Technical Memorandum #1 – Identification of Remedial Action Objectives (Montrose, 2022b) and amended by the EPA (letter dated September 30, 2022) are as follows.

- **RAO1:** Prevent human exposure by direct contact to the surficial and subsurface soil across the CBA to mercury through ingestion and dermal contact above levels protective of commercial, industrial, and recreational use of the area.
- **RAO2:** Treat to reduce the leachability potential of mercury, elemental mercury beads (Hg0), and mercury partitioned to the aquifer matrix of the surficial aquifer to achieve a 90% reduction of leached mercury (dissolved phase in groundwater) as a performance standard. For the Remedial Goal (RG) or cleanup level for mercury in the dissolved phase in groundwater, the EPA is using the 95% Upper Confidence Limit (UCL) Exposure Point Concentration (EPC) in the RI (Table 7.6 of the RI) of 32 μg/L. A 90% reduction of this value results in an RG of 3.2 μg/L for mercury (dissolved phase in groundwater).
    - For the Remedial Goal RG or cleanup level for RAO2, the EPA will utilize multiple lines of evidence to demonstrate the efficacy of the mercury sequestration technology for the aquifer matrix and a 90% reduction of dissolved-phase mercury as a performance standard.
    - The first line of evidence will comprise a series of controlled bench/laboratory scale evaluations to identify the most suitable mercury sequestration chemistry under site-specific conditions utilizing site soils from the former Cell Buildings Area and site groundwater sourced from an up-gradient well not impacted by mercury.
    - For the second line of evidence, bench-scale treatments that achieve the performance goal will be subjected to chemical and spectroscopic test methods to confirm the transformation and sequestration of mercury in the laboratory-treated Cell Building Area soils and assess the permanence of the treatment (e.g., post-treatment leachability via the EPA's Leaching Environmental Assessment Framework ("LEAF")).
    - The third line of evidence will be following full-scale implementation of the ICS treatment. The success of the selected mercury sequestration amendment will be assessed by tracking amendment distribution (using the expanded monitoring well network and tracers) and monitoring the dissolved-phase mercury condition across the treatment footprint to confirm that the Remedial Goal or cleanup level of 3.2 μg/L has been met. Further details on the methods and analysis will be developed in a pilot study work plan and in the Remedial Design.

Note: The FFS listed RAO3 to address potential Hg^0 emissions from the CBA. However, additional sampling for mercury vapor as reported in the FFS has indicated this is not an ongoing or potential future risk that needs to be addressed based on soil gas and ambient air sampling results. Also, RAO2 has been modified from a soil concentration goal as stated in the Proposed Plan to a measurement of mercury in the aquifer matrix using 3 lines of evidence based on discussions with the EPA's Office of Research and Development and Region 4 regarding the analyses of mercury using the LEAF method and utilizing lab, bench and in the field pilot studies.

9.0 DESCRIPTION OF ALTERNATIVES

Remedial alternatives developed for this interim early action at the LCP Superfund Site, OU2 are presented below. The primary risk driver is Hg^0 contamination in the CBA soil. Soil remediation is required at the Site to prevent future leaching of Hg^0 to the groundwater. This interim early action is protective of human health and the environment in the short term and is intended to provide adequate protection until a final ROD is signed; complies with those federal and State requirements that are applicable or relevant and appropriate for this limited-scope action; and is cost-effective.

9.1 REMEDIAL ALTERNATIVES

9.1.1 REMEDIAL ALTERNATIVE 1: NO ACTION

Estimated Capital Cost: $15,000
Estimated Operation and Maintenance (O&M) Cost: $210,000
Estimated O&M Cost, 7% discount: $86,863
Estimated Net Present Worth (NPW) Cost: $101,863
Estimated Construction Timeframe: 0 months
Estimated Time to Achieve RAO/Cleanup Levels: Not Applicable (N/A)

Section 300.430(e)(6) of the NCP directs that a "No Action Alternative" be evaluated to provide a baseline scenario against which to compare all other alternatives (EPA, 1992). Typically, the No Action Alternative only includes compliance monitoring. In general, the alternative is applicable when there is no current or potential threat to human health and the environment, or when CERCLA exclusions preclude taking an action. Under the No Action Alternative, no funds would be expended to control or remediate the contaminated media. Funds are required for annual inspection of adherence to the UEC (e.g., land use restriction). Under Alternative 1, the Site would remain in its present condition.

9.1.2 REMEDIAL ALTERNATIVE 2: IN SITU BIOLOGICAL TREATMENT (SOIL DERMAL COVER)

Estimated Capital Cost: $3,737,000
Estimated O&M Cost: $2,166,000
Estimated O&M Cost, 7% discount: $893,448
Estimated NPW Cost: $4,630,448
Estimated Construction Timeframe: 1.5 years
Estimated Time to Achieve RAO/Cleanup Levels: RAO1 met upon completion of dermal cover maintenance. RAO2 met over the 30-year period of Monitoring

This alternative involves in situ application of a biological agent (or agent to induce biological activity) into the areas containing beads of Hg^0. This technology develops out of wastewater treatment applications and is recognized by the EPA as viable in that regard (i.e., for treatment of dissolved phase), but it would be innovative to apply to treatment of Hg^0 beads. This Alternative would require further studies and field testing to verify the efficacy on Hg^0.

Future sampling and monitoring will continue as part of the Remedial Action. Bench-scale studies would be required to select the appropriate biological treatment along with field studies and a full treatability study before full implementation. The selected delivery method for biological agent will depend on the results of the treatability studies. However, the EPA expects that biological agents would be delivered using an injection technology with injection wells installed to directly treat the mercury in the subsurface of the CBA. If this is the case, the subsurface obstructions and pilings beneath the CBA do not preclude the injection and distribution of the media. Injection points or possibly amendment volumes can be modified to maintain amendment loading targets.

Remedial Alternative 2 maintains the soil dermal cover and land use restrictions established under the existing Site institutional controls (ICs). The soil dermal cover across the CBA along portions of the periphery is less than 2-ft thick. Under this alternative, additional clean fill soil will be used to ensure a minimum 2-ft thickness of the cover throughout the CBA. Alternative 2 includes performance monitoring including groundwater monitoring.

9.1.3 REMEDIAL ALTERNATIVE 3: IN SITU CHEMICAL SEQUESTRATION (SOIL DERMAL COVER)

Estimated Capital Cost: $4,502,000
Estimated Operation and Maintenance (O&M) Cost: $210,000 + $722,000 for = $932,000
Estimated O&M Cost, 7% discount: 593,996
Estimated Net Present Worth (NPW) Cost: $5,095,996
Estimated Construction Timeframe: 1.5 years
Estimated Time to Achieve RAO/Cleanup Levels: RAO1 met upon completion of dermal cover maintenance. RAO2 met over the 2-year period of Performance Monitoring

This alternative is an In Situ Chemical Sequestration (ICS) approach designed to sequester Hg^0 (chemically alter the Hg^0 or passivate the Hg^0) in the CBA soil (aquifer matrix) and mitigate the transfer of mercury to a dissolved-phase plume. The alternative combines other elements of existing Site controls including IC and the soil dermal cover. Alternative 3 will require a bench-scale and full treatability study like Alternative 2, however the technology has been demonstrated and is better understood than biological amendments as described in Alternative 2. An advantage of ICS is the technology is implemented with conventional injection wells or direct injection technology as a liquid slurry into the aquifer matrix. The subsurface obstructions and pilings beneath the CBA do not preclude the injection and distribution of the media. Injection points or amendment volumes can be modified to maintain amendment loading targets.

Alternative 3 maintains existing land use restrictions and the use and improvement of the soil dermal cover the same as Alternative 2 and includes two years of performance monitoring.

9.2 COMMON ELEMENTS OF EACH ALTERNATIVE

A common element to all remedial alternatives is the Site's IC (a recorded environmental covenant), which is presently in place and provides for various land use restrictions including precluding use of groundwater and limiting future land use to non-residential. With the exception of the No Action alternative, all of the action alternatives evaluated allow for a pre-design investigation to fill design data gaps prior to designing and implementing the remedy as well as pilot studies to refine implementation of the alternatives. Both action alternatives also include periodic monitoring of the Site to document the effectiveness and continued protectiveness of the remedy and improvements to the existing soil dermal cover.

Inspections of the Site would be conducted to confirm compliance with IC land use restrictions, and an annual compliance certificate would be prepared and provided to the EPA. Prior to any property conveyance, the EPA would be notified. The ICs would be maintained indefinitely, or as long as they are required to maintain protectiveness of the remedy.

10.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

As required by the NCP at 40 CFR §300.430(e)(9)(ii), the FFS used a comparative analysis to assess the relative performance of each alternative in relation to nine specific evaluation criteria (excluding the two modifying criteria: State Acceptance and Community Acceptance). The purpose of this analysis was to identify the advantages and disadvantages of each alternative relative to the other alternatives. The nine criteria are divided into three categories: two threshold criteria (Overall Protection of Human Health and the Environment, and Compliance with ARARs); five primary balancing criteria (Long-term Effectiveness and Permanence; Reduction of Toxicity, Mobility, and Volume through Treatment; Short-term Effectiveness; Implementability; and Cost); and two modifying criteria (State and Community Acceptance). Below is a summary of the detailed comparative analysis of alternatives against the nine criteria.

10.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Overall protection of human health and the environment addresses whether the alternative provides adequate protection of human health and the environment, and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or ICs.

10.1.1 Remedial Alternative 1: NFA

The current state of the CBA area controls exposure. As summarized in the FFS Report, the dermal soil cover effectively protects human health (and the environment), and the IC in place adequately addresses all modes of potential exposure which might otherwise result in unacceptable health risks. The IC precludes residential land use and groundwater extraction and requires that any work on the Site where CBA surface or subsurface soils are to be disturbed (e.g., excavation, construction, utility installation, or maintenance) must be performed by informed and properly trained personnel using appropriate personal protective equipment, and lastly, any new building construction must involve a vapor intrusion assessment. As noted in the HHRA, the results indicated a cancer risk for the hypothetical resident and the excavation worker and the noncancer HI exceeded 1 for the excavation worker. NFA would not be protective of these receptors.

10.1.2 Remedial Alternative 2: In Situ Biological Treatment (with Soil Dermal Cover)

The in situ application of biological agents into the shallow aquifer is intended to reduce the leachability potential of Hg^0 beads present in the subsurface, and in doing so provide for added protection of human health and the environment. The dermal soil cover effectively protects human health and will be enhanced by additional soil placement along the fringe, and the IC adequately addresses all modes of potential exposure which might otherwise result in unacceptable health risks. The IC, which is already in place, is a component of all remedial alternatives and provides stated measures for protection against contaminant exposure. The biological treatment enhances the level of protection of human health and the environment by treating the mercury in multiple forms. Lastly, any new building construction must involve a vapor intrusion assessment.

10.1.3 Remedial Alternative 3: ICS (with Soil Dermal Cover)

Remedial Alternative 3 is protective of human health and the environment. The dermal soil cover effectively protects human health and will be enhanced by additional soil placement along the fringe, and the IC adequately addresses all modes of potential exposure which might otherwise result in unacceptable health risks. The IC, which is already in place, is a component of all remedial alternatives and provides stated measures for protection against contaminant exposure. The ICS treatment enhances the level of protection of human health and the environment by treating the mercury in multiple forms. Lastly, any new building construction must involve a vapor intrusion assessment.

10.2 COMPLIANCE WITH ARARS

Section 121(d) of CERCLA, as amended, specifies in part, that remedial actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances or particular circumstances at a site unless such ARAR(s) are waived under CERCLA Section 121(d)(4). See also 40 CFR § 300.430(f)(1)(ii)(B). ARARs include only federal and state environmental or facility citing laws/regulations and do not include occupational safety or worker protection requirements. Compliance with Occupational Safety and Health Administration (OSHA) standards is required by 40 CFR § 300.150 and, therefore, the CERCLA requirement for compliance with or wavier of ARARs does not apply to OSHA standards.

‘Applicable requirements’ means those cleanup levels, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental laws or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. ‘Relevant and appropriate requirements’ means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility citing laws that, while not “applicable” to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. [See 40 C.F.R. § 300.5

Definitions] Pursuant to 40 CFR § 300.400(g)(5), only those state standards that are promulgated, identified in a timely manner, and more stringent than federal requirements may be applicable or relevant and appropriate. For purposes of identification and notification of promulgated state standards, the term promulgated means that the standards are of general applicability and are legally enforceable. State standards are considered more stringent where there is no corresponding federal standard, the state standard provides a more stringent concentration of a contaminant, or the state standard is broader in scope than a federal requirement.

In addition to ARARs, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The "to-be-considered" (TBC) category consists of advisories, criteria, or guidance that were developed by the EPA, other federal agencies, or states that may be useful in developing CERCLA remedies. See 40 CFR § 300.400(g)(3). TBCs can be used in the absence of ARARs when ARARs are insufficient to develop cleanup levels, or when multiple contaminants may be posing a cumulative risk. See EPA, Office of Land and Emergency Management (OLEM) Directive No. 9234.0-07, *Documenting Applicable, or Relevant and Appropriate Requirements in CERCLA Response Action Decisions* (March 1, 2023).

There are three different categories of ARARs:

<u>Chemical–specific requirements</u> include those laws and regulations governing the release of materials possessing certain chemical or physical characteristics or containing specified chemical compounds. Chemical-specific requirements set health- or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, contaminants, and pollutants.

<u>Action-specific requirements</u> are technology-based or establish performance, design, or other similar action-specific controls or regulations for the activities related to the management of hazardous substances or pollutants. Action-specific ARARs are triggered by the types of remedial activities and types of wastes (i.e., RCRA hazardous waste and/or PCB remediation waste) that are generated, stored, treated, disposed, emitted, discharged, or otherwise managed.

<u>Location-specific requirements</u> are design requirements or activity restrictions based on the geographic or physical position of the site and its surrounding area. Location-specific requirements set restrictions on the types of remedial activities that can be performed based on site-specific characteristics or location such as floodplains, coastal areas, wetlands or critical habitat.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes or provides a basis for invoking a waiver under CERCLA §121(d)(4).

10.2.1 Remedial Alternative 1: NFA

Remedial Alternative 1 does not comply with ARARs because no remedial activity is implemented, and there are no chemical-specific ARARs identified for this interim early action.

10.2.2 Remedial Alternative 2: In Situ Biological Treatment (with Soil Dermal Cover)

Remedial Alternative 2 complies with ARARs regarding aquatic resources and coastal zone areas, threatened and endangered species, land-disturbing activities, waste characterization, treatment, transportation, and disposal, temporary storage of wastes, treatment and disposal of PCBs, underground injection wells, and discharges of wastewaters.

10.2.3 Remedial Alternative 3: ICS (with Soil Dermal Cover)

Remedial Alternative 3 complies with ARARs the same as Remedial Alternative 2.

10.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Long-term effectiveness and permanence refers to expected residual risk, and the ability of a remedy to maintain reliable protection of human health and the environment over time until the cleanup levels are met. This criterion includes the consideration of residual risk that will remain on-site following remediation, and the adequacy and reliability of controls.

10.3.1 Remedial Alternative 1: NFA

The NFA alternative is ineffective in the long-term as no maintenance to the CBA soil dermal cover is required, potential changes in subsurface condition will not be monitored, and the alternative does not reduce the Hg^0 presence through treatment.

10.3.2 Remedial Alternative 2: In Situ Biological Treatment (with Soil Dermal Cover)

The long-term effectiveness of a biological-based treatment is uncertain as the technology has not been used in the context of Hg^0 treatment in the subsurface. Continued maintenance of the CBA soil dermal cover with the added soil on the fringes should provide even more protection than current conditions.

10.3.3 Remedial Alternative 3: ICS (with Soil Dermal Cover)

ICS was selected for development as a remedial alternative partially for its long-term effectiveness and its implementability. The ICS end product, HgS, is stable and insoluble under the present-day and expected future CBA geochemical setting and that of the background groundwater condition based on thermodynamic considerations as discussed in the FFS Report. Factors that could potentially enhance HgS solubility, high dissolved ion concentrations from the historical release of brine, and the solubilized organic matter due to the former CBP condition, are diminishing as evaluated in the OU2 RI Report. These conditions are expected to continue to decline as background groundwater replaces the current CBA condition and as the CO_2 remaining in the system continues to buffer the groundwater in the area.

10.4 REDUCTION IN TOXICITY, MOBILITY, AND VOLUME

Reduction of toxicity, mobility, or volume (TMV) through treatment refers to the anticipated performance of the treatment technologies to address principal threats that may be included as part of a remedy.

10.4.1 Remedial Alternative 1: NFA

The NFA alternative does not achieve a reduction in Hg^0 toxicity, mobility, or volume.

10.4.2 Remedial Alternative 2: In Situ Biological Treatment (with Soil Dermal Cover)

Alternative 2 is intended to achieve a reduction in Hg^0 toxicity, mobility, or volume through active treatment involving biological technologies. Biological treatment has been used in mercury-containing wastewater applications but is considered innovative in the context of Hg^0 in soil. Additional proof of process would be needed involving extensive literature review, bench scale testing, and field testing and demonstration. Long-term effectiveness of TMV could also be determined by the periodic sampling of groundwater currently being implemented.

10.4.3 Remedial Alternative 3: ICS (with and Soil Dermal Cover)

The objective of the ICS alternative is to achieve a reduction in Hg^0 and other forms of mercury compounds in the subsurface toxicity, mobility, or volume through in situ treatment resulting in conversion and encapsulation of Hg^0. While ICS is considered an “innovative” remedy, it has been demonstrated in other locations and is supported by known geochemical processes. Long-term effectiveness could also be determined by the periodic sampling of groundwater currently being implemented.

10.5 SHORT-TERM EFFECTIVENESS

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

10.5.1 Remedial Alternative 1: NFA

The NFA alternative is considered effective in the short-term for RAO1 as the dermal cover prevents direct contact with subsurface Hg^0, and vapor emissions are within acceptable risk levels. The NFA alternative, however, is ineffective concerning RAO2 as it does not reduce the Hg^0 presence through treatment.

10.5.2 Remedial Alternative 2: In Situ Biological Treatment (with Soil Dermal Cover)

The efficacy of biological treatment for an Hg^0 condition is innovative and would require testing to evaluate the effectiveness of this approach in addressing RAO2. The present risk is within an acceptable range for the Site land use under the IC restrictions for direct contact or vapor intrusion. Addition of clean soil along the CBA soil cover periphery will enhance the effectiveness of this element of the remedy (i.e., dermal contact protection). Performance monitoring would determine the short-term effectiveness. Due to the expected long-term action for biological treatment, the time to meet RAOs is estimated to be 30 years after the injection phase of 15.2 months. Minimal staging will be needed to implement the injection technology and there will be minimal impacts to the community during the injection phase or the monitoring phase. As this is an injection technology, impacts to commercial Site workers are also expected to be minimal with low chances of accidents or exposure to Site contaminants.

10.5.3 Remedial Alternative 3: ICS (with Soil Dermal Cover)

The chemical reaction rate between the ICS amendment(s) and Hg^0 is expected to occur soon after application. Although the sequestration of subsurface Hg^0 is not expected to occur uniformly throughout the CBA at the time of implementation, it will reasonably occur on the scale of months following as dispersion and diffusion processes serve to further distribute the applied media. Due to the relative simplicity of the direct injections, multiple injections can be performed in targeted areas as needed to achieve adequate distribution of the ICS chemistry (based on performance monitoring following the initial application). The efficacy of ICS treatment for an Hg0 condition is also somewhat innovative and would require treatability studies as part of this approach in addressing RAO2. The present risk is within an acceptable range for the Site land use under current IC restrictions for direct contact or vapor intrusion. Addition of clean soil along the CBA soil cover periphery will enhance the effectiveness of this element of the remedy (i.e., dermal contact protection). The chemical reaction rate between the ICS amendment(s) and Hg0 is expected to occur soon after application. Although the sequestration of subsurface Hg0 is not expected to occur uniformly throughout the CBA at the time of implementation, it will likely occur on the scale of months following as dispersion and diffusion processes serve to further distribute the applied media. Due to the relative simplicity of the direct injections, multiple injections can be performed in targeted areas as needed to achieve adequate distribution of the ICS chemistry (based on performance monitoring following the initial application). Due to the expected shorter-term action for ICS treatment, the time to meet RAOs is estimated to be 2 years after the injection phase of 15.2 months. Minimal staging will be needed to implement the injection technology and there will be minimal impacts to the community during the injection phase or the monitoring phase. As this is an injection technology impacts to commercial Site workers are also expected to be minimal with low chances of accidents or exposure to Site contaminants. Appropriate precautions will be taken into consideration for polysulfides to minimize any commercial Site worker contact risk.

10.6 IMPLEMENTABILITY

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other government entities are also considered.

10.6.1 Remedial Alternative 1: NFA

There are no actions to implement.

10.6.2 Remedial Alternative 2: In Situ Biological Treatment (with Soil Dermal Cover)

In situ treatment is readily implemented by direct injection of liquid biological agents into the subsurface zones characterized with Hg^0 beads. Biological treatment of mercury involves conversion of soluble mercury into a less soluble Hg^0 form or into insoluble HgS. High concentrations of contaminants such as mercury or chlorine can inhibit microbial activity. Nutrients, pH, and temperature must be maintained at levels that optimize biological activity and growth. Pretreatment with pH amendment agents such as sodium hydroxide or phosphoric acid is essential to maintain an optimal pH range. Nutrient additives such as sucrose, yeast, and salt may be required to support the growth of microbes. Bench-scale studies would be required to select the appropriate biological treatment along with field studies and a full treatability study before full implementation. The selected delivery method for biological agent will depend on the results of the treatability studies but is likely to be injection similar to Alternative 3.

The soil dermal cover presently exists and has been in place since 1997 and will be enhanced for uniform thickness of at least 24 inches at the fringes. The soil dermal cover can be maintained with conventional earthwork equipment; no unique cover materials are necessary.

10.6.3 Remedial Alternative 3: ICS (with Soil Dermal Cover)

There are two tasks to achieve ICS implementability. The first task is the chemical reaction of the selected sequestration chemistry with Hg^0. The second task is the delivery of the selected sequestration chemistry to the subsurface Hg^0. The development of the sequestration chemistry is summarized in the FFS Report, and up to four different chemical approaches will be evaluated with bench-scale evaluation. The sequestration chemistry evaluation will focus on the efficiency of each chemistry to convert and stabilize Hg^0 under Site-specific conditions including potential interfering factors. Thermodynamically, all options proposed are capable of achieving Hg^0 sequestration. The second task involving the delivery of the sequestration chemistry to the subsurface Hg^0 is implementable through conventional drilling technology (i.e., direct push injections). Direct push drilling has successfully penetrated the full depth of the CBA where Hg^0 is known to reside.

The dispersal of the sequestration chemistry to Hg^0 is expected to be feasible and has been previously demonstrated at the Site for delivery of CO_2 in situ. In vertical profile, Hg^0 droplets are not uniformly distributed across the depth of the Satilla but are found as droplets occurring in the aquifer sands at the interface of well-sorted sand lenses perched atop a layer of low permeability clay or silt. The occurrence of the Hg^0 droplets within the aquifer sands, and therefore within layers of higher permeability, is anticipated to benefit the distribution and contact of chemical amendments with the entrained Hg^0 droplets, i.e., the applied amendment will follow the path of lesser resistance, higher permeability. The soil dermal component of Alternative 3 has the same implementability considerations of Alternative 2.

10.7 COST

Cost estimates, including capital costs and long-term operating costs, were prepared for each alternative, and are summarized below.

10.7.1 Remedial Alternative 1: NFA

- Capital Cost: $15,000
- 30-yr O&M Cost: $210,000
- 30-yr O&M Cost, 7% discount: $86,863

The estimated cost for Remedial Alternative 1 is $101,863 and is based on annual inspection of adherence to the UEC (e.g., land use restriction) for a 30-year period. Details of the estimated cost are provided in the FFS Report.

10.7.2 Remedial Alternative 2: In Situ Biological Treatment (with Soil Dermal Cover)

- Capital Cost: $3,737,000
- 30-yr O&M Cost: $2,166,000
- 30-yr O&M Cost, 7% discount: $893,448

The estimated cost for Remedial Alternative 2 is $4,630,448 with the 7% discount and is based on study and implementation of biological treatment, annual inspection of the UEC (e.g., land use restriction), annual groundwater monitoring, and enhancement and maintenance of the CBA soil dermal cover for a 30-year period. The cost includes an assumed maintenance injection at some point into the future to revitalize the applied microbial population. The cost framework and basis are provided in the FFS Report. These were updated per the EPA's approval of the FFS for MNA Evaluation only, not as an alternative. The EPA proposed plan issued in 2024 further updated the framework and basis by eliminating MNA from all alternatives considered as the periodic groundwater sampling currently being implemented at the Site will include sampling for MNA parameters and an evaluation of the results and it is not included in this selected remedy.

10.7.3 Remedial Alternative 3: ICS (with Soil Dermal Cover)

- Capital Cost: $4,502,000
- 30-yr O&M Cost: $210,000
- 30-yr O&M Cost, 7% discount: $86,863

The estimated cost for Remedial Alternative 3 is $4,588,863 comprised of ICS pilot study work and completion of the ICS treatment for the two treatment zones with a two-year performance monitoring period, as well as the other obligations, inspection of adherence to the UEC (e.g., land use restriction), and enhancement and long-term maintenance of the CBA soil dermal cover as outlined for Remedial Alternative 2. The cost framework and basis are provided in the FFS Report. These were first updated per the EPA's approval of the FFS for MNA Evaluation only, not as an alternative. The EPA proposed plan issued in 2024 further updated the framework and basis by eliminating MNA from all alternatives considered as the periodic groundwater sampling currently being implemented at the Site will include a sampling for MNA parameters with all COCs and an MNA evaluation and it is not included in this selected remedy. The detailed estimated costs associated with each alternative are found in Appendix E of the FFS Report (Montrose, 2023). Appendix C provides a more detailed cost estimate for the selected remedy.

10.8 STATE AND COMMUNITY ACCEPTANCE

GAEPD has been fully engaged in the RI and FFS and has supported the efforts and the preferred alternative in the Proposed Plan. GAEPD concurs with the selected alternative as an early action interim remedy to address mercury in the subsurface and aquifer matrix. The EPA held multiple information sessions with the community and community groups and representatives to brief on the results of the RI and the FFS process and findings. The EPA also held multiple informal community information sessions and a formal public meeting during the comment period on the proposed plan and extended the public comment period to 60 days upon community request. Community acceptance was indicated in the majority of comments received of the preferred alternative in the proposed plan and was also indicated in the verbal statements in the information sessions.

Written comments were received during the public comment period. Comments received regarding the relevant to the action being taken are addressed in the Responsiveness Summary in Appendix A.

11.0 PRINCIPAL THREAT WASTES

The NCP establishes an expectation that the EPA will use treatment to address the principal threats posed by a site wherever practicable (40 C.F..R § 300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic, or highly mobile, which generally cannot be contained in a reliable manner, or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained, and that would present only a low risk in the event of exposure. The manner in which principal threats are addressed, generally, will determine whether the statutory preference for treatment as a principal element is satisfied. The Hg^0 within the CBA soils on the LCP Superfund Site, OU2 are considered to be "principal threat wastes" because the Hg^0 beads could pose a risk to human health via vapor intrusion if contacted by receptors and are a continuing highly toxic source of contamination to the groundwater.

Alternative 1, No Action does not address the mercury principal threat wastes. Alternative 2, Biological treatment would possibly address mercury principal threat wastes but would likely require significant testing to determine the level of efficacy. Alternative 3, In situ Chemical Sequestration is more proven to be effective in treating mercury principal threat wastes.

12.0 SELECTED REMEDY

12.1 RATIONALE FOR THE SELECTED REMEDY

The EPA's Selected Remedy for the Site is Alternative 3 – In situ Chemical Sequestration (a form of chemical treatment), and Improvement and Maintenance of the Existing Soil Dermal Cover, and Institutional Controls (in the form of the existing recorded Environmental Covenant and Zoning restrictions). This remedy consists of the improvement and maintenance of the existing soil dermal cover to a minimum of 2 feet (24 inches) over all portions of contaminated soil to minimize water infiltration (by being graded to promote runoff) and to limit inadvertent human intrusion activities. ICS, using polysulfide and/or other amendments as appropriate, would be applied via underground injection to the subsurface prior to finalizing the soil cover to convert Hg0 to a form of HgS and to minimize the dissolution of mercury. In situ chemical treatment, in the form of sulfur amendments, would be applied to the subsurface prior to soil cover enhancement to minimize the dissolution of mercury. Performance monitoring would be implemented following the subsurface amendments and cover maintenance. ICs would continue to be maintained to restrict land use to non-residential of the area. See the proposed ICS design layout shown on Figure 12-1.

Based on information available at this time, the EPA believes the selected remedy, Alternative 3, would be protective of human health and the environment and would comply with identified state and federal ARARs. The decisive factors for the selected remedy are the superior long-term effectiveness and permanence and the use of treatment to reduce toxicity, mobility, or volume of principal threats. As shown on Table 12-1, Alternative 3 provides the best balance of tradeoffs among the other alternatives with respect to the nine NCP criteria for the evaluation and selection of the remedy at the Site. The EPA expects the selected remedy to satisfy the following statutory requirements of CERCLA 121(b): 1) be protective of human health and the environment; 2) comply with ARARs (or justify a waiver); 3) be cost-effective; and 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

12.2 DESCRIPTION OF THE SELECTED REMEDY

The EPA's Selected Remedy is In situ Chemical Sequestration (a form of chemical treatment), Improvement and Maintenance of the Existing Soil Dermal Cover, and Institutional Controls (in the form of the existing recorded Environmental Covenant and Zoning restrictions). This alternative has been modified from the FFS as Sitewide groundwater monitoring including sampling for Monitored Natural Attenuation (MNA) parameters is now planned to be conducted pursuant to the 1995 Administrative Order by Consent for Remedial Investigation/Feasibility Study and is not part of the remedy. However, groundwater monitoring will be conducted to assess the performance of the in situ treatments. The selected remedy is an interim early action to address mercury in the subsurface beneath the former Cell Building Area (CBA) in OU2 which acts as a source of groundwater contamination. OU1 (the salt marsh) has already been addressed in a previous remedy selection and the remedial action has been implemented. OU1 is now in the monitoring phase for the remedy. OU3 was addressed by earlier removal actions and a subsequent No Further Action ROD. OU2 will require a final ROD in the future to fully address all COCs in groundwater.

The primary components of the selected remedy include:

- Implementing in situ chemical sequestration (ICS) (a form of chemical treatment) to address subsurface mercury contamination in the CBA.
- Improving and maintaining the soil dermal cover that exists across the CBA.
- Maintain institutional controls (ICs) (in the form of the existing recorded environmental covenant and zoning restrictions).

This alternative consists of the improvement and maintenance of the existing soil dermal cover over all portions of contaminated soil in the CBA to minimize water infiltration (by being graded to promote runoff) and limiting inadvertent human intrusion activities. The cover will be sloped, where possible, to facilitate drainage and would be constructed to a uniform thickness of at least 24 inches (2 feet). The cover does not meet landfill final cover requirements and is not intended to prevent leaching of COCs into groundwater. The final remedy for OU2 will evaluate the need to modify the cover.

Mercury (Hg) is present at the LCP Site in multiple forms: an elemental state (Hg0) of metallic mercury observed as discrete "beads" in the subsurface, in a state where it has formed compounds (usually salts) in the soil and aquifer matrix, and in a dissolved state in groundwater. In situ chemical sequestration (ICS) (a form of chemical treatment) using polysulfide and/or other amendments as appropriate, would be applied to the subsurface prior to finalizing the soil cover to convert elemental mercury (Hg0) to a form of mercuric sulfide and to minimize the dissolution of mercury. Other existing forms of mercury in the subsurface treatment area would also be addressed and converted to insoluble and less mobile forms of mercuric sulfide. This remedy is selected because it will achieve substantial risk reduction by both treating the source materials constituting principal threats at the Site and providing safe management of remaining material. This combination reduces risk sooner and takes less time than the other alternatives. Although it was stated in the EPA's approval of the FFS that evaluation of MNA through periodic groundwater monitoring (including MNA parameters) would be a component of the alternatives evaluated for this Proposed Plan, the EPA has since requested that the Potentially Responsible Parties (PRPs) implement periodic groundwater monitoring as soon as possible to provide information for the evaluation of a final remedy that addresses all chemicals of concern (COCs) in groundwater. The EPA has requested the monitoring include collection parameters to evaluate MNA, therefore, MNA is no longer included in the alternatives in the proposed plan. The existing Institutional Controls (ICs) would continue to be maintained to control use of the area.

The selected remedy uses a chemical treatment that alters the mineralogical state of Hg0 in situ, either chemically converting Hg0 entirely to HgS or physically isolating the Hg0 beads with a passive surface layer of insoluble HgS. Therefore, this selected remedy inhibits further solubilization of Hg0 and minimizes Hg0 as a continuing source to groundwater.

Common to any in situ amendment treatment approach, the evaluation begins with a review of the scientific literature as applied to the Site conditions and evolves through controlled pilot testing to support the remedial design and selection of specific ICS amendments and strengths. The objective of the ICS development is to provide sufficient information to substantiate the approach and recognize factors to be evaluated in subsequent pilot testing. A framework for the development of the ICS remedial alternative, to be completed as a series of site-specific studies and bench-scale testing, is outlined. The framework steps include:

- Detailed assessment of the CBA groundwater;
- Refinement of the CBA geochemical model;
- Bench-scale studies of ICS amendments; and
- ICS design.

These framework steps are the anticipated plan, which is subject to change as the pilot studies and Remedial Design are developed and implemented.

12.2.1 Detailed Assessment of CBA Groundwater

A detailed assessment of the groundwater chemical profile in the ICS treatment zones is the initial step of the ICS design process and supports multiple objectives. First, the chemical profile establishes a baseline condition (i.e., pretreatment condition) of the ICS treatment zones. Second, the detailed chemical profile will be used to refine the CBA geochemical model with the collection of major ions, dissolved constituents (e.g., mercury, other metals, natural organic matter [NOM]), and geochemical parameters (e.g., pH, oxidation-reduction potential, temperature, and alkalinity). Third, performance monitoring wells will be used to test the ICS effects on the dissolved-phase mercury as well as to monitor the amendment concentration during application.

Currently, no monitoring wells occur within the proposed ICS treatment zone in former Cell Building 1, and a single well pair (MW-362A/B) is located in the Cell Building 2 ICS treatment zone. Therefore, additional monitoring well clusters (‘A’ and ‘B’ well) are proposed in each ICS treatment zone that span the Satilla Formation consistent with existing monitoring well clusters MW-361A,B and MW-362A,B (Figure 12-2). The ICS treatment zone monitoring wells will be installed with continuous soil coring to further assess the distribution of Hg^0 and select core locations for use in bench-scale studies.

12.2.2 Refinement of CBA Geochemical Model

Chemical equilibrium modeling of mercury phases under extrapolated CBA conditions and that of the background groundwater are presented in Section 6.3 of the FFS (Montrose, 2023). The purpose of the FFS chemical equilibrium assessment is to forecast the stability of solid HgS under both groundwater systems as a means to evaluate the ICS alternative. A refinement and expansion of the CBA chemical equilibrium modeling will be completed following the groundwater characterization in the ICS treatment areas. First, the geochemical and compositional make-up of the groundwater in the ICS treatment zones will be evaluated to confirm the preliminary modeling completed in the FFS, including the forecast long-term stability of solid HgS. This assessment will be more rigorous in that a broader compositional make-up of the groundwater will be available. Second, modeling of the various amendments, amendment doses, and potentially competing factors can be assessed at the desktop level to support and streamline the bench-scale design.

12.2.3 Bench-Scale Studies of ICS Amendments

Laboratory-controlled bench-scale testing of potential ICS amendments will be performed to evaluate amendment reactivity and suitable concentration, with testing performed under the range of Site-specific geochemical conditions present in the CBA treatment zones. The sequestration amendments to be evaluated include sodium polysulfide, colloidal sulfur, iron sulfide, and potentially one or more non-sulfur-based amendments subject to further evaluation. Each of the amendment chemistries will be evaluated separately and in combination to promote the sequestration of Hg^0 and oxidized mercury species at the Hg^0 bead surface. As described, the sulfur-based amendment aims to transform dissolved Hg^0 to solid HgS and chemically precipitate an insoluble shell of solid HgS on the surface of Hg^0 beads. Solid HgS is established to be highly insoluble and stable under natural conditions.

The efficacy of the sequestration amendments will be evaluated with bench-scale testing, and the testing design will simulate to the extent practicable Site conditions. To achieve this objective, it is proposed to collect soil cores from the CBA where Hg^0 beads are known to occur using Shelby Tube sampling methodology or a similar direct push approach using a core liner system to minimize sample disturbance. Collection of undisturbed soil cores with Hg^0 beads was previously achieved to study Hg partitioning to the aquifer matrix (EPS, 2018). Visual assessment of the cores in the field will be necessary to confirm the presence of Hg^0 beads before shipment to the laboratory. Methods to best preserve the soil cores for transport to the laboratory for bench scale testing will be evaluated (e.g., sample isolation/sealing or freezing of sample). The bench-scale testing, forecast to be in the form of up-flow columns, will require special precautions to simulate Site conditions and minimize exposure to oxidative conditions. Standard practices to achieve this goal include the use of an anaerobic chamber (i.e., glovebox) to perform bench-scale testing and deoxygenating reagents. Full details and standard operating procedures will be developed.

It is anticipated that the bench-scale design will first assess the accessibility (i.e., logistics), preparation, and baseline performance of several amendments, with the selection of one or more amendments to evaluate under Site groundwater conditions. The factors to be evaluated in the bench-scale study (on a preliminary basis) are summarized below.

Parameter	**Purpose of Parameter Evaluation**
Amendment Type	Evaluate the baseline reactivity of amendment with collected soil column sample
Amendment Dose	Evaluate the reactivity of amendment under forecast mass balance ratios of Hg to S (e.g., 1:1, 1:5, 1:20, etc.)
pH	Evaluate the reactivity of amendment and amendment-Hg^0 end product under the range of ICS treatment zone pH
NOM	Evaluate the role of NOM on sequestration chemistry and end product formation (i.e., rate of reaction and inhibitory effects)
Ionic Composition	Evaluate the reactivity of amendment under the Site-specific salinity condition

Under certain conditions, soluble HgS complexes may form in the presence of excess sulfide and highly alkaline groundwater (e.g., above pH 8). These factors can be mitigated, if necessary, by applying sulfur amendments at lower concentrations and pH buffering. The last assessment of CBA groundwater (2019/2020) found the groundwater condition in CBA wells to range from 6.3 to 7.0, with one well, MW-362A, last reported at pH 8.0. However, the pH of groundwater exhibits a consistent downward trend in 2019 and 2020 data following the CO_2 sparge treatment, and the pH likely continued to decline as pH gradients equilibrated following the CO_2 treatment (groundwater pH equilibration was observed elsewhere in the CBP following CO_2 treatment). Furthermore, the current groundwater pH is consistent with background groundwater (neutral to slightly acidic) reducing the probability of this interference. The pH condition of the ICS treatment zones will be evaluated during the detailed assessment of CBA groundwater and applied to the bench-scale testing.

Groundwater NOM is elevated in the CBA due to the past caustic release even though the pH has been neutralized following the CO_2 sparging. The formation of solid HgS, most notably metacinnabar, can be slowed in the presence of dissolved NOM (Ravichandran, 1998), and high concentrations of NOM have also shown modest interference with the reaction of elemental sulfur and mercury (Gong, 2014). In these studies, the ability of NOM to interfere with solid HgS formation is correlated to two NOM properties: aromaticity and molecular weight.

Therefore, evaluating the Site-specific NOM and utilization of NOM in bench-scale testing is warranted to evaluate the ICS amendment performance.

Two lines of evidence are proposed to evaluate the efficacy of the ICS amendments. The first line of evidence will assess changes in Hg^0 solubilization through direct testing of dissolved mercury in leachate, comparing amended versus control (i.e., nonamended) simulations. The second line of evidence will assess the physical transformation of Hg^0 beads. The physical transformation will be assessed visually (unaided or with microscopy) and spectroscopically. Visually, a darkening of the Hg^0 beads in contrast to the baseline reflective metallic state will indicate the formation of a surface precipitate or reaction. If deemed practical, microscopy of the Hg^0 beads may be completed to identify the nature of the surface precipitate and elemental composition (e.g., scanning electron microscopy). As the objective of the sulfur-based amendment is to transform the Hg^0 to solid HgS, it is proposed to confirm the mineralogical transformation with x-ray diffraction (XRD). The application of XRD will be subject to the ability to physically isolate transformed Hg^0 beads, which establishes the requirement to field verify the presence of Hg^0 beads in soil core samples before transport to the laboratory for bench testing. Identifying Hg^0 beads is feasible based on prior core collection work, with past soil core assessments identifying Hg^0 beads up to 2 millimeters in size. The Hg^0 beads are easily discerned in contrast to the uniform color and consistency of the sand lenses in which the Hg^0 beads reside (see the photo in FFS Section 5.3.4).

12.2.4 ICS Design

Following the bench-scale studies and demonstration of Hg^0 sequestration as solid HgS, the technology process will be extrapolated to full-scale for the proposed ICS treatment zones. The final design will be part of the overall CBA Remedial Design submittal.

12.3 EXPECTED OUTCOME OF THE SELECTED REMEDY

The expected outcome of this interim remedy will be to alter the mineralogical state of Hg0 in situ, either chemically converting Hg0 entirely to HgS or physically isolating the Hg0 beads with a passive surface layer of insoluble HgS. Therefore, this selected remedy inhibits further solubilization of Hg0 and minimizes Hg0 as a continuing source to groundwater. It is expected that after treatment, mercury will not be detected in the treatment area above the cleanup level of 3.2 μg/L dissolved in on site groundwater and that chemical and/or spectrographic analyses will indicate Hg0 has been converted to HgS in the aquifer matrix.

Available land use(s) upon achieving cleanup levels include the current zoning for industrial use, as well as commercial use and recreational use as demonstrated by the recreational use risk assessment.

Ground-water will still not be available for use until achieving cleanup levels that will be determined in the final remedy for Site-wide groundwater as the levels are above the Safe Drinking Water Act Maximum Contaminant Levels and risk-based drinking water levels.

The final cleanup level for mercury in the aquifer matrix (as defined by analyses of dissolved mercury in groundwater and leach water from aquifer matrix samples) is 3.2 μg/L which is based on a 90% reduction of the maximum Exposure Point Concentration of 32 μg/L from the results of the Remedial Investigation. While the risk at the cleanup levels is reduced, it is not acceptable to restore the groundwater for potable use at this time. In addition, the full list of COCs is not being addressed and will need to be addressed in a future final remedial action, as appropriate.

This interim early action is protective of human health and the environment in the short term and is intended to provide adequate protection until a final ROD is signed; it complies with federal and State environmental requirements that are applicable, or relevant and appropriate, for this limited-scope action; and it is cost-effective. Because this remedy will result in hazardous substances remaining on-Site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the RA.

Because this is an interim early action ROD, review of this Site and remedy will be ongoing, as the EPA continues to develop remedial alternatives for the Site. In particular, periodic groundwater sampling will be performed on a regular basis to monitor the neutralization of the CBP condition and the downgradient extent of dissolved mercury.

The interim early action will provide protection of human health and the environment by eliminating, reducing, or controlling risks at the Site through treatment, monitoring, and the maintenance of ICs.

13.0 STATUTORY DETERMINATION

Based on the information currently available, the EPA believes the interim early action for the Site meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the selected remedy will satisfy the following statutory requirements of CERCLA Section 121(b):

- Be protective of human health and the environment;
- Comply with ARARs;
- Be cost effective; and
- Use permanent solutions, and alternative treatment technologies, or resource recovery technologies, to the maximum extent practicable.

13.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The interim early action is protective of human health and the environment in the short term. Protection of human health will be achieved by active treatment of the multiple forms of mercury contamination with ICS.

13.2 COMPLIANCE WITH ARARS

Section 121(d)(2) of CERCLA, and the NCP at 40 CFR § 300.430(f)(1)(ii)(B), require that RAs at CERCLA sites attain legally applicable, or relevant and appropriate, federal and more stringent state requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA Section 121(d)(4). The Selected Remedy will comply with all Location- and Action-specific ARARs and TBC guidance presented in Tables 13-1 and 13-2; no chemical-specific ARARs are identified for the Site.

Location-specific ARARs include requirements for aquatic resources, floodplains and coastal zone areas, and threatened and endangered species.

Action-specific ARARs include requirements for land-disturbing activities, waste characterization, treatment, transportation, and disposal, temporary storage of wastes, treatment and disposal of PCB remediation wastes, underground injection wells, and discharges of wastewaters.

13.3 COST EFFECTIVENESS

The EPA has determined that the Selected Remedy is cost-effective, and that the overall protectiveness of the remedy is proportional to the overall cost. As specified in 40 CFR §300.430(f)(l)(ii)(D), the cost-effectiveness of the Selected Remedy was assessed by comparing the protectiveness of human-health and the environment in relation to three balancing criteria (i.e., long-term effectiveness and permanence; reduction in toxicity/mobility/volume; and short-term effectiveness), with the other alternatives considered.

While more than one remedial alternative can be considered cost-effective, CERCLA does not mandate that the most cost-effective, or least expensive remedy be selected. The estimated total cost (i.e., capital plus present worth of O&M costs) of the Selected Remedy is $4,588,863, at a 7% annual discount rate.

13.4 USE OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICEABLE

The EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site during this interim early action. The Selected Remedy under this interim early action is not designed or expected to be final, but the selected remedy does represent the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element, bias against off-Site treatment and disposal, and considering State and community acceptance. The IC precludes residential land use and groundwater extraction and requires that any work on the Site where CBA surface or subsurface soils are to be disturbed (e.g., excavation, construction, utility installation, or maintenance) must be performed by informed and properly trained personnel using appropriate personal protective equipment, and lastly, any new building construction must involve a vapor intrusion assessment.

13.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

CERCLA Section 121(b) specifies remedial actions, which permanently and significantly reduce the toxicity, mobility, or volume of the hazardous substances, pollutants, and contaminants as a principal element, are to be preferred over remedial actions not involving such treatment. The preference for treatment is addressed in this IEAROD and will be addressed in the final decision document for the Site. It should be noted that the interim early action selected remedy component of ICS, to treat multiple forms of subsurface mercury contamination supports the treatment preference for principal threats posed by the Site.

13.6 FIVE-YEAR REVIEW REQUIREMENTS

Section 121(c) of CERCLA, and the NCP at 40 CFR § 300.430(f)(5)(iii)(C), provide the statutory and legal bases for conducting five-year reviews. This remedy will result in hazardous substances, pollutants, or contaminants permanently remaining on-Site above levels that allow for unlimited use and unrestricted exposure; therefore, a policy review will be conducted within five years of construction completion for the Site, to ensure that the remedy is, or will be, protective of human health and the environment. ICs, and Five-Year Reviews, will be required until all groundwater and soil cleanup levels are achieved.

14.0 DOCUMENTATION OF SIGNIFICANT CHANGES

To fulfill CERCLA §117(b), and NCP at 40 CFR §§ 300.430(f)(5)(iii)(B), and 300.430(f)(3)(ii)(A), the ROD must document and discuss the reasons for any significant changes made to the Selected Remedy, from the time the Proposed Plan was released for public comment, to the final selection of the remedy. The interim early action remedy selected for the Site in this interim early action ROD is the same as the preferred remedy released in the Proposed Plan for public comment, with no changes.

It should be noted that RAO 2 has been modified from the Proposed Plan causing the Remedial Goal associated with RAO 2 to also be updated. Information and feedback received through the Proposed Plan process and discussions with the EPA Region 4 technical staff and EPA Office of Research and Development experts as well as with Georgia EPD and the PRPs determined that normal subsurface aquifer matrix laboratory analyses would likely not demonstrate the results of the ICS correctly. Therefore, the EPA concluded that the RAO should be modified to focus on the concentration of mercury in leach water from the treated subsurface aquifer matrix using multiple lines of evidence and remedial goal (i.e., cleanup level) equal to that for groundwater of 3.2 μg/L for mercury after treatment. The remedy is unchanged. Only the cleanup level and the lines of evidence to measure attainment of the cleanup level are modified. The EPA also relied on review from internal subject matter experts to ensure the selected remedy includes an appropriate amount of flexibility for the remedial designers to develop and implement the remedial components.

As noted in the Proposed Plan, the alternatives presented in the PP and this IEAROD do not have an MNA component. Groundwater sampling is ongoing as part of the Remedial Investigation and the results of that sampling will be used to evaluate alternatives for the final remedy for sitewide groundwater in OU2.

PART 3: RESPONSIVENESS SUMMARY

This Responsiveness Summary for the LCP Superfund Site, OU2 has been prepared in accordance with CERCLA, as amended by SARA, and the NCP at 40 CFR § 300.430(f). The Responsiveness Summary documents, for the public record, the EPA's response to comments received on the Proposed Plan during the public comment period.

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TABLES

Table 2-1a
1994-1997 CBA Soil Data: Mercury

Location/ Depth(ft)	Mercury (mg/kg)
96262-15	
2	5.3
96262-16	
3	4.1
96262-17	
2	1.0
96262-18	
3	ND
96262-19	
2	2.7
96289-02	
4	10,400
96289-03	
4	5,730
96289-04	
4	2,750
96289-05	
2	91
96289-06	
5	9.4
96289-07	
5	53
96290-01	
4	287
96290-02	
4	803
LC-217	
2	50
LC-246	
2	110
4	16.0
LC-247	
2	3,700
4	120
LC-248	
2	210
LC-249	
2	220
4	280
LC-250	
2	840
4	370

Location/ Depth(ft)	Mercury (mg/kg)
LC-285	
2.5	1.4
3	0.29
5	0.85
LC-251	
2	140
4	96
LC-252	
2	83
4	36
LC-253	
2	140
4	51
LC-261	
3.5	4.2
5.5	7.4
LC-262	
3.5	10.0
5.5	37
LC-263	
3	13.0
5	2.0
LC-264	
2	90
4	30
5	12.0
LC-265	
2	24
4	24
LC-266	
2	6.4
4	0.80
LC-267	
2	4.8
4	3.6
LC-268	
2	0.27
4	0.75
LC-269	
2	300
4	26
LC-270	
2	27
4	7.2

Location/ Depth(ft)	Mercury (mg/kg)
LC-271	
2	12.0
4	1.7
LC-272	
3	4.4
5	1.9
LC-273	
3	5.2
5	10.0
LC-274	
2	22
4	15.0
LC-275	
2	16.0
4	2.7
LC-276	
2	6.1
4	2.2
LC-277	
2	10.0
4	0.95
LC-278	
2	4.2
4	1.7
LC-279	
2	4.8
4	0.55
LC-280	
2	4.2
4	1.9
LC-281	
3	10.0
5	5.5
LC-282	
2	5.4
4	3.3
LC-283	
2	6.8
4	4.7
LC-284	
2	1.8
4	15.0

Table 2-1a
1994-1997 CBA Soil Data: Mercury

Location/ Depth(ft)	Mercury (mg/kg)
LC-286	
2.5	21
3	3.0
5	7.2
LC-287	
3	1.6
5	1.0
LC-288	
3	37
5	17.0
LC-289	
2.5	43
3.5	22
5.5	25
LC-290	
2	260
4	8.0
LC-291	
2	26
4	8.8
LC-292	
2	13.0
4	52
LC-293	
2	660
4	100
LC-294	
2	150
4	12.0
LC-295	
2	42
4	76
LC-296	
2	0.17
4	0.06
LC-297	
2	15.0
4	10.0
LC-298	
2	16.0
4	3.5
LC-299	
2	6.4
4	1.4
LC-300	
2	8.7
4	1.0

Location/ Depth(ft)	Mercury (mg/kg)
LC-301	
2	6.9
4	13.0
LC-302	
2	72
4	25
LC-303	
0	22
2	6.3
LC-304	
2	35
4	2.2
LC-305	
2	35
4	3.2
LC-306	
2	2.1
4	5.4
LC-307	
2	13.0
4	5.6
SB-480	
7	97
13	92
19	238
32	18.5
37	5.8
SB-477	
24	90
SB-478	
18	1.4
19	17.1
25	35
39	1.3
44	4.2
SB-481	
9	2.2
16	2.3
22	18.3
26	12.7
39	5.7
44	1.6
SB-479	
12	1.7
19	71
32	6,120
37	1,180
39	ND
44	13.7

Location/ Depth(ft)	Mercury (mg/kg)
SB-482	
10	4.5
18	2.5
21	1,620
26	14.9
30	74
34	12.7
39	17.7
46	5.3
SB-483	
14	148
25	10.4
35	5.9
45	2.3
SB-484	
7	14.6
17	37
29	26
31	46,900
33	70,100
39	17.6
41	5.0
44	4.2
55	2.8

Table 2-1b
1994-1997 CBA Soil Data: Metals

Location:	LC-217	96262-15	96262-16	96262-17	96262-18	96262-19	96289-02	96289-03	96289-04	96289-05	96289-06	96289-07	96290-01	96290-02
Depth (ft):	**2**	**2**	**3**	**2**	**3**	**2**	**4**	**4**	**4**	**2**	**5**	**5**	**4**	**4**
Parameter														
Aluminum	2,200	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	ND (0.006)	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ND (0.006)	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	14	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	ND (0.001)	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	ND (0.001)	--	--	--	--	--	--	--	--	--	--	--	--	--
Calcium	15,000	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	5.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	ND (0.002)	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	8.7	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron	13,000	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	260	72.5	55.1	34.5	19.9	86.7	13.9	20.6	ND (0.013)	ND (0.0116)	ND (0.0114)	ND (0.013)	ND (0.0136)	ND (0.0118)
Magnesium	790	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	69	--	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ND (0.002)	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	4.1	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	ND (0.4)	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	ND (0.008)	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	ND (0.002)	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	1,300	--	--	--	--	--	--	--	--	--	--	--	--	--
Strontium	250	--	--	--	--	--	--	--	--	--	--	--	--	--
Tellurium	ND (0.01)	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	ND (0.02)	--	--	--	--	--	--	--	--	--	--	--	--	--
Tin	ND (0.006)	--	--	--	--	--	--	--	--	--	--	--	--	--
Titanium	63	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	8.9	--	--	--	--	--	--	--	--	--	--	--	--	--
Yttrium	ND (0.002)	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	100	--	--	--	--	--	--	--	--	--	--	--	--	--

Units: mg/kg
--: not tested
ND: non-detect (detection limit)

Table 2-1c
1994-1997 CBA Soil Data: VOCs

Location:	LC-261		LC-262		LC-263		LC-264		LC-265		LC-285		LC-286		LC-287		LC-288		LC-289	
Depth (ft):	3.5		3.5		3		2		2		3		3		3		3		3.5	
Parameter	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
1,1,1,2-Tetrachloroethane	--	--	--	--	ND	34	--	--	ND	64	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,1,2,2-Tetrachloroethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,1,2-Trichloroethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,1-Dichloroethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,1-Dichloroethene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,1-Dichloropropene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,2,3-Trichloropropane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,2-Dichloroethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,2-Dichloropropane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,3-Dichloropropane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
2,2-Dichloropropane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
2-Butanone (MEK)	ND	530	ND	520	ND	340	ND	540	ND	640	ND	870	ND	690	ND	630	ND	1100	ND	500
2-Chlorotoluene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
2-Hexanone	ND	130	ND	130	ND	85	ND	140	ND	160	ND	220	ND	170	ND	160	ND	270	ND	130
4-Chlorotoluene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
4-Methyl-2-pentanone	ND	130	ND	130	ND	85	ND	140	ND	160	ND	220	ND	170	ND	160	ND	270	ND	130
Acetone	ND	530	ND	520	ND	340	ND	540	ND	640	ND	870	350	ND	ND	630	ND	1100	ND	500
Benzene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Bromobenzene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Bromochloromethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Bromodichloromethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Bromoform	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Bromomethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Carbon disulfide	ND	130	ND	130	ND	85	ND	140	ND	160	ND	220	ND	170	ND	160	ND	270	ND	130
Carbon tetrachloride	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Chlorobenzene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Chloroethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Chloroform	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Chloromethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
cis-1,2-Dichloroethene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
cis-1,3-Dichloropropene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Dibromochloromethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Dibromomethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Dichloromethane (Methylene chloride)	ND	53	ND	52	ND	34	ND	54	ND	64	ND	180	ND	69	ND	63	ND	110	ND	50
Ethyl benzene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Isopropylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.4	ND
o-Xylene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Styrene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Tetrachloroethene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Toluene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
trans-1,2-Dichloroethene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
trans-1,3-Dichloropropene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Trichloroethene	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Trichlorofluoromethane	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Vinyl chloride	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50
Xylenes (unspecified)	ND	53	ND	52	ND	34	ND	54	ND	64	ND	87	ND	69	ND	63	ND	110	ND	50

Units: µg/kg

ND: non-detect

--: not tested

Table 2-1d
1994-1997 CBA Soil Data: SVOCs/PAHs

Location:	LC-217		LC-261		LC-262		LC-263		LC-264		LC-
Depth (ft):	2		3.5		3.5		3		2		2
Parameter	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result
1,2,4-Trichlorobenzene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
1,2-Dichlorobenzene	--	--	ND	53	ND	52	ND	34	ND	54	ND
1,3-Dichlorobenzene	--	--	ND	53	ND	52	ND	34	ND	54	ND
1,4-Dichlorobenzene	--	--	ND	53	ND	52	ND	34	ND	54	ND
2,2'-Chloroisopropylether	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2,3,4,6-Tetrachlorophenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2,4,5-Trichlorophenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2,4,6-Trichlorophenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2,4-Dichlorophenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2,4-Dimethylphenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2,4-Dinitrophenol	ND	15,000	ND	15,000	ND	18,000	ND	18,000	ND	18,000	ND
2,6-Dinitrotoluene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2-Chloronaphthalene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2-Chlorophenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2-Methylnaphthalene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2-Methylphenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2-Nitroaniline	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
2-Nitrophenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
3,3'-Dichlorobenzidine	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
3/4-Methylphenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
3-Nitroaniline	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
4,6-Dinitro-2-methylphenol	ND	15,000	ND	15,000	ND	18,000	ND	18,000	ND	18,000	ND
4-Bromophenyl-phenylether	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
4-Chloro-3-methylphenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
4-Chloroaniline	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
4-Chlorophenyl-phenylether	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
4-Nitroaniline	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
4-Nitrophenol	ND	15,000	ND	15,000	ND	18,000	ND	18,000	ND	18,000	ND
Acenaphthene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Acenaphthylene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Anthracene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Benzo(a)anthracene	960	ND	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Benzo(a)pyrene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Benzo(b/k)fluoranthene	1,300	ND	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Benzo(g,h,i)perylene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
bis(2-Chloroethoxy) methane	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
bis(2-Chloroethyl) ether	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
bis(2-Ethylhexyl) phthalate	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Butylbenzylphthalate	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Carbazole	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Chrysene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Cyclohexanone	--	--	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Dibenzo(a,h)anthracene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Dibenzofuran	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Diethylphthalate	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Dimethylphthalate	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Di-n-butylphthalate	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Di-n-octylphthalate	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Fluoranthene	1,800	ND	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Fluorene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Hexachlorobenzene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Hexachlorobutadiene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Hexachlorocyclopentadiene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Hexachloroethane	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Indeno(1,2,3-cd)pyrene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Isophorone	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Naphthalene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Nitrobenzene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
N-Nitroso-di-n-propylamine	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
N-Nitrosodiphenylamine/Diphenylamine	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Pentachlorophenol	ND	15,000	ND	15,000	ND	18,000	ND	18,000	ND	18,000	ND
Phenanthrene	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Phenol	ND	7,500	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Pyrene	1,800	ND	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND
Pyridine	--	--	ND	7,300	ND	8,800	ND	8,800	ND	8,900	ND

Units: µg/kg
ND: non-detect
--: not tested

Table 2-1d
1994-1997 CBA Soil Data: SVOCs/PAHs

Location:	265	LC-285		LC-286		LC-287		LC-288		LC-289	
Depth (ft):	2	3		3		3		3		3.5	
Parameter	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
1,2,4-Trichlorobenzene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
1,2-Dichlorobenzene	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,3-Dichlorobenzene	64	ND	87	ND	69	ND	63	ND	110	ND	50
1,4-Dichlorobenzene	64	ND	87	ND	69	ND	63	ND	110	ND	50
2,2'-Chloroisopropylether	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2,3,4,6-Tetrachlorophenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2,4,5-Trichlorophenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2,4,6-Trichlorophenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2,4-Dichlorophenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2,4-Dimethylphenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2,4-Dinitrophenol	13,000	ND	15,000	ND	17,000	ND	13,000	ND	14,000	ND	12,000
2,6-Dinitrotoluene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2-Chloronaphthalene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2-Chlorophenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2-Methylnaphthalene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2-Methylphenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2-Nitroaniline	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
2-Nitrophenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
3,3'-Dichlorobenzidine	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
3/4-Methylphenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
3-Nitroaniline	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
4,6-Dinitro-2-methylphenol	13,000	ND	15,000	ND	17,000	ND	13,000	ND	14,000	ND	12,000
4-Bromophenyl-phenylether	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
4-Chloro-3-methylphenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
4-Chloroaniline	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
4-Chlorophenyl-phenylether	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
4-Nitroaniline	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
4-Nitrophenol	13,000	ND	15,000	ND	17,000	ND	13,000	ND	14,000	ND	12,000
Acenaphthene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Acenaphthylene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Anthracene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Benzo(a)anthracene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Benzo(a)pyrene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Benzo(b/k)fluoranthene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Benzo(g,h,i)perylene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
bis(2-Chloroethoxy) methane	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
bis(2-Chloroethyl) ether	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
bis(2-Ethylhexyl) phthalate	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Butylbenzylphthalate	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Carbazole	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Chrysene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Cyclohexanone	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Dibenzo(a,h)anthracene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Dibenzofuran	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Diethylphthalate	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Dimethylphthalate	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Di-n-butylphthalate	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Di-n-octylphthalate	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Fluoranthene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Fluorene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Hexachlorobenzene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Hexachlorobutadiene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Hexachlorocyclopentadiene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Hexachloroethane	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Indeno(1,2,3-cd)pyrene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Isophorone	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Naphthalene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Nitrobenzene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
N-Nitroso-di-n-propylamine	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
N-Nitrosodiphenylamine/Diphenylamine	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Pentachlorophenol	13,000	ND	15,000	ND	17,000	ND	13,000	ND	14,000	ND	12,000
Phenanthrene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Phenol	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Pyrene	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000
Pyridine	6,600	ND	7,400	ND	8,300	ND	6,600	ND	7,100	ND	6,000

Units: µg/kg
ND: non-detect
--: not tested

Table 2-1e
1994-1997 CBA Soil Data: PCB Aroclors

Location/ Depth (ft)	Aroclor-1016		Aroclor-1221		Aroclor-1232		Aroclor-1242		Aroclor-1248		Aroclor-1254		Aroclor-1260		Aroclor-1268	
	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
96262-15																
2	ND	2.36	ND	2.36	ND	2.36	ND	2.36	ND	2.36	ND	2.36	ND	2.36	ND	2.36
96262-16																
3	ND	2.66	ND	2.66	ND	2.66	ND	2.66	ND	2.66	ND	2.66	ND	2.66	ND	2.66
96262-17																
2	ND	2.42	ND	2.42	ND	2.42	ND	2.42	ND	2.42	ND	2.42	ND	2.42	ND	2.42
96262-18																
3	ND	2.64	ND	2.64	ND	2.64	ND	2.64	ND	2.64	ND	2.64	ND	2.64	ND	2.64
96262-19																
2	ND	2.16	ND	2.16	ND	2.16	ND	2.16	ND	2.16	ND	2.16	ND	2.16	7300	2.16
96289-02																
4	ND	2.52	ND	2.52	ND	2.52	ND	2.52	ND	2.52	ND	2.52	ND	2.52	2800	2.52
96289-03																
4	ND	2.74	ND	2.74	ND	2.74	ND	2.74	ND	2.74	ND	2.74	ND	2.74	ND	2.74
96289-04																
4	ND	2.66	ND	2.66	ND	2.66	ND	2.66	ND	2.66	ND	2.66	ND	2.66	ND	2.66
96289-05																
2	ND	2.32	ND	2.32	ND	2.32	ND	2.32	ND	2.32	ND	2.32	ND	2.32	ND	2.32
96289-06																
5	ND	2.28	ND	2.28	ND	2.28	ND	2.28	ND	2.28	ND	2.28	ND	2.28	ND	2.28
96289-07																
5	ND	2.6	ND	2.6	ND	2.6	ND	2.6	ND	2.6	ND	2.6	ND	2.6	ND	2.6
96290-01																
4	ND	2.71	ND	2.71	ND	2.71	ND	2.71	ND	2.71	ND	2.71	ND	2.71	ND	2.71
96290-02																
4	ND	2.37	ND	2.37	ND	2.37	ND	2.37	ND	2.37	ND	2.37	ND	2.37	6000	2.37
LC-246																
2	ND	0.23	ND	0.23	ND	0.23	ND	0.23	ND	0.23	ND	0.7	740	ND	420	ND
4	ND	0.21	ND	0.21	ND	0.21	ND	0.21	ND	0.21	ND	0.1	130	ND	47	ND
LC-247																
2	ND	0.22	ND	0.22	ND	0.22	ND	0.22	ND	0.22	1100	ND	ND	1	380	ND
4	ND	0.28	ND	0.28	ND	0.28	ND	0.28	ND	0.28	160	ND	ND	0.15	ND	0.14
LC-248																
2	ND	0.2	ND	0.2	ND	0.2	ND	0.2	ND	0.2	ND	0.35	380	ND	380	ND
LC-249																
2	ND	2	ND	2	ND	2	ND	2	ND	2	7500	ND	ND	7	67000	ND
4	ND	0.18	ND	0.18	ND	0.18	ND	0.18	ND	0.18	2800	ND	ND	2.5	22000	ND
LC-250																
2	ND	0.31	ND	0.31	ND	0.31	ND	0.31	ND	0.31	1100	ND	ND	1	1700	ND
4	ND	0.21	ND	0.21	ND	0.21	ND	0.21	ND	0.21	ND	0.7	710	ND	52	ND
LC-251																
2	ND	0.19	ND	0.19	ND	0.19	ND	0.19	ND	0.19	ND	1	1300	ND	50000	ND
4	ND	0.2	ND	0.2	ND	0.2	ND	0.2	ND	0.2	ND	0.23	ND	0.23	170	ND
LC-252																
4	ND	0.21	ND	0.21	ND	0.21	ND	0.21	ND	0.21	140	ND	ND	0.1	750	ND
LC-266																
4	ND	0.21	ND	0.21	ND	0.21	ND	0.21	ND	0.21	ND	0.33	ND	0.33	ND	0.24

Units: µg/kg
ND: non-detect

Table 2-2a
2018 CBA Soil Core Data: Total Mercury

CB1-CBP-1

Depth (ft)	µg/kg
19.5	210
34.5	43
45	88

CB1-CBP-2

Depth (ft)	µg/kg
20	1.1
35	0.46
46	35

CB1-SB-1

Depth (ft)	µg/kg
7	5,360
8.5	1,920
13.5	261
19	713
21	26
23.5	870
28.5	230
33	119
38	84
40	22
43.3	393
48	489
49	49
53.3	262

CB1-SB-2

Depth (ft)	µg/kg
7.5	9,510
9	289
12.5	36
18	102
20	0.17
22.5	5,940
28.5	1,450
31.5	189
35	36
35.7	323
40.2	86
44	282
47.5	117
48	763
52.5	331

CB1-SB-4

Depth (ft)	µg/kg
8.5	33,400
9.5	63
12.5	137
17.5	8.6
20	0.36
23	1,220
27.5	197
31.7	179
35	383
35.3	1,190
39.5	30
43.8	249
47	158
51.5	3,660

CB1-SB-5

Depth (ft)	µg/kg
5.5	4,190
8.5	462
13.5	324
17.5	1,670
20	392
22.5	862
27.5	1,410
32.5	1,040
36	39
37.5	530
42.5	370
47.5	490
48	48
52.5	0.00

CB2-SB-1

Depth (ft)	µg/kg
4	44,300
7	118
13	103
17.5	119
20	0.32
23	621
28	15.8
33	11.3
35	22
38.5	142
43.5	112
48.5	329
50	465
53.5	767

CB2-SB-2

Depth (ft)	µg/kg
7.5	23,500
9.5	6,770
13	1,640
18	389
22	1.3
22.5	26
27.5	240
33	1.4
33.5	117
38.5	29
43.3	17.2
49	56

CB2-SB-3

Depth (ft)	µg/kg
6.5	13,600
9.5	141
12.5	142
18	601
22.5	243
28	621
29	19.7
33	1,070
38	278
42	193
49	7.8
52.5	183,000

CB2-SB-4

Depth (ft)	µg/kg
8	135,000
9.5	139,000
12.5	16,900
18.3	23,400
20	7,340
23	188,000
26	137,000
35	3,040
36	23,700
49	691

CB2-SB-5

Depth (ft)	µg/kg
6	3,330
9	324
13.5	266
17.5	673
21	5.7
22.5	714
27.5	1,540
32.5	729
35	22
37	114
41	676
45	249
48.5	1,770

CB2-SB-6

Depth (ft)	µg/kg
7.8	200,000
9.5	44,000
13.5	11,800
18	4,690
20	5,070
23	10,800
28	7,250
33	2,850
35.5	151
38	1,940
43	94
48.5	175
49	32

CB2-SB-7

Depth (ft)	µg/kg
9.5	233
13	146
18	61
21.5	51
25.5	75
31	2,100
36.5	130
41.5	333
46.5	5.4
51.5	6.7

CB2-SB-8

Depth (ft)	µg/kg
8.5	16,300
12.5	71
17.5	32
22.5	5,200
28	209
32.5	705
38.5	317
43.5	330
48.5	399
53.5	391

SP-CBP-3

Depth (ft)	µg/kg
20	38
35	5.2
50	237

SP-CBP-4

Depth (ft)	µg/kg
20	165
35	289
46	86

SP-CBP-5

Depth (ft)	µg/kg
20.5	258
35	128
45	238

SP-SB-1

Depth (ft)	µg/kg
7	8,040
9	87
14	98
18	1,100
23	6,990
24	182
27.5	2,210
32.5	3,100
35.5	139
37.5	374
42.5	76
48	105
49	624
52.5	799

Table 2-2b
2018 CBA Soil Core Data: PAHs

Location/Sample Depth (ft)	1-Methyl Naphthalene		2-Methylnaphthalene		Acenaphthene		Acenaphthylene		Anthracene		Benzo(a)anthracene		Benzo(a)pyrene		Benzo(b)fluoranthene		Benzo(g,h,i)perylene		Benzo(k)fluoranthene	
	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
CB1-SB-1																				
7	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.006	ND	0.005	ND	0.006	ND	0.006	ND	0.006	ND	0.006
8.5	10	0.037	4.9	0.021	5.7	0.022	ND	0.021	3.3	0.023	2.9	0.021	1.3	0.022	1.4	0.023	0.55	0.022	1.2	0.022
12.5	8.5	0.049	4.5	0.055	2.4	0.006	ND	0.005	1.9	0.006	1.1	0.005	0.46	0.006	0.41	0.006	0.14	0.006	0.37	0.006
CB1-SB-2																				
7.5	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.006	0.006	0.005	ND	0.006	ND	0.006	ND	0.006	ND	0.006
9	ND	0.019	ND	0.021	0.30	0.022	ND	0.021	0.15	0.023	0.18	0.021	0.15	0.022	0.11	0.023	0.18	0.023	0.078	0.023
13.5	0.013	0.005	ND	0.006	0.006	0.006	ND	0.006	ND	0.006	ND	0.005	ND	0.006	ND	0.006	ND	0.006	ND	0.006
CB1-SB-4																				
8.5	0.021	0.005	0.032	0.005	0.20	0.006	0.027	0.005	0.53	0.006	2.2	0.005	1.8	0.006	1.8	0.006	1.2	0.006	1.7	0.006
9.5	ND	0.005	0.096	0.005	0.26	0.005	ND	0.005	0.22	0.006	0.63	0.005	0.48	0.006	0.29	0.006	0.39	0.006	0.16	0.006
13.5	ND	0.005	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.005	ND	0.006	ND	0.006	ND	0.006	ND	0.006
CB1-SB-5																				
5.5	0.28	0.005	0.36	0.006	0.079	0.006	ND	0.006	0.13	0.006	0.47	0.005	0.40	0.006	0.37	0.006	0.29	0.006	0.29	0.006
8.5	9	0.026	15	0.29	0.36	0.030	ND	0.029	0.53	0.032	1.2	0.029	0.82	0.031	0.50	0.032	0.57	0.031	0.23	0.031
13.5	3.1	0.020	6.3	0.022	0.65	0.023	ND	0.022	2.8	0.024	1.1	0.022	0.53	0.023	0.23	0.024	0.34	0.024	0.14	0.024
CB2-SB-1																				
4	0.008	0.005	0.013	0.005	ND	0.005	ND	0.005	ND	0.006	0.017	0.005	0.022	0.005	0.023	0.006	0.062	0.005	0.015	0.005
7	0.078	0.023	0.17	0.026	0.047	0.026	ND	0.026	0.11	0.028	0.66	0.025	0.89	0.027	0.58	0.028	0.97	0.027	0.23	0.027
11.5	0.026	0.019	0.024	0.021	ND	0.022	ND	0.021	ND	0.023	0.035	0.021	ND	0.022	ND	0.023	ND	0.023	ND	0.022
CB2-SB-2																				
7.5	ND	0.005	ND	0.005	ND	0.005	ND	0.005	0.006	0.006	0.022	0.005	0.016	0.005	0.022	0.006	0.016	0.006	0.017	0.005
9.5	ND	0.005	ND	0.005	0.041	0.006	ND	0.005	0.051	0.006	0.10	0.005	0.069	0.006	0.043	0.006	0.069	0.006	0.017	0.006
11.5	0.006	0.005	ND	0.006	0.006	0.006	ND	0.006	0.009	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006
CB2-SB-3																				
6.5	ND	0.005	ND	0.005	ND	0.005	ND	0.005	ND	0.006	0.046	0.005	0.027	0.005	0.050	0.006	0.029	0.006	0.047	0.005
9.5	0.007	0.005	0.016	0.005	ND	0.006	ND	0.005	ND	0.006	0.035	0.005	0.044	0.006	0.027	0.006	0.063	0.006	0.015	0.006
12.5	ND	0.005	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006	ND	0.006
CB2-SB-4																				
8	0.089	0.005	0.11	0.005	ND	0.005	ND	0.005	ND	0.006	0.068	0.005	0.10	0.006	0.096	0.006	0.14	0.006	0.033	0.006
9.5	8	0.096	10	0.11	0.72	0.11	ND	0.11	ND	0.12	1.9	0.11	1.6	0.11	1.00	0.12	1.4	0.12	0.46	0.11
11.5	31	0.098	64	1.1	1.5	0.11	ND	0.11	3.4	0.12	8.8	0.11	4.8	0.12	2.6	0.12	2.3	0.12	1.3	0.12
CB2-SB-5																				
6	ND	0.005	ND	0.006	ND	0.006	ND	0.006	0.013	0.006	0.062	0.006	0.053	0.006	0.058	0.006	0.042	0.006	0.052	0.006
9	16	0.093	8.6	0.10	1.2	0.11	ND	0.10	3.1	0.11	17	0.10	7.7	0.11	4.1	0.11	3.5	0.11	2.3	0.11
16	0.015	0.005	0.007	0.005	ND	0.005	ND	0.005	ND	0.006	0.017	0.005	0.009	0.006	ND	0.006	ND	0.006	ND	0.006
CB2-SB-6																				
7.8	0.015	0.005	0.038	0.005	ND	0.006	ND	0.005	0.012	0.006	0.067	0.005	0.051	0.006	0.058	0.006	0.10	0.006	0.033	0.006
9.5	2.0	0.010	3.5	0.011	ND	0.011	ND	0.011	ND	0.012	0.035	0.011	ND	0.012	0.020	0.012	0.021	0.012	ND	0.012
CB2-SB-7																				
9.5	3.7	0.024	3.9	0.027	0.21	0.006	ND	0.005	0.078	0.006	0.044	0.005	0.024	0.006	0.017	0.006	0.016	0.006	0.007	0.006
SP-SB-1																				
7	0.18	0.005	0.063	0.005	0.13	0.005	ND	0.005	0.17	0.006	0.70	0.005	0.65	0.006	0.68	0.006	0.53	0.006	0.48	0.006
9	8.2	0.047	5.2	0.053	0.41	0.005	ND	0.005	0.48	0.006	0.60	0.005	0.58	0.005	0.38	0.006	0.48	0.006	0.15	0.006
13	2.3	0.020	ND	0.023	0.12	0.023	ND	0.023	0.090	0.025	0.18	0.022	0.13	0.024	0.087	0.025	0.083	0.024	0.039	0.024

Units: mg/kg
ND: non-detect

Table 2-2b
2018 CBA Soil Core Data: PAHs

Location/Sample	Chrysene		Dibenzo(a,h)anthracene		Dibenzofuran		Fluoranthene		Fluorene		Indeno(1,2,3-cd)pyrene		Naphthalene		Phenanthrene		Pyrene	
Depth (ft)	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
CB1-SB-1																		
7	ND	0.005	ND	0.005	ND	0.003	ND	0.006	ND	0.006	ND	0.007	ND	0.005	ND	0.006	ND	0.005
8.5	2.5	0.019	0.21	0.021	3.4	0.011	9.1	0.023	6	0.023	0.41	0.029	10	0.038	14	0.046	7.9	0.020
12.5	0.86	0.005	0.066	0.006	0.93	0.003	4.9	0.060	4.1	0.061	0.13	0.008	10	0.051	11	0.060	3.8	0.052
CB1-SB-2																		
7.5	0.005	0.005	ND	0.005	ND	0.003	0.010	0.006	ND	0.006	ND	0.007	ND	0.005	0.007	0.006	0.009	0.005
9	0.20	0.020	0.041	0.022	ND	0.011	0.41	0.023	0.17	0.023	0.072	0.030	ND	0.019	0.14	0.023	0.68	0.020
13.5	ND	0.005	ND	0.006	ND	0.003	0.008	0.006	0.007	0.006	ND	0.008	0.006	0.005	0.022	0.006	0.010	0.005
CB1-SB-4																		
8.5	2	0.005	0.37	0.006	0.085	0.003	5	0.030	0.16	0.006	1.00	0.008	0.047	0.005	2	0.006	4.2	0.026
9.5	0.69	0.005	0.14	0.005	ND	0.003	0.69	0.006	0.26	0.006	0.17	0.007	ND	0.005	0.34	0.006	1.5	0.005
13.5	ND	0.005	ND	0.006	ND	0.003	ND	0.006	ND	0.006	ND	0.008	ND	0.005	ND	0.006	ND	0.005
CB1-SB-5																		
5.5	0.48	0.005	0.15	0.006	0.022	0.003	0.76	0.006	0.092	0.006	0.23	0.008	ND	0.005	0.57	0.006	0.81	0.005
8.5	1.3	0.027	0.39	0.030	ND	0.015	0.56	0.032	0.84	0.032	0.31	0.040	1.8	0.027	2.8	0.032	2.8	0.027
13.5	0.96	0.020	0.20	0.023	0.20	0.011	1.6	0.024	2.6	0.024	0.16	0.031	1.3	0.020	29	0.24	5.7	0.021
CB2-SB-1																		
4	0.023	0.005	0.012	0.005	ND	0.003	0.023	0.006	ND	0.006	0.020	0.007	0.007	0.005	0.016	0.006	0.028	0.005
7	0.92	0.024	0.45	0.026	0.039	0.013	0.21	0.028	0.078	0.028	0.43	0.035	0.067	0.023	0.24	0.028	1.6	0.024
11.5	0.032	0.019	ND	0.022	ND	0.011	ND	0.023	ND	0.023	ND	0.029	ND	0.019	0.027	0.023	0.079	0.020
CB2-SB-2																		
7.5	0.023	0.005	0.006	0.005	ND	0.003	0.049	0.006	ND	0.006	0.013	0.007	ND	0.005	0.029	0.006	0.037	0.005
9.5	0.14	0.005	0.030	0.005	ND	0.003	0.042	0.006	0.078	0.006	0.025	0.007	ND	0.005	0.037	0.006	0.29	0.005
11.5	0.007	0.005	ND	0.006	ND	0.003	0.006	0.006	0.014	0.006	ND	0.008	ND	0.005	0.018	0.006	0.029	0.005
CB2-SB-3																		
6.5	0.064	0.005	0.012	0.005	ND	0.003	0.13	0.006	ND	0.006	0.028	0.007	ND	0.005	0.028	0.006	0.090	0.005
9.5	0.048	0.005	0.026	0.006	ND	0.003	0.011	0.006	ND	0.006	0.024	0.008	0.007	0.005	0.016	0.006	0.092	0.005
12.5	ND	0.005	ND	0.006	ND	0.003	ND	0.006	ND	0.006	ND	0.008	ND	0.005	ND	0.006	ND	0.005
CB2-SB-4																		
8	0.14	0.005	0.072	0.005	ND	0.003	0.027	0.006	ND	0.006	0.060	0.007	0.087	0.005	0.054	0.006	0.29	0.005
9.5	2.4	0.099	0.79	0.11	ND	0.056	0.80	0.12	1.4	0.12	0.65	0.15	7.7	0.099	2.6	0.12	3.6	0.10
11.5	9.4	0.10	1.6	0.11	1.2	0.057	3.2	0.12	4.3	0.12	1.2	0.15	13	0.10	18	0.12	17	0.10
CB2-SB-5																		
6	0.064	0.005	0.016	0.006	ND	0.003	0.12	0.006	ND	0.006	0.035	0.008	ND	0.005	0.045	0.006	0.099	0.005
9	17	0.096	2.6	0.11	0.43	0.054	5	0.11	2.6	0.11	1.8	0.14	ND	0.095	6.5	0.11	24	0.098
16	0.018	0.005	ND	0.005	ND	0.003	ND	0.006	ND	0.006	ND	0.007	ND	0.005	0.007	0.006	0.033	0.005
CB2-SB-6																		
7.8	0.098	0.005	0.034	0.006	0.005	0.003	0.054	0.006	ND	0.006	0.044	0.007	0.017	0.005	0.059	0.006	0.11	0.005
9.5	0.077	0.010	ND	0.011	ND	0.006	0.026	0.012	ND	0.012	ND	0.015	0.76	0.010	0.19	0.012	0.12	0.010
CB2-SB-7																		
9.5	0.040	0.005	ND	0.005	ND	0.003	0.033	0.006	0.40	0.006	0.010	0.007	ND	0.005	0.27	0.006	0.11	0.005
SP-SB-1																		
7	0.69	0.005	0.16	0.005	ND	0.003	1.3	0.006	0.16	0.006	0.41	0.007	ND	0.005	0.54	0.006	1.2	0.005
9	0.66	0.005	0.24	0.005	0.19	0.003	0.42	0.006	1.00	0.006	0.27	0.007	1.8	0.005	1.9	0.006	1.1	0.005
13	0.18	0.021	0.059	0.023	ND	0.012	0.092	0.025	ND	0.025	0.066	0.031	ND	0.021	0.21	0.025	0.29	0.021

Units: mg/kg
ND: non-detect

Table 2-2c
2018 CBA Soil Core Data: Metals

Location/Sample	Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium		Calcium		Chromium		Cobalt		Copper		Iron	
Depth (ft)	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
CB1-SB-1																						
7	3,520	3.9	ND	0.16	ND	0.47	4.9	0.14	ND	0.25	ND	0.14	2,120	8.1	4.3	0.14	0.48	0.15	1.7	0.14	798	4.9
8.5	2,750	3.8	ND	0.15	1.3	0.45	25.9	0.13	ND	0.24	ND	0.14	1,630	7.7	2.2	0.14	0.53	0.15	6.3	0.14	2,590	4.7
CB1-SB-2																						
7.5	5,200	3.8	ND	0.15	0.51	0.46	11.1	0.13	ND	0.24	ND	0.14	774	7.9	4.0	0.14	0.49	0.15	1.3	0.14	1,150	4.8
9	3,380	3.9	ND	0.16	0.58	0.47	7.2	0.13	ND	0.25	ND	0.14	1,110	8.0	4.2	0.14	0.31	0.15	2.0	0.14	804	4.9
CB1-SB-4																						
8.5	4,180	4.0	ND	0.16	ND	0.47	10.2	0.14	ND	0.25	ND	0.15	7,480	8.1	4.2	0.14	1.9	0.15	10.1	0.14	1,140	5.0
9.5	2,200	3.8	ND	0.15	ND	0.46	6.0	0.13	ND	0.24	ND	0.14	1,310	7.9	2.8	0.14	ND	0.15	2.1	0.14	745	4.8
CB1-SB-5																						
5.5	3,650	4.0	0.47	0.16	ND	0.48	5.0	0.14	ND	0.25	ND	0.15	1,270	8.3	2.9	0.14	0.98	0.16	3.7	0.14	1,020	5.1
8.5	807	4.2	0.36	0.17	ND	0.50	6.8	0.14	ND	0.26	ND	0.15	1,690	8.6	1.9	0.15	0.17	0.16	4.3	0.15	1,970	5.2
CB2-SB-1																						
4	1,680	3.7	ND	0.15	ND	0.44	7.6	0.13	ND	0.23	ND	0.14	387	7.6	3.3	0.13	0.19	0.14	6.5	0.13	689	4.7
7	2,970	3.8	ND	0.15	1.1	0.45	14.6	0.13	ND	0.24	ND	0.14	3,120	7.7	2.5	0.14	0.43	0.15	10.0	0.13	2,340	4.7
CB2-SB-2																						
7.5	1,430	3.7	ND	0.15	ND	0.45	5.4	0.13	ND	0.24	ND	0.14	1,790	7.7	1.7	0.13	0.97	0.15	3.5	0.13	897	4.7
9.5	2,270	4.0	ND	0.16	ND	0.47	4.6	0.14	ND	0.25	ND	0.15	937	8.1	1.7	0.14	ND	0.16	1.5	0.14	1,040	5.0
CB2-SB-3																						
6.5	2,730	3.7	0.25	0.15	ND	0.44	7.8	0.13	ND	0.23	ND	0.14	2,400	7.6	1.8	0.13	1.9	0.14	5.7	0.13	1,130	4.7
9.5	3,520	3.9	ND	0.16	0.83	0.47	4.5	0.13	ND	0.25	ND	0.14	1,310	8.0	4.1	0.14	0.19	0.15	2.1	0.14	2,350	4.9
CB2-SB-4																						
8	2,260	3.9	ND	0.16	ND	0.47	10.2	0.13	ND	0.25	ND	0.14	290	8.0	2.0	0.14	0.24	0.15	3.0	0.14	1,050	4.9
9.5	4,640	3.9	ND	0.16	ND	0.46	22.9	0.13	ND	0.25	ND	0.14	3,420	8.0	2.9	0.14	0.53	0.15	12.6	0.14	3,600	4.9
CB2-SB-5																						
6	1,300	4.1	ND	0.16	ND	0.49	3.5	0.14	ND	0.26	ND	0.15	1,100	8.4	1.1	0.15	0.66	0.16	3.4	0.15	514	5.2
9	308	3.8	ND	0.15	ND	0.46	2.9	0.13	ND	0.24	ND	0.14	330	7.8	0.79	0.14	ND	0.15	0.67	0.14	389	4.8
CB2-SB-6																						
7.8	3,930	3.9	ND	0.16	ND	0.47	19.0	0.14	ND	0.25	ND	0.15	2,550	8.1	3.5	0.14	0.71	0.15	9.3	0.14	1,760	5.0
9.5	3,880	3.9	ND	0.16	ND	0.47	8.5	0.14	ND	0.25	ND	0.15	630	8.1	2.1	0.14	0.21	0.15	3.1	0.14	638	5.0
CB2-SB-7																						
9.5	4,920	3.9	ND	0.16	ND	0.47	3.9	0.14	ND	0.25	ND	0.14	1,010	8.1	4.7	0.14	ND	0.15	1.7	0.14	468	4.9
SP-SB-1																						
7	2,810	3.8	ND	0.15	ND	0.46	26.8	0.13	ND	0.24	ND	0.14	6,780	7.8	3.2	0.14	0.87	0.15	7.2	0.14	1,530	4.8
9	1,660	3.8	ND	0.15	0.56	0.46	12.8	0.13	ND	0.24	ND	0.14	529	7.8	2.6	0.14	0.30	0.15	3.6	0.14	2,000	4.8

Units: mg/kg
ND: non-detect

Table 2-2c
2018 CBA Soil Core Data: Metals

Location/Sample	Lead		Magnesium		Manganese		Nickel		Potassium		Selenium		Silver		Sodium		Thallium		Vanadium		Zinc	
Depth (ft)	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
CB1-SB-1																						
7	3.4	0.17	161	4.3	5.9	0.16	0.66	0.16	108	8.1	ND	0.32	ND	0.17	527	5.3	ND	0.13	1.3	0.17	1.6	0.96
8.5	16.4	0.16	150	4.1	17.6	0.15	2.8	0.15	90.4	7.8	0.35	0.31	ND	0.17	911	5.1	ND	0.12	4.6	0.17	9.7	0.92
CB1-SB-2																						
7.5	3.4	0.16	125	4.2	13.6	0.16	1.8	0.15	163	8.0	ND	0.31	ND	0.17	488	5.2	ND	0.12	2.3	0.17	3.0	0.94
9	8.1	0.16	235	4.2	6.2	0.16	5.5	0.15	74.4	8.0	ND	0.31	ND	0.17	687	5.2	ND	0.13	4.8	0.17	3.7	0.95
CB1-SB-4																						
8.5	6.7	0.17	306	4.3	9.6	0.16	2.1	0.16	151	8.2	0.53	0.32	0.49	0.17	403	5.3	ND	0.13	3.5	0.17	14.3	0.97
9.5	10.0	0.16	94.5	4.2	5.3	0.15	1.2	0.15	44.9	7.9	ND	0.31	ND	0.17	505	5.2	ND	0.12	2.5	0.17	3.8	0.94
CB1-SB-5																						
5.5	3.4	0.17	95.5	4.4	4.2	0.16	0.77	0.16	186	8.3	ND	0.33	ND	0.18	530	5.4	ND	0.13	1.9	0.18	2.6	0.98
8.5	50.0	0.18	125	4.5	12.6	0.17	1.1	0.16	59.9	8.6	ND	0.34	ND	0.18	351	5.6	ND	0.13	2.2	0.18	11.4	1.0
CB2-SB-1																						
4	23.1	0.16	94.9	4.0	6.9	0.15	1.3	0.15	87.7	7.7	ND	0.30	0.19	0.16	64.0	5.0	ND	0.12	1.3	0.16	9.1	0.91
7	20.2	0.16	253	4.1	19.9	0.15	3.6	0.15	98.4	7.8	0.56	0.31	ND	0.16	119	5.1	ND	0.12	4.5	0.16	10.1	0.92
CB2-SB-2																						
7.5	2.3	0.16	89.6	4.1	12.3	0.15	0.93	0.15	77.8	7.8	ND	0.30	0.64	0.16	434	5.0	ND	0.12	0.79	0.16	2.8	0.91
9.5	3.9	0.17	71.4	4.3	9.1	0.16	1.1	0.16	166	8.2	ND	0.32	ND	0.17	698	5.3	ND	0.13	1.4	0.17	2.3	0.97
CB2-SB-3																						
6.5	2.7	0.16	146	4.0	27.8	0.15	0.95	0.15	215	7.7	ND	0.30	0.17	0.16	258	5.0	ND	0.12	1.2	0.16	2.6	0.91
9.5	8.6	0.17	74.1	4.2	9.1	0.16	1.1	0.15	46.9	8.1	ND	0.32	ND	0.17	924	5.3	ND	0.13	1.7	0.17	2.5	0.95
CB2-SB-4																						
8	11.2	0.17	144	4.2	5.3	0.16	0.85	0.15	136	8.1	ND	0.32	ND	0.17	1,900	5.3	0.14	0.13	0.43	0.17	8.6	0.95
9.5	286	0.16	421	4.2	23.6	0.16	1.7	0.15	64.4	8.0	ND	0.31	0.19	0.17	3,760	5.2	ND	0.13	1.4	0.17	22.7	0.95
CB2-SB-5																						
6	2.3	0.17	67.9	4.4	3.3	0.16	0.39	0.16	45.5	8.5	ND	0.33	ND	0.18	64.9	5.5	ND	0.13	0.90	0.18	3.3	1.00
9	11.6	0.16	15.0	4.1	2.5	0.15	0.37	0.15	30.4	7.9	ND	0.31	ND	0.17	54.3	5.1	ND	0.12	0.65	0.17	1.8	0.93
CB2-SB-6																						
7.8	6.9	0.17	254	4.3	22.0	0.16	1.6	0.16	88.1	8.2	ND	0.32	0.27	0.17	3,280	5.3	ND	0.13	1.4	0.17	12.2	0.96
9.5	2.7	0.17	156	4.3	2.9	0.16	0.28	0.16	62.7	8.2	ND	0.32	ND	0.17	3,830	5.3	ND	0.13	0.41	0.17	5.4	0.96
CB2-SB-7																						
9.5	5.3	0.17	151	4.3	3.5	0.16	0.86	0.16	81.3	8.1	0.34	0.32	ND	0.17	74.5	5.3	ND	0.13	1.6	0.17	1.1	0.96
SP-SB-1																						
7	72.0	0.16	256	4.2	15.7	0.15	1.9	0.15	92.5	7.9	ND	0.31	ND	0.17	81.6	5.1	ND	0.12	2.2	0.17	9.6	0.93
9	41.6	0.16	348	4.2	9.6	0.15	3.0	0.15	53.7	7.9	ND	0.31	ND	0.17	175	5.1	ND	0.12	2.2	0.17	13.8	0.93

Units: mg/kg
ND: non-detect

Table 2-3a
2021 CBA Surface Soil Investigation: VOCs

Location	D1 (feet)	D2 (feet)	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dibromo-3-chloropropane	1,2-Dibromoethane
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-500	1.5	2	<0.00081	<0.00054	<0.00068	<0.00068	<0.00068	<0.00068	<0.00054
SB-501	1.75	2	<0.00063	<0.00042	<0.00052	<0.00052	<0.00052	<0.00052	<0.00042
SB-502	1.75	2	<0.00066	<0.00044	<0.00055	<0.00055	<0.00055	<0.00055	<0.00044
SB-503	1.75	2	<0.00064	<0.00042	<0.00053	<0.00053	<0.00053	<0.00053	<0.00042
SB-504	0.25	1.75	<0.00068	<0.00045	<0.00057	<0.00057	<0.00057	<0.00057	<0.00045
SB-505	1	2	<0.00058	<0.00039	<0.00048	<0.00048	<0.00048	<0.00048	<0.00039
SB-506	1	2	<0.00061	<0.00041	<0.00051	<0.00051	<0.00051	<0.00051	<0.00041
SB-507	1	2	<0.00062	<0.00041	<0.00051	<0.00051	<0.00051	<0.00051	<0.00041
SB-508	1	2	<0.00058	<0.00038	<0.00048	<0.00048	<0.00048	<0.00048	<0.00038
SB-509	0.75	2	<0.00058	<0.00039	<0.00048	<0.00048	<0.00048	<0.00048	<0.00039
SB-510	1	2	<0.0006	<0.0004	<0.0005	<0.0005	<0.0005	<0.0005	<0.0004
SB-511	0.75	2	<0.00065	<0.00043	<0.00054	<0.00054	<0.00054	<0.00054	<0.00043

Location	D1 (feet)	D2 (feet)	1,2-Dichloroethane	1,2-Dichloropropane	2-Butanone (MEK)	2-Hexanone	4-Methyl-2-pentanone	Acetone	Benzene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-500	1.5	2	<0.00081	<0.00068	0.01	0.016	0.0034	0.034	<0.00068
SB-501	1.75	2	<0.00063	<0.00052	0.0087	0.0013	<0.001	0.070	<0.00052
SB-502	1.75	2	<0.00066	<0.00055	0.008	<0.0011	<0.0011	0.046	<0.00055
SB-503	1.75	2	<0.00064	<0.00053	0.049	<0.0011	<0.0011	0.084	<0.00053
SB-504	0.25	1.75	<0.00068	<0.00057	0.0056	0.015	0.0032	0.042	<0.00057
SB-505	1	2	<0.00058	<0.00048	<0.0019	<0.00096	<0.00096	0.022	<0.00048
SB-506	1	2	<0.00061	<0.00051	0.0029	0.0024	<0.001	0.035	<0.00051
SB-507	1	2	<0.00062	<0.00051	0.0026	0.0016	<0.001	0.028	<0.00051
SB-508	1	2	<0.00058	<0.00048	<0.0019	<0.00096	<0.00096	0.024	<0.00048
SB-509	0.75	2	<0.00058	<0.00048	<0.0019	0.0021	<0.00097	0.024	<0.00048
SB-510	1	2	<0.0006	<0.0005	0.0078	0.0012	<0.001	0.060	<0.0005
SB-511	0.75	2	<0.00065	<0.00054	0.0051	<0.0011	<0.0011	0.066	<0.00054

Location	D1 (feet)	D2 (feet)	Bromodichloromethane	Bromoform	Bromomethane	Carbon disulfide	Carbon tetrachloride	Chlorobenzene	Chloroethane
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-500	1.5	2	<0.00054	<0.0068	<0.00095	0.00090	0.0023	<0.00068	<0.0014
SB-501	1.75	2	<0.00042	<0.0052	<0.00073	<0.00063	<0.00052	<0.00052	<0.001
SB-502	1.75	2	<0.00044	<0.0055	<0.00077	0.00069	<0.00055	<0.00055	<0.0011
SB-503	1.75	2	<0.00042	<0.0053	<0.00074	<0.00064	<0.00053	<0.00053	<0.0011
SB-504	0.25	1.75	<0.00045	<0.0057	<0.0008	<0.00068	<0.00057	<0.00057	<0.0011
SB-505	1	2	<0.00039	<0.0048	<0.00068	<0.00058	<0.00048	<0.00048	<0.00096
SB-506	1	2	<0.00041	<0.0051	<0.00071	<0.00061	<0.00051	<0.00051	<0.001
SB-507	1	2	<0.00041	<0.0051	<0.00072	<0.00062	<0.00051	<0.00051	<0.001
SB-508	1	2	<0.00038	<0.0048	<0.00067	<0.00058	<0.00048	<0.00048	<0.00096
SB-509	0.75	2	<0.00039	<0.0048	<0.00068	<0.00058	<0.00048	<0.00048	<0.00097
SB-510	1	2	<0.0004	<0.005	<0.0007	<0.0006	<0.0005	<0.0005	<0.001
SB-511	0.75	2	<0.00043	<0.0054	<0.00076	<0.00065	<0.00054	<0.00054	<0.0011

Notes:
D1: Top of sampling interval
D2: Bottom of sampling interval

Table 2-3a
2021 CBA Surface Soil Investigation: VOCs

Location	D1 (feet)	D2 (feet)	Chloroform	Chloromethane	cis-1,2-Dichloroethene	cis-1,3-	Dibromochloromethane	Dichlorodifluoromethane	Ethyl benzene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-500	1.5	2	0.0097	<0.00081	<0.00068	<0.00054	<0.00068	<0.00081	<0.00054
SB-501	1.75	2	<0.00063	<0.00063	<0.00052	<0.00042	<0.00052	<0.00063	<0.00042
SB-502	1.75	2	<0.00066	<0.00066	<0.00055	<0.00044	<0.00055	<0.00066	<0.00044
SB-503	1.75	2	<0.00064	<0.00064	<0.00053	<0.00042	<0.00053	<0.00064	<0.00042
SB-504	0.25	1.75	<0.00068	<0.00068	<0.00057	<0.00045	<0.00057	<0.00068	<0.00045
SB-505	1	2	<0.00058	<0.00058	<0.00048	<0.00039	<0.00048	<0.00058	<0.00039
SB-506	1	2	<0.00061	<0.00061	<0.00051	<0.00041	<0.00051	<0.00061	<0.00041
SB-507	1	2	<0.00062	<0.00062	<0.00051	<0.00041	<0.00051	<0.00062	<0.00041
SB-508	1	2	<0.00058	<0.00058	<0.00048	<0.00038	<0.00048	<0.00058	<0.00038
SB-509	0.75	2	<0.00058	<0.00058	<0.00048	<0.00039	<0.00048	<0.00058	<0.00039
SB-510	1	2	<0.0006	<0.0006	<0.0005	<0.0004	<0.0005	<0.0006	<0.0004
SB-511	0.75	2	0.00075	<0.00065	<0.00054	<0.00043	<0.00054	<0.00065	<0.00043

Location	D1 (feet)	D2 (feet)	Isopropylbenzene	Methyl tertbutyl ether	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	trans-1,2-
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-500	1.5	2	<0.00054	<0.00068	<0.0027	<0.00054	<0.00068	0.0014	<0.00068
SB-501	1.75	2	<0.00042	<0.00052	<0.0021	<0.00042	<0.00052	0.0010	<0.00052
SB-502	1.75	2	<0.00044	<0.00055	<0.0022	<0.00044	<0.00055	0.0019	<0.00055
SB-503	1.75	2	<0.00042	<0.00053	<0.0021	<0.00042	<0.00053	0.00064	<0.00053
SB-504	0.25	1.75	<0.00045	<0.00057	<0.0023	<0.00045	<0.00057	0.0010	<0.00057
SB-505	1	2	<0.00039	<0.00048	<0.0019	<0.00039	<0.00048	0.0018	<0.00048
SB-506	1	2	<0.00041	<0.00051	<0.002	<0.00041	<0.00051	0.0015	<0.00051
SB-507	1	2	<0.00041	<0.00051	<0.0021	<0.00041	<0.00051	0.0015	<0.00051
SB-508	1	2	<0.00038	<0.00048	<0.0019	<0.00038	0.00095	<0.00058	<0.00048
SB-509	0.75	2	<0.00039	<0.00048	<0.0019	<0.00039	<0.00048	0.0017	<0.00048
SB-510	1	2	<0.0004	<0.0005	<0.002	<0.0004	0.0023	0.0022	<0.0005
SB-511	0.75	2	<0.00043	<0.00054	<0.0022	<0.00043	<0.00054	0.0025	<0.00054

Location	D1 (feet)	D2 (feet)	trans-1,3-	Trichloroethene	Trichlorofluoromethane	Vinyl chloride	Xylenes (unspecified)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-500	1.5	2	<0.00068	<0.00068	<0.00095	<0.00081	<0.0019
SB-501	1.75	2	<0.00052	<0.00052	<0.00073	<0.00063	<0.0015
SB-502	1.75	2	<0.00055	<0.00055	<0.00077	<0.00066	<0.0015
SB-503	1.75	2	<0.00053	<0.00053	<0.00074	<0.00064	<0.0015
SB-504	0.25	1.75	<0.00057	<0.00057	<0.0008	<0.00068	<0.0016
SB-505	1	2	<0.00048	<0.00048	<0.00068	<0.00058	<0.0014
SB-506	1	2	<0.00051	<0.00051	<0.00071	<0.00061	<0.0014
SB-507	1	2	<0.00051	<0.00051	<0.00072	<0.00062	<0.0014
SB-508	1	2	<0.00048	<0.00048	<0.00067	<0.00058	<0.0013
SB-509	0.75	2	<0.00048	<0.00048	<0.00068	<0.00058	<0.0014
SB-510	1	2	<0.0005	<0.0005	<0.0007	<0.0006	<0.0014
SB-511	0.75	2	<0.00054	<0.00054	<0.00076	<0.00065	<0.0015

Notes:
D1: Top of sampling interval
D2: Bottom of sampling interval

Table 2-3b
2021 CBA Surface Soil Investigation: PAHs

Location	D1 (feet)	D2 (feet)	1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1-Methyl Naphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-500	1.5	2	<0.0068	<0.00068	<0.00068	<0.00054	0.0092	0.024	0.0014	0.00082
SB-501	1.75	2	<0.0052	<0.00052	<0.00052	<0.00042	0.040	0.057	0.086	0.019
SB-502	1.75	2	<0.0055	<0.00055	<0.00055	<0.00044	0.080	0.14	0.032	0.018
SB-503	1.75	2	<0.0053	<0.00053	<0.00053	<0.00042	0.29	0.44	0.077	0.19
SB-504	0.25	1.75	<0.0057	<0.00057	<0.00057	<0.00045	<0.0038	<0.0076	<0.0038	<0.0019
SB-505	1	2	<0.0048	<0.00048	<0.00048	<0.00039	0.0024	0.0046	0.0018	0.0012
SB-506	1	2	<0.0051	<0.00051	<0.00051	<0.00041	0.0087	0.014	0.0029	0.011
SB-507	1	2	<0.0051	<0.00051	<0.00051	<0.00041	<0.00081	<0.0016	<0.00081	<0.00041
SB-508	1	2	<0.0048	<0.00048	<0.00048	<0.00038	0.0026	0.0045	0.0015	0.00071
SB-509	0.75	2	<0.0048	<0.00048	<0.00048	<0.00039	<0.0038	<0.0076	<0.0038	<0.0019
SB-510	1	2	<0.005	<0.0005	<0.0005	<0.0004	0.077	0.16	0.0071	0.0088
SB-511	0.75	2	<0.0054	<0.00054	<0.00054	<0.00043	0.062	0.14	0.032	0.0086

Location	D1 (feet)	D2 (feet)	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-500	1.5	2	0.0061	0.068	0.057	0.085	0.046	0.019	0.096	0.022
SB-501	1.75	2	0.12	0.57	0.65	1.1	0.45	0.36	0.72	0.13
SB-502	1.75	2	0.085	0.29	0.43	0.53	0.34	0.16	0.32	0.11
SB-503	1.75	2	0.35	1.5	1.9	2.9	0.98	0.88	1.7	0.45
SB-504	0.25	1.75	<0.0038	0.0079	0.0082	0.012	0.0065	0.0044	0.0078	<0.0038
SB-505	1	2	0.0053	0.032	0.043	0.044	0.049	0.014	0.037	0.019
SB-506	1	2	0.016	0.057	0.072	0.11	0.061	0.037	0.071	0.022
SB-507	1	2	<0.00081	<0.00081	<0.00081	<0.00081	<0.00081	<0.00081	0.00053	<0.00081
SB-508	1	2	0.0051	0.026	0.031	0.063	0.024	<0.00078	0.032	0.0077
SB-509	0.75	2	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0019	<0.0038
SB-510	1	2	0.033	0.19	0.23	0.23	0.18	<0.00078	0.26	0.055
SB-511	0.75	2	0.11	0.51	0.51	0.79	0.23	0.27	0.55	0.078

Location	D1 (feet)	D2 (feet)	Dibenzofuran	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-500	1.5	2	0.0018	0.060	0.0014	0.034	0.0071	0.041	0.080
SB-501	1.75	2	0.039	1.3	0.053	0.44	0.042	0.74	1.2
SB-502	1.75	2	0.030	0.39	0.023	0.22	0.074	0.30	0.46
SB-503	1.75	2	0.14	1.6	0.062	0.88	0.34	0.96	1.9
SB-504	0.25	1.75	<0.0038	0.014	<0.0038	0.0054	<0.0076	0.0064	0.013
SB-505	1	2	0.0030	0.035	0.0021	0.032	0.0068	0.023	0.034
SB-506	1	2	0.0038	0.084	0.0024	0.053	0.0081	0.045	0.077
SB-507	1	2	<0.00081	0.0010	<0.00081	<0.00081	<0.0016	<0.0012	0.00083
SB-508	1	2	0.0011	0.050	0.0014	0.022	0.0021	0.023	0.041
SB-509	0.75	2	<0.0038	<0.0038	<0.0038	<0.0038	<0.0076	<0.0057	<0.0038
SB-510	1	2	0.0094	0.091	0.0066	0.070	0.051	0.17	0.37
SB-511	0.75	2	0.029	0.95	0.022	0.23	0.073	0.65	0.80

Notes:
D1: Top depth of sample interval
D2: Bottom depth of sample interval

Table 2-3c
2021 CBA Surface Soil Investigation: PCB Aroclors

Location	D1 (feet)	D2 (feet)	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1262	Aroclor-1268	Total Aroclors
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-500	1.5	2	<0.11	<0.11	<0.11	<0.11	<0.11	2.0	1.4	<0.14	5.8	9.2
SB-501	1.75	2	<3.0	<3.0	<3.0	<3.0	<3.0	4.3	3.9	<3.6	14	22
SB-502	1.75	2	<0.059	<0.059	<0.059	<0.059	<0.059	<0.071	1.9	<0.071	0.65	2.6
SB-503	1.75	2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.5	7.6	<1.5	8.1	16
SB-504	0.25	1.75	<0.006	<0.006	<0.006	<0.006	<0.006	<0.0072	<0.0072	<0.0072	0.014	0.014
SB-505	1	2	<0.006	<0.006	<0.006	<0.006	<0.006	0.093	0.084	<0.0073	0.27	0.45
SB-506	1	2	<0.12	<0.12	<0.12	<0.12	<0.12	0.89	1.9	<0.15	2.1	4.9
SB-507	1	2	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0078	<0.0078	<0.0078	0.01	0.01
SB-508	1	2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.5	<1.5	<1.5	47	47
SB-509	0.75	2	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0074	<0.0074	<0.0074	0.015	0.015
SB-510	1	2	<1.3	<1.3	<1.3	<1.3	<1.3	<1.5	<1.5	<1.5	33	33
SB-511	0.75	2	<0.12	<0.12	<0.12	<0.12	<0.12	0.69	0.61	<0.15	0.78	2.1

Notes:
D1: Top of sampling interval
D2: Bottom of sampling interval

Table 2-3d
2021 CBA Surface Soil Investigation: Metals

Location	D1 (feet)	D2 (feet)	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Cadmium mg/kg	Calcium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg
SB-500	1.5	2	3,300	0.29	0.33	37	0.16	0.21	8,300	4.1	2.0	12	4,600	39
SB-501	1.75	2	2,500	0.49	1.4	19	0.11	0.54	2,300	10	0.87	47	7,400	71
SB-502	1.75	2	4,500	0.15	0.84	20	0.11	0.096	7,000	5.0	0.51	9.3	2,900	38
SB-503	1.75	2	5,800	0.43	3.1	36	0.14	0.20	1,000	11	1.5	20	8,600	56
SB-504	0.25	1.75	7,000	<0.14	0.71	17	0.12	<0.055	350	6.3	0.52	0.60	2,100	3.2
SB-505	1	2	5,900	<0.097	0.80	22	0.17	0.083	200	7.4	0.49	1.7	2,300	4.6
SB-506	1	2	4,000	0.11	0.40	14	0.16	0.043	120	5.3	0.43	6.2	1,500	8.8
SB-507	1	2	4,700	<0.11	0.28	11	0.097	<0.042	160	5.1	0.30	0.61	1,200	2.2
SB-508	1	2	4,800	<0.12	0.48	24	0.11	0.30	81,000	7.3	0.60	5.1	2,400	11
SB-509	0.75	2	7,400	<0.13	0.44	18	0.15	<0.054	120	7.5	0.53	0.96	1,700	3.6
SB-510	1	2	5,300	0.23	0.96	26	0.12	0.13	530	8.1	1.1	17	4,300	130
SB-511	0.75	2	5,200	0.16	1.3	29	0.27	0.25	11,000	7.1	4.5	15	5,600	40

Location	D1 (feet)	D2 (feet)	Magnesium mg/kg	Manganese mg/kg	Mercury mg/kg	Nickel mg/kg	Potassium mg/kg	Selenium mg/kg	Silver mg/kg	Sodium mg/kg	Thallium mg/kg	Vanadium mg/kg	Zinc mg/kg
SB-500	1.5	2	660	49	15	4.7	350	<0.13	0.054	500	<0.04	3.8	86
SB-501	1.75	2	230	54	97	8.3	66	<0.13	2.5	28	<0.04	23	190
SB-502	1.75	2	370	38	4.7	3.1	110	0.12	0.13	<24	<0.035	8.9	18
SB-503	1.75	2	730	110	18	6.9	270	0.25	0.91	35	0.057	16	180
SB-504	0.25	1.75	270	5.2	1.3	1.6	190	0.25	<0.045	<29	<0.043	7.6	4.0
SB-505	1	2	290	10	1.1	1.2	220	0.25	<0.031	<20	0.063	8.4	7.9
SB-506	1	2	200	8.2	2.7	1.2	160	0.27	0.11	<23	0.044	5.8	12
SB-507	1	2	200	4.7	4.6	0.84	150	0.18	<0.034	<22	<0.033	5.3	2.8
SB-508	1	2	650	35	68	5.2	180	0.21	0.11	40	0.055	6.7	76
SB-509	0.75	2	270	6.1	0.034	1.2	210	0.14	<0.043	<29	0.059	8.5	4.7
SB-510	1	2	300	28	46	4.5	240	0.18	0.092	27	0.056	8.2	200
SB-511	0.75	2	570	40	19	7.4	170	0.18	<0.038	47	0.066	6.8	49

Notes:
D1: Top of sampling interval
D2: Bottom of sampling interval

Table 2-4 CBA Mercury Vapor Measurements
LCP Chemicals (Brunswick, GA)

Location	Subsurface (S)(1)	Subsurface (S1)(2)	Surface (S)(1)	Surface (S1)(2)	Breathing Zone (S)(1)	Breathing Zone (S1)(2)
	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3
A1	76	81	14	16	15	11
A2	37	39	27	29	26	25
A3	69	66	45	46	22	24
A4	72	77	43	47	30	32
A5	27	29	32	33	31	33
A6	1,451	1,454	45	46	39	42
A7	18	22	38	40	43	42
A8	16	17	36	35	39	42
A9	16	19	35	34	34	34
A10	36	36	47	43	45	44
A11	25	26	37	39	39	39
A12	39	36	40	42	40	40
A13	20	22	47	38	36	32
B1	68	64	32	34	26	27
B2	69	71	29	23	24	24
B3	57	59	30	28	24	24
B4	54	53	20	21	20	20
B5	55	52	23	26	29	29
B6	48	44	27	28	25	25
B7	52	53	30	32	32	33
B8	93	91	41	42	42	41
B9	44	45	37	37	32	31
B10	21	24	34	35	38	36
B11	43	44	41	42	41	40
B12	23	26	45	47	39	41
B13	57	54	56	52	44	43
C1	67	62	28	34	19	21
C2	99	99	30	31	24	23
C3	91	92	30	29	23	25
C4	92	95	26	26	24	24
C5	54	54	12	14	13	15
C6	64	61	19	20	16	16
C7	41	44	17	18	18	16
C8	51	53	15	14	19	19
C9	56	59	19	19	19	18
C10	55	54	33	29	24	24
C11	52	53	25	24	20	21
C12	95	99	33	35	22	22
C13	73	73	33	37	26	26
D1	40	42	29	26	19	21
D2	38	38	27	26	21	21
D3	51	48	16	16	15	17
D4	51	49	36	35	18	20
D5	47	47	23	23	12	15
D6	73	72	17	14	10	10
D7	40	43	14	12	7	8
D8	54	52	11	12	11	11
D9	42	44	10	10	12	11
D10	53	55	16	17	14	13
D11	79	73	19	18	22	25
D12	366	328	43	39	37	33

Notes on Page 3

Table 2-4 CBA Mercury Vapor Measurements
LCP Chemicals (Brunswick, GA)

Location	Subsurface (S)(1)	Subsurface (S1)(2)	Surface (S)(1)	Surface (S1)(2)	Breathing Zone (S)(1)	Breathing Zone (S1)(2)
	ng/m³	ng/m³	ng/m³	ng/m³	ng/m³	ng/m³
D13	92	87	28	27	27	26
E1	61	60	30	29	29	29
E2	49	49	23	20	15	14
E3	11,670	12,470	29	29	24	19
E4	116	116	31	31	17	17
E5	72	73	29	30	17	19
E6	54	53	20	20	16	18
E7	64	64	23	22	13	12
E8	75	76	17	16	18	19
E9	54	56	20	21	15	17
E10	71	68	22	23	15	14
E11	50	53	27	31	18	18
E12	66	65	20	20	14	16
E13	55	55	21	21	16	17
F1	31	35	21	21	16	17
F2	79	75	14	18	15	17
F3	93	92	19	20	12	13
F4	80	83	27	25	14	14
F5	61	61	29	28	19	19
F6	78	77	29	30	22	22
F7	69	66	29	29	24	24
F8	48	49	29	28	24	24
F9	62	62	35	34	26	25
F10	3,600	4,540	35	33	24	24
F11	6,828	6,709	36	39	27	27
F12	92	89	49	48	30	28
F13	53	51	35	35	31	32
G1	38	37	39	39	33	32
G2	48	43	33	33	26	28
G3	68	68	27	27	34	34
G4	59	54	29	29	27	26
G5	69	66	13	14	2	2
G6	100	100	12	11	2	2
G7	36	37	12	12	9	9
G8	7,905	7,835	18	20	13	11
G9	60	59	19	19	14	15
G10	71	71	31	31	12	11
G11	833	800	31	31	26	26
G12	76	75	39	31	27	28
G13	38	36	30	30	30	30
H1	119	124	37	42	36	37
H2	120	121	45	47	36	36
H3	90	93	64	59	43	42
H4	56	55	46	43	39	40
H5	57	59	54	51	48	49
H6	54	54	46	47	50	48
H7	37	0	43	41	44	45
H8	47	47	37	37	39	40
H9	49	48	34	34	32	38
H10	55	48	42	25	33	34
H11	34	32	35	35	40	38

Table 2-4 CBA Mercury Vapor Measurements
LCP Chemicals (Brunswick, GA)

Location	Subsurface (S)[1]	Subsurface (S1)[2]	Surface (S)[1]	Surface (S1)[2]	Breathing Zone (S)[1]	Breathing Zone (S1)[2]
	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3
H12	58	49	45	49	41	41
H13	90	92	43	42	39	35
Bkgd-1	--	--	35	34	24	25
Bkgd-2	--	--	41	39	30	28
Bkgd-1	--	--	21	22	17	16
Bkgd-2	--	--	29	30	18	16
Bkgd-1	--	--	8	9	10	11
Bkgd-2	--	--	17	18	21	21
Bkgd-1	--	--	6	7	4	4
Bkgd-2	--	--	14	12	11	11
Bkgd-SS-1	18	18	--	--	--	--
Bkgd-SS-2	24	25	--	--	--	--
Bkgd-SS-3	60	61	--	--	--	--
Bkgd-SS-4	44	49	--	--	--	--
Bkgd-SS-5	84	84	--	--	--	--

NOTES:

[1] S = instantaneous reading

[2] S1 = 10 second running mean value

*Breathing Zone - 5 feet above land surface

*Subsurface - ~ 1 foot deep, 3/4" diameter hole

*Surface and BZ samples collected on 7/27/2022

*Subsurface samples collected on 7/28/2022

7/27/2022 Weather:

8:00: Sunny, 80°F with expected high of 91°F, barometric pressure o 764.9 mmHg

11:00: Sunny, 86°F, W 6mph, barometric pressure of 765.2 mmHg

14:10: Sunny, 91°F, S/SE 9mph, barometric pressure of 764.3 mmHg

15:58: P. Cloudy, 90°F, SE 11mph, barometric pressure of 763.4 mmHg

7/28/2022 Weather:

7:42: Sunny, 76°F, SW 3 mph, Baro: 763.9 mmHg

Zero Test with carbon filter

7/27/2022: 4 ng/m3

7/28/2022: 3 ng/m3

Table 5.1
2017-2020 Groundwater Evaluation: Metals

Aquifer Setting	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	lead	Magnesium	Manganese	mercury	Nickel	Potassium	Selenium	Silver
# of Samples																			
Upper Satilla	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69
Middle Satilla	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Lower Satilla	109	109	109	109	109	109	108	109	109	109	109	109	108	109	108	109	108	109	109
Ebenezer	34	34	75	34	34	34	34	75	34	34	34	34	34	34	75	34	34	34	34
# of Detections																			
Upper Satilla	66	12	58	69	51	23	69	66	54	49	67	60	69	67	64	48	67	50	7
Middle Satilla	77	16	62	80	72	23	80	78	60	57	80	67	80	77	76	60	76	56	6
Lower Satilla	96	27	88	109	101	27	108	106	89	68	109	88	108	107	103	93	108	74	5
Ebenezer	20	2	46	30	13	2	33	61	18	18	32	15	30	25	71	24	34	5	0
% Detection																			
Upper Satilla	96%	17%	84%	100%	74%	33%	100%	96%	78%	71%	97%	87%	100%	97%	93%	70%	97%	72%	10%
Middle Satilla	96%	20%	78%	100%	90%	29%	100%	98%	75%	71%	100%	84%	100%	96%	95%	75%	95%	70%	8%
Lower Satilla	88%	25%	81%	100%	93%	25%	100%	97%	82%	62%	100%	81%	100%	98%	95%	85%	100%	68%	5%
Ebenezer	49%	5%	50%	73%	32%	5%	80%	66%	44%	44%	78%	37%	73%	61%	77%	59%	83%	12%	0%
# Detects Above MCL (RSL)																			
Upper Satilla	16	0	16	1	8	0	0	10	2	0	3	15	0	2	20	0	0	3	0
Middle Satilla	17	0	34	1	30	0	0	32	5	0	7	25	0	0	42	0	0	14	0
Lower Satilla	18	0	41	1	49	0	0	45	5	0	15	6	0	9	59	0	0	12	0
Ebenezer	0	0	13	0	0	0	0	1	0	0	2	0	0	6	26	0	0	0	0
% Detects Above MCL (RSL)																			
Upper Satilla	23%	0%	23%	1%	12%	0%	0%	14%	3%	0%	4%	22%	0%	3%	29%	0%	0%	4%	0%
Middle Satilla	21%	0%	43%	1%	38%	0%	0%	40%	6%	0%	9%	31%	0%	0%	53%	0%	0%	18%	0%
Lower Satilla	17%	0%	38%	1%	45%	0%	0%	41%	5%	0%	14%	6%	0%	8%	55%	0%	0%	11%	0%
Ebenezer	0%	0%	17%	0%	0%	0%	0%	1%	0%	0%	6%	0%	0%	18%	35%	0%	0%	0%	0%

(1) Green Shading: Parameter exceeds MCL (or RSL) >10% of samples
(2) Note: Aluminum, Iron and Manganese were not evaluated as contaminants

Table 5.1
2017-2020 Groundwater Evaluation: Metals

Aquifer Setting	Sodium	Thallium	Vanadium	Zinc
# of Samples				
Upper Satilla	69	69	69	69
Middle Satilla	80	80	80	80
Lower Satilla	108	109	109	109
Ebenezer	34	34	34	34
# of Detections				
Upper Satilla	69	11	61	50
Middle Satilla	80	12	74	54
Lower Satilla	108	14	104	71
Ebenezer	34	2	30	11
% Detection				
Upper Satilla	100%	16%	88%	72%
Middle Satilla	100%	15%	93%	68%
Lower Satilla	100%	13%	95%	65%
Ebenezer	83%	5%	73%	27%
# Detects Above MCL (RSL)				
Upper Satilla	0	0	18	0
Middle Satilla	0	0	42	0
Lower Satilla	0	3	63	0
Ebenezer	0	0	15	0
% Detects Above MCL (RSL)				
Upper Satilla	0%	0%	26%	0%
Middle Satilla	0%	0%	53%	0%
Lower Satilla	0%	3%	58%	0%
Ebenezer	0%	0%	44%	0%

(1) Green Shading: Parameter exceeds MCL (or RSL) >10% of samples
(2) Note: Aluminum, Iron and Manganese were not evaluated as contaminants

Table 5.2
2017-2020 Groundwater Evaluation: VOCs

Aquifer Setting	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,1-Dichloropropene	1,2,3-Trichloropropane	1,2,4-Trimethylbenzene	1,2-Dibromoethane	1,2-Dichloroethane	1,2-Dichloropropane	1,2-Dichloropropane	1,3,5-Trimethylbenzene	2,2-Dichloropropane	2-Butanone (MEK)	2-Chlorotoluene	2-Hexanone	4-Chlorotoluene	Acetone	Benzene	Bromodichloromethane	Carbon disulfide	Chlorobenzene
# of Samples																						
Upper Satilla	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66
Middle Satilla	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
Lower Satilla	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ebenezer	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
# of Detections																						
Upper Satilla	1	0	22	5	5	2	35	0	1	2	7	26	1	2	11	3	1	26	40	1	42	26
Middle Satilla	1	0	23	5	1	0	40	0	0	1	6	25	1	1	2	0	0	18	43	0	39	30
Lower Satilla	1	1	18	2	1	1	44	1	1	3	7	31	0	1	3	2	2	38	54	2	53	30
Ebenezer	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	17	14	0	23	1
% Detection																						
Upper Satilla	2%	0%	33%	8%	8%	3%	53%	0%	2%	3%	11%	39%	2%	3%	17%	5%	2%	39%	61%	2%	64%	39%
Middle Satilla	1%	0%	32%	7%	1%	0%	56%	0%	0%	1%	8%	35%	1%	1%	3%	0%	0%	25%	60%	0%	54%	42%
Lower Satilla	1%	1%	18%	2%	1%	1%	44%	1%	1%	3%	7%	31%	0%	1%	3%	2%	2%	38%	54%	2%	53%	30%
Ebenezer	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	41%	34%	0%	56%	2%
# Detects Above MCL (RSL)																						
Upper Satilla	1	0	3	0	0	1	4	0	0	0	0	1	0	0	0	0	0	0	10	0	0	7
Middle Satilla	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6
Lower Satilla	1	1	4	0	0	0	6	1	0	1	0	2	0	0	0	0	0	0	2	0	0	3
Ebenezer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Detects Above MCL (RSL)																						
Upper Satilla	2%	0%	5%	0%	0%	2%	6%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	15%	0%	0%	11%
Middle Satilla	1%	0%	1%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	8%
Lower Satilla	1%	1%	4%	0%	0%	0%	6%	1%	0%	1%	0%	2%	0%	0%	0%	0%	0%	0%	2%	0%	0%	3%
Ebenezer	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

(1) Green Shading: Parameter exceeds MCL (or RSL) >10% of samples

Table 5.2
2017-2020 Groundwater Evaluation: VOCs

Aquifer Setting	Chloroethane	Chloroform	Chloromethane	cis-1,2-Dichloroethene	Dichloromethane (Methyl	Ethyl benzene	Isopropylbenzene	m&p-Xylene	n-Butylbenzene	n-Propylbenzene	o-Xylene	p-Isopropyltoluene	sec-Butylbenzene	tert-Butylbenzene	Tetrachloroethene	Toluene	trans-1,2-Dichloroethene	Trichloroethene	Vinyl chloride
# of Samples																			
Upper Satilla	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66
Middle Satilla	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
Lower Satilla	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ebenezer	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
# of Detections																			
Upper Satilla	3	3	6	26	25	40	43	34	29	40	30	31	40	40	4	43	5	7	7
Middle Satilla	3	4	3	38	26	40	41	34	24	39	34	31	35	30	0	44	10	7	2
Lower Satilla	6	3	11	33	37	50	47	35	17	45	39	21	25	28	1	51	5	4	3
Ebenezer	0	0	4	2	9	9	7	6	0	5	4	0	0	0	0	16	0	0	1
% Detection																			
Upper Satilla	5%	5%	9%	39%	38%	61%	65%	52%	44%	61%	45%	47%	61%	61%	6%	65%	8%	11%	11%
Middle Satilla	4%	6%	4%	53%	36%	56%	57%	47%	33%	54%	47%	43%	49%	42%	0%	61%	14%	10%	3%
Lower Satilla	6%	3%	11%	33%	37%	50%	47%	35%	17%	45%	39%	21%	25%	28%	1%	51%	5%	4%	3%
Ebenezer	0%	0%	10%	5%	22%	22%	17%	15%	0%	12%	10%	0%	0%	0%	0%	39%	0%	0%	2%
# Detects Above MCL (R																			
Upper Satilla	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Middle Satilla	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower Satilla	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ebenezer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Detects Above MCL (I																			
Upper Satilla	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	3%
Middle Satilla	0%	0%	0%	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lower Satilla	0%	0%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Ebenezer	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

(1) Green Shading: Parameter exceeds MCL (or RSL) >10% of samples

Table 5.3
2017-2020 Groundwater Evaluation: SVOCs

Aquifer Setting	1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1-Methyl Naphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Dibenzofuran
# of Samples																	
Upper Satilla	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66
Middle Satilla	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
Lower Satilla	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ebenezer	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
# of Detections																	
Upper Satilla	5	19	19	21	49	50	48	22	48	28	16	21	21	8	20	9	42
Middle Satilla	13	27	28	28	62	60	60	30	56	31	28	32	28	9	19	4	49
Lower Satilla	4	30	11	23	88	73	67	14	58	31	35	44	34	17	19	5	48
Ebenezer	1	0	1	0	27	24	7	1	9	8	6	6	7	6	4	2	3
% Detection																	
Upper Satilla	8%	29%	29%	32%	74%	76%	73%	33%	73%	42%	24%	32%	32%	12%	30%	14%	64%
Middle Satilla	18%	38%	39%	39%	86%	83%	83%	42%	78%	43%	39%	44%	39%	13%	26%	6%	68%
Lower Satilla	4%	30%	11%	23%	88%	73%	67%	14%	58%	31%	35%	44%	34%	17%	19%	5%	48%
Ebenezer	2%	0%	2%	0%	66%	59%	17%	2%	22%	20%	15%	15%	17%	15%	10%	5%	7%
# Detects of Above MCL (RSL)																	
Upper Satilla	0	0	0	3	36	7	0	0	0	13	5	4	0	0	0	4	0
Middle Satilla	0	1	0	2	41	0	0	0	0	21	2	2	0	0	0	2	0
Lower Satilla	0	0	0	0	36	1	0	0	0	10	4	3	0	0	0	3	0
Ebenezer	0	0	0	0	1	0	0	0	0	2	1	1	0	0	0	1	0
% Detects Above MCL (RSL)																	
Upper Satilla	0%	0%	0%	5%	55%	11%	0%	0%	0%	20%	8%	6%	0%	0%	0%	6%	0%
Middle Satilla	0%	1%	0%	3%	57%	0%	0%	0%	0%	29%	3%	3%	0%	0%	0%	3%	0%
Lower Satilla	0%	0%	0%	0%	36%	1%	0%	0%	0%	10%	4%	3%	0%	0%	0%	3%	0%
Ebenezer	0%	0%	0%	0%	2%	0%	0%	0%	0%	5%	2%	2%	0%	0%	0%	2%	0%

(1) Green Shading: Parameter exceeds MCL (or RSL) >10% of samples

Table 5.3
2017-2020 Groundwater Evaluation: SVOCs

Aquifer Setting	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
# of Samples						
Upper Satilla	66	66	66	66	66	66
Middle Satilla	72	72	72	74	72	72
Lower Satilla	100	100	100	102	100	100
Ebenezer	41	41	41	41	41	41
# of Detections						
Upper Satilla	27	48	15	54	37	34
Middle Satilla	27	56	25	69	42	42
Lower Satilla	26	59	27	91	46	48
Ebenezer	4	11	8	23	13	12
% Detection						
Upper Satilla	41%	73%	23%	82%	56%	52%
Middle Satilla	38%	78%	35%	93%	58%	58%
Lower Satilla	26%	59%	27%	89%	46%	48%
Ebenezer	10%	27%	20%	56%	32%	29%
# Detects of Above MCL (RSL)						
Upper Satilla	0	0	2	44	0	0
Middle Satilla	0	0	1	62	0	0
Lower Satilla	0	0	1	74	0	0
Ebenezer	0	0	1	6	0	0
% Detects Above MCL (RSL)						
Upper Satilla	0%	0%	3%	67%	0%	0%
Middle Satilla	0%	0%	1%	84%	0%	0%
Lower Satilla	0%	0%	1%	73%	0%	0%
Ebenezer	0%	0%	2%	15%	0%	0%

(1) Green Shading: Parameter exceeds MCL (or RSL) >10% of samples

Table 6-1 Surface Water Dioxin Toxicity Equivalence Concentration (TEC) and Aroclor-1268 Concentrations

Location	Year	Dioxin Total TEC, pg/L	Aroclor-1268, µg/L	Description
C-6	2000	1.69	1 U	Eastern Creek
C-8	2000	3.72	1 U	Eastern Creek
C-15	2000	2.74	1 U	mouth of Western Creek
C-15 (duplicate)	2000	4.64	NA	mouth of Western Creek
TC-C	2000	1.91	1 U	Troup Creek reference
CR-C	2000	2.85	0.33 J	Crescent River reference

Notes:
TEC conversion used WHO TEF (2005) factor
NA - not analyzed
pg/L - picogram per liter
µg/L - microgram per liter
U - Below detection limit
J - Estimated value

Table 7.1
Summary of Groundwater COPCs

Parameter	Satilla GW	Ebenezer GW
1,2,4-Trichlorobenzene	Yes	
1,2-Dichlorobenzene	Yes	
1,3-Dichlorobenzene	Yes	
1,4-Dichlorobenzene	Yes	
1-Methyl Naphthalene	Yes	
2-Methylnaphthalene	Yes	
Benzo(a)anthracene	Yes	Yes
Benzo(a)pyrene	Yes	Yes
Benzo(b)fluoranthene	Yes	Yes
Dibenzo(a,h)anthracene	Yes	Yes
Dibenzofuran	Yes	
Indeno(1,2,3-cd)pyrene	Yes	Yes
Naphthalene	Yes	Yes
1,1,2,2-Tetrachloroethane	Yes	
1,1,2-Trichloroethane	Yes	
1,1-Dichloroethane	Yes	
1,1-Dichloropropene	Yes	
1,2,3-Trichloropropane	Yes	
1,2,4-Trimethylbenzene	Yes	
1,2-Dibromo-3-chloropropane	Yes	
1,2-Dibromoethane	Yes	
1,2-Dichloropropane	Yes	
1,3,5-Trimethylbenzene	Yes	
2-Hexanone	Yes	
Acetone	Yes	
Benzene	Yes	Yes
Bromodichloromethane	Yes	
Chlorobenzene	Yes	
Chloroform	Yes	
cis-1,2-Dichloroethene	Yes	
Ethyl benzene	Yes	
Isopropylbenzene	Yes	
m&p-Xylene	Yes	
o-Xylene	Yes	
Toluene	Yes	
Trichloroethene	Yes	
Vinyl chloride	Yes	

Parameter	Satilla GW	Ebenezer GW
Aluminum	Yes	Yes
Antimony	Yes	
Arsenic	Yes	Yes
Barium	Yes	
Beryllium	Yes	
Cadmium	Yes	Yes
Chromium VI	Yes	Yes
Cobalt	Yes	
Copper	Yes	
Iron	Yes	Yes
lead	Yes	
Manganese	Yes	Yes
Mercury	Yes	Yes
Methyl mercury	Yes	
Nickel	Yes	Yes
Selenium	Yes	Yes
Thallium	Yes	
Vanadium	Yes	Yes
Zinc	Yes	

Table 7-2 Summary of Soil COPCs

Parameter	CBA Surface Soil	CBA Mixed Soil
Aroclor-1254	Yes	Yes
Aroclor-1260	Yes	Yes
Aroclor-1268	Yes	Yes
Benzo(a)anthracene	Yes	Yes
Benzo(a)pyrene	Yes	Yes
Benzo(b)fluoranthene	Yes	Yes
Benzo(b/k)fluoranthene		Yes
Dibenzo(a,h)anthracene	Yes	Yes
Arsenic	Yes	Yes
Chromium*	Yes	Yes
Cobalt	Yes	Yes
Iron	Yes	Yes
Lead		Yes
Mercury	Yes	Yes

* Total chromium evaluated as hexavalent chromium

Table 7-3
Exposure Point Concentrations - Groundwater

COPC	South Satilla GW EPC		North Satilla GW EPC		South Ebenezer GW EPC	
	EPC (mg/L)	Basis	EPC (mg/L)	Basis	EPC (mg/L)	Basis
Aluminum	29	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	125	99% KM (Chebyshev) UCL	0.038	95% KM (t) UCL
Antimony	0.00071	95% KM (t) UCL	0.00018	95% KM (t) UCL	N/A	
Arsenic	0.022	95% KM (t) UCL	0.035	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.030	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)
Barium	0.53	95% Adjusted Gamma UCL	0.86	95% Adjusted Gamma UCL	N/A	
Beryllium	0.02	95% KM (t) UCL	0.0036	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	N/A	
Cadmium	0.00044	95% KM (t) UCL	0.00086	95% KM (t) UCL	0.00014	Maximum Detected
Chromium VI	0.0658	95% Student's-t UCL		Not Detected	0.040	Maximum Detected
Cobalt	0.00318	95% KM Adjusted Gamma UCL	0.0077	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	N/A	
Copper	0.015	95% KM (t) UCL	0.010	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	N/A	
Iron	11	95% Adjusted Gamma UCL	16	95% Adjusted Gamma UCL	0.82	95% KM Adjusted Gamma UCL
Lead	0.026	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.063	99% Chebyshev (Mean, Sd) UCL	N/A	
Manganese	0.18	95% Adjusted Gamma UCL	0.72	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0039	95% KM (t) UCL
Mercury	0.011	95% Adjusted Gamma UCL	0.0038	99% Chebyshev (Mean, Sd) UCL	0.031	95% Adjusted Gamma UCL
Methyl mercury	2.1664E-4	95% Student's-t UCL				
Nickel	0.053	95% KM Adjusted Gamma UCL	0.060	99% KM (Chebyshev) UCL	0.028	95% KM (t) UCL
Selenium	0.0081	95% KM Adjusted Gamma UCL	0.0077	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.012	95% KM (t) UCL
Thallium	0.00024	95% KM (t) UCL	0.00015	95% KM (t) UCL		
Vanadium	1.1	95% Adjusted Gamma UCL	0.89	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.39	95% Student's-t UCL
Zinc	0.048	95% KM Adjusted Gamma UCL	0.12	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	N/A	
1,2,4-Trichlorobenzene	0.0013	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.00026	95% KM (Chebyshev) UCL	N/A	
1,2-Dichlorobenzene	0.048	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.00031	95% KM (t) UCL	N/A	
1,3-Dichlorobenzene	0.0017	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0035	99% KM (Chebyshev) UCL	N/A	
1,4-Dichlorobenzene	0.0075	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0035	95% KM (Chebyshev) UCL	N/A	
1-Methyl Naphthalene	0.0044	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.058	95% KM (t) UCL	N/A	
2-Methylnaphthalene	0.0051	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.088	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	N/A	
Benzo(a)anthracene	0.00025	Maximum Detected	0.000094	95% KM (t) UCL	0.00014	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)
Benzo(a)pyrene	0.000078	95% KM (t) UCL	0.000075	95% KM (t) UCL	0.00016	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)

Table 7-4
Exposure Point Concentrations - Soil

COPC	Mixed Soil EPC			Surface Soil EPC		
	95% UCL (mg/kg)	Basis	EPC (FI x 95% UCL) (mg/kg)	95% UCL (mg/kg)	Basis	EPC (FI x 95% UCL) (mg/kg)
Arsenic	2.064	95% Adjusted Gamma UCL	1.4	1.323	95% Student's-t UCL	0.19
Chromium VI	6.272	95% Student's-t UCL	4.1	8.078	95% Student's-t UCL	1.1
Cobalt	1.844	95% Adjusted Gamma UCL	1.2	1.94	95% H-UCL	0.27
Iron	5808	95% Student's-t UCL	3833	4971	95% Student's-t UCL	696
lead	108.8	95% Adjusted Gamma UCL	72			
Mercury	179.7	95% H-UCL	119	89.9	95% Adjusted Gamma UCL	13
Aroclor-1254	18.69	97.5% Chebyshev (Mean, Sd) UCL	12	1.447	95% KM (t) UCL	0.20
Aroclor-1260	18.86	97.5% Chebyshev (Mean, Sd) UCL	12	2.727	95% KM (t) UCL	0.38
Aroclor-1268	62.85	97.5% Chebyshev (Mean, Sd) UCL	41	37.58	95% Adjusted Gamma UCL	5.3
Benzo(a)anthracene	10.2	99% Chebyshev (Mean, Sd) UCL	6.7	0.499	95% KM (t) UCL	0.07
Benzo(a)pyrene	10.63	99% Chebyshev (Mean, Sd) UCL	7.0	0.612	95% KM (t) UCL	0.09
Benzo(b)fluoranthene	1.139	95% Adjusted Gamma UCL	0.75	0.928	95% KM (t) UCL	0.13
Benzo(b/k)fluoranthene	8.287	95% Student's-t UCL	5.5	N/A		
Dibenzo(a,h)anthracene	10.67	99% Chebyshev (Mean, Sd) UCL	7.0	0.244	95% KM Bootstrap t UCL	0.034

FI surface soil	14%
FI mixed soil	66%

Table 7-5 Exposure Point Concentrations - Golf Course Receptors

		Redevelopment Area ("1-2")				CBA		
Analyte	CAS No.	Native Soil EPC (mg/kg)	Basis	EPC with FI = 1	EPC with FI = 0.70	Native Soil EPC (mg/kg)	Basis	CBA EPC (FI = 0.14)
4,6-Dinitro-2-methylphenol	534521	32	Max (1 detect)	32	22		not analyzed	
Aldrin	309002	0.0029	Max (1 detect)	0.0029	0.0020		not analyzed	
Aluminum	7429905	4502	95% Student's-t UCL	4502	3151	5728	95% Student's-t UCL	802
Antimony	7440360	1.4	95% KM (t) UCL	1.4	1.0	0.28	95% KM (t) UCL	0.039
Aroclor 1221	11104282	0.27	Max (1 detect)	0.27	0.19		Not detected	
Aroclor 1254	11097691	0.80	KM H-UCL	0.80	0.56	1.3	95% KM (t) UCL	0.18
Aroclor 1260	11096825	1.5	95% KM (t) UCL	1.5	1.0	3.3	95% KM (t) UCL	0.46
Aroclor 1268	11100144	2.2	95% KM Approximate Gamma UCL	2.2	1.5	41	95% Adjusted Gamma UCL	5.7
Arsenic	7440382	1.9	KM H-UCL	1.9	1.3	1.5	95% Student's-t UCL	0.22
Benz[a]anthracene	56553	0.70	KM H-UCL	0.70	0.49	0.70	95% KM (t) UCL	0.10
Benzene	71432	0.0038	95% KM Approximate Gamma UCL	0.0038	0.0026		Not detected	
Benzo[a]pyrene	50328	0.79	KM H-UCL	0.79	0.56	0.79	95% KM (t) UCL	0.11
Benzo[b/k]fluoranthene	NA	0.50	95% KM Adjusted Gamma UCL	0.50	0.35		not analyzed	
Benzo[b]fluoranthene	205992	0.72	KM H-UCL	0.72	0.51	1.2	95% KM (t) UCL	0.17
Benzo[k]fluoranthene	207089	0.14	95% KM Approximate Gamma UCL	0.14	0.09	0.33	95% KM (t) UCL	0.046
Bis(2-ethylhexyl)phthalate	117817	0.53	KM H-UCL	0.53	0.37		not analyzed	
Cadmium	7440439	0.12	95% KM (t) UCL	0.12	0.08	0.23	95% KM (t) UCL	0.032
Carbazole	86748	0.047	Max (95%UCL exceeds Max)	0.047	0.033		not analyzed	
Chloroform	67663	0.0034	95% KM (t) UCL	0.0034	0.0024	0.0097	Max (2 detects)	0.00136
Chromium	7440473	7.3	KM H-UCL	7.3	5.1	8.2	95% Student's-t UCL	1.2
Chrysene	218019	1.1	KM H-UCL	1.1	0.8	1.3	95% KM Bootstrap t UCL	0.18
Cobalt	7440484	0.78	95% KM Approximate Gamma UCL	0.78	0.54	1.6	95% Student's-t UCL	0.23
DDT	50293	0.084	95% KM Adjusted Gamma UCL	0.084	0.059		not analyzed	
Dibenz[a,h]anthracene	53703	0.23	KM H-UCL	0.23	0.16	0.34	95% KM Bootstrap t UCL	0.047
Dibenzofuran	132649	0.019	95% KM Approximate Gamma UCL	0.019	0.013	0.10	95% KM Bootstrap t UCL	0.014
Dibromochloromethane	124481	0.05	Max (1 detect)	0.05	0.035		Not detected	
Dichlorobenzene, 1,4-	106467	0.0002	Max (1 detect)	0.0002	0.00014		Not detected	
Dieldrin	60571	0.0021	Max (2 detects)	0.0021	0.0015		not analyzed	
Endrin	72208	0.0052	95% KM (t) UCL	0.0052	0.0036		not analyzed	
Ethylbenzene	100414	0.0063	95% KM (t) UCL	0.0063	0.0044		Not detected	
Hexachlorocyclohexane, Alpha-	319846	0.00018	Max (2 detects)	0.00018	0.00013		not analyzed	
Indeno[1,2,3-cd]pyrene	193395	0.52	KM H-UCL	0.52	0.37	0.52	95% KM Bootstrap t UCL	0.073

Table 7-6a
Chemical-Specific Information

Parameter	Form	Surrogate	SFo (mg/kg/d)$^{-1}$		IUR (µg/m^3)$^{-1}$		RfD (mg/kg/d)		RfCi (mg/m^3)		Volatile	Mutagen	GIABS	ABSd	RBA	PEF (m^3/kg)	VF (m^3/kg)	1/VF + 1/PEF (m^3/kg)$^{-1}$
Aluminum							1.0E+00	P	0.005	P			1		1	1.36E+09		7.35E-10
Antimony							4.0E-04	I	0.0003	A			0.15		1	1.36E+09		7.35E-10
Arsenic			1.5E+00	I	4.3E-03	I	3.0E-04	I	0.000015	C			1	0.03	0.6	1.36E+09		7.35E-10
Barium							2.0E-01	I	0.0005	H			0.07		1	1.36E+09		7.35E-10
Beryllium					2.4E-03	I	2.0E-03	I	0.00002	I			0.007		1	1.36E+09		7.35E-10
Cadmium	water				1.8E-03	I	1.0E-04	A	0.00001	A			0.05	0.001	1	1.36E+09		7.35E-10
Chromium	VI		5.0E-01	C	8.4E-02	G	3.0E-03	I	0.0001	I		M	0.025		1	1.36E+09		7.35E-10
Cobalt					9.0E-03	P	3.0E-04	P	0.000006	P			1		1	1.36E+09		7.35E-10
Copper							4.0E-02	H					1		1	1.36E+09		7.35E-10
Iron							7.0E-01	P					1		1	1.36E+09		7.35E-10
Lead													1		1	1.36E+09		7.35E-10
Manganese	water						2.4E-02	G	0.00005	I			0.04		1	1.36E+09		7.35E-10
Mercury	elemental								0.0003	I	V		1		1	1.36E+09	3.5E+04	2.88E-05
Mercury	salts						0.0003	I	0.0003	G			0.07		1	1.36E+09		7.35E-10
Methyl mercury							1.0E-04	I					1		1	1.36E+09		7.35E-10
Nickel					2.6E-04	C	2.0E-02	I	0.00009	A			0.04		1	1.36E+09		7.35E-10
Selenium							5.0E-03	I	0.02	C			1		1	1.36E+09		7.35E-10
Thallium							1.0E-05	X					1		1	1.36E+09		7.35E-10
Vanadium							5.0E-03	G	0.0001	A			0.026		1	1.36E+09		7.35E-10
Zinc							3.0E-01	I					1		1	1.36E+09		7.35E-10
Aroclor-1254			2.0E+00	G	5.7E-04	G	2.0E-05	I			V		1	0.14	1	1.36E+09	8.4E+05	1.19E-06
Aroclor-1260			2.0E+00	G	5.7E-04	G					V		1	0.14	1	1.36E+09	1.3E+06	7.64E-07
Aroclor-1268		(Aroclor-1254)	2.0E+00	G	5.7E-04	G	2.0E-05	I			V		1	0.14	1	1.36E+09	8.4E+05	1.19E-06
1,2,4-Trichlorobenzene			2.9E-02	P			1.0E-02	I	0.002	P	V		1		1	1.36E+09	3.0E+04	3.34E-05
1,2-Dichlorobenzene							9.0E-02	I	0.2	H	V		1		1	1.36E+09	1.2E+04	8.55E-05
1,3-Dichlorobenzene		1,2-Dichlorobenzene					9.0E-02	I	0.2	H	V		1		1	1.36E+09	1.2E+04	8.55E-05
1,4-Dichlorobenzene			5.4E-03	C	1.1E-05	C	7.0E-02	A	0.8	I	V		1		1	1.36E+09	1.0E+04	9.62E-05
1-Methyl Naphthalene			2.9E-02	P			7.0E-02	A			V		1	0.13	1	1.36E+09	5.9E+04	1.71E-05
2-Methylnaphthalene							4.0E-03	I			V		1	0.13	1	1.36E+09	5.8E+04	1.72E-05
Benzo(a)anthracene			1.0E-01	E	6.0E-05	E					V	M	1	0.13	1	1.36E+09	4.4E+06	2.27E-07
Benzo(a)pyrene			1.0E+00	I	6.0E-04	I	3.0E-04	I	0.000002	I		M	1	0.13	1	1.36E+09		7.35E-10
Benzo(b)fluoranthene			1.0E-01	E	6.0E-05	E						M	1	0.13	1	1.36E+09		7.35E-10
Benzo(b/k)fluoranthene		(Benzo(b)fluoranthene)	1.0E-01	E	6.0E-05	E						M	1	0.13	1	1.36E+09		7.35E-10
Dibenzo(a,h)anthracene			1.0E+00	E	6.0E-04	E						M	1	0.13	1	1.36E+09		7.35E-10
Dibenzofuran							1.0E-03	X			V		1		1	1.36E+09	1.6E+05	6.41E-06
Indeno(1,2,3-cd)pyrene			1.0E-01	E	6.0E-05	E						M	1	0.13	1	1.36E+09		7.35E-10
Naphthalene				*		*	2.0E-02	I	0.003	I	V		1	0.13	1	1.36E+09	4.6E+04	2.16E-05
1,1,2,2-Tetrachloroethane			2.0E-01	I	5.8E-05	C	2.0E-02	I			V		1		1	1.36E+09	1.5E+04	6.62E-05
1,1,2-Trichloroethane			5.7E-02	I	1.6E-05	I	4.0E-03	I	0.0002	X	V		1		1	1.36E+09	7.2E+03	1.39E-04
1,1-Dichloroethane			5.7E-03	C	1.6E-06	C	2.0E-01	P			V		1		1	1.36E+09	2.1E+03	4.81E-04
1,1-Dichloropropene		1,3-Dichloropropene	1.0E-01	I	4.0E-06	I	3.0E-02	I	0.02	I	V		1		1	1.36E+09	3.6E+03	2.78E-04
1,2,3-Trichloropropane			3.0E+01	I			4.0E-03	I	0.0003	I	V	M	1		1	1.36E+09	1.6E+04	6.37E-05
1,2,4-Trimethylbenzene							1.0E-02	I	0.06	I	V		1		1	1.36E+09	7.9E+03	1.26E-04
1,2-Dibromo-3-chloropropane			8.0E-01	P	6.0E-03	P	2.0E-04	P	0.0002	I	V	M	1		1	1.36E+09	3.2E+04	3.13E-05

Table 7-6a
Chemical-Specific Information

Parameter	Form	Surrogate	SFo (mg/kg/d)$^{-1}$		IUR (µg/m^3)$^{-1}$		RfD (mg/kg/d)		RfCi (mg/m^3)		Volatile	Mutagen	GIABS	ABSd	RBA	PEF (m^3/kg)	VF (m^3/kg)	1/VF + 1/PEF (m^3/kg)$^{-1}$
1,2-Dibromoethane			2.0E+00	I	6.0E-04	I	9.0E-03	I	0.009	I	V		1		1	1.36E+09	8.6E+03	1.16E-04
1,2-Dichloropropane			3.7E-02	P	3.7E-06	P	4.0E-02	P	0.004	I	V		1		1	1.36E+09	3.8E+03	2.64E-04
1,3,5-Trimethylbenzene							1.0E-02	I	0.06	I	V		1		1	1.36E+09	6.6E+03	1.51E-04
2-Hexanone							5.0E-03	I	0.03	I	V		1		1	1.36E+09	1.3E+04	7.52E-05
Acetone							9.0E-01	I			V		1		1	1.36E+09	1.4E+04	7.30E-05
Benzene			5.5E-02	I	7.8E-06	I	4.0E-03	I	0.03	I	V		1		1	1.36E+09	3.5E+03	2.82E-04
Bromodichloromethane			6.2E-02	I	3.7E-05	C	2.0E-02	I			V		1		1	1.36E+09	4.0E+03	2.52E-04
Chlorobenzene							2.0E-02	I	0.05	P	V		1		1	1.36E+09	6.5E+03	1.55E-04
Chloroform			3.1E-02	C	2.3E-05	I	1.0E-02	I	0.098	A	V		1		1	1.36E+09	2.6E+03	3.80E-04
cis-1,2-Dichloroethene							2.0E-03	I			V		1		1	1.36E+09	2.5E+03	4.00E-04
Ethyl benzene			1.1E-02	C	2.5E-06	C	1.0E-01	I	1	I	V		1		1	1.36E+09	5.7E+03	1.76E-04
Isopropylbenzene							1.0E-01	I	0.4	I	V		1		1	1.36E+09	6.2E+03	1.61E-04
m&p-Xylene		(m-Xylene)					2.0E-01	G	0.1	G	V		1		1	1.36E+09	5.5E+03	1.82E-04
o-Xylene							2.0E-01	G	0.1	G	V		1		1	1.36E+09	6.5E+03	1.55E-04
Toluene							8.0E-02	I	5	I	V		1		1	1.36E+09	4.3E+03	2.33E-04
Trichloroethene			4.6E-02	I	4.1E-06	I	5.0E-04	I	0.002	I	V	M	1		1	1.36E+09	2.2E+03	4.52E-04
Vinyl chloride			7.2E-01	I	4.4E-06	I	3.0E-03	I	0.1	I	V	M	1		1	1.36E+09	9.6E+02	1.05E-03

Toxicity Sources:

A ATSDR - Agency for Toxic Substances and Disease Registry minimal risk levels
C California EPA Office of Environmental Health and Hazard Assessment
E Toxicity Equivilence Factors applied
G User's Guide for RSLs
H HEAST - EPA's Health Effects Assessment Summary Table
I IRIS - EPA's Integrated Risk Information System
P PPRTV (The Provisional Peer Reviewed Toxicity Values) Screening Level
X PPRTV's Screening toxicity values

* As recommended by Georgia EPD, naphthalene is assessed based on non-carcinogenic responses due to significant uncertainty in California EPA's carcinogenic toxicity values used in RSL tables.

Table 7-6b
Chemical-Specific Information - Excavation Worker

Parameter	Form	Surrogate	Chronic RfD (mg/kg/d)		Chronic RfCi (mg/m^3)		Subchronic RfD (mg/kg/d)		Subchronic RfCi (mg/m^3)		RfD Used (mg/kg/d)	RfC Used (mg/m^3)	V	MW (g/mol)	H'	HLC (atm-m^3/mol)	H and HLC Ref	Koc (cm^3/g)	Koc Ref	Dia (cm^2/s)	Diw (cm^2/s)	Dia and Diw Ref	Trench VF (L/m^3)	Subchronic VF (m^3/kg)	PEF (m^3/kg)	Subchronic 1/VF + 1/PEF (m^3/kg)$^{-1}$
Aluminum			1	P	0.005	P	1	A			1	0.005		26.982											3.34E+09	2.99E-10
Antimony			0.0004	I	0.0003	A	0.0004	P	0.001	A	0.0004	0.001		121.76											3.34E+09	2.99E-10
Arsenic			0.0003	I	0.000015	C					0.0003	0.000015		74.922											3.34E+09	2.99E-10
Barium			0.2	I	0.0005	H	0.2	A	0.005	H	0.2	0.005		137.33											3.34E+09	2.99E-10
Beryllium			0.002	I	0.00002	I	0.005	H			0.005	0.00002		9.01											3.34E+09	2.99E-10
Cadmium	water		0.0001	A	0.00001	A	0.0005	A			0.0005	0.00001		112.4											3.34E+09	2.99E-10
Chromium	VI		0.003	I	0.0001	I					0.003	0.0001		51.996											3.34E+09	2.99E-10
Cobalt			0.0003	P	0.000006	P	0.003	P	0.00002	P	0.003	0.00002		58.93											3.34E+09	2.99E-10
Copper			0.04	H			0.01	A			0.01			63.546											3.34E+09	2.99E-10
Iron			0.7	P			0.7	P			0.7			55.847											3.34E+09	2.99E-10
Lead														207.2											3.34E+09	2.99E-10
Manganese	water		0.024	G	0.00005	I					0.024	0.00005		54.938											3.34E+09	2.99E-10
Mercury	elemental				0.0003	I			0.0003	H		0.0003	V	200.59	0.352	0.008622	PP			0.0307	6.3E-06	W	9.38E+00	1.6E+03	3.34E+09	6.33E-04
Mercury	salts		0.0003	I	0.0003	G	2.00E-03	A			0.002	0.0003		271.5											3.34E+09	2.99E-10
Methyl mercury			0.0001	I			1.5	H			1.5			216.63											3.34E+09	2.99E-10
Nickel			0.02	I	0.00009	A	0.02	H	0.0002	A	0.02	0.0002		58.71											3.34E+09	2.99E-10
Selenium			0.005	I	0.02	C	0.005	H			0.005	0.02		78.96											3.34E+09	2.99E-10
Thallium			0.00001	X			0.00004	S			0.00004			204.38											3.34E+09	2.99E-10
Vanadium			0.005	G	0.0001	A	0.01	A			0.01	0.0001		50.94											3.34E+09	2.99E-10
Zinc			0.3	I			0.3	A			0.3			65.37											3.34E+09	2.99E-10
Aroclor-1254			0.00002	I			0.00003	A			0.00003		V	326.44	0.0116	0.000283	PP	130500	EPI	0.02372	6.1E-06	W	6.31E+00	8.0E+05	3.34E+09	1.25E-06
Aroclor-1260													V	395.33	0.0137	0.000336	PP	349700	EPI	0.022024	5.61E-06	W	5.90E+00	1.2E+06	3.34E+09	8.04E-07
Aroclor-1268		(Aroclor-1254)	0.00002	I			3.0E-05	A			0.00003		V	326.44	0.0116	0.000283		130500		0.02372	6.1E-06	W	6.31E+00	8.0E+05	3.34E+09	1.25E-06
1,2,4-Trichlorobenzene			0.01	I	0.002	P	0.09	P	0.02	P	0.09	0.02	V	181.45	0.0581	0.00142	PP	1356	EPI	0.039599	8.4E-06	W	9.56E+00	2.8E+04	3.34E+09	3.54E-05
1,2-Dichlorobenzene			0.09	I	0.2	H	0.6	A	2	H	0.6	2	V	147	0.0785	0.00192	PP	382.9	EPI	0.05617	8.92E-06	W	1.07E+01	1.1E+04	3.34E+09	9.10E-05
1,3-Dichlorobenzene		1,2-Dichlorobenzene	0.09	I	0.2	H	0.6	A	2	H	0.6	2	V	147	0.0785	0.00192		382.9		0.05617	8.92E-06	W	1.07E+01	1.1E+04	3.34E+09	9.10E-05
1,4-Dichlorobenzene			0.07	A	0.8	I	0.07	A	1.20245	A	0.07	1.202454	V	147	0.0985	0.00241	PP	375.3	EPI	0.055043	8.68E-06	W	1.08E+01	9.8E+03	3.34E+09	1.02E-04
1-Methyl Naphthalene			0.07	A							0.07		V	142.2	0.021	0.000514	PP	2528	EPI	0.05277	7.85E-06	W	1.01E+01	5.5E+04	3.34E+09	1.80E-05
2-Methylnaphthalene			0.004	I			0.004	P			0.004		V	142.2	0.0212	0.000518	PP	2478	EPI	0.052432	7.78E-06	W	1.01E+01	5.5E+04	3.34E+09	1.82E-05
Benzo(a)anthracene													V	228.3	0.0005	0.000012	PP	176900	EPI	0.026114	6.75E-06	W	1.67E+00	4.2E+06	3.34E+09	2.40E-07
Benzo(a)pyrene			0.0003	I	0.000002	I					0.0003	0.000002		252.32	2E-05	4.57E-07	PP	587400	EPI	0.025476	6.58E-06	W			3.34E+09	2.99E-10
Benzo(b)fluoranthene														252.32	3E-05	6.57E-07	PP	599400	EPI	0.025022	6.43E-06	W			3.34E+09	2.99E-10
Benzo(b/k)fluoranthene		(Benzo(b)fluoranthene)												252.32	3E-05	6.57E-07		599400		0.025022	6.43E-06	W			3.34E+09	2.99E-10
Dibenzo(a,h)anthracene														278.36	6E-06	1.41E-07	EPI	1912000	EPI	0.023619	6.02E-06	W			3.34E+09	2.99E-10
Dibenzofuran			0.001	X			0.004	P			0.004		V	168.2	0.0087	0.000213	EPI	9161	EPI	0.065066	7.38E-06	W	8.22E+00	1.5E+05	3.34E+09	6.79E-06
Indeno(1,2,3-cd)pyrene														276.34	1E-05	3.48E-07	PP	1951000	EPI	0.024713	6.37E-06	W			3.34E+09	2.99E-10
Naphthalene				*		*	0.6	A			0.6		V	128.18	0.018	0.00044	PP	1544	EPI	0.060499	8.38E-06	W	1.05E+01	4.4E+04	3.34E+09	2.28E-05
1,1,2,2-Tetrachloroethane			0.02	I			0.05	I			0.05		V	167.85	0.015	0.000367	PP	94.94	EPI	0.048921	9.29E-06	W	8.99E+00	1.4E+04	3.34E+09	7.14E-05
1,1,2-Trichloroethane			0.004	I	0.0002	X	0.004	P	0.01091	A	0.004	0.01091	V	133.41	0.0337	0.000824	PP	60.7	EPI	0.06689	1E-05	W	1.08E+01	6.6E+03	3.34E+09	1.51E-04
1,1-Dichloroethane			0.2	P			2	P			2		V	98.96	0.2298	0.00562	PP	31.82	EPI	0.083645	1.06E-05	W	1.33E+01	1.9E+03	3.34E+09	5.40E-04
1,1-Dichloropropene		1,3-Dichloropropene	0.03	I	0.02	I	0.2	P			0.2	0.02	V	110.97	0.1451	0.00355	PP	7.22E+01	EPI	0.076272	1.01E-05	W	1.25E+01	3.3E+03	3.34E+09	3.07E-04
1,2,3-Trichloropropane			0.004	I	0.0003	I	0.06	H			0.06	0.0003	V	147.43	0.014	0.000343	PP	115.8	EPI	0.057466	9.24E-06	W	9.48E+00	1.5E+04	3.34E+09	6.85E-05
1,2,4-Trimethylbenzene			0.01	I	0.06	I	0.04	I	0.2	I	0.04	0.2	V	120.2	0.2518	0.00616	PP	614.3	EPI	0.060675	7.92E-06	W	1.21E+01	7.4E+03	3.34E+09	1.34E-04
1,2-Dibromo-3-chloropropane			0.0002	P	0.0002	I	0.002	P	0.002	P	0.002	0.002	V	236.33	0.006	0.000147	EPI	115.8	EPI	0.032135	8.9E-06	W	6.45E+00	3.0E+04	3.34E+09	3.36E-05
1,2-Dibromoethane			0.009	I	0.009	I			0.002	H	0.009	0.002	V	187.86	0.0266	0.00065	PP	39.6	EPI	0.043035	1.04E-05	W	9.01E+00	7.8E+03	3.34E+09	1.28E-04
1,2-Dichloropropane			0.04	P	0.004	I	0.04	P			0.04	0.004	V	112.99	0.1153	0.00282	PP	60.7	EPI	0.07334	9.73E-06	W	1.23E+01	3.5E+03	3.34E+09	2.89E-04
1,3,5-Trimethylbenzene			0.01	I	0.06	I	0.04	I	0.2	I	0.04	0.2	V	120.2	0.3585	0.00877	PP	602.1	EPI	0.060225	7.84E-06	W	1.21E+01	6.2E+03	3.34E+09	1.61E-04
2-Hexanone			0.005	I	0.03	I					0.005	0.03	V	100.16	0.0038	9.32E-05	EPI	14.98	EPI	0.070356	8.44E-06	W	8.18E+00	1.2E+04	3.34E+09	8.60E-05
Acetone			0.9	I	31	A	1	H	31	A	1	30.88098	V	58.081	0.0014	0.000035	PP	2.364	EPI	0.105921	1.15E-05	W	6.17E+00	1.1E+04	3.34E+09	8.88E-05
Benzene			0.004	I	0.03	I	0.01	P	0.08	P	0.01	0.08	V	78.115	0.2269	0.00555	PP	145.8	EPI	0.089534	1.03E-05	W	1.50E+01	3.3E+03	3.34E+09	3.05E-04
Bromodichloromethane			0.02	I			0.008	P	0.02	P	0.008	0.02	V	163.83	0.0867	0.00212	PP	31.82	EPI	0.056263	1.07E-05	W	1.02E+01	3.6E+03	3.34E+09	2.82E-04
Chlorobenzene			0.02	I	0.05	P	0.07	P	0.5	P	0.07	0.5	V	112.56	0.1271	0.00311	PP	233.9	EPI	0.072131	9.48E-06	W	1.24E+01	6.0E+03	3.34E+09	1.66E-04
Chloroform			0.01	I	0.098	A	0.1	A	0.24413	A	0.1	0.244131	V	119.38	0.15	0.00367	PP	31.82	EPI	0.07692	1.09E-05	W	1.20E+01	2.3E+03	3.34E+09	4.27E-04
cis-1,2-Dichloroethene			0.002	I			0.02	P			0.02		V	96.944	0.1668	0.00408	PP	39.6	EPI	0.088406	1.13E-05	W	1.34E+01	2.2E+03	3.34E+09	4.45E-04
Ethyl benzene			0.1	I	1	I	0.05	P	9	P	0.05	9	V	106.17	0.3222	0.00788	PP	446.1	EPI	0.068465	8.46E-06	W	1.29E+01	5.3E+03	3.34E+09	1.88E-04
Isopropylbenzene			0.1	I	0.4	I	0.4	H	0.09	H	0.4	0.09	V	120.2	0.4702	0.0115	PP	697.8	EPI	0.060304	7.86E-06	W	1.21E+01	5.8E+03	3.34E+09	1.71E-04
m&p-Xylene		(m-Xylene)	0.2	G	0.1	G	0.4	P	0.4	P	0.4	0.4	V	106.17	0.2935	0.00718	PP	3.75E+02	EPI	0.068366	8.44E-06	W	1.29E+01	5.1E+03	3.34E+09	1.95E-04
o-Xylene			0.2	G	0.1	G	0.4	P	0.4	P	0.4	0.4	V	106.17	0.2118	0.00518	PP	382.9	EPI	0.06892	8.53E-06	W	1.28E+01	6.1E+03	3.34E+09	1.65E-04

Table 7-6b
Chemical-Specific Information - Excavation Worker

Parameter	Form	Surrogate	Chronic RfD (mg/kg/d)		Chronic RfCi (mg/m^3)		Subchronic RfD (mg/kg/d)		Subchronic RfCi (mg/m^3)		RfD Used (mg/kg/d)	RfC Used (mg/m^3)	V	MW (g/mol)	H'	HLC (atm-m^3/mol)	H and HLC Ref	Koc (cm^3/g)	Koc Ref	Dia (cm^2/s)	Diw (cm^2/s)	Dia and Diw Ref	Trench VF (L/m^3)	Subchronic VF (m^3/kg)	PEF (m^3/kg)	Subchronic 1/VF + 1/PEF ($m^3/kg)^{-1}$
Toluene			0.08	I	5	I	0.8	P	5	P	0.8	5	V	92.142	0.2715	0.00664	PP	233.9	EPI	0.077804	9.2E-06	W	1.38E+01	4.0E+03	3.34E+09	2.50E-04
Trichloroethene			0.0005	I	0.002	I	0.0005	A	0.00215	A	0.0005	0.00215	V	131.39	0.4027	0.00985	PP	60.7	EPI	0.068662	1.02E-05	W	1.16E+01	2.0E+03	3.34E+09	5.02E-04
Vinyl chloride			0.003	I	0.1	I			0.07669	A	0.003	0.076687	V	62.499	1.1365	0.0278	PP	21.73	EPI	0.10712	1.2E-05	W	1.69E+01	8.1E+02	3.34E+09	1.23E-03

Toxicity Sources:

A ATSDR - Agency for Toxic Substances and Disease Registry minimal risk levels
C California EPA Office of Environmental Health and Hazard Assessment
E Toxicity Equivilence Factors applied
G User's Guide for RSLs
H HEAST - EPA's Health Effects Assessment Summary Table
I IRIS - EPA's Integrated Risk Information System
P PPRTV (The Provisional Peer Reviewed Toxicity Values) Screening Level
X PPRTV's Screening toxicity values

Physical-Chemical Sources:

EPI EPA's Estimation Programs Interface
PP PHYSPROP: Physical Properties Database developed by Syracuse Research Corporation
W Water9 Version 2.0 wastewater treatment model (EPA, 2001)

V: Volatile

* As recommended by Georgia EPD, naphthalene is assessed based on non-carcinogenic responses due to significant uncertainty in California EPA's carcinogenic toxicity values used in RSL tables.

Trench VF (Equation 2-4 from VADEQ)

$$VF = \frac{Ki \times A \times F \times 10^{-3}\ L/cm^3 \times 10^4\ cm^2/m^2 \times 3600\ s/hr}{ACH \times TV}$$

$$Ki = \frac{1}{[(1/k_{iL}) + [(R^*T)/(HLC * k_{iG})]]}$$ Overall Mass Transfer Coefficient (cm/s)

$$k_{iL} = MW_{O2}/MWi)^{0.5} * (T/298) * K_{LO2}$$ Liquid-phase Mass Transfer Coefficient (cm/s)

$$k_{iG} = (MW_{H2O}/MWi)^{0.335} * (T/298)^{1.005} \times K_{gH2O}$$ Gas-phase Mass Transfer Coefficient (cm/s)

A	2.2204
F	1
ACH	2
TV	3.38389
R	8.2E-05
T	298
MWO2	32
MWH2O	18
kLO2	0.002
kGO2	0.8333

Unlimited source model for subchronic exposure

$$VF = (Q/Ca) \times (1/Fd) \times 10^{-4} \times \frac{(3.14 \times Da \times T)^{1/2}}{2 \times \rho b \times Da}$$

Q/Csa	53.09		
ρb	1.5	EPA default (SSSG)	
T	30240000	seconds	
Fd	0.186		

Where:

$Q/Csa = A \times \exp[(\ln Ac - B)^2 / C]$

A	14.8349	Supplmental Soil Screening Guidance (Appendix D - Zone 6 Atlanta, GA)
B	17.9259	Supplmental Soil Screening Guidance (Appendix D - Zone 6 Atlanta, GA)
C	204.1516	Supplmental Soil Screening Guidance (Appendix D - Zone 6 Atlanta, GA)
Ac	6	Areal extent of site soil contam (acres)

Q/Csa = 53.0941508

$Fd = 0.1852 + (5.3537/tc) + (-9.6318/tc^2)$ tc = T/3600

$$Da = \frac{(\theta a^{10/3} \times Dia \times H') + (\theta w^{10/3} \times Diw)}{n^2 \times [(\rho b \times Kd) + \theta w + (\theta a \times H')]}$$

θa	0.283962	L/L	EPA default
θw	0.15	L/L	EPA default
Kd	Koc x foc	cm3/g	
Koc	Chem spec	cm3/g	
foc	0.0083		Site-specific value (Feasibility Study OU3)
n	0.433962	L/L	EPA default
Dia	Chem spec	cm	Diffusivity in air
Diw	Chem spec	cm	Diffusivity in water
H'	Chem spec		Henry's law constant

Table 7-7
Chemical-Specific Information: Groundwater Dermal Pathway

Parameter	Form	Surrogate	In EPD	MW	log Kow	Kp (cm/hr)	B	τ event (hr/event)	FA	t* (hr)	RME			CTE		
											Event Factor Adult (cm/event)	Event Factor Child (cm/event)	Event Factor Res-Adj (cm/event)	Event Factor Adult (cm/event)	Event Factor Child (cm/event)	Event Factor Res-Adj (cm/event)
Aluminum			Yes	2.7E+01		1.0E-03	2.0E-03	1.5E-01	1.0	3.6E-01	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Antimony			Yes	1.2E+02		1.0E-03	4.2E-03	5.1E-01	1.0	1.2E+00	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Arsenic			Yes	7.5E+01		1.0E-03	3.3E-03	2.8E-01	1.0	6.6E-01	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Barium			Yes	1.4E+02		1.0E-03	4.5E-03	6.2E-01	1.0	1.5E+00	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Beryllium			Yes	9.0E+00		1.0E-03	1.2E-03	1.2E-01	1.0	2.8E-01	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Cadmium	water		Yes	1.1E+02		1.0E-03	4.1E-03	4.5E-01	1.0	1.1E+00	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Chromium	VI		Yes	5.2E+01		2.0E-03	5.5E-03	2.1E-01	1.0	4.9E-01	0.0014	0.0011	0.0014	0.0005	0.0007	0.0005
Cobalt			Yes	5.9E+01		4.0E-04	1.2E-03	2.2E-01	1.0	5.4E-01	0.0003	0.0002	0.0003	0.0001	0.0001	0.0001
Copper			Yes	6.4E+01		1.0E-03	3.1E-03	2.4E-01	1.0	5.7E-01	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Iron			Yes	5.6E+01		1.0E-03	2.9E-03	2.2E-01	1.0	5.2E-01	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
lead			Yes	2.1E+02		1.0E-04	5.5E-04	1.5E+00	1.0	3.7E+00	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000
Manganese	water		Yes	5.5E+01		1.0E-03	2.9E-03	2.1E-01	1.0	5.1E-01	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Mercury	salts		Yes	2.7E+02	-2.2E-01	1.0E-03	6.3E-03	3.5E+00	1.0	8.4E+00	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Methyl mercury			Yes	2.2E+02		1.0E-03	5.7E-03	1.7E+00	1.0	4.1E+00	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Nickel			Yes	5.9E+01		2.0E-04	5.9E-04	2.2E-01	1.0	5.4E-01	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Selenium			Yes	7.9E+01		1.0E-03	3.4E-03	2.9E-01	1.0	7.0E-01	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Thallium			Yes	2.0E+02		1.0E-03	5.5E-03	1.5E+00	1.0	3.5E+00	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Vanadium			Yes	5.1E+01		1.0E-03	2.7E-03	2.0E-01	1.0	4.9E-01	0.0007	0.0005	0.0007	0.0003	0.0003	0.0003
Zinc			Yes	6.5E+01		6.0E-04	1.9E-03	2.4E-01	1.0	5.9E-01	0.0004	0.0003	0.0004	0.0002	0.0002	0.0002
Aroclor-1254			No	3.3E+02	6.5E+00	7.5E-01	5.2E+00	7.1E+00	0.5	3.1E+01	2.3266	2.0291	2.2738	1.3806	1.5862	1.4202
Aroclor-1260			No	4.0E+02	7.6E+00	9.9E-01	7.5E+00	1.7E+01	0.0	7.7E+01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aroclor-1268		(Aroclor-1254)	No	3.3E+02	6.5E+00	7.5E-01	5.2E+00	7.1E+00	0.5	3.1E+01	2.3266	2.0291	2.2738	1.3806	1.5862	1.4202
1,2,4-Trichlorobenzene			Yes	1.8E+02	4.0E+00	7.1E-02	3.7E-01	1.1E+00	1.0	2.6E+00	0.1715	0.1496	0.1676	0.1018	0.1169	0.1047
1,2-Dichlorobenzene			Yes	1.5E+02	3.4E+00	4.5E-02	2.1E-01	7.0E-01	1.0	1.7E+00	0.0869	0.0758	0.0849	0.0516	0.0592	0.0530
1,3-Dichlorobenzene		1,2-Dichlorobenzene	Yes	1.5E+02	3.4E+00	4.5E-02	2.1E-01	7.0E-01	1.0	1.7E+00	0.0869	0.0758	0.0849	0.0516	0.0592	0.0530
1,4-Dichlorobenzene			Yes	1.5E+02	3.4E+00	4.5E-02	2.1E-01	7.0E-01	1.0	1.7E+00	0.0883	0.0770	0.0863	0.0524	0.0602	0.0539
1-Methyl Naphthalene			Yes	1.4E+02	3.9E+00	9.3E-02	4.3E-01	6.6E-01	1.0	1.6E+00	0.1759	0.1534	0.1719	0.1044	0.1199	0.1074
2-Methylnaphthalene			Yes	1.4E+02	3.9E+00	9.2E-02	4.2E-01	6.6E-01	1.0	1.6E+00	0.1732	0.1511	0.1693	0.1028	0.1181	0.1057
Benzo(a)anthracene			No	2.3E+02	5.8E+00	5.5E-01	3.2E+00	2.0E+00	1.0	8.5E+00	1.8166	1.5843	1.7754	1.0780	1.2385	1.1089
Benzo(a)pyrene			No	2.5E+02	6.1E+00	7.1E-01	4.4E+00	2.7E+00	1.0	1.2E+01	2.7395	2.3891	2.6773	1.6256	1.8677	1.6722
Benzo(b)fluoranthene			No	2.5E+02	5.8E+00	4.2E-01	2.5E+00	2.7E+00	1.0	1.1E+01	1.6022	1.3973	1.5658	0.9507	1.0923	0.9780
Benzo(b/k)fluoranthene		(Benzo(b)fluoranthene)	No	2.5E+02	5.8E+00	4.2E-01	2.5E+00	2.7E+00	1.0	1.1E+01	1.6022	1.3973	1.5658	0.9507	1.0923	0.9780
Dibenzo(a,h)anthracene			No	2.8E+02	6.8E+00	9.5E-01	6.1E+00	3.8E+00	0.6	1.7E+01	2.5986	2.2662	2.5396	1.5420	1.7716	1.5862
Dibenzofuran			Yes	1.7E+02	4.1E+00	9.8E-02	4.9E-01	9.2E-01	1.0	2.2E+00	0.2178	0.1899	0.2129	0.1292	0.1485	0.1329
Indeno(1,2,3-cd)pyrene			No	2.8E+02	6.7E+00	1.2E+00	7.9E+00	3.7E+00	0.6	1.7E+01	3.3374	2.9106	3.2616	1.9804	2.2753	2.0372
Naphthalene			Yes	1.3E+02	3.3E+00	4.7E-02	2.0E-01	5.5E-01	1.0	1.3E+00	0.0804	0.0701	0.0786	0.0477	0.0548	0.0491
1,1,2,2-Tetrachloroethane			Yes	1.7E+02	2.4E+00	6.9E-03	3.5E-02	9.2E-01	1.0	2.2E+00	0.0155	0.0135	0.0151	0.0092	0.0105	0.0094
1,1,2-Trichloroethane			Yes	1.3E+02	1.9E+00	5.0E-03	2.2E-02	5.9E-01	1.0	1.4E+00	0.0090	0.0078	0.0088	0.0053	0.0061	0.0055
1,1-Dichloroethane			Yes	9.9E+01	1.8E+00	6.8E-03	2.6E-02	3.8E-01	1.0	9.0E-01	0.0096	0.0084	0.0094	0.0057	0.0066	0.0059
1,1-Dichloropropene		1,3-Dichloropropene	Yes	1.1E+02	2.0E+00	8.3E-03	3.4E-02	4.4E-01	1.0	1.1E+00	0.0129	0.0112	0.0126	0.0076	0.0088	0.0079
1,2,3-Trichloropropane			Yes	1.5E+02	2.3E+00	7.5E-03	3.5E-02	7.0E-01	1.0	1.7E+00	0.0147	0.0128	0.0144	0.0087	0.0100	0.0090
1,2,4-Trimethylbenzene			Yes	1.2E+02	3.6E+00	8.6E-02	3.6E-01	5.0E-01	1.0	1.2E+00	0.1405	0.1225	0.1373	0.0834	0.0958	0.0858
1,2-Dibromo-3-chloropropane			Yes	2.4E+02	3.0E+00	6.9E-03	4.1E-02	2.2E+00	1.0	5.3E+00	0.0237	0.0207	0.0232	0.0141	0.0162	0.0145

Table 7-7
Chemical-Specific Information: Groundwater Dermal Pathway

Parameter	Form	Surrogate	In EPD	MW	log Kow	Kp (cm/hr)	B	Ƭ event (hr/event)	FA	t* (hr)	RME			CTE		
											Event Factor Adult (cm/event)	Event Factor Child (cm/event)	Event Factor Res-Adj (cm/event)	Event Factor Adult (cm/event)	Event Factor Child (cm/event)	Event Factor Res-Adj (cm/event)
1,2-Dibromoethane			Yes	1.9E+02	2.0E+00	2.8E-03	1.5E-02	1.2E+00	1.0	2.8E+00	0.0070	0.0061	0.0069	0.0042	0.0048	0.0043
1,2-Dichloropropane			Yes	1.1E+02	2.0E+00	7.5E-03	3.1E-02	4.5E-01	1.0	1.1E+00	0.0118	0.0103	0.0115	0.0070	0.0080	0.0072
1,3,5-Trimethylbenzene			Yes	1.2E+02	3.4E+00	6.2E-02	2.6E-01	5.0E-01	1.0	1.2E+00	0.1018	0.0888	0.0995	0.0604	0.0694	0.0621
2-Hexanone			Yes	1.0E+02	1.4E+00	3.6E-03	1.4E-02	3.8E-01	1.0	9.2E-01	0.0051	0.0045	0.0050	0.0030	0.0035	0.0031
Acetone			Yes	5.8E+01	-2.4E-01	5.1E-04	1.5E-03	2.2E-01	1.0	5.3E-01	0.0006	0.0005	0.0006	0.0003	0.0004	0.0003
Benzene			Yes	7.8E+01	2.1E+00	1.5E-02	5.1E-02	2.9E-01	1.0	6.9E-01	0.0191	0.0162	0.0182	0.0110	0.0127	0.0114
Bromodichloromethane			Yes	1.6E+02	2.0E+00	4.0E-03	2.0E-02	8.7E-01	1.0	2.1E+00	0.0087	0.0076	0.0085	0.0052	0.0060	0.0053
Chlorobenzene			Yes	1.1E+02	2.8E+00	2.8E-02	1.2E-01	4.5E-01	1.0	1.1E+00	0.0440	0.0384	0.0430	0.0261	0.0300	0.0269
Chloroform			Yes	1.2E+02	2.0E+00	6.8E-03	2.9E-02	4.9E-01	1.0	1.2E+00	0.0111	0.0097	0.0109	0.0066	0.0076	0.0068
cis-1,2-Dichloroethene			Yes	9.7E+01	1.9E+00	1.1E-02	4.2E-02	3.7E-01	1.0	8.8E-01	0.0155	0.0135	0.0152	0.0092	0.0106	0.0095
Ethyl benzene			Yes	1.1E+02	3.2E+00	4.9E-02	2.0E-01	4.1E-01	1.0	9.9E-01	0.0738	0.0644	0.0721	0.0438	0.0503	0.0451
Isopropylbenzene			Yes	1.2E+02	3.7E+00	9.0E-02	3.8E-01	5.0E-01	1.0	1.2E+00	0.1470	0.1282	0.1437	0.0873	0.1002	0.0898
m&p-Xylene		(m-Xylene)	Yes	1.1E+02	3.2E+00	5.3E-02	2.1E-01	4.1E-01	1.0	9.9E-01	0.0797	0.0695	0.0779	0.0473	0.0543	0.0486
o-Xylene			Yes	1.1E+02	3.1E+00	4.7E-02	1.9E-01	4.1E-01	1.0	9.9E-01	0.0705	0.0615	0.0689	0.0419	0.0481	0.0431
Toluene			Yes	9.2E+01	2.7E+00	3.1E-02	1.1E-01	3.5E-01	1.0	8.3E-01	0.0425	0.0371	0.0416	0.0252	0.0290	0.0260
Trichloroethene			Yes	1.3E+02	2.4E+00	1.2E-02	5.1E-02	5.7E-01	1.0	1.4E+00	0.0204	0.0178	0.0200	0.0121	0.0139	0.0125
Vinyl chloride			Yes	6.2E+01	1.4E+00	8.4E-03	2.5E-02	2.4E-01	1.0	5.7E-01	0.0098	0.0083	0.0096	0.0056	0.0065	0.0058

Notes:

Source: RSL November 2021

In EPD: in effective predictive domain. Dermines use in groundwater dermal pathway.

DAevent = Cw x Event Factor

Event Factor:

Inorganics: Event Factor = Kp x tev

Organics:

if tev <= t* Event Factor = $2x\ FA \times Kp \times ((6 \times Ƭ \times tev) / pi)^{0.5}$

if tev > t* Event Factor = $FA \times Kp \times [tev/(1+B) + 2 \times Ƭ \times ((1+3B + 3B^2)/(1+B)^2)]$

lsc= 1E-03

	RME	CTE	
tev Adult =	0.71	0.25	hr/ev
tev Child =	0.54	0.33	hr/ev
tev Res-Adj =	0.68	0.26	hr/ev

Example Calculation:

Ethyl benzene

t* = 9.9E-01
FA = 1.0
Kp = 4.9E-02
Ƭ = 4.1E-01
tev Adult = 0.71
tev Child = 0.54
tev Res-Adj = 0.68

tev < t*: DA_eventF = $2x\ FA \times Kp \times ((6 \times Ƭ \times tev) / pi)^{0.5}$

= $2 \times 1 \times 0.049 \times ((6 \times 0.41 \times tev)/3.14)^{0.5}$ 7.90E-01

= $0.0986 \times (0.79 \times tev)^{0.5}$

Adult = $0.098 \times (0.79 \times 0.71)^{0.5}$ = 0.074 cm/ev

Child = $0.098 \times (0.79 \times 0.54)^{0.5}$ = 0.064 cm/ev

Res-Adj = $0.098 \times (0.79 \times 0.67)^{0.5}$ = 0.072 cm/ev

Table 7-8 Chemical Specific Information - Golf Course Receptors

Analyte	CAS No.	Surrogate / Form	Oral SF Soil $(mg/kg\text{-}d)^{-1}$		Inhalation IUR Soil $(\mu g/m^3)^{-1}$		Dermal SF Soil $(mg/kg\text{-}d)^{-1}$	Oral RfD Soil (mg/kg-d)		Inhalation RfC Soil (mg/m^3)		Dermal RfD Soil (mg/kg-d)	GIABS	ABS	VF m^3/kg	1/VF + 1/PEF (kg/m^3)	RBA	V	M
4,6-Dinitro-2-methylphenol	534521							8.00E-05	X			8.00E-05	1	0.1		7.35E-10	1		
Aldrin	309002		1.70E+01	I	4.90E-03	I	1.70E+01	3.00E-05	I			3.00E-05	1		1.72E+06	5.82E-07	1	V	
Aluminum	7429905							1.00E+00	P	5.00E-03	P	1.00E+00	1			7.35E-10	1		
Antimony	7440360	Metallic						4.0E-04	I	3.0E-04	A	6.0E-05	0.15			7.35E-10	1		
Aroclor 1221	11104282	Total PCBs (cancer)	2.0E+00	I	5.7E-04	I	2.0E+00						1	0.14	2.04E+05	4.90E-06	1	V	
Aroclor 1254	11097691	Total PCBs (cancer)	2.0E+00	I	5.7E-04	I	2.0E+00	2.0E-05	I			2.0E-05	1	0.14	8.43E+05	1.19E-06	1	V	
Aroclor 1260	11096825	Total PCBs (cancer)	2.0E+00	I	5.7E-04	I	2.0E+00						1	0.14	1.31E+06	7.64E-07	1	V	
Aroclor 1268	11100144	Total PCBs (cancer) Aroclor 1254 (noncancer)	2.0E+00	I	5.7E-04	I	2.0E+00	2.0E-05	I			2.0E-05	1	0.14	8.43E+05	1.19E-06	1	V	
Arsenic	7440382	Inorganic	1.5E+00	I	4.3E-03	I	1.5E+00	3.0E-04	I	1.5E-05	C	3.0E-04	1	0.03		7.35E-10	0.6		
Benz[a]anthracene	56553		1.0E-01	E	6.0E-05	E	1.0E-01						1	0.13	4.41E+06	2.27E-07	1	V	M
Benzene	71432		5.5E-02	I	7.8E-06	I	5.5E-02	4.0E-03	I	3.0E-02	I	4.0E-03	1		3.54E+03	2.82E-04	1	V	
Benzo[a]pyrene	50328		1.0E+00	I	6.0E-04	I	1.0E+00	3.0E-04	I	2.0E-06	I	3.0E-04	1	0.13		7.35E-10	1		M
Benzo[b/k]fluoranthene	NA	Benzo(b)fluoranthene	1.0E-01	E	6.0E-05	E	1.0E-01						1	0.13		7.35E-10	1		M
Benzo[b]fluoranthene	205992		1.0E-01	E	6.0E-05	E	1.0E-01						1	0.13		7.35E-10	1		M
Benzo[k]fluoranthene	207089		1.0E-02	E	6.0E-06	E	1.0E-02						1	0.13		7.35E-10	1		M
Bis(2-ethylhexyl)phthalate	117817		1.4E-02	I	2.4E-06	C	1.4E-02	2.0E-02	I			2.0E-02	1	0.1		7.35E-10	1		
Cadmium	7440439	Diet			1.8E-03	I		1.0E-03	I	1.0E-05	A	2.5E-05	0.025	0		7.35E-10	1		
Carbazole	86748		2.0E-02	H			2.0E-02						1	0.01		7.35E-10	1		
Chloroform	67663		3.1E-02	C	2.3E-05	I	3.1E-02	1.0E-02	I	9.8E-02	A	1.0E-02	1		2.63E+03	3.80E-04	1	V	
Chromium	7440473	Hexavalent	5.0E-01	C	1.2E-02	I	1.3E-02	3.0E-03	I	1.0E-04	I	7.5E-05	0.025			7.35E-10	1		M
Chrysene	218019		1.0E-03	E	6.0E-07	E	1.0E-03						1	0.13		7.35E-10	1		M
Cobalt	7440484				9.0E-03	P		3.0E-04	P	6.0E-06	P	3.0E-04	1			7.35E-10	1		
DDT	50293	4,4'	3.4E-01	I	9.7E-05	I	3.4E-01	5.0E-04	I			5.0E-04	1	0.03		7.35E-10	1		
Dibenz[a,h]anthracene	53703		1.0E+00	E	6.0E-04	E	1.0E+00						1	0.13		7.35E-10	1		M
Dibenzofuran	132649							1.0E-03	X			1.0E-03	1		1.56E+05	6.41E-06	1	V	
Dibromochloromethane	124481		8.4E-02	I			8.4E-02	2.0E-02	I			2.0E-02	1		7.95E+03	1.26E-04	1	V	
Dichlorobenzene, 1,4-	106467		5.4E-03	C	1.1E-05	C	5.4E-03	7.0E-02	A	8.0E-01	I	7.0E-02	1		1.04E+04	9.62E-05	1	V	
Dieldrin	60571		1.6E+01	I	4.6E-03	I	1.6E+01	5.0E-05	I			5.0E-05	1	0.1		7.35E-10	1		
Endrin	72208							3.0E-04	I			3.0E-04	1	0.1		7.35E-10	1		
Ethylbenzene	100414		1.1E-02	C	2.5E-06	C	1.1E-02	1.0E-01	I	1.0E+00	I	1.0E-01	1		5.67E+03	1.76E-04	1	V	
Hexachlorocyclohexane, Alpha-	319846		6.3E+00	I	1.8E-03	I	6.3E+00	8.0E-03	A			8.0E-03	1	0.1		7.35E-10	1		
Indeno[1,2,3-cd]pyrene	193395		1.0E-01	E	6.0E-05	E	1.0E-01						1	0.13		7.35E-10	1		M
Iron	7439896							7.0E-01	P			7.0E-01	1			7.35E-10	1		
Manganese	7439965	Diet						9.0E-02	I*	5.0E-05	I	1.4E-01	1			7.35E-10	1		
Mercury	7487947	Inorganic Salts						3.0E-04	I	3.0E-04	G	2.1E-05	0.07			7.35E-10	1		
Mercury	7487947	Elemental								3.0E-04	I		1		3.47E+04	2.88E-05	1	V	
Methylene Chloride	75092		2.0E-03	I	1.0E-08	I	2.0E-03	6.0E-03	I	6.0E-01	I	6.0E-03	1		2.19E+03	4.57E-04	1	V	M
Naphthalene	91203		1.2E-01	C	3.4E-05	C	1.2E-01	2.0E-02	I	3.0E-03	I	2.0E-02	1	0.13	4.63E+04	2.16E-05	1	V	
Naphthalene, 1-Methyl	90120		2.9E-02	P			2.9E-02	7.0E-02	A			7.0E-02	1	0.13	5.86E+04	1.71E-05	1	V	
Naphthalene, 2-Methyl	91576							4.0E-03	I			4.0E-03	1	0.13	5.80E+04	1.72E-05	1	V	

Table 7-8 Chemical Specific Information - Golf Course Receptors

Analyte	CAS No.	Surrogate / Form	Oral SF Soil (mg/kg-d)$^{-1}$		Inhalation IUR Soil (µg/m^3)$^{-1}$		Dermal SF Soil (mg/kg-d)$^{-1}$	Oral RfD Soil (mg/kg-d)		Inhalation RfC Soil (mg/m^3)		Dermal RfD Soil (mg/kg-d)	GIABS	ABS	VF m^3/kg	1/VF + 1/PEF (kg/m^3)	RBA	V	M
Nitrobenzene	98953				4.0E-05	I		2.0E-03	I	9.0E-03	I	2.0E-03	1		7.32E+04	1.37E-05	1	V	
n-butylbenzene	104518							5.0E-02	P			5.0E-02	1		8.14E+03	1.23E-04	1	V	
n-Propylbenzene	103651							1.0E-01	X	1.0E+00	X	1.0E-01	1		6.99E+03	1.43E-04	1	V	
Pyrene	129000							3.0E-02	I			3.0E-02	1	0.13	2.38E+06	4.21E-07	1	V	
Tetrachloroethene	127184		2.1E-03	I	2.6E-07	I	2.1E-03	6.0E-03	I	4.0E-02	I	6.0E-03	1		2.35E+03	4.26E-04	1	V	
Thallium	7440280	Soluble Salts						1.0E-05	X			1.0E-05	1			7.35E-10	1		
Trimethylbenzene, 1,2,4-	95636							1.0E-02	I	6.0E-02	I	1.0E-02	1		7.91E+03	1.26E-04	1	V	
Trimethylbenzene, 1,3,5-	108678							1.0E-02	I	6.0E-02	I	1.0E-02	1		6.61E+03	1.51E-04	1	V	
Vanadium	7440622	Compounds						5.0E-03	I**	1.0E-04	A	1.3E-04	0.026			7.35E-10	1		
Zinc	7440666	Compounds						3.0E-01	I			3.0E-01	1			7.35E-10	1		

Toxicity Sources:

A ATSDR - Agency for Toxic Substances and Disease Registry minimal risk levels
C California EPA Office of Environmental Health and Hazard Assessment
E Toxicity Equivilence Factors applied
G User's Guide for RSLs
H HEAST - EPA's Health Effects Assessment Summary Table
I IRIS - EPA's Integrated Risk Information System
I* IRIS; adjusted for non-dietary exposure
I** IRIS; for total Vanadium, EPA R4 recommends using the IRIS (Tier 1 source) RfD for Vanadium Pentoxide, appropriately adjusted for molecular weight.
P PPRTV (The Provisional Peer Reviewed Toxicity Values) Screening Level
X PPRTV's Screening toxicity values

Dermal RfD = Oral RfD x GIABS
Dermal SF = Oral SF x GIABS

GIABS: Gastrointestinal Absorption
ABS: Dermal Absorption

PEF: Particulate Emission Factor = 1.36E9 m^3/kg
RBA: Relative Bioavailability

V: Volatile
M: Mutagenic

Table 7-9a
Hazard/Risk Calculations - Groundwater North Satilla - RME

Parameter	Form	GW EPC (µg/L)	RfDo (mg/kg/d)	SFo $(mg/kg/d)^{-1}$	RfC (mg/m^3)	IUR $(µg/m^3)^{-1}$	1/VF + 1/PEF $(m^3/kg)^{-1}$	GIABS	M	V	In EPD
Aluminum		125100	1		0.005		7.35E-10	1			Yes
Antimony		0.8	0.0004		0.0003		7.35E-10	0.15			Yes
Arsenic		35	0.0003	1.5	0.000015	0.0043	7.35E-10	1			Yes
Barium		860	0.2		0.0005		7.35E-10	0.07			Yes
Beryllium		3.6	0.002		0.00002	0.0024	7.35E-10	0.007			Yes
Cadmium	water	0.86	0.0001		0.00001	0.0018	7.35E-10	0.05			Yes
Cobalt		7.7	0.0003		0.000006	0.009	7.35E-10	1			Yes
Copper		10	0.04				7.35E-10	1			Yes
Iron		15990	0.7				7.35E-10	1			Yes
Lead		63					7.35E-10	1			Yes
Manganese	water	722	0.024		0.00005		7.35E-10	0.04			Yes
Mercury	salts	3.8	0.0003		0.0003		7.35E-10	0.07			Yes
Nickel		60	0.02		0.00009	0.00026	7.35E-10	0.04			Yes
Selenium		7.7	0.005		0.02		7.35E-10	1			Yes
Thallium		0.15	0.00001				7.35E-10	1			Yes
Vanadium		888	0.005		0.0001		7.35E-10	0.026			Yes
Zinc		124	0.3				7.35E-10	1			Yes
1,2,4-Trichlorobenzene		0.26	0.01	0.029	0.002		3.34E-05	1		V	Yes
1,2-Dichlorobenzene		0.31	0.09		0.2		8.55E-05	1		V	Yes
1,3-Dichlorobenzene		3.5	0.09		0.2		8.55E-05	1		V	Yes
1,4-Dichlorobenzene		3.5	0.07	0.0054	0.8	0.000011	9.62E-05	1		V	Yes
1-Methyl Naphthalene		58	0.07	0.029			1.71E-05	1		V	Yes
2-Methylnaphthalene		88	0.004				1.72E-05	1		V	Yes
Benzo(a)anthracene		0.094		0.1		0.00006	2.27E-07	1	M	V	No
Benzo(a)pyrene		0.075	0.0003	1	0.000002	0.0006	7.35E-10	1	M		No
Benzo(b)fluoranthene		0.078		0.1		0.00006	7.35E-10	1	M		No
Dibenzo(a,h)anthracene		0.17		1		0.0006	7.35E-10	1	M		No
Dibenzofuran		0.28	0.001				6.41E-06	1		V	Yes
Indeno(1,2,3-cd)pyrene		0.046		0.1		0.00006	7.35E-10	1	M		No
Naphthalene		121	0.02		0.003		2.16E-05	1		V	Yes
1,1,2-Trichloroethane		22	0.004	0.057	0.0002	0.000016	1.39E-04	1		V	Yes
1,1-Dichloroethane		0.81	0.2	0.0057		0.0000016	4.81E-04	1		V	Yes
1,1-Dichloropropene		0.34	0.03	0.1	0.02	0.000004	2.78E-04	1		V	Yes
1,2,3-Trichloropropane		0.46	0.004	30	0.0003		6.37E-05	1	M	V	Yes
1,2,4-Trimethylbenzene		205	0.01		0.06		1.26E-04	1		V	Yes
1,2-Dibromoethane		0.15	0.009	2	0.009	0.0006	1.16E-04	1		V	Yes
1,2-Dichloropropane		3.0	0.04	0.037	0.004	0.0000037	2.64E-04	1		V	Yes
1,3,5-Trimethylbenzene		57	0.01		0.06		1.51E-04	1		V	Yes
Acetone		47	0.9				7.30E-05	1		V	Yes
Benzene		21	0.004	0.055	0.03	0.0000078	2.82E-04	1		V	Yes
Bromodichloromethane		0.56	0.02	0.062		0.000037	2.52E-04	1		V	Yes
Chlorobenzene		0.87	0.02		0.05		1.55E-04	1		V	Yes
Chloroform		0.40	0.01	0.031	0.098	0.000023	3.80E-04	1		V	Yes
cis-1,2-Dichloroethene		0.13	0.002				4.00E-04	1		V	Yes
Ethyl benzene		267	0.1	0.011	1	0.0000025	1.76E-04	1		V	Yes
Isopropylbenzene		21	0.1		0.4		1.61E-04	1		V	Yes
m&p-Xylene		1052	0.2		0.1		1.82E-04	1		V	Yes
o-Xylene		63	0.2		0.1		1.55E-04	1		V	Yes
Toluene		265	0.08		5		2.33E-04	1		V	Yes
Trichloroethene		0.35	0.0005	0.046	0.002	0.0000041	4.52E-04	1	M	V	Yes

Child Resident

Parameter	Ingestion ADD (mg/kg-d)	Ingestion Hazard	Inhalation ADC (mg/m^3)	Inhalation Hazard	Dermal EvF (cm/ev)	Dermal ADD (mg/kg-d)	Dermal Hazard	Total Hazard
Aluminum	6E+00	6E+00			5E-04	3E-02	3E-02	6E+00
Antimony	4E-05	1E-01			5E-04	1E-06	3E-03	1E-01
Arsenic	2E-03	6E+00			5E-04	8E-06	3E-02	6E+00
Barium	4E-02	2E-01			5E-04	3E-03	1E-02	2E-01
Beryllium	2E-04	9E-02			5E-04	1E-04	6E-02	1E-01
Cadmium	4E-05	4E-01			5E-04	4E-06	4E-02	5E-01
Cobalt	4E-04	1E+00			2E-04	7E-07	2E-03	1E+00
Copper	5E-04	1E-02			5E-04	2E-06	6E-05	1E-02
Iron	8E-01	1E+00			5E-04	4E-03	5E-03	1E+00
Lead								
Manganese	4E-02	2E+00			5E-04	4E-03	2E-01	2E+00
Mercury	2E-04	6E-01			5E-04	1E-05	4E-02	7E-01
Nickel	3E-03	1E-01			1E-04	7E-05	3E-03	2E-01
Selenium	4E-04	8E-02			5E-04	2E-06	3E-04	8E-02
Thallium	8E-06	8E-01			5E-04	3E-08	3E-03	8E-01
Vanadium	4E-02	9E+00			5E-04	8E-03	2E+00	1E+01
Zinc	6E-03	2E-02			3E-04	2E-05	5E-05	2E-02
1,2,4-Trichlorobenzene	1E-05	1E-03	3E-05	2E-02	1E-01	2E-05	2E-03	2E-02
1,2-Dichlorobenzene	2E-05	2E-04	4E-05	2E-04	8E-02	1E-05	1E-04	5E-04
1,3-Dichlorobenzene	2E-04	2E-03	4E-04	2E-03	8E-02	1E-04	1E-03	5E-03
1,4-Dichlorobenzene	2E-04	3E-03	4E-04	6E-04	8E-02	1E-04	2E-03	5E-03
1-Methyl Naphthalene	3E-03	4E-02			2E-01	4E-03	5E-02	9E-02
2-Methylnaphthalene	4E-03	1E+00			2E-01	5E-03	1E+00	2E+00
Benzo(a)anthracene								
Benzo(a)pyrene	4E-06	1E-02						1E-02
Benzo(b)fluoranthene								
Dibenzo(a,h)anthracene								
Dibenzofuran	1E-05	1E-02			2E-01	2E-05	2E-02	4E-02
Indeno(1,2,3-cd)pyrene								
Naphthalene	6E-03	3E-01	2E-02	5E+00	7E-02	3E-03	2E-01	6E+00
1,1,2-Trichloroethane	1E-03	3E-01	3E-03	1E+01	8E-03	7E-05	2E-02	1E+01
1,1-Dichloroethane	4E-05	2E-04			8E-03	3E-06	1E-05	2E-04
1,1-Dichloropropene	2E-05	6E-04	4E-05	2E-03	1E-02	2E-06	5E-05	3E-03
1,2,3-Trichloropropane	2E-05	6E-03	6E-05	2E-01	1E-02	2E-06	6E-04	2E-01
1,2,4-Trimethylbenzene	1E-02	1E+00	3E-02	4E-01	1E-01	1E-02	1E+00	2E+00
1,2-Dibromoethane	7E-06	8E-04	2E-05	2E-03	6E-03	4E-07	4E-05	3E-03
1,2-Dichloropropane	1E-04	4E-03	4E-04	9E-02	1E-02	1E-05	3E-04	1E-01
1,3,5-Trimethylbenzene	3E-03	3E-01	7E-03	1E-01	9E-02	2E-03	2E-01	6E-01
Acetone	2E-03	3E-03			5E-04	1E-05	1E-05	3E-03
Benzene	1E-03	3E-01	3E-03	9E-02	2E-02	1E-04	3E-02	4E-01
Bromodichloromethane	3E-05	1E-03			8E-03	2E-06	9E-05	1E-03
Chlorobenzene	4E-05	2E-03	1E-04	2E-03	4E-02	1E-05	7E-04	5E-03
Chloroform	2E-05	2E-03	5E-05	5E-04	1E-02	2E-06	2E-04	3E-03
cis-1,2-Dichloroethene	7E-06	3E-03			1E-02	7E-07	4E-04	4E-03
Ethyl benzene	1E-02	1E-01	3E-02	3E-02	6E-02	7E-03	7E-02	2E-01
Isopropylbenzene	1E-03	1E-02	3E-03	7E-03	1E-01	1E-03	1E-02	3E-02
m&p-Xylene	5E-02	3E-01	1E-01	1E+00	7E-02	3E-02	1E-01	2E+00
o-Xylene	3E-03	2E-02	8E-03	8E-02	6E-02	2E-03	8E-03	1E-01
Toluene	1E-02	2E-01	3E-02	7E-03	4E-02	4E-03	5E-02	2E-01
Trichloroethene	2E-05	3E-02	4E-05	2E-02	2E-02	3E-06	5E-03	6E-02
							Hazard Index	58

Adult Resident

Parameter	Ingestion ADD (mg/kg-d)	Ingestion Hazard	Inhalation ADC (mg/m^3)	Inhalation Hazard	Dermal EvF (cm/ev)	Dermal ADD (mg/kg-d)	Dermal Hazard	Total Hazard
Aluminum	4E+00	4E+00			7E-04	2E-02	2E-02	4E+00
Antimony	2E-05	6E-02			7E-04	9E-07	2E-03	6E-02
Arsenic	1E-03	4E+00			7E-04	6E-06	2E-02	4E+00
Barium	3E-02	1E-01			7E-04	2E-03	1E-02	1E-01
Beryllium	1E-04	5E-02			7E-04	9E-05	4E-02	1E-01
Cadmium	3E-05	3E-01			7E-04	3E-06	3E-02	3E-01
Cobalt	2E-04	8E-01			3E-04	5E-07	2E-03	8E-01
Copper	3E-04	8E-03			7E-04	2E-06	4E-05	8E-03
Iron	5E-01	7E-01			7E-04	3E-03	4E-03	7E-01
Lead								
Manganese	2E-02	9E-01			7E-04	3E-03	1E-01	1E+00
Mercury	1E-04	4E-01			7E-04	9E-06	3E-02	4E-01
Nickel	2E-03	9E-02			1E-04	5E-05	3E-03	9E-02
Selenium	2E-04	5E-02			7E-04	1E-06	3E-04	5E-02
Thallium	5E-06	5E-01			7E-04	3E-08	3E-03	5E-01
Vanadium	3E-02	5E+00			7E-04	6E-03	1E+00	6E+00
Zinc	4E-03	1E-02			4E-04	1E-05	4E-05	1E-02
1,2,4-Trichlorobenzene	8E-06	8E-04	3E-05	2E-02	2E-01	1E-05	1E-03	2E-02
1,2-Dichlorobenzene	9E-06	1E-04	4E-05	2E-04	9E-02	6E-06	7E-05	4E-04
1,3-Dichlorobenzene	1E-04	1E-03	4E-04	2E-03	9E-02	7E-05	8E-04	4E-03
1,4-Dichlorobenzene	1E-04	2E-03	4E-04	6E-04	9E-02	7E-05	1E-03	3E-03
1-Methyl Naphthalene	2E-03	2E-02			2E-01	2E-03	3E-02	6E-02
2-Methylnaphthalene	3E-03	7E-01			2E-01	4E-03	9E-01	2E+00
Benzo(a)anthracene								
Benzo(a)pyrene	2E-06	7E-03						7E-03
Benzo(b)fluoranthene								
Dibenzo(a,h)anthracene								
Dibenzofuran	8E-06	8E-03			2E-01	1E-05	1E-02	2E-02
Indeno(1,2,3-cd)pyrene								
Naphthalene	4E-03	2E-01	2E-02	5E+00	8E-02	2E-03	1E-01	5E+00
1,1,2-Trichloroethane	7E-04	2E-01	3E-03	1E+01	9E-03	5E-05	1E-02	1E+01
1,1-Dichloroethane	2E-05	1E-04			1E-02	2E-06	9E-06	1E-04
1,1-Dichloropropene	1E-05	3E-04	4E-05	2E-03	1E-02	1E-06	3E-05	3E-03
1,2,3-Trichloropropane	1E-05	3E-03	6E-05	2E-01	1E-02	2E-06	4E-04	2E-01
1,2,4-Trimethylbenzene	6E-03	6E-01	3E-02	4E-01	1E-01	7E-03	7E-01	2E+00
1,2-Dibromoethane	4E-06	5E-04	2E-05	2E-03	7E-03	2E-07	3E-05	3E-03
1,2-Dichloropropane	9E-05	2E-03	4E-04	9E-02	1E-02	8E-06	2E-04	9E-02
1,3,5-Trimethylbenzene	2E-03	2E-01	7E-03	1E-01	1E-01	1E-03	1E-01	4E-01
Acetone	1E-03	2E-03			6E-04	7E-06	7E-06	2E-03
Benzene	6E-04	2E-01	3E-03	9E-02	2E-02	9E-05	2E-02	3E-01
Bromodichloromethane	2E-05	8E-04			9E-03	1E-06	6E-05	9E-04
Chlorobenzene	3E-05	1E-03	1E-04	2E-03	4E-02	9E-06	5E-04	4E-03
Chloroform	1E-05	1E-03	5E-05	5E-04	1E-02	1E-06	1E-04	2E-03
cis-1,2-Dichloroethene	4E-06	2E-03			2E-02	5E-07	2E-04	2E-03
Ethyl benzene	8E-03	8E-02	3E-02	3E-02	7E-02	5E-03	5E-02	2E-01
Isopropylbenzene	6E-04	6E-03	3E-03	7E-03	1E-01	7E-04	7E-03	2E-02
m&p-Xylene	3E-02	2E-01	1E-01	1E+00	8E-02	2E-02	1E-01	2E+00
o-Xylene	2E-03	9E-03	8E-03	8E-02	7E-02	1E-03	5E-03	9E-02
Toluene	8E-03	1E-01	3E-02	7E-03	4E-02	3E-03	3E-02	1E-01
Trichloroethene	1E-05	2E-02	4E-05	2E-02	2E-02	2E-06	3E-03	5E-02
							Hazard Index	44

Resident-Adjusted

Parameter	Ingestion LADD (mg/kg-d)	Ingestion Risk	Inhalation LAC $(µg/m^3)$	Inhalation Risk	Dermal EvF (cm/ev)	Dermal LADD (mg/kg-d)	Dermal Risk	Total Risk
Aluminum								
Antimony								
Arsenic	5E-04	7E-04			7E-04	2E-06	4E-06	7E-04
Barium								
Beryllium								
Cadmium								
Cobalt								
Copper								
Iron								
Lead								
Manganese								
Mercury								
Nickel								
Selenium								
Thallium								
Vanadium								
Zinc								
1,2,4-Trichlorobenzene	3E-06	1E-07			2E-01	4E-06	1E-07	2E-07
1,2-Dichlorobenzene								
1,3-Dichlorobenzene								
1,4-Dichlorobenzene	5E-05	2E-07	2E-01	2E-06	9E-02	3E-05	2E-07	2E-06
1-Methyl Naphthalene	7E-04	2E-05			2E-01	1E-03	3E-05	5E-05
2-Methylnaphthalene								
Benzo(a)anthracene	4E-06	4E-07	1E-02	7E-07				1E-06
Benzo(a)pyrene	3E-06	3E-06						3E-06
Benzo(b)fluoranthene	3E-06	3E-07						3E-07
Dibenzo(a,h)anthracene	7E-06	7E-06						7E-06
Dibenzofuran								
Indeno(1,2,3-cd)pyrene	2E-06	2E-07						2E-07
Naphthalene								
1,1,2-Trichloroethane	3E-04	2E-05	1E+00	2E-05	9E-03	2E-05	1E-06	3E-05
1,1-Dichloroethane	1E-05	6E-08	4E-02	6E-08	9E-03	8E-07	4E-09	1E-07
1,1-Dichloropropene	4E-06	4E-07	2E-02	6E-08	1E-02	4E-07	4E-08	5E-07
1,2,3-Trichloropropane	2E-05	6E-04			1E-02	2E-06	6E-05	6E-04
1,2,4-Trimethylbenzene								
1,2-Dibromoethane	2E-06	4E-06	7E-03	4E-06	7E-03	1E-07	2E-07	8E-06
1,2-Dichloropropane	4E-05	1E-06	1E-01	5E-07	1E-02	3E-06	1E-07	2E-06
1,3,5-Trimethylbenzene								
Acetone								
Benzene	3E-04	1E-05	1E+00	7E-06	2E-02	4E-05	2E-06	2E-05
Bromodichloromethane	7E-06	4E-07	3E-02	1E-06	9E-03	5E-07	3E-08	1E-06
Chlorobenzene								
Chloroform	5E-06	2E-07	2E-02	4E-07	1E-02	4E-07	1E-08	6E-07
cis-1,2-Dichloroethene								
Ethyl benzene	3E-03	4E-05	1E+01	3E-05	7E-02	2E-03	2E-05	9E-05
Isopropylbenzene								
m&p-Xylene								
o-Xylene								
Toluene								
Trichloroethene	6E-06	3E-07	9E-02	4E-07	2E-02	1E-06	5E-08	7E-07
							Total ELCR	2E-03

V: Volatile; inhalation only calculated if volatile
Dermal only calculated if in effective predictive domain (In EPD)

EvF: Event Factor

(shaded) HQ > 0.1 or ELCR > 10^{-6}

Table 7-9b

Hazard/Risk Calculations - Groundwater North Satilla - CTE

Parameter	Form	GW EPC	RfDo	SFo	RfC	IUR	1/VF + 1/PEF	GIABS	M	V	In	Child Resident								Adult Resident								Resident-Adjusted							
												Ingestion		Inhalation		Dermal			Total	Ingestion		Inhalation		Dermal			Total	Ingestion		Inhalation		Dermal			Total
		(µg/L)	(mg/kg/d)	$(mg/kg/d)^{-1}$	(mg/m^3)	$(\mu g/m^3)^{-1}$	$(m^3/kg)^{-1}$				EPD	ADD (mg/kg-d)	Hazard	ADC (mg/m^3)	Hazard	EvF (cm/ev)	ADD (mg/kg-d)	Hazard	Hazard	ADD (mg/kg-d)	Hazard	ADC (mg/m^3)	Hazard	EvF (cm/ev)	ADD (mg/kg-d)	Hazard	Hazard	LADD (mg/kg-d)	Risk	LAC $(\mu g/m^3)$	Risk	EvF (cm/ev)	LADD (mg/kg-d)	Risk	Risk
Aluminum		125100	1		0.005		7.35E-10	1			Yes	4E+00	4E+00			3E-04	2E-02	2E-02	4E+00	2E+00	2E+00			3E-04	7E-03	7E-03	2E+00								
Antimony		0.8	0.0004		0.0003		7.35E-10	0.15			Yes	2E-05	6E-02			3E-04	7E-07	2E-03	6E-02	1E-05	3E-02			3E-04	3E-07	8E-04	3E-02								
Arsenic		35	0.0003	1.5	0.000015	0.0043	7.35E-10	1			Yes	1E-03	3E+00			3E-04	5E-06	2E-02	3E+00	5E-04	2E+00			3E-04	2E-06	7E-03	2E+00	8E-05	1E-04			3E-04	3E-07	5E-07	1E-04
Barium		860	0.2		0.0005		7.35E-10	0.07			Yes	2E-02	1E-01			3E-04	2E-03	8E-03	1E-01	1E-02	6E-02			3E-04	7E-04	4E-03	7E-02								
Beryllium		3.6	0.002		0.00002	0.0024	7.35E-10	0.007			Yes	1E-04	5E-02			3E-04	7E-05	3E-02	9E-02	5E-05	3E-02			3E-04	3E-05	2E-02	4E-02								
Cadmium	water	0.86	0.0001		0.00001	0.0018	7.35E-10	0.05			Yes	2E-05	2E-01			3E-04	2E-06	2E-02	3E-01	1E-05	1E-01			3E-04	1E-06	1E-02	1E-01								
Cobalt		7.7	0.0003		0.000006	0.009	7.35E-10	1			Yes	2E-04	7E-01			1E-04	4E-07	1E-03	7E-01	1E-04	4E-01			1E-04	2E-07	6E-04	4E-01								
Copper		10	0.04				7.35E-10	1			Yes	3E-04	7E-03			3E-04	1E-06	3E-05	7E-03	1E-04	4E-03			3E-04	6E-07	1E-05	4E-03								
Iron		15990	0.7				7.35E-10	1			Yes	5E-01	7E-01			3E-04	2E-03	3E-03	7E-01	2E-01	3E-01			3E-04	9E-04	1E-03	3E-01								
Lead		63					7.35E-10	1			Yes																								
Manganese	water	722	0.024		0.00005		7.35E-10	0.04			Yes	2E-02	9E-01			3E-04	2E-03	1E-01	1E+00	1E-02	4E-01			3E-04	1E-03	4E-02	5E-01								
Mercury	salts	3.8	0.0003		0.0003		7.35E-10	0.07			Yes	1E-04	4E-01			3E-04	7E-06	2E-02	4E-01	5E-05	2E-01			3E-04	3E-06	1E-02	2E-01								
Nickel		60	0.02		0.00009	0.00026	7.35E-10	0.04			Yes	2E-03	9E-02			7E-05	4E-05	2E-03	9E-02	9E-04	4E-02			5E-05	2E-05	9E-04	4E-02								
Selenium		7.7	0.005		0.02		7.35E-10	1			Yes	2E-04	4E-02			3E-04	1E-06	2E-04	4E-02	1E-04	2E-02			3E-04	5E-07	9E-05	2E-02								
Thallium		0.15	0.00001				7.35E-10	1			Yes	4E-06	4E-01			3E-04	2E-08	2E-03	4E-01	2E-06	2E-01			3E-04	9E-09	9E-04	2E-01								
Vanadium		888	0.005		0.0001		7.35E-10	0.026			Yes	3E-02	5E+00			3E-04	5E-03	9E-01	6E+00	1E-02	3E+00			3E-04	2E-03	4E-01	3E+00								
Zinc		124	0.3				7.35E-10	1			Yes	4E-03	1E-02			2E-04	1E-05	3E-05	1E-02	2E-03	6E-03			2E-04	4E-06	1E-05	6E-03								
1,2,4-Trichlorobenzene		0.26	0.01	0.029	0.002		3.34E-05	1		V	Yes	7E-06	7E-04	3E-05	2E-02	1E-01	1E-05	1E-03	2E-02	4E-06	4E-04	3E-05	2E-02	1E-01	6E-06	6E-04	2E-02	6E-07	2E-08			1E-01	1E-06	3E-08	4E-08
1,2-Dichlorobenzene		0.31	0.09		0.2		8.55E-05	1		V	Yes	9E-06	1E-04	4E-05	2E-04	6E-02	8E-06	8E-05	4E-04	5E-06	5E-05	4E-05	2E-04	5E-02	4E-06	4E-05	3E-04								
1,3-Dichlorobenzene		3.5	0.09		0.2		8.55E-05	1		V	Yes	1E-04	1E-03	4E-04	2E-03	6E-02	8E-05	9E-04	4E-03	5E-05	6E-04	4E-04	2E-03	5E-02	4E-05	5E-04	3E-03								
1,4-Dichlorobenzene		3.5	0.07	0.0054	0.8	0.000011	9.62E-05	1		V	Yes	1E-04	1E-03	4E-04	6E-04	6E-02	9E-05	1E-03	3E-03	5E-05	7E-04	4E-04	6E-04	5E-02	4E-05	6E-04	2E-03	8E-06	4E-08	6E-02	6E-07	5E-02	7E-06	4E-08	7E-07
1-Methyl Naphthalene		58	0.07	0.029			1.71E-05	1		V	Yes	2E-03	2E-02			1E-01	3E-03	4E-02	6E-02	8E-04	1E-02			1E-01	1E-03	2E-02	3E-02	1E-04	4E-06			1E-01	2E-04	6E-06	1E-05
2-Methylnaphthalene		88	0.004				1.72E-05	1		V	Yes	3E-03	6E-01			1E-01	4E-03	1E+00	2E+00	1E-03	3E-01			1E-01	2E-03	5E-01	9E-01								
Benzo(a)anthracene		0.094		0.1		0.00006	2.27E-07	1	M	V	No																	2E-06	2E-07	1E-02	7E-07				9E-07
Benzo(a)pyrene		0.075	0.0003	1	0.000002	0.0006	7.35E-10	1	M		No	2E-06	7E-03						7E-03	1E-06	4E-03						4E-03	2E-06	2E-06						2E-06
Benzo(b)fluoranthene		0.078		0.1		0.00006	7.35E-10	1	M		No																	2E-06	2E-07						2E-07
Dibenzo(a,h)anthracene		0.17		1		0.0006	7.35E-10	1	M		No																	4E-06	4E-06						4E-06
Dibenzofuran		0.28	0.001				6.41E-06	1		V	Yes	8E-06	8E-03			1E-01	2E-05	2E-02	3E-02	4E-06	4E-03			1E-01	9E-06	9E-03	1E-02								
Indeno(1,2,3-cd)pyrene		0.046		0.1		0.00006	7.35E-10	1	M		No																	1E-06	1E-07						1E-07
Naphthalene		121	0.02		0.003		2.16E-05	1		V	Yes	3E-03	2E-01	2E-02	5E+00	5E-02	3E-03	1E-01	5E+00	2E-03	9E-02	2E-02	5E+00	5E-02	1E-03	7E-02	5E+00								
1,1,2-Trichloroethane		22	0.004	0.057	0.0002	0.000016	1.39E-04	1		V	Yes	6E-04	2E-01	3E-03	1E+01	6E-03	5E-05	1E-02	1E+01	3E-04	8E-02	3E-03	1E+01	5E-03	3E-05	7E-03	1E+01	5E-05	3E-06	4E-01	6E-06	5E-03	4E-06	2E-07	9E-06
1,1-Dichloroethane		0.81	0.2	0.0057		0.0000016	4.81E-04	1		V	Yes	2E-05	1E-04			7E-03	2E-06	1E-05	1E-04	1E-05	6E-05			6E-03	1E-06	5E-06	6E-05	2E-06	1E-08	1E-02	2E-08	6E-03	2E-07	1E-09	3E-08
1,1-Dichloropropene		0.34	0.03	0.1	0.02	0.000004	2.78E-04	1		V	Yes	1E-05	3E-04	4E-05	2E-03	9E-03	1E-06	4E-05	3E-03	5E-06	2E-04	4E-05	2E-03	8E-03	6E-07	2E-05	2E-03	8E-07	8E-08	6E-03	2E-08	8E-03	1E-07	1E-08	1E-07
1,2,3-Trichloropropane		0.46	0.004	30	0.0003		6.37E-05	1	M	V	Yes	1E-05	3E-03	6E-05	2E-01	1E-02	2E-06	5E-04	2E-01	7E-06	2E-03	6E-05	2E-01	9E-03	9E-07	2E-04	2E-01	1E-05	3E-04			9E-03	1E-06	4E-05	3E-04
1,2,4-Trimethylbenzene		205	0.01		0.06		1.26E-04	1		V	Yes	6E-03	6E-01	3E-02	4E-01	1E-01	8E-03	8E-01	2E+00	3E-03	3E-01	3E-02	4E-01	8E-02	4E-03	4E-01	1E+00								
1,2-Dibromoethane		0.15	0.009	2	0.009	0.0006	1.16E-04	1		V	Yes	4E-06	5E-04	2E-05	2E-03	5E-03	3E-07	3E-05	3E-03	2E-06	2E-04	2E-05	2E-03	4E-03	1E-07	2E-05	2E-03	3E-07	7E-07	2E-03	1E-06	4E-03	2E-08	5E-08	2E-06
1,2-Dichloropropane		3.0	0.04	0.037	0.004	0.0000037	2.64E-04	1		V	Yes	9E-05	2E-03	4E-04	9E-02	8E-03	1E-05	2E-04	9E-02	4E-05	1E-03	4E-04	9E-02	7E-03	5E-06	1E-04	9E-02	7E-06	2E-07	5E-02	2E-07	7E-03	7E-07	3E-08	5E-07
1,3,5-Trimethylbenzene		57	0.01		0.06		1.51E-04	1		V	Yes	2E-03	2E-01	7E-03	1E-01	7E-02	2E-03	2E-01	4E-01	8E-04	8E-02	7E-03	1E-01	6E-02	8E-04	8E-02	3E-01								
Acetone		47	0.9				7.30E-05	1		V	Yes	1E-03	2E-03			4E-04	7E-06	8E-06	2E-03	7E-04	8E-04			3E-04	4E-06	4E-06	8E-04								
Benzene		21	0.004	0.055	0.03	0.0000078	2.82E-04	1		V	Yes	6E-04	1E-01	3E-03	9E-02	1E-02	1E-04	3E-02	3E-01	3E-04	7E-02	3E-03	9E-02	1E-02	5E-05	1E-02	2E-01	5E-05	3E-06	3E-01	3E-06	1E-02	8E-06	5E-07	6E-06
Bromodichloromethane		0.56	0.02	0.062		0.000037	2.52E-04	1		V	Yes	2E-05	8E-04			6E-03	1E-06	7E-05	9E-04	8E-06	4E-04			5E-03	7E-07	3E-05	4E-04	1E-06	8E-08	9E-03	3E-07	5E-03	1E-07	7E-09	4E-07
Chlorobenzene		0.87	0.02		0.05		1.55E-04	1		V	Yes	3E-05	1E-03	1E-04	2E-03	3E-02	1E-05	5E-04	4E-03	1E-05	6E-04	1E-04	2E-03	3E-02	5E-06	3E-04	3E-03								
Chloroform		0.40	0.01	0.031	0.098	0.000023	3.80E-04	1		V	Yes	1E-05	1E-03	5E-05	5E-04	8E-03	1E-06	1E-04	2E-03	6E-06	6E-04	5E-05	5E-04	7E-03	6E-07	6E-05	1E-03	9E-07	3E-08	6E-03	1E-07	7E-03	9E-08	3E-09	2E-07
cis-1,2-Dichloroethene		0.13	0.002				4.00E-04	1		V	Yes	4E-06	2E-03			1E-02	6E-07	3E-04	2E-03	2E-06	1E-03			9E-03	3E-07	1E-04	1E-03								
Ethyl benzene		267	0.1	0.011	1	0.0000025	1.76E-04	1		V	Yes	8E-03	8E-02	3E-02	3E-02	5E-02	5E-03	5E-02	2E-01	4E-03	4E-02	3E-02	3E-02	4E-02	3E-03	3E-02	1E-01	6E-04	7E-06	4E+00	1E-05	5E-02	4E-04	5E-06	2E-05
Isopropylbenzene		21	0.1		0.4		1.61E-04	1		V	Yes	6E-04	6E-03	3E-03	7E-03	1E-01	9E-04	9E-03	2E-02	3E-04	3E-03	3E-03	7E-03	9E-02	4E-04	4E-03	1E-02								
m&p-Xylene		1052	0.2		0.1		1.82E-04	1		V	Yes	3E-02	2E-01	1E-01	1E+00	5E-02	2E-02	1E-01	2E+00	2E-02	8E-02	1E-01	1E+00	5E-02	1E-02	6E-02	1E+00								
o-Xylene		63	0.2		0.1		1.55E-04	1		V	Yes	2E-03	9E-03	8E-03	8E-02	5E-02	1E-03	6E-03	9E-02	9E-04	5E-03	8E-03	8E-02	4E-02	6E-04	3E-03	9E-02								
Toluene		265	0.08		5		2.33E-04	1		V	Yes	8E-03	1E-01	3E-02	7E-03	3E-02	3E-03	4E-02	1E-01	4E-03	5E-02	3E-02	7E-03	3E-02	2E-03	2E-02	7E-02								
Trichloroethene		0.35	0.0005	0.046	0.002	0.0000041	4.52E-04	1	M	V	Yes	1E-05	2E-02	4E-05	2E-02	1E-02	2E-06	4E-03	5E-02	5E-06	1E-02	4E-05	2E-02	1E-02	1E-06	2E-03	3E-02	2E-06	1E-07	9E-02	4E-07	2E-02	4E-07	2E-08	5E-07
																		Hazard Index	43							Hazard Index	32							Total ELCR	5E-04

V: Volatile; inhalation only calculated if volatile

Dermal only calculated if in effective predictive domain (In EPD)

EvF: Event Factor

(highlighted) HQ > 0.1 or ELCR > 10^{-6}

Table 7-10a

Hazard/Risk Calculations - Groundwater South Satilla - RME

Parameter	Form	GW EPC (µg/L)	RfDo (mg/kg/d)	SFo $(mg/kg/d)^{-1}$	RfC (mg/m^3)	IUR $(\mu g/m^3)^{-1}$	1/VF + 1/PEF $(m^3/kg)^{-1}$	GIABS	M	V	In EPD
Aluminum		29000	1		0.005		7.35E-10	1			Yes
Antimony		0.71	0.0004		0.0003		7.35E-10	0.15			Yes
Arsenic		22	0.0003	1.5	0.000015	0.0043	7.35E-10	1			Yes
Barium		529	0.2		0.0005		7.35E-10	0.07			Yes
Beryllium		19	0.002		0.00002	0.0024	7.35E-10	0.007			Yes
Cadmium	water	0.44	0.0001		0.00001	0.0018	7.35E-10	0.05			Yes
Chromium VI		66	0.003	0.5	0.0001	0.084	7.35E-10	0.025	M		Yes
Cobalt		3.2	0.0003		0.000006	0.009	7.35E-10	1			Yes
Copper		15	0.04				7.35E-10	1			Yes
Iron		10920	0.7				7.35E-10	1			Yes
Lead		26					7.35E-10	1			Yes
Manganese	water	178	0.024		0.00005		7.35E-10	0.04			Yes
Mercury	salts	11	0.0003		0.0003		7.35E-10	0.07			Yes
Methyl mercury		0.22	0.0001				7.35E-10	1			Yes
Nickel		53	0.02		0.00009	0.00026	7.35E-10	0.04			Yes
Selenium		8.1	0.005		0.02		7.35E-10	1			Yes
Thallium		0.24	0.00001				7.35E-10	1			Yes
Vanadium		1116	0.005		0.0001		7.35E-10	0.026			Yes
Zinc		48	0.3				7.35E-10	1			Yes
1,2,4-Trichlorobenzene		1.3	0.01	0.029	0.002		3.34E-05	1		V	Yes
1,2-Dichlorobenzene		48	0.09		0.2		8.55E-05	1		V	Yes
1,3-Dichlorobenzene		1.7	0.09		0.2		8.55E-05	1		V	Yes
1,4-Dichlorobenzene		7.5	0.07	0.0054	0.8	0.000011	9.62E-05	1		V	Yes
1-Methyl Naphthalene		4	0.07	0.029			1.71E-05	1		V	Yes
2-Methylnaphthalene		5	0.004				1.72E-05	1		V	Yes
Benzo(a)anthracene		0.25		0.1		0.00006	2.27E-07	1	M	V	No
Benzo(a)pyrene		0.078	0.0003	1	0.000002	0.0006	7.35E-10	1	M		No
Benzo(b)fluoranthene		0.12		0.1		0.00006	7.35E-10	1	M		No
Dibenzofuran		0.10	0.001				6.41E-06	1		V	Yes
Indeno(1,2,3-cd)pyrene		0.037		0.1		0.00006	7.35E-10	1	M		No
Naphthalene		5.6	0.02		0.003		2.16E-05	1		V	Yes
1,1,2,2-Tetrachloroethane		0.14	0.02	0.2		0.000058	6.62E-05	1		V	Yes
1,1-Dichloroethane		0.73	0.2	0.0057		0.0000016	4.81E-04	1		V	Yes
1,2,4-Trimethylbenzene		56	0.01		0.06		1.26E-04	1		V	Yes
1,2-Dibromo-3-chloropropane		0.27	0.0002	0.8	0.0002	0.006	3.13E-05	1	M	V	Yes
1,2-Dichloropropane		0.5	0.04	0.037	0.004	0.0000037	2.64E-04	1		V	Yes
1,3,5-Trimethylbenzene		9	0.01		0.06		1.51E-04	1		V	Yes
2-Hexanone		0.76	0.005		0.03		7.52E-05	1		V	Yes
Acetone		10	0.9				7.30E-05	1		V	Yes
Benzene		2	0.004	0.055	0.03	0.0000078	2.82E-04	1		V	Yes
Bromodichloromethane		0.068	0.02	0.062		0.000037	2.52E-04	1		V	Yes
Chlorobenzene		47	0.02		0.05		1.55E-04	1		V	Yes
cis-1,2-Dichloroethene		0.88	0.002				4.00E-04	1		V	Yes
Ethyl benzene		3.38	0.1	0.011	1	0.0000025	1.76E-04	1		V	Yes
Isopropylbenzene		3.13	0.1		0.4		1.61E-04	1		V	Yes
m&p-Xylene		11	0.2		0.1		1.82E-04	1		V	Yes
o-Xylene		3	0.2		0.1		1.55E-04	1		V	Yes
Toluene		0.65	0.08		5		2.33E-04	1		V	Yes
Vinyl chloride		0.37	0.003	0.72	0.1	0.0000044	1.05E-03	1	M	V	Yes

Child Resident

Parameter	Ingestion		Inhalation		Dermal			Total
	ADD (mg/kg-d)	Hazard	ADC (mg/m^3)	Hazard	EvF (cm/ev)	ADD (mg/kg-d)	Hazard	Hazard
Aluminum	1E+00	1E+00			5E-04	6E-03	6E-03	1E+00
Antimony	4E-05	9E-02			5E-04	1E-06	3E-03	9E-02
Arsenic	1E-03	4E+00			5E-04	5E-06	2E-02	4E+00
Barium	3E-02	1E-01			5E-04	2E-03	8E-03	1E-01
Beryllium	1E-03	5E-01			5E-04	6E-04	3E-01	8E-01
Cadmium	2E-05	2E-01			5E-04	2E-06	2E-02	2E-01
Chromium VI	3E-03	1E+00			1E-03	1E-03	4E-01	1E+00
Cobalt	2E-04	5E-01			2E-04	3E-07	9E-04	5E-01
Copper	8E-04	2E-02			5E-04	3E-06	8E-05	2E-02
Iron	5E-01	8E-01			5E-04	2E-03	3E-03	8E-01
Lead								
Manganese	9E-03	4E-01			5E-04	1E-03	4E-02	4E-01
Mercury	5E-04	2E+00			5E-04	3E-05	1E-01	2E+00
Methyl mercury	1E-05	1E-01			5E-04	5E-08	5E-04	1E-01
Nickel	3E-03	1E-01			1E-04	6E-05	3E-03	1E-01
Selenium	4E-04	8E-02			5E-04	2E-06	4E-04	8E-02
Thallium	1E-05	1E+00			5E-04	5E-08	5E-03	1E+00
Vanadium	6E-02	1E+01			5E-04	9E-03	2E+00	1E+01
Zinc	2E-03	8E-03			3E-04	6E-06	2E-05	8E-03
1,2,4-Trichlorobenzene	6E-05	6E-03	2E-04	8E-02	1E-01	8E-05	8E-03	9E-02
1,2-Dichlorobenzene	2E-03	3E-02	6E-03	3E-02	8E-02	1E-03	2E-02	7E-02
1,3-Dichlorobenzene	9E-05	1E-03	2E-04	1E-03	8E-02	5E-05	6E-04	3E-03
1,4-Dichlorobenzene	4E-04	5E-03	9E-04	1E-03	8E-02	2E-04	3E-03	1E-02
1-Methyl Naphthalene	2E-04	3E-03			2E-01	3E-04	4E-03	7E-03
2-Methylnaphthalene	3E-04	6E-02			2E-01	3E-04	8E-02	1E-01
Benzo(a)anthracene								
Benzo(a)pyrene	4E-06	1E-02						1E-02
Benzo(b)fluoranthene								
Dibenzofuran	5E-06	5E-03			2E-01	8E-06	8E-03	1E-02
Indeno(1,2,3-cd)pyrene								
Naphthalene	3E-04	1E-02	7E-04	2E-01	7E-02	2E-04	8E-03	3E-01
1,1,2,2-Tetrachloroethane	7E-06	3E-04			1E-02	8E-07	4E-05	4E-04
1,1-Dichloroethane	4E-05	2E-04			8E-03	2E-06	1E-05	2E-04
1,2,4-Trimethylbenzene	3E-03	3E-01	7E-03	1E-01	1E-01	3E-03	3E-01	7E-01
1,2-Dibromo-3-chloropropane	1E-05	7E-02	3E-05	2E-01	2E-02	2E-06	1E-02	2E-01
1,2-Dichloropropane	2E-05	6E-04	6E-05	2E-02	1E-02	2E-06	5E-05	2E-02
1,3,5-Trimethylbenzene	4E-04	4E-02	1E-03	2E-02	9E-02	3E-04	3E-02	9E-02
2-Hexanone	4E-05	8E-03	9E-05	3E-03	4E-03	1E-06	3E-04	1E-02
Acetone	5E-04	6E-04			5E-04	2E-06	2E-06	6E-04
Benzene	1E-04	3E-02	3E-04	9E-03	2E-02	1E-05	4E-03	4E-02
Bromodichloromethane	3E-06	2E-04			8E-03	2E-07	1E-05	2E-04
Chlorobenzene	2E-03	1E-01	6E-03	1E-01	4E-02	7E-04	4E-02	3E-01
cis-1,2-Dichloroethene	4E-05	2E-02			1E-02	5E-06	2E-03	2E-02
Ethyl benzene	2E-04	2E-03	4E-04	4E-04	6E-02	9E-05	9E-04	3E-03
Isopropylbenzene	2E-04	2E-03	4E-04	1E-03	1E-01	2E-04	2E-03	4E-03
m&p-Xylene	6E-04	3E-03	1E-03	1E-02	7E-02	3E-04	2E-03	2E-02
o-Xylene	2E-04	8E-04	4E-04	4E-03	6E-02	8E-05	4E-04	5E-03
Toluene	3E-05	4E-04	8E-05	2E-05	4E-02	1E-05	1E-04	5E-04
Vinyl chloride	2E-05	6E-03	5E-05	5E-04	8E-03	1E-06	4E-04	7E-03
							Hazard Index	28

Adult Resident

Parameter	Ingestion		Inhalation		Dermal			Total
	ADD (mg/kg-d)	Hazard	ADC (mg/m^3)	Hazard	EvF (cm/ev)	ADD (mg/kg-d)	Hazard	Hazard
Aluminum	9E-01	9E-01			7E-04	5E-03	5E-03	9E-01
Antimony	2E-05	5E-02			7E-04	8E-07	2E-03	6E-02
Arsenic	7E-04	2E+00			7E-04	4E-06	1E-02	2E+00
Barium	2E-02	8E-02			7E-04	1E-03	6E-03	9E-02
Beryllium	6E-04	3E-01			7E-04	5E-04	2E-01	5E-01
Cadmium	1E-05	1E-01			7E-04	1E-06	1E-02	1E-01
Chromium VI	2E-03	7E-01			1E-03	9E-04	3E-01	1E+00
Cobalt	1E-04	3E-01			3E-04	2E-07	7E-04	3E-01
Copper	5E-04	1E-02			7E-04	3E-06	6E-05	1E-02
Iron	3E-01	5E-01			7E-04	2E-03	3E-03	5E-01
Lead								
Manganese	5E-03	2E-01			7E-04	7E-04	3E-02	3E-01
Mercury	3E-04	1E+00			7E-04	3E-05	9E-02	1E+00
Methyl mercury	6E-06	6E-02			7E-04	4E-08	4E-04	7E-02
Nickel	2E-03	8E-02			1E-04	4E-05	2E-03	8E-02
Selenium	2E-04	5E-02			7E-04	1E-06	3E-04	5E-02
Thallium	7E-06	7E-01			7E-04	4E-08	4E-03	7E-01
Vanadium	3E-02	7E+00			7E-04	7E-03	1E+00	8E+00
Zinc	1E-03	5E-03			4E-04	5E-06	2E-05	5E-03
1,2,4-Trichlorobenzene	4E-05	4E-03	2E-04	8E-02	2E-01	5E-05	5E-03	9E-02
1,2-Dichlorobenzene	1E-03	2E-02	6E-03	3E-02	9E-02	1E-03	1E-02	6E-02
1,3-Dichlorobenzene	5E-05	6E-04	2E-04	1E-03	9E-02	4E-05	4E-04	2E-03
1,4-Dichlorobenzene	2E-04	3E-03	9E-04	1E-03	9E-02	2E-04	2E-03	7E-03
1-Methyl Naphthalene	1E-04	2E-03			2E-01	2E-04	3E-03	4E-03
2-Methylnaphthalene	2E-04	4E-02			2E-01	2E-04	5E-02	9E-02
Benzo(a)anthracene								
Benzo(a)pyrene	2E-06	8E-03						8E-03
Benzo(b)fluoranthene								
Dibenzofuran	3E-06	3E-03			2E-01	5E-06	5E-03	8E-03
Indeno(1,2,3-cd)pyrene								
Naphthalene	2E-04	8E-03	7E-04	2E-01	8E-02	1E-04	5E-03	2E-01
1,1,2,2-Tetrachloroethane	4E-06	2E-04			2E-02	5E-07	3E-05	2E-04
1,1-Dichloroethane	2E-05	1E-04			1E-02	2E-06	8E-06	1E-04
1,2,4-Trimethylbenzene	2E-03	2E-01	7E-03	1E-01	1E-01	2E-03	2E-01	5E-01
1,2-Dibromo-3-chloropropane	8E-06	4E-02	3E-05	2E-01	2E-02	2E-06	8E-03	2E-01
1,2-Dichloropropane	1E-05	4E-04	6E-05	2E-02	1E-02	1E-06	3E-05	2E-02
1,3,5-Trimethylbenzene	3E-04	3E-02	1E-03	2E-02	1E-01	2E-04	2E-02	7E-02
2-Hexanone	2E-05	5E-03	9E-05	3E-03	5E-03	9E-07	2E-04	8E-03
Acetone	3E-04	3E-04			6E-04	1E-06	2E-06	3E-04
Benzene	6E-05	2E-02	3E-04	9E-03	2E-02	1E-05	2E-03	3E-02
Bromodichloromethane	2E-06	1E-04			9E-03	1E-07	7E-06	1E-04
Chlorobenzene	1E-03	7E-02	6E-03	1E-01	4E-02	5E-04	2E-02	2E-01
cis-1,2-Dichloroethene	3E-05	1E-02			2E-02	3E-06	2E-03	1E-02
Ethyl benzene	1E-04	1E-03	4E-04	4E-04	7E-02	6E-05	6E-04	2E-03
Isopropylbenzene	9E-05	9E-04	4E-04	1E-03	1E-01	1E-04	1E-03	3E-03
m&p-Xylene	3E-04	2E-03	1E-03	1E-02	8E-02	2E-04	1E-03	2E-02
o-Xylene	9E-05	5E-04	4E-04	4E-03	7E-02	5E-05	3E-04	5E-03
Toluene	2E-05	2E-04	8E-05	2E-05	4E-02	6E-06	8E-05	3E-04
Vinyl chloride	1E-05	4E-03	5E-05	5E-04	1E-02	9E-07	3E-04	4E-03
							Hazard Index	18

Resident-Adjusted

Parameter	Ingestion		Inhalation		Dermal			Total
	LADD (mg/kg-d)	Risk	LAC $(\mu g/m^3)$	Risk	EvF (cm/ev)	LADD (mg/kg-d)	Risk	Risk
Aluminum								
Antimony								
Arsenic	3E-04	4E-04			7E-04	2E-06	2E-06	4E-04
Barium								
Beryllium								
Cadmium								
Chromium VI	3E-03	1E-03			1E-03	1E-03	6E-04	2E-03
Cobalt								
Copper								
Iron								
Lead								
Manganese								
Mercury								
Methyl mercury								
Nickel								
Selenium								
Thallium								
Vanadium								
Zinc								
1,2,4-Trichlorobenzene	2E-05	5E-07			2E-01	2E-05	6E-07	1E-06
1,2-Dichlorobenzene								
1,3-Dichlorobenzene								
1,4-Dichlorobenzene	1E-04	5E-07	3E-01	4E-06	9E-02	7E-05	4E-07	5E-06
1-Methyl Naphthalene	6E-05	2E-06			2E-01	8E-05	2E-06	4E-06
2-Methylnaphthalene								
Benzo(a)anthracene	1E-05	1E-06	3E-02	2E-06				3E-06
Benzo(a)pyrene	3E-06	3E-06						3E-06
Benzo(b)fluoranthene	5E-06	5E-07						5E-07
Dibenzofuran								
Indeno(1,2,3-cd)pyrene	1E-06	1E-07						1E-07
Naphthalene								
1,1,2,2-Tetrachloroethane	2E-06	4E-07	6E-03	4E-07	2E-02	2E-07	4E-08	8E-07
1,1-Dichloroethane	9E-06	5E-08	3E-02	5E-08	9E-03	7E-07	4E-09	1E-07
1,2,4-Trimethylbenzene								
1,2-Dibromo-3-chloropropane	1E-05	9E-06	3E-02	2E-04	2E-02	2E-06	2E-06	2E-04
1,2-Dichloropropane	6E-06	2E-07	2E-02	9E-08	1E-02	6E-07	2E-08	3E-07
1,3,5-Trimethylbenzene								
2-Hexanone								
Acetone								
Benzene	3E-05	2E-06	1E-01	8E-07	2E-02	4E-06	2E-07	3E-06
Bromodichloromethane	9E-07	5E-08	3E-03	1E-07	9E-03	6E-08	4E-09	2E-07
Chlorobenzene								
cis-1,2-Dichloroethene								
Ethyl benzene	4E-05	5E-07	2E-01	4E-07	7E-02	2E-05	3E-07	1E-06
Isopropylbenzene								
m&p-Xylene								
o-Xylene								
Toluene								
Vinyl chloride	2E-05	2E-05	7E-02	3E-07	1E-02	2E-06	1E-06	2E-05
							Total ELCR	3E-03

V: Volatile; inhalation only calculated if volatile

Dermal only calculated if in effective predictive domain (In EPD)

EvF: Event Factor

(shaded) HQ > 0.1 or ELCR > 10^{-6}

Table 7-10b

Hazard/Risk Calculations - Groundwater South Satilla - CTE

												Child Resident								Adult Resident								Resident-Adjusted						
Parameter	Form	GW EPC (µg/L)	RfDo (mg/kg/d)	SFo $(mg/kg/d)^{-1}$	RfC (mg/m^3)	IUR $(\mu g/m^3)^{-1}$	1/VF + 1/PEF $(m^3/kg)^{-1}$	GIABS	M	V	In EPD	Ingestion ADD (mg/kg-d)	Ingestion Hazard	Inhalation ADC (mg/m^3)	Inhalation Hazard	Dermal EvF (cm/ev)	Dermal ADD (mg/kg-d)	Dermal Hazard	Total Hazard	Ingestion ADD (mg/kg-d)	Ingestion Hazard	Inhalation ADC (mg/m^3)	Inhalation Hazard	Dermal EvF (cm/ev)	Dermal ADD (mg/kg-d)	Dermal Hazard	Total Hazard	Ingestion LADD (mg/kg-d)	Ingestion Risk	Inhalation LAC $(\mu g/m^3)$	Inhalation Risk	Dermal EvF (cm/ev)	Dermal LADD (mg/kg-d)	Dermal Risk
Aluminum		29000	1		0.005		7.35E-10	1			Yes	8E-01	8E-01			3E-04	4E-03	4E-03	8E-01	4E-01	4E-01			3E-04	2E-03	2E-03	4E-01							
Antimony		0.71	0.0004		0.0003		7.35E-10	0.15			Yes	2E-05	5E-02			3E-04	6E-07	2E-03	5E-02	1E-05	3E-02			3E-04	3E-07	7E-04	3E-02							
Arsenic		22	0.0003	1.5	0.000015	0.0043	7.35E-10	1			Yes	6E-04	2E+00			3E-04	3E-06	1E-02	2E+00	3E-04	1E+00			3E-04	1E-06	4E-03	1E+00	5E-05	7E-05			3E-04	2E-07	3E-07
Barium		529	0.2		0.0005		7.35E-10	0.07			Yes	2E-02	8E-02			3E-04	1E-03	5E-03	8E-02	8E-03	4E-02			3E-04	4E-04	2E-03	4E-02							
Beryllium		19	0.002		0.00002	0.0024	7.35E-10	0.007			Yes	6E-04	3E-01			3E-04	4E-04	2E-01	5E-01	3E-04	1E-01			3E-04	2E-04	8E-02	2E-01							
Cadmium	water	0.44	0.0001		0.00001	0.0018	7.35E-10	0.05			Yes	1E-05	1E-01			3E-04	1E-06	1E-02	1E-01	6E-06	6E-02			3E-04	5E-07	5E-03	7E-02							
Chromium VI		66	0.003	0.5	0.0001	0.084	7.35E-10	0.025	M		Yes	2E-03	6E-01			7E-04	7E-04	2E-01	9E-01	9E-04	3E-01			5E-04	3E-04	1E-01	4E-01	1E-03	7E-04			5E-04	4E-04	2E-04
Cobalt		3.2	0.0003		0.000006	0.009	7.35E-10	1			Yes	9E-05	3E-01			1E-04	2E-07	6E-04	3E-01	5E-05	2E-01			1E-04	7E-08	2E-04	2E-01							
Copper		15	0.04				7.35E-10	1			Yes	4E-04	1E-02			3E-04	2E-06	5E-05	1E-02	2E-04	6E-03			3E-04	9E-07	2E-05	6E-03							
Iron		10920	0.7				7.35E-10	1			Yes	3E-01	4E-01			3E-04	1E-03	2E-03	5E-01	2E-01	2E-01			3E-04	6E-04	9E-04	2E-01							
Lead		26					7.35E-10	1			Yes																							
Manganese	water	178	0.024		0.00005		7.35E-10	0.04			Yes	5E-03	2E-01			3E-04	6E-04	2E-02	2E-01	3E-03	1E-01			3E-04	3E-04	1E-02	1E-01							
Mercury	salts	11	0.0003		0.0003		7.35E-10	0.07			Yes	3E-04	1E+00			3E-04	2E-05	7E-02	1E+00	2E-04	5E-01			3E-04	9E-06	3E-02	6E-01							
Methyl mercury		0.22	0.0001				7.35E-10	1			Yes	6E-06	6E-02			3E-04	3E-08	3E-04	6E-02	3E-06	3E-02			3E-04	1E-08	1E-04	3E-02							
Nickel		53	0.02		0.00009	0.00026	7.35E-10	0.04			Yes	2E-03	8E-02			7E-05	4E-05	2E-03	8E-02	8E-04	4E-02			5E-05	2E-05	8E-04	4E-02							
Selenium		8.1	0.005		0.02		7.35E-10	1			Yes	2E-04	5E-02			3E-04	1E-06	2E-04	5E-02	1E-04	2E-02			3E-04	5E-07	1E-04	2E-02							
Thallium		0.24	0.00001				7.35E-10	1			Yes	7E-06	7E-01			3E-04	3E-08	3E-03	7E-01	3E-06	3E-01			3E-04	1E-08	1E-03	3E-01							
Vanadium		1116	0.005		0.0001		7.35E-10	0.026			Yes	3E-02	6E+00			3E-04	6E-03	1E+00	8E+00	2E-02	3E+00			3E-04	3E-03	5E-01	4E+00							
Zinc		48	0.3				7.35E-10	1			Yes	1E-03	5E-03			2E-04	4E-06	1E-05	5E-03	7E-04	2E-03			2E-04	2E-06	6E-06	2E-03							
1,2,4-Trichlorobenzene		1.3	0.01	0.029	0.002		3.34E-05	1		V	Yes	4E-05	4E-03	2E-04	8E-02	1E-01	6E-05	6E-03	9E-02	2E-05	2E-03	2E-04	8E-02	1E-01	3E-05	3E-03	9E-02	3E-06	8E-08			1E-01	5E-06	1E-07
1,2-Dichlorobenzene		48	0.09		0.2		8.55E-05	1		V	Yes	1E-03	2E-02	6E-03	3E-02	6E-02	1E-03	1E-02	6E-02	7E-04	8E-03	6E-03	3E-02	5E-02	6E-04	7E-03	4E-02							
1,3-Dichlorobenzene		1.7	0.09		0.2		8.55E-05	1		V	Yes	5E-05	6E-04	2E-04	1E-03	6E-02	4E-05	5E-04	2E-03	3E-05	3E-04	2E-04	1E-03	5E-02	2E-05	2E-04	2E-03							
1,4-Dichlorobenzene		7.5	0.07	0.0054	0.8	0.000011	9.62E-05	1		V	Yes	2E-04	3E-03	9E-04	1E-03	6E-02	2E-04	3E-03	7E-03	1E-04	2E-03	9E-04	1E-03	5E-02	9E-05	1E-03	4E-03	2E-05	9E-08	1E-01	1E-06	5E-02	1E-05	8E-08
1-Methyl Naphthalene		4	0.07	0.029			1.71E-05	1		V	Yes	1E-04	2E-03			1E-01	2E-04	3E-03	5E-03	6E-05	9E-04			1E-01	1E-04	2E-03	2E-03	1E-05	3E-07			1E-01	2E-05	5E-07
2-Methylnaphthalene		5	0.004				1.72E-05	1		V	Yes	1E-04	4E-02			1E-01	2E-04	6E-02	1E-01	7E-05	2E-02			1E-01	1E-04	3E-02	5E-02							
Benzo(a)anthracene		0.25		0.1		0.00006	2.27E-07	1	M	V	No																	5E-06	5E-07	3E-02	2E-06			
Benzo(a)pyrene		0.078	0.0003	1	0.000002	0.0006	7.35E-10	1	M		No	2E-06	7E-03						7E-03	1E-06	4E-03						4E-03	2E-06	2E-06					
Benzo(b)fluoranthene		0.12		0.1		0.00006	7.35E-10	1	M		No																	3E-06	3E-07					
Dibenzofuran		0.10	0.001				6.41E-06	1		V	Yes	3E-06	3E-03			1E-01	6E-06	6E-03	9E-03	1E-06	1E-03			1E-01	3E-06	3E-03	4E-03							
Indeno(1,2,3-cd)pyrene		0.037		0.1		0.00006	7.35E-10	1	M		No																	8E-07	8E-08					
Naphthalene		5.6	0.02		0.003		2.16E-05	1		V	Yes	2E-04	8E-03	7E-04	2E-01	5E-02	1E-04	6E-03	2E-01	8E-05	4E-03	7E-04	2E-01	5E-02	6E-05	3E-03	2E-01							
1,1,2,2-Tetrachloroethane		0.14	0.02	0.2		0.000058	6.62E-05	1		V	Yes	4E-06	2E-04			1E-02	6E-07	3E-05	2E-04	2E-06	1E-04			9E-03	3E-07	2E-05	1E-04	3E-07	6E-08	2E-03	1E-07	9E-03	5E-08	9E-09
1,1-Dichloroethane		0.73	0.2	0.0057		1.6E-06	4.81E-04	1		V	Yes	2E-05	1E-04			7E-03	2E-06	1E-05	1E-04	1E-05	5E-05			6E-03	1E-06	5E-06	6E-05	2E-06	9E-09	1E-02	2E-08	6E-03	2E-07	9E-10
1,2,4-Trimethylbenzene		56	0.01		0.06		1.26E-04	1		V	Yes	2E-03	2E-01	7E-03	1E-01	1E-01	2E-03	2E-01	5E-01	8E-04	8E-02	7E-03	1E-01	8E-02	1E-03	1E-01	3E-01							
1,2-Dibromo-3-chloropropane		0.27	0.0002	0.8	0.0002	0.006	3.13E-05	1	M	V	Yes	8E-06	4E-02	3E-05	2E-01	2E-02	2E-06	9E-03	2E-01	4E-06	2E-02	3E-05	2E-01	1E-02	9E-07	4E-03	2E-01	6E-06	5E-06	3E-02	2E-04	1E-02	1E-06	1E-06
1,2-Dichloropropane		0.5	0.04	0.037	0.004	3.7E-06	2.64E-04	1		V	Yes	1E-05	4E-04	6E-05	2E-02	8E-03	2E-06	4E-05	2E-02	7E-06	2E-04	6E-05	2E-02	7E-03	8E-07	2E-05	2E-02	1E-06	4E-08	8E-03	3E-08	7E-03	1E-07	5E-09
1,3,5-Trimethylbenzene		9	0.01		0.06		1.51E-04	1		V	Yes	3E-04	3E-02	1E-03	2E-02	7E-02	2E-04	2E-02	7E-02	1E-04	1E-02	1E-03	2E-02	6E-02	1E-04	1E-02	4E-02							
2-Hexanone		0.76	0.005		0.03		7.52E-05	1		V	Yes	2E-05	4E-03	9E-05	3E-03	3E-03	1E-06	2E-04	8E-03	1E-05	2E-03	9E-05	3E-03	3E-03	5E-07	1E-04	5E-03							
Acetone		10	0.9				7.30E-05	1		V	Yes	3E-04	3E-04			4E-04	2E-06	2E-06	3E-04	1E-04	2E-04			3E-04	8E-07	9E-07	2E-04							
Benzene		2	0.004	0.055	0.03	7.8E-06	2.82E-04	1		V	Yes	6E-05	2E-02	3E-04	9E-03	1E-02	1E-05	3E-03	3E-02	3E-05	8E-03	3E-04	9E-03	1E-02	6E-06	1E-03	2E-02	5E-06	3E-07	3E-02	3E-07	1E-02	9E-07	5E-08
Bromodichloromethane		0.068	0.02	0.062		0.000037	2.52E-04	1		V	Yes	2E-06	1E-04			6E-03	2E-07	8E-06	1E-04	1E-06	5E-05			5E-03	8E-08	4E-06	5E-05	2E-07	1E-08	1E-03	4E-08	5E-03	1E-08	8E-10
Chlorobenzene		47	0.02		0.05		1.55E-04	1		V	Yes	1E-03	7E-02	6E-03	1E-01	3E-02	6E-04	3E-02	2E-01	7E-04	3E-02	6E-03	1E-01	3E-02	3E-04	1E-02	2E-01							
cis-1,2-Dichloroethene		0.88	0.002				4.00E-04	1		V	Yes	3E-05	1E-02			1E-02	4E-06	2E-03	1E-02	1E-05	6E-03			9E-03	2E-06	9E-04	7E-03							
Ethyl benzene		3.38	0.1	0.011	1	2.5E-06	1.76E-04	1		V	Yes	1E-04	1E-03	4E-04	4E-04	5E-02	7E-05	7E-04	2E-03	5E-05	5E-04	4E-04	4E-04	4E-02	3E-05	3E-04	1E-03	8E-06	8E-08	5E-02	1E-07	5E-02	5E-06	6E-08
Isopropylbenzene		3.13	0.1		0.4		1.61E-04	1		V	Yes	9E-05	9E-04	4E-04	1E-03	1E-01	1E-04	1E-03	3E-03	5E-05	5E-04	4E-04	1E-03	9E-02	6E-05	6E-04	2E-03							
m&p-Xylene		11	0.2		0.1		1.82E-04	1		V	Yes	3E-04	2E-03	1E-03	1E-02	5E-02	2E-04	1E-03	2E-02	2E-04	8E-04	1E-03	1E-02	5E-02	1E-04	6E-04	2E-02							
o-Xylene		3	0.2		0.1		1.55E-04	1		V	Yes	9E-05	5E-04	4E-04	4E-03	5E-02	6E-05	3E-04	5E-03	5E-05	2E-04	4E-04	4E-03	4E-02	3E-05	2E-04	4E-03							
Toluene		0.65	0.08		5		2.33E-04	1		V	Yes	2E-05	2E-04	8E-05	2E-05	3E-02	8E-06	1E-04	3E-04	9E-06	1E-04	8E-05	2E-05	3E-02	4E-06	5E-05	2E-04							
Vinyl chloride		0.37	0.003	0.72	0.1	4.4E-06	1.05E-03	1	M	V	Yes	1E-05	4E-03	5E-05	5E-04	6E-03	1E-06	3E-04	4E-03	5E-06	2E-03	5E-05	5E-04	6E-03	5E-07	2E-04	2E-03	1E-05	9E-06	5E-02	2E-07	1E-02	1E-06	7E-07
																		Hazard Index	17							Hazard Index	9							Total ELCR

V: Volatile; inhalation only calculated if volatile

Dermal only calculated if in effective predictive domain (In EPD)

EvF: Event Factor

(Highlighted) HQ > 0.1 or ELCR > 10^{-6}

Table 7-10b
Hazard/Risk Calculations - Groundwater South Satilla - CTE

Parameter	Total Risk
Aluminum	
Antimony	
Arsenic	8E-05
Barium	
Beryllium	
Cadmium	
Chromium VI	9E-04
Cobalt	
Copper	
Iron	
Lead	
Manganese	
Mercury	
Methyl mercury	
Nickel	
Selenium	
Thallium	
Vanadium	
Zinc	
1,2,4-Trichlorobenzene	2E-07
1,2-Dichlorobenzene	
1,3-Dichlorobenzene	
1,4-Dichlorobenzene	1E-06
1-Methyl Naphthalene	8E-07
2-Methylnaphthalene	
Benzo(a)anthracene	2E-06
Benzo(a)pyrene	2E-06
Benzo(b)fluoranthene	3E-07
Dibenzofuran	
Indeno(1,2,3-cd)pyrene	8E-08
Naphthalene	
1,1,2,2-Tetrachloroethane	2E-07
1,1-Dichloroethane	3E-08
1,2,4-Trimethylbenzene	
1,2-Dibromo-3-chloropropane	2E-04
1,2-Dichloropropane	8E-08
1,3,5-Trimethylbenzene	
2-Hexanone	
Acetone	
Benzene	6E-07
Bromodichloromethane	5E-08
Chlorobenzene	
cis-1,2-Dichloroethene	
Ethyl benzene	3E-07
Isopropylbenzene	
m&p-Xylene	
o-Xylene	
Toluene	
Vinyl chloride	1E-05
	1E-03

Table 7-11a

Hazard/Risk Calculations - Groundwater South Ebenezer - RME

Parameter	Form	GW EPC	RfDo	SFo	RfC	IUR	1/VF + 1/PEF	GIABS	M	V	In	Child Resident							
												Ingestion		Inhalation		Dermal			Total
		(µg/L)	(mg/kg/d)	$(mg/kg/d)^{-1}$	(mg/m^3)	$(\mu g/m^3)^{-1}$	$(m^3/kg)^{-1}$				EPD	ADD (mg/kg-d)	Hazard	ADC (mg/m^3)	Hazard	EvF (cm/ev)	ADD (mg/kg-d)	Hazard	Hazard
Aluminum		38	1		0.005		7.35E-10	1			Yes	2E-03	2E-03			5E-04	8E-06	8E-06	2E-03
Arsenic		30	0.0003	1.5	0.000015	0.0043	7.35E-10	1			Yes	2E-03	5E+00			5E-04	7E-06	2E-02	5E+00
Cadmium	water	0.14	0.0001		0.00001	0.0018	7.35E-10	0.05			Yes	7E-06	7E-02			5E-04	6E-07	6E-03	8E-02
Chromium VI		40	0.003	0.5	0.0001	0.084	7.35E-10	0.025	M		Yes	2E-03	7E-01			1E-03	7E-04	2E-01	9E-01
Iron		820	0.7				7.35E-10	1			Yes	4E-02	6E-02			5E-04	2E-04	3E-04	6E-02
Manganese	water	3.9	0.024		0.00005		7.35E-10	0.04			Yes	2E-04	8E-03			5E-04	2E-05	9E-04	9E-03
Mercury	salts	31	0.0003		0.0003		7.35E-10	0.07			Yes	2E-03	5E+00			5E-04	1E-04	3E-01	5E+00
Nickel		28	0.02		0.00009	0.00026	7.35E-10	0.04			Yes	1E-03	7E-02			1E-04	3E-05	2E-03	7E-02
Selenium		12	0.005		0.02		7.35E-10	1			Yes	6E-04	1E-01			5E-04	3E-06	5E-04	1E-01
Vanadium		385	0.005		0.0001		7.35E-10	0.026			Yes	2E-02	4E+00			5E-04	3E-03	7E-01	4E+00
Benzo(a)anthracene		0.14		0.1		0.00006	2.27E-07	1	M	V	No								
Benzo(a)pyrene		0.16	0.0003	1	0.000002	0.0006	7.35E-10	1	M		No	8E-06	3E-02						3E-02
Benzo(b)fluoranthene		0.15		0.1		0.00006	7.35E-10	1	M		No								
Dibenzo(a,h)anthracene		0.59		1		0.0006	7.35E-10	1	M		No								
Indeno(1,2,3-cd)pyrene		0.21		0.1		0.00006	7.35E-10	1	M		No								
Naphthalene		0.84	0.02		0.003		2.16E-05	1		V	Yes	4E-05	2E-03	1E-04	4E-02	7E-02	2E-05	1E-03	4E-02
Benzene		0.91	0.004	0.055	0.03	0.0000078	2.82E-04	1		V	Yes	5E-05	1E-02	1E-04	4E-03	2E-02	6E-06	1E-03	2E-02
																		Hazard Index	16

Parameter	Adult Resident								Resident-Adjusted							
	Ingestion		Inhalation		Dermal			Total	Ingestion		Inhalation		Dermal			Total
	ADD (mg/kg-d)	Hazard	ADC (mg/m^3)	Hazard	EvF (cm/ev)	ADD (mg/kg-d)	Hazard	Hazard	LADD (mg/kg-d)	Risk	LAC $(\mu g/m^3)$	Risk	EvF (cm/ev)	LADD (mg/kg-d)	Risk	Risk
Aluminum	1E-03	1E-03			7E-04	6E-06	6E-06	1E-03								
Arsenic	9E-04	3E+00			7E-04	5E-06	2E-02	3E+00	4E-04	6E-04			7E-04	2E-06	3E-06	6E-04
Cadmium	4E-06	4E-02			7E-04	5E-07	5E-03	5E-02								
Chromium VI	1E-03	4E-01			1E-03	5E-04	2E-01	6E-01	2E-03	8E-04			1E-03	7E-04	3E-04	1E-03
Iron	2E-02	4E-02			7E-04	1E-04	2E-04	4E-02								
Manganese	1E-04	5E-03			7E-04	2E-05	7E-04	5E-03								
Mercury	9E-04	3E+00			7E-04	7E-05	2E-01	3E+00								
Nickel	8E-04	4E-02			1E-04	2E-05	1E-03	4E-02								
Selenium	3E-04	7E-02			7E-04	2E-06	4E-04	7E-02								
Vanadium	1E-02	2E+00			7E-04	2E-03	5E-01	3E+00								
Benzo(a)anthracene									5E-06	5E-07	2E-02	1E-06				2E-06
Benzo(a)pyrene	5E-06	2E-02						2E-02	6E-06	6E-06						6E-06
Benzo(b)fluoranthene									6E-06	6E-07						6E-07
Dibenzo(a,h)anthracene									2E-05	2E-05						2E-05
Indeno(1,2,3-cd)pyrene									8E-06	8E-07						8E-07
Naphthalene	3E-05	1E-03	1E-04	4E-02	8E-02	2E-05	8E-04	4E-02								
Benzene	3E-05	7E-03	1E-04	4E-03	2E-02	4E-06	1E-03	1E-02	1E-05	6E-07	4E-02	3E-07	2E-02	2E-06	9E-08	1E-06
							Hazard Index	10							Total ELCR	2E-03

V: Volatile; inhalation only calculated if volatile

Dermal only calculated if in effective predictive domain (In EPD)

EvF: Event Factor

(highlighted) HQ > 0.1 or ELCR > 10^{-6}

Table 7-11b
Hazard/Risk Calculations - Groundwater South Ebenezer - CTE

												Child Resident								Adult Resident								Resident-Adjusted							
Parameter	Form	GW EPC	RfDo	SFo	RfC	IUR	1/VF + 1/PEF	GIABS	M	V	In	Ingestion		Inhalation		Dermal			Total	Ingestion		Inhalation		Dermal			Total	Ingestion		Inhalation		Dermal			Total
		(µg/L)	(mg/kg/d)	$(mg/kg/d)^{-1}$	(mg/m^3)	$(\mu g/m^3)^{-1}$	$(m^3/kg)^{-1}$				EPD	ADD (mg/kg-d)	Hazard	ADC (mg/m^3)	Hazard	EvF (cm/ev)	ADD (mg/kg-d)	Hazard	Hazard	ADD (mg/kg-d)	Hazard	ADC (mg/m^3)	Hazard	EvF (cm/ev)	ADD (mg/kg-d)	Hazard	Hazard	LADD (mg/kg-d)	Risk	LAC $(\mu g/m^3)$	Risk	EvF (cm/ev)	LADD (mg/kg-d)	Risk	Risk
Aluminum		38	1		0.005		7.35E-10	1			Yes	1E-03	1E-03			3E-04	5E-06	5E-06	1E-03	6E-04	6E-04			3E-04	2E-06	2E-06	6E-04								
Arsenic		30	0.0003	1.5	0.000015	0.0043	7.35E-10	1			Yes	9E-04	3E+00			3E-04	4E-06	1E-02	3E+00	4E-04	1E+00			3E-04	2E-06	6E-03	1E+00	7E-05	1E-04			3E-04	3E-07	4E-07	1E-04
Cadmium	water	0.14	0.0001		0.00001	0.0018	7.35E-10	0.05			Yes	4E-06	4E-02			3E-04	4E-07	4E-03	4E-02	2E-06	2E-02			3E-04	2E-07	2E-03	2E-02								
Chromium VI		40	0.003	0.5	0.0001	0.084	7.35E-10	0.025	M		Yes	1E-03	4E-01			7E-04	4E-04	1E-01	5E-01	6E-04	2E-01			5E-04	2E-04	6E-02	3E-01	9E-04	4E-04			5E-04	3E-04	1E-04	6E-04
Iron		820	0.7				7.35E-10	1			Yes	2E-02	3E-02			3E-04	1E-04	2E-04	3E-02	1E-02	2E-02			3E-04	5E-05	7E-05	2E-02								
Manganese	water	3.9	0.024		0.00005		7.35E-10	0.04			Yes	1E-04	5E-03			3E-04	1E-05	5E-04	5E-03	6E-05	2E-03			3E-04	6E-06	2E-04	3E-03								
Mercury	salts	31	0.0003		0.0003		7.35E-10	0.07			Yes	9E-04	3E+00			3E-04	6E-05	2E-01	3E+00	4E-04	1E+00			3E-04	3E-05	9E-02	2E+00								
Nickel		28	0.02		0.00009	0.00026	7.35E-10	0.04			Yes	8E-04	4E-02			7E-05	2E-05	9E-04	4E-02	4E-04	2E-02			5E-05	8E-06	4E-04	2E-02								
Selenium		12	0.005		0.02		7.35E-10	1			Yes	3E-04	7E-02			3E-04	2E-06	3E-04	7E-02	2E-04	3E-02			3E-04	7E-07	1E-04	3E-02								
Vanadium		385	0.005		0.0001		7.35E-10	0.026			Yes	1E-02	2E+00			3E-04	2E-03	4E-01	3E+00	6E-03	1E+00			3E-04	9E-04	2E-01	1E+00								
Benzo(a)anthracene		0.14		0.1		0.00006	2.27E-07	1	M	V	No																	3E-06	3E-07	2E-02	1E-06				1E-06
Benzo(a)pyrene		0.16	0.0003	1	0.000002	0.0006	7.35E-10	1	M		No	5E-06	2E-02						2E-02	2E-06	8E-03						8E-03	3E-06	3E-06						3E-06
Benzo(b)fluoranthene		0.15		0.1		0.00006	7.35E-10	1	M		No																	3E-06	3E-07						3E-07
Dibenzo(a,h)anthracene		0.59		1		0.0006	7.35E-10	1	M		No																	1E-05	1E-05						1E-05
Indeno(1,2,3-cd)pyrene		0.21		0.1		0.00006	7.35E-10	1	M		No																	4E-06	4E-07						4E-07
Naphthalene		0.84	0.02		0.003		2.16E-05	1		V	Yes	2E-05	1E-03	1E-04	4E-02	5E-02	2E-05	9E-04	4E-02	1E-05	6E-04	1E-04	4E-02	5E-02	9E-06	5E-04	4E-02								
Benzene		0.91	0.004	0.055	0.03	0.0000078	2.82E-04	1		V	Yes	3E-05	7E-03	1E-04	4E-03	1E-02	5E-06	1E-03	1E-02	1E-05	3E-03	1E-04	4E-03	1E-02	2E-06	6E-04	8E-03	2E-06	1E-07	1E-02	1E-07	1E-02	4E-07	2E-08	2E-07
																		Hazard Index	9							Hazard Index	5							Total ELCR	7E-04

V: Volatile; inhalation only calculated if volatile
Dermal only calculated if in effective predictive domain (In EPD)

EvF: Event Factor

(highlighted) HQ > 0.1 or ELCR > 10^{-6}

Table 7-12
Vapor Intrusion Evaluation - Hypothetical Resident and Site Worker

Chemical	Residential Target Groundwater Concentration (µg/L)	Commercial/Industrial Target Groundwater Concentration (µg/L)	S Satilla EPC (µg/L)	S Satilla EPC > Screening?	N Satilla EPC (µg/L)	N Satilla EPC > Screening?
1,2,4-Trichlorobenzene	3.6E+01	1.5E+02	1.3E-03	No	2.6E-04	No
1,2,4-Trimethylbenzene	2.5E+02	1.0E+03	5.6E-02	No	2.1E-01	No
1,2-Dichlorobenzene	2.7E+03	1.1E+04	4.8E-02	No	3.1E-04	No
1,3,5-Trimethylbenzene	1.8E+02	7.3E+02	8.8E-03	No	5.7E-02	No
1,4-Dichlorobenzene	2.6E+00	1.1E+01	7.5E-03	No	3.5E-03	No
Benzene	1.6E+00	6.9E+00	2.2E-03	No	2.1E-02	No
Chlorobenzene	4.1E+02	1.7E+03	4.7E-02	No	8.7E-04	No
Ethylbenzene	3.5E+00	1.5E+01	7.6E-04	No	ND	
m&p-Xylene	3.6E+02	1.5E+03	1.1E-02	No	1.1E+00	No
Naphthalene	4.6E+00	2.0E+01	5.6E-03	No	1.2E-01	No
o-Xylene	4.9E+02	2.1E+03	3.2E-03	No	6.3E-02	No
Trichloroethene	1.2E+00	7.4E+00	ND		3.5E-04	No

Target groundwater concentrations from VISL (TCR=1E-6 or THQ=1)

Table 7-13

Hazard/Risk Calculations - Trench Vapors Excavation Worker - North Satilla

								RME				CTE			
Parameter	**Form**	**GW EPC (µg/L)**	**Subchronic RfC (mg/m^3)**	**IUR ($µg/m^3$)$^{-1}$**	**V**	**Trench VF (L/m^3)**	**Ct ($µg/m^3$)**	**Inhalation**		**Inhalation**		**Inhalation**		**Inhalation**	
								ADD (mg/m^3)	**Hazard**	**LAC ($µg/m^3$)**	**Risk**	**ADD (mg/m^3)**	**Hazard**	**LAC ($µg/m^3$)**	**Risk**
Aluminum		125100	5.0E-03												
Antimony		0.18	1.0E-03												
Arsenic		35	1.5E-05	4.3E-03											
Barium		860	5.0E-03												
Beryllium		3.6	2.0E-05	2.4E-03											
Cadmium	water	0.86	1.0E-05	1.8E-03											
Cobalt		7.7	2.0E-05	9.0E-03											
Copper		10													
Iron		15990													
Lead		63													
Manganese	water	722	5.0E-05												
Mercury	salts	3.8	3.0E-04												
Nickel		60	2.0E-04	2.6E-04											
Selenium		7.7	2.0E-02												
Thallium		0.15													
Vanadium		888	1.0E-04												
Zinc		124													
1,2,4-Trichlorobenzene		0.26	2.0E-02		V	9.56E+00	2.49E+00	1E-04	7E-03			1E-04	7E-03		
1,2-Dichlorobenzene		0.31	2.0E+00		V	1.07E+01	3.37E+00	2E-04	1E-04			2E-04	1E-04		
1,3-Dichlorobenzene		3.5	2.0E+00		V	1.07E+01	3.70E+01	2E-03	1E-03			2E-03	1E-03		
1,4-Dichlorobenzene		3.5	1.2E+00	1.1E-05	V	1.08E+01	3.81E+01	2E-03	2E-03	2E-02	2E-07	2E-03	2E-03	7E-03	8E-08
1-Methyl Naphthalene		58			V	1.01E+01	5.82E+02								
2-Methylnaphthalene		88			V	1.01E+01	8.93E+02								
Benzo(a)anthracene		0.094		6.0E-05	V	1.67E+00	1.58E-01			7E-05	4E-09			3E-05	2E-09
Benzo(a)pyrene		0.075	2.0E-06	6.0E-04											
Benzo(b)fluoranthene		0.078		6.0E-05											
Dibenzo(a,h)anthracene		0.17		6.0E-04											
Dibenzofuran		0.28			V	8.22E+00	2.32E+00								
Indeno(1,2,3-cd)pyrene		0.046		6.0E-05											
Naphthalene		121		3.4E-05	V	1.05E+01	1.27E+03			5E-01	2E-05			2E-01	8E-06
1,1,2-Trichloroethane		22	1.1E-02	1.6E-05	V	1.08E+01	2.38E+02	1E-02	1E+00	1E-01	2E-06	1E-02	1E+00	5E-02	7E-07
1,1-Dichloroethane		0.81		1.6E-06	V	1.33E+01	1.08E+01			5E-03	7E-09			2E-03	3E-09
1,1-Dichloropropene		0.34	2.0E-02	4.0E-06	V	1.25E+01	4.29E+00	3E-04	1E-02	2E-03	7E-09	3E-04	1E-02	8E-04	3E-09
1,2,3-Trichloropropane		0.46	3.0E-04		V	9.48E+00	4.36E+00	3E-04	9E-01			3E-04	9E-01		
1,2,4-Trimethylbenzene		205	2.0E-01		V	1.21E+01	2.48E+03	1E-01	7E-01			1E-01	7E-01		
1,2-Dibromoethane		0.15	2.0E-03	6.0E-04	V	9.01E+00	1.35E+00	8E-05	4E-02	6E-04	3E-07	8E-05	4E-02	3E-04	2E-07
1,2-Dichloropropane		3.0	4.0E-03	3.7E-06	V	1.23E+01	3.65E+01	2E-03	5E-01	2E-02	6E-08	2E-03	5E-01	7E-03	3E-08
1,3,5-Trimethylbenzene		57	2.0E-01		V	1.21E+01	6.95E+02	4E-02	2E-01			4E-02	2E-01		
Acetone		47	3.1E+01		V	6.17E+00	2.90E+02	2E-02	6E-04			2E-02	6E-04		
Benzene		21	8.0E-02	7.8E-06	V	1.50E+01	3.10E+02	2E-02	2E-01	1E-01	1E-06	2E-02	2E-01	6E-02	5E-07
Bromodichloromethane		0.56	2.0E-02	3.7E-05	V	1.02E+01	5.70E+00	3E-04	2E-02	2E-03	9E-08	3E-04	2E-02	1E-03	4E-08
Chlorobenzene		0.87	5.0E-01		V	1.24E+01	1.08E+01	6E-04	1E-03			6E-04	1E-03		
Chloroform		0.40	2.4E-01	2.3E-05	V	1.20E+01	4.76E+00	3E-04	1E-03	2E-03	5E-08	3E-04	1E-03	9E-04	2E-08
cis-1,2-Dichloroethene		0.13			V	1.34E+01	1.79E+00								
Ethyl benzene		267	9.0E+00	2.5E-06	V	1.29E+01	3.44E+03	2E-01	2E-02	1E+00	4E-06	2E-01	2E-02	7E-01	2E-06
Isopropylbenzene		21	9.0E-02		V	1.21E+01	2.55E+02	2E-02	2E-01			2E-02	2E-01		
m&p-Xylene		1052	4.0E-01		V	1.29E+01	1.35E+04	8E-01	2E+00			8E-01	2E+00		
o-Xylene		63	4.0E-01		V	1.28E+01	8.09E+02	5E-02	1E-01			5E-02	1E-01		
Toluene		265	5.0E+00		V	1.38E+01	3.66E+03	2E-01	4E-02			2E-01	4E-02		
Trichloroethene		0.35	2.2E-03	4.1E-06	V	4.52E-04	1.57E-04	9E-09	4E-06	7E-08	3E-13	9E-09	4E-06	3E-08	1E-13
Total									**6E+00**		**3E-05**		**6E+00**		**1E-05**

V: Volatile; inhalation only calculated if volatile

(shaded) HQ > 0.1 or ELCR > 10^{-6}

Table 7-14

Hazard/Risk Calculations - Trench Vapors Excavation Worker - South Satilla

Parameter	Form	GW EPC (µg/L)	Subchronic RfC (mg/m^3)	IUR (µg/m^3)$^{-1}$	Trench VF (L/m^3)	Ct (µg/m^3)	RME Inhalation ADD (mg/m^3)	RME Inhalation Hazard	RME Inhalation LAC (µg/m^3)	RME Inhalation Risk	CTE Inhalation ADD (mg/m^3)	CTE Inhalation Hazard	CTE Inhalation LAC (µg/m^3)	CTE Inhalation Risk
Aluminum		29000	5.0E-03											
Antimony		0.71	1.0E-03											
Arsenic		22	1.5E-05	4.3E-03										
Barium		529	5.0E-03											
Beryllium		19.4	2.0E-05	2.4E-03										
Cadmium	water	0.44	1.0E-05	1.8E-03										
Chromium	VI	65.8	1.0E-04	8.4E-02										
Cobalt		3.2	2.0E-05	9.0E-03										
Copper		15												
Iron		10920												
Lead		26												
Manganese	water	178	5.0E-05											
Mercury	salts	11.0	3.0E-04											
Methyl mercury		0.22												
Nickel		53	2.0E-04	2.6E-04										
Selenium		8.1	2.0E-02											
Thallium		0.24												
Vanadium		1116	1.0E-04											
Zinc		48												
1,2,4-Trichlorobenzene		1.29	2.0E-02		9.56E+00	1.23E+01	7E-04	4E-02			7E-04	4E-02		
1,2-Dichlorobenzene		48.20	2.0E+00		1.07E+01	5.16E+02	3E-02	2E-02			3E-02	2E-02		
1,3-Dichlorobenzene		1.7	2.0E+00		1.07E+01	1.86E+01	1E-03	6E-04			1E-03	6E-04		
1,4-Dichlorobenzene		7.5	1.2E+00	1.1E-05	1.08E+01	8.04E+01	5E-03	4E-03	3E-02	4E-07	5E-03	4E-03	2E-02	2E-07
1-Methyl Naphthalene		4			1.01E+01	4.41E+01								
2-Methylnaphthalene		5			1.01E+01	5.19E+01								
Benzo(a)anthracene		0.25		6.0E-05	1.67E+00	4.18E-01			2E-04	1E-08			8E-05	5E-09
Benzo(a)pyrene		0.078	2.0E-06	6.0E-04										
Benzo(b)fluoranthene		0.12		6.0E-05										
Dibenzofuran		0.10			8.22E+00	8.01E-01								
Indeno(1,2,3-cd)pyrene		0.037		6.0E-05										
Naphthalene		5.6		3.4E-05	1.05E+01	5.87E+01			2E-02	8E-07			1E-02	4E-07
1,1,2,2-Tetrachloroethane		0.14		5.8E-05	8.99E+00	1.26E+00			5E-04	3E-08			2E-04	1E-08
1,1-Dichloroethane		0.73		1.6E-06	1.33E+01	9.67E+00			4E-03	7E-09			2E-03	3E-09
1,2,4-Trimethylbenzene		56	2.0E-01		1.21E+01	6.76E+02	4E-02	2E-01			4E-02	2E-01		
1,2-Dibromo-3-chloropropane		0.27	2.0E-03	6.0E-03	6.45E+00	1.74E+00	1E-04	5E-02	7E-04	4E-06	1E-04	5E-02	3E-04	2E-06
1,2-Dichloropropane		0.5	4.0E-03	3.7E-06	1.23E+01	6.14E+00	4E-04	9E-02	3E-03	1E-08	4E-04	9E-02	1E-03	4E-09
1,3,5-Trimethylbenzene		9	2.0E-01		1.21E+01	1.07E+02	6E-03	3E-02			6E-03	3E-02		
2-Hexanone		0.76	3.0E-02		8.18E+00	6.22E+00	4E-04	1E-02			4E-04	1E-02		
Acetone		10	3.1E+01		6.17E+00	6.17E+01	4E-03	1E-04			4E-03	1E-04		
Benzene		2	8.0E-02	7.8E-06	1.50E+01	3.22E+01	2E-03	2E-02	1E-02	1E-07	2E-03	2E-02	6E-03	5E-08
Bromodichloromethane		0.07	2.0E-02	3.7E-05	1.02E+01	6.92E-01	4E-05	2E-03	3E-04	1E-08	4E-05	2E-03	1E-04	5E-09
Chlorobenzene		47	5.0E-01		1.24E+01	5.75E+02	3E-02	7E-02			3E-02	7E-02		
cis-1,2-Dichloroethene		0.88			1.34E+01	1.17E+01								
Ethyl benzene		3.4	9.0E+00	2.5E-06	1.29E+01	4.35E+01	3E-03	3E-04	2E-02	5E-08	3E-03	3E-04	8E-03	2E-08
Isopropylbenzene		3.1	9.0E-02		1.21E+01	3.80E+01	2E-03	3E-02			2E-03	3E-02		
m&p-Xylene		11	4.0E-01		1.29E+01	1.44E+02	9E-03	2E-02			9E-03	2E-02		
o-Xylene		3	4.0E-01		1.28E+01	4.07E+01	2E-03	6E-03			2E-03	6E-03		
Toluene		0.65	5.0E+00		1.38E+01	8.94E+00	5E-04	1E-04			5E-04	1E-04		
Vinyl chloride		0.37	7.7E-02	4.4E-06	1.69E+01	6.24E+00	4E-04	5E-03	3E-03	1E-08	4E-04	5E-03	1E-03	5E-09
Total								**6E-01**		**6E-06**		**6E-01**		**3E-06**

V: Volatile; inhalation only calculated if volatile

(highlighted) HQ > 0.1 or ELCR > 10^{-6}

Table 7-15a
Hazard/Risk Calculations - Soil Site Worker - RME

Parameter	Form	Soil EPC (mg/kg)	RfDo (mg/kg/d)	SFo $(mg/kg/d)^{-1}$	RfC (mg/m^3)	IUR $(\mu g/m^3)^{-1}$	1/VF + 1/PEF $(m^3/kg)^{-1}$	GIABS	ABS	RBA	V	Ingestion				Inhalation				Dermal				Total	Total
												ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	ADC (mg/m^3)	LAC $(\mu g/m^3)$	Hazard	Risk	ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	Hazard	Risk
Arsenic		0.18522	0.0003	1.5	0.000015	0.0043	7.35E-10	1	0.03	0.6		8.6E-08	3.1E-08	2.9E-04	4.6E-08	2.8E-11	1.0E-08	1.9E-06	4.3E-11	1.8E-08	6.5E-09	6.0E-05	9.7E-09	3E-04	6E-08
Chromium	VI	1.13092	0.003	0.5	0.0001	0.084	7.35E-10	0.025		1		8.7E-07	3.1E-07	2.9E-04	1.6E-07	1.7E-10	6.1E-08	1.7E-06	5.1E-09					3E-04	2E-07
Cobalt		0.2716	0.0003		0.000006	0.009	7.35E-10	1		1		2.1E-07	7.5E-08	7.0E-04		4.1E-11	1.5E-08	6.8E-06	1.3E-10					7E-04	1E-10
Iron		695.94	0.7				7.35E-10	1		1		5.4E-04	1.9E-04	7.7E-04		1.1E-07	3.8E-05							8E-04	
Mercury	salts	12.586	0.0003		0.0003		7.35E-10	0.07		1		9.7E-06	3.5E-06	3.2E-02		1.9E-09	6.8E-07	6.3E-06						3E-02	
Aroclor-1254		0.20258	0.00002	2		0.00057	1.19E-06	1	0.14	1	V	1.6E-07	5.6E-08	7.8E-03	1.1E-07	4.9E-08	1.8E-05		1.0E-08	9.2E-08	3.3E-08	4.6E-03	6.6E-08	1E-02	2E-07
Aroclor-1260		0.38178		2		0.00057	7.64E-07	1	0.14	1	V	2.9E-07	1.1E-07		2.1E-07	6.0E-08	2.1E-05		1.2E-08	1.7E-07	6.2E-08		1.2E-07		3E-07
Aroclor-1268		5.2612	0.00002	2		0.00057	1.19E-06	1	0.14	1	V	4.1E-06	1.4E-06	2.0E-01	2.9E-06	1.3E-06	4.6E-04		2.6E-07	2.4E-06	8.6E-07	1.2E-01	1.7E-06	3E-01	5E-06
Benzo(a)anthracene		0.06986		0.1		0.00006	2.27E-07	1	0.13	1	V	5.4E-08	1.9E-08		1.9E-09	3.3E-09	1.2E-06		7.0E-11	3.0E-08	1.1E-08		1.1E-09		3E-09
Benzo(a)pyrene		0.08568	0.0003	1	0.000002	0.0006	7.35E-10	1	0.13	1		6.6E-08	2.4E-08	2.2E-04	2.4E-08	1.3E-11	4.6E-09	6.5E-06	2.8E-12	3.6E-08	1.3E-08	1.2E-04	1.3E-08	3E-04	4E-08
Benzo(b)fluoranthene		0.12992		0.1		0.00006	7.35E-10	1	0.13	1		1.0E-07	3.6E-08		3.6E-09	2.0E-11	7.0E-09		4.2E-13	5.5E-08	2.0E-08		2.0E-09		6E-09
Dibenzo(a,h)anthracene		0.03416		1		0.0006	7.35E-10	1	0.13	1		2.6E-08	9.4E-09		9.4E-09	5.2E-12	1.8E-09		1.1E-12	1.4E-08	5.2E-09		5.2E-09		1E-08
Total																								**4E-01**	**6E-06**

Table 7-15b
Hazard/Risk Calculations - Soil Site Worker - CTE

Parameter	Form	Soil EPC (mg/kg)	RfDo (mg/kg/d)	SFo (mg/kg/d)-1	RfC (mg/m3)	IUR (µg/m3)-1	1/VF + 1/PEF (m3/kg)-1	GIABS	ABS	RBA	V	Ingestion				Inhalation				Dermal				Total	
												ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	ADC (mg/m^3)	LAC $(\mu g/m^3)$	Hazard	Risk	ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	Hazard	Risk
Arsenic		0.18522	0.0003	1.5	0.000015	0.0043	7.35E-10	1	0.03	0.6		2.1E-08	2.7E-09	6.9E-05	4.0E-09	2.7E-11	3.5E-09	1.8E-06	1.5E-11	2.9E-09	3.8E-10	9.8E-06	5.7E-10	8E-05	5E-09
Chromium	VI	1.13092	0.003	0.5	0.0001	0.084	7.35E-10	0.025		1		2.1E-07	2.7E-08	7.1E-05	1.4E-08	1.7E-10	2.1E-08	1.7E-06	1.8E-09					7E-05	2E-08
Cobalt		0.2716	0.0003		0.000006	0.009	7.35E-10	1		1		5.1E-08	6.5E-09	1.7E-04		4.0E-11	5.1E-09	6.7E-06	4.6E-11					2E-04	5E-11
Iron		695.94	0.7				7.35E-10	1		1		1.3E-04	1.7E-05	1.9E-04		1.0E-07	1.3E-05							2E-04	
Mercury	salts	12.586	0.0003		0.0003		7.35E-10	0.07		1		2.4E-06	3.0E-07	7.9E-03		1.9E-09	2.4E-07	6.2E-06						8E-03	
Aroclor-1254		0.20258	0.00002	2		0.00057	1.19E-06	1	0.14	1	V	3.8E-08	4.9E-09	1.9E-03	9.8E-09	4.8E-08	6.2E-06		3.5E-09	1.5E-08	1.9E-09	7.5E-04	3.9E-09	3E-03	2E-08
Aroclor-1260		0.38178		2		0.00057	7.64E-07	1	0.14	1	V	7.2E-08	9.2E-09		1.8E-08	5.8E-08	7.5E-06		4.3E-09	2.8E-08	3.6E-09		7.3E-09		3E-08
Aroclor-1268		5.2612	0.00002	2		0.00057	1.19E-06	1	0.14	1	V	9.9E-07	1.3E-07	4.9E-02	2.5E-07	1.2E-06	1.6E-04		9.2E-08	3.9E-07	5.0E-08	1.9E-02	1.0E-07	7E-02	4E-07
Benzo(a)anthracene		0.06986		0.1		0.00006	2.27E-07	1	0.13	1	V	1.3E-08	1.7E-09		1.7E-10	3.2E-09	4.1E-07		2.5E-11	4.8E-09	6.2E-10		6.2E-11		3E-10
Benzo(a)pyrene		0.08568	0.0003	1	0.000002	0.0006	7.35E-10	1	0.13	1		1.6E-08	2.1E-09	5.4E-05	2.1E-09	1.3E-11	1.6E-09	6.3E-06	9.7E-13	5.9E-09	7.6E-10	2.0E-05	7.6E-10	8E-05	3E-09
Benzo(b)fluoranthene		0.12992		0.1		0.00006	7.35E-10	1	0.13	1		2.4E-08	3.1E-09		3.1E-10	1.9E-11	2.5E-09		1.5E-13	8.9E-09	1.1E-09		1.1E-10		4E-10
Dibenzo(a,h)anthracene		0.03416		1		0.0006	7.35E-10	1	0.13	1		6.4E-09	8.2E-10		8.2E-10	5.0E-12	6.5E-10		3.9E-13	2.3E-09	3.0E-10		3.0E-10		1E-09
Total																								**8E-02**	**5E-07**

V: Volatile; inhalation only calculated if volatile

HQ > 0.1 or ELCR > 10^{-6}

Table 7-16a

Hazard/Risk Calculations - Soil Excavation Worker - RME

Parameter	Form	Soil EPC	Subchronic RfDo	SFo	Subchronic RfC	IUR	Subchronic 1/VF + 1/PEF	GIABS	ABS	RBA	M	V	Ingestion ADD	Ingestion LADD	Ingestion Hazard	Ingestion Risk	Inhalation ADC	Inhalation LAC	Inhalation Hazard	Inhalation Risk	Dermal ADD	Dermal LADD	Dermal Hazard	Dermal Risk	Total Hazard	Total Risk
		(mg/kg)	(mg/kg/d)	$(mg/kg/d)^{-1}$	(mg/m^3)	$(\mu g/m^3)^{-1}$	$(m^3/kg)^{-1}$						(mg/kg-d)	(mg/kg-d)			(mg/m^3)	$(\mu g/m^3)$			(mg/kg-d)	(mg/kg-d)				
Arsenic		1.36224	0.0003	1.5	0.000015	0.0043	2.99E-10	1	0.03	0.6			2.4E-06	1.7E-08	8.0E-03	2.6E-08	9.7E-11	6.9E-10	6.5E-06	3.0E-12	3.9E-07	2.8E-09	1.3E-03	4.1E-09	9E-03	3E-08
Chromium	VI	4.13952	0.003	0.5	0.0001	0.084	2.99E-10	0.025		1	M		1.2E-05	8.7E-08	4.1E-03	4.3E-08	3.0E-10	2.1E-09	3.0E-06	1.8E-10					4E-03	4E-08
Cobalt		1.21704	0.003		0.00002	0.009	2.99E-10	1		1			3.6E-06	2.6E-08	1.2E-03		8.7E-11	6.2E-10	4.3E-06	5.6E-12					1E-03	6E-12
Iron		3833.28	0.7				2.99E-10	1		1			1.1E-02	8.0E-05	1.6E-02		2.7E-07	1.9E-06							2E-02	
Lead		71.808					2.99E-10	1		1			2.1E-04	1.5E-06			5.1E-09	3.6E-08								
Mercury	elemental	118.602			0.0003		6.33E-04	1		1		V	3.5E-04	2.5E-06			1.8E-02	1.3E-01	6.0E+01						6E+01	
Mercury	salts	118.602	0.002		0.0003		2.99E-10	0.07		1			3.5E-04	2.5E-06	1.7E-01		8.5E-09	6.0E-08	2.8E-05						2E-01	
Aroclor-1254		12.3354	0.00003	2		0.00057	1.25E-06	1	0.14	1		V	3.6E-05	2.6E-07	1.2E+00	5.2E-07	3.7E-06	2.6E-05		1.5E-08	1.6E-05	1.2E-07	5.4E-01	2.3E-07	2E+00	8E-07
Aroclor-1260		12.4476		2		0.00057	8.04E-07	1	0.14	1		V	3.7E-05	2.6E-07		5.2E-07	2.4E-06	1.7E-05		9.7E-09	1.6E-05	1.2E-07		2.3E-07		8E-07
Aroclor-1268		41.481	0.00003	2		0.00057	1.25E-06	1	0.14	1		V	1.2E-04	8.7E-07	4.1E+00	1.7E-06	1.2E-05	8.8E-05		5.0E-08	5.5E-05	3.9E-07	1.8E+00	7.8E-07	6E+00	3E-06
Benzo(a)anthracene		6.732		0.1		0.00006	2.40E-07	1	0.13	1	M	V	2.0E-05	1.4E-07		1.4E-08	3.8E-07	2.7E-06		1.6E-10	8.3E-06	5.9E-08		5.9E-09		2E-08
Benzo(a)pyrene		7.0158	0.0003	1	0.000002	0.0006	2.99E-10	1	0.13	1	M		2.1E-05	1.5E-07	6.9E-02	1.5E-07	5.0E-10	3.6E-09	2.5E-04	2.1E-12	8.6E-06	6.1E-08	2.9E-02	6.1E-08	1E-01	2E-07
Benzo(b)fluoranthene		0.75174		0.1		0.00006	2.99E-10	1	0.13	1	M		2.2E-06	1.6E-08		1.6E-09	5.4E-11	3.8E-10		2.3E-14	9.2E-07	6.6E-09		6.6E-10		2E-09
Benzo(b/k)fluoranthene		5.46942		0.1		0.00006	2.99E-10	1	0.13	1	M		1.6E-05	1.1E-07		1.1E-08	3.9E-10	2.8E-09		1.7E-13	6.7E-06	4.8E-08		4.8E-09		2E-08
Dibenzo(a,h)anthracene		7.0422		1		0.0006	2.99E-10	1	0.13	1	M		2.1E-05	1.5E-07		1.5E-07	5.0E-10	3.6E-09		2.1E-12	8.6E-06	6.2E-08		6.2E-08		2E-07
Total (using elemental mercury)																									**67**	
Total (using mercury salts)																									**8**	**5E-06**

Table 7-16b

Hazard/Risk Calculations - Soil Excavation Worker - CTE

Parameter	Form	Soil EPC	Subchronic RfDo	SFo	Subchronic RfC	IUR	Subchronic 1/VF + 1/PEF	GIABS	ABS	RBA	M	V	Ingestion ADD	Ingestion LADD	Ingestion Hazard	Ingestion Risk	Inhalation ADC	Inhalation LAC	Inhalation Hazard	Inhalation Risk	Dermal ADD	Dermal LADD	Dermal Hazard	Dermal Risk	Total Hazard	Total Risk
		(mg/kg)	(mg/kg/d)	$(mg/kg/d)^{-1}$	(mg/m^3)	$(\mu g/m^3)^{-1}$	$(m^3/kg)^{-1}$						(mg/kg-d)	(mg/kg-d)			(mg/m^3)	$(\mu g/m^3)$			(mg/kg-d)	(mg/kg-d)				
Arsenic		1.36224	0.0003	1.5	0.000015	0.0043	2.99E-10	1	0.03	0.6			7.3E-07	2.4E-09	2.4E-03	3.6E-09	9.7E-11	3.2E-10	6.5E-06	1.4E-12	6.9E-08	2.3E-10	2.3E-04	3.4E-10	3E-03	4E-09
Chromium	VI	4.13952	0.003	0.5	0.0001	0.084	2.99E-10	0.025		1	M		3.7E-06	1.2E-08	1.2E-03	6.1E-09	2.9E-10	9.7E-10	2.9E-06	8.1E-11					1E-03	6E-09
Cobalt		1.21704	0.003		0.00002	0.009	2.99E-10	1		1			1.1E-06	3.6E-09	3.6E-04		8.6E-11	2.8E-10	4.3E-06	2.6E-12					4E-04	3E-12
Iron		3833.28	0.7				2.99E-10	1		1			3.4E-03	1.1E-05	4.9E-03		2.7E-07	9.0E-07							5E-03	
Lead		71.808					2.99E-10	1		1			6.4E-05	2.1E-07			5.1E-09	1.7E-08								
Mercury	elemental	118.602			0.0003		6.33E-04	1		1		V	1.1E-04	3.5E-07			1.8E-02	5.9E-02	5.9E+01						6E+01	
Mercury	salts	118.602	0.002		0.0003		2.99E-10	0.07		1			1.1E-04	3.5E-07	5.3E-02		8.4E-09	2.8E-08	2.8E-05						5E-02	
Aroclor-1254		12.3354	0.00003	2		0.00057	1.25E-06	1	0.14	1		V	1.1E-05	3.6E-08	3.7E-01	7.2E-08	3.7E-06	1.2E-05		6.9E-09	2.9E-06	9.6E-09	9.7E-02	1.9E-08	5E-01	1E-07
Aroclor-1260		12.4476		2		0.00057	8.04E-07	1	0.14	1		V	1.1E-05	3.6E-08		7.3E-08	2.4E-06	7.8E-06		4.5E-09	2.9E-06	9.7E-09		1.9E-08		1E-07
Aroclor-1268		41.481	0.00003	2		0.00057	1.25E-06	1	0.14	1		V	3.7E-05	1.2E-07	1.2E+00	2.4E-07	1.2E-05	4.1E-05		2.3E-08	9.8E-06	3.2E-08	3.3E-01	6.5E-08	2E+00	3E-07
Benzo(a)anthracene		6.732		0.1		0.00006	2.40E-07	1	0.13	1	M	V	6.0E-06	2.0E-08		2.0E-09	3.8E-07	1.3E-06		7.6E-11	1.5E-06	4.9E-09		4.9E-10		3E-09
Benzo(a)pyrene		7.0158	0.0003	1	0.000002	0.0006	2.99E-10	1	0.13	1	M		6.2E-06	2.1E-08	2.1E-02	2.1E-08	5.0E-10	1.6E-09	2.5E-04	9.8E-13	1.5E-06	5.1E-09	5.1E-03	5.1E-09	3E-02	3E-08
Benzo(b)fluoranthene		0.75174		0.1		0.00006	2.99E-10	1	0.13	1	M		6.7E-07	2.2E-09		2.2E-10	5.3E-11	1.8E-10		1.1E-14	1.7E-07	5.4E-10		5.4E-11		3E-10
Benzo(b/k)fluoranthene		5.46942		0.1		0.00006	2.99E-10	1	0.13	1	M		4.9E-06	1.6E-08		1.6E-09	3.9E-10	1.3E-09		7.7E-14	1.2E-06	4.0E-09		4.0E-10		2E-09
Dibenzo(a,h)anthracene		7.0422		1		0.0006	2.99E-10	1	0.13	1	M		6.3E-06	2.1E-08		2.1E-08	5.0E-10	1.6E-09		9.9E-13	1.5E-06	5.1E-09		5.1E-09		3E-08
Total (using elemental mercury)																									**61**	
Total (using mercury salts)																									**2**	**6E-07**

V: Volatile; inhalation only calculated if volatile

(highlighted) HQ > 0.1 or ELCR > 10^{-6}

Table 7-17a
Hazard/Risk Calculations - Soil Adolescent Trespasser (Current) - RME

Parameter	Form	Soil EPC	RfDo	SFo	RfC	IUR	1/VF + 1/PEF	GIABS	ABS	RBA	M	V	Ingestion				Inhalation				Dermal				Total	
		(mg/kg)	(mg/kg/d)	(mg/kg/d)-1	(mg/m3)	(µg/m3)-1	(m3/kg)-1						ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	ADC (mg/m^3)	LAC (µg/m^3)	Hazard	Risk	ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	Hazard	Risk
Arsenic		0.18522	0.0003	1.5	0.000015	0.0043	7.35294E-10	1	0.03	0.6			8.1E-09	1.2E-09	2.7E-05	1.7E-09	1.5E-12	2.1E-10	1.0E-07	9.2E-13	6.4E-09	9.1E-10	2.1E-05	1.4E-09	5E-05	3E-09
Chromium	VI	1.13092	0.003	0.5	0.0001	0.084	7.35294E-10	0.025		1	M		8.3E-08	1.2E-08	2.8E-05	5.9E-09	9.1E-12	1.3E-09	9.1E-08	1.1E-10					3E-05	6E-09
Cobalt		0.2716	0.0003		0.000006	0.009	7.35294E-10	1		1			2.0E-08	2.8E-09	6.6E-05		2.2E-12	3.1E-10	3.6E-07	2.8E-12					7E-05	3E-12
Iron		695.94	0.7				7.35294E-10	1		1			5.1E-05	7.3E-06	7.3E-05		5.6E-09	8.0E-07							7E-05	
Mercury	salts	12.586	0.0003		0.0003		7.35294E-10	0.07		1			9.2E-07	1.3E-07	3.1E-03		1.0E-10	1.4E-08	3.4E-07						3E-03	
Aroclor-1254		0.20258	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	1.5E-08	2.1E-09	7.4E-04	4.2E-09	2.6E-09	3.8E-07		2.1E-10	3.3E-08	4.7E-09	1.6E-03	9.3E-09	2E-03	1E-08
Aroclor-1260		0.38178		2		0.00057	7.64094E-07	1	0.14	1		V	2.8E-08	4.0E-09		8.0E-09	3.2E-09	4.6E-07		2.6E-10	6.2E-08	8.8E-09		1.8E-08		3E-08
Aroclor-1268		5.2612	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	3.8E-07	5.5E-08	1.9E-02	1.1E-07	6.8E-08	9.8E-06		5.6E-09	8.5E-07	1.2E-07	4.2E-02	2.4E-07	6E-02	4E-07
Benzo(a)anthracene		0.06986		0.1		0.00006	2.27493E-07	1	0.13	1	M	V	5.1E-09	7.3E-10		7.3E-11	1.7E-10	2.5E-08		1.5E-12	1.0E-08	1.5E-09		1.5E-10		2E-10
Benzo(a)pyrene		0.08568	0.0003	1	0.000002	0.0006	7.35294E-10	1	0.13	1	M		6.3E-09	8.9E-10	2.1E-05	8.9E-10	6.9E-13	9.9E-11	3.5E-07	5.9E-14	1.3E-08	1.8E-09	4.3E-05	1.8E-09	6E-05	3E-09
Benzo(b)fluoranthene		0.12992		0.1		0.00006	7.35294E-10	1	0.13	1	M		9.5E-09	1.4E-09		1.4E-10	1.0E-12	1.5E-10		9.0E-15	1.9E-08	2.8E-09		2.8E-10		4E-10
Dibenzo(a,h)anthracene		0.03416		1		0.0006	7.35294E-10	1	0.13	1	M		2.5E-09	3.6E-10		3.6E-10	2.8E-13	3.9E-11		2.4E-14	5.1E-09	7.3E-10		7.3E-10		1E-09
Total																									**7E-02**	**4E-07**

Table 7-17b
Hazard/Risk Calculations - Soil Adolescent Trespasser (Current) - CTE

Parameter	Form	Soil EPC	RfDo	SFo	RfC	IUR	1/VF + 1/PEF	GIABS	ABS	RBA	M	V	Ingestion				Inhalation				Dermal				Total	
		(mg/kg)	(mg/kg/d)	(mg/kg/d)-1	(mg/m3)	(µg/m3)-1	(m3/kg)-1						ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	ADC (mg/m^3)	LAC (µg/m^3)	Hazard	Risk	ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	Hazard	Risk
Arsenic		0.18522	0.0003	1.5	0.000015	0.0043	7.35294E-10	1	0.03	0.6			4.1E-10	5.8E-11	1.4E-06	8.7E-11	3.7E-13	5.3E-11	2.5E-08	2.3E-13	5.6E-10	8.0E-11	1.9E-06	1.2E-10	3E-06	2E-10
Chromium	VI	1.13092	0.003	0.5	0.0001	0.084	7.35294E-10	0.025		1	M		4.1E-09	5.9E-10	1.4E-06	3.0E-10	2.3E-12	3.3E-10	2.3E-08	2.7E-11					1E-06	3E-10
Cobalt		0.2716	0.0003		0.000006	0.009	7.35294E-10	1		1			9.9E-10	1.4E-10	3.3E-06		5.5E-13	7.8E-11	9.1E-08	7.0E-13					3E-06	7E-13
Iron		695.94	0.7				7.35294E-10	1		1			2.5E-06	3.6E-07	3.6E-06		1.4E-09	2.0E-07							4E-06	
Mercury	salts	12.586	0.0003		0.0003		7.35294E-10	0.07		1			4.6E-08	6.6E-09	1.5E-04		2.5E-11	3.6E-09	8.5E-08						2E-04	
Aroclor-1254		0.20258	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	7.4E-10	1.1E-10	3.7E-05	2.1E-10	6.6E-10	9.4E-08		5.4E-11	2.8E-09	4.1E-10	1.4E-04	8.1E-10	2E-04	1E-09
Aroclor-1260		0.38178		2		0.00057	7.64094E-07	1	0.14	1		V	1.4E-09	2.0E-10		4.0E-10	8.0E-10	1.1E-07		6.5E-11	5.4E-09	7.7E-10		1.5E-09		2E-09
Aroclor-1268		5.2612	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	1.9E-08	2.7E-09	9.6E-04	5.5E-09	1.7E-08	2.4E-06		1.4E-09	7.4E-08	1.1E-08	3.7E-03	2.1E-08	5E-03	3E-08
Benzo(a)anthracene		0.06986		0.1		0.00006	2.27493E-07	1	0.13	1	M	V	2.6E-10	3.6E-11		3.6E-12	4.4E-11	6.2E-09		3.7E-13	9.1E-10	1.3E-10		1.3E-11		2E-11
Benzo(a)pyrene		0.08568	0.0003	1	0.000002	0.0006	7.35294E-10	1	0.13	1	M		3.1E-10	4.5E-11	1.0E-06	4.5E-11	1.7E-13	2.5E-11	8.6E-08	1.5E-14	1.1E-09	1.6E-10	3.7E-06	1.6E-10	5E-06	2E-10
Benzo(b)fluoranthene		0.12992		0.1		0.00006	7.35294E-10	1	0.13	1	M		4.7E-10	6.8E-11		6.8E-12	2.6E-13	3.7E-11		2.2E-15	1.7E-09	2.4E-10		2.4E-11		3E-11
Dibenzo(a,h)anthracene		0.03416		1		0.0006	7.35294E-10	1	0.13	1	M		1.2E-10	1.8E-11		1.8E-11	6.9E-14	9.8E-12		5.9E-15	4.5E-10	6.4E-11		6.4E-11		8E-11
Total																									**5E-03**	**3E-08**

V: Volatile; inhalation only calculated if volatile

HQ > 0.1 or ELCR > 10^{-6}

Table 7-18a
Hazard/Risk Calculations - Soil Adolescent Trespasser (Future) - RME

Parameter	Form	Soil EPC	RfDo	SFo	RfC	IUR	1/VF + 1/PEF	GIABS	ABS	RBA	M	V	Ingestion				Inhalation				Dermal				Total	
		(mg/kg)	(mg/kg/d)	(mg/kg/d)-1	(mg/m3)	(µg/m3)-1	(m3/kg)-1						ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	ADC (mg/m^3)	LAC (µg/m^3)	Hazard	Risk	ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	Hazard	Risk
Arsenic		0.18522	0.0003	1.5	0.000015	0.0043	7.35294E-10	1	0.03	0.6			1.8E-08	2.5E-09	5.9E-05	3.8E-09	3.2E-12	4.6E-10	2.2E-07	2.0E-12	1.4E-08	2.0E-09	4.6E-05	3.0E-09	1E-04	7E-09
Chromium	VI	1.13092	0.003	0.5	0.0001	0.084	7.35294E-10	0.025		1	M		1.8E-07	2.6E-08	6.0E-05	1.3E-08	2.0E-11	2.8E-09	2.0E-07	2.4E-10					6E-05	1E-08
Cobalt		0.2716	0.0003		0.000006	0.009	7.35294E-10	1		1			4.3E-08	6.1E-09	1.4E-04		4.7E-12	6.8E-10	7.9E-07	6.1E-12					1E-04	6E-12
Iron		695.94	0.7				7.35294E-10	1		1			1.1E-04	1.6E-05	1.6E-04		1.2E-08	1.7E-06							2E-04	
Mercury	salts	12.586	0.0003		0.0003		7.35294E-10	0.07		1			2.0E-06	2.8E-07	6.6E-03		2.2E-10	3.1E-08	7.3E-07						7E-03	
Aroclor-1254		0.20258	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	3.2E-08	4.6E-09	1.6E-03	9.2E-09	5.7E-09	8.2E-07		4.6E-10	7.1E-08	1.0E-08	3.5E-03	2.0E-08	5E-03	3E-08
Aroclor-1260		0.38178		2		0.00057	7.64094E-07	1	0.14	1		V	6.0E-08	8.6E-09		1.7E-08	6.9E-09	9.9E-07		5.6E-10	1.3E-07	1.9E-08		3.8E-08		6E-08
Aroclor-1268		5.2612	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	8.3E-07	1.2E-07	4.2E-02	2.4E-07	1.5E-07	2.1E-05		1.2E-08	1.8E-06	2.6E-07	9.2E-02	5.3E-07	1E-01	8E-07
Benzo(a)anthracene		0.06986		0.1		0.00006	2.27493E-07	1	0.13	1	M	V	1.1E-08	1.6E-09		1.6E-10	3.8E-10	5.4E-08		3.2E-12	2.3E-08	3.2E-09		3.2E-10		5E-10
Benzo(a)pyrene		0.08568	0.0003	1	0.000002	0.0006	7.35294E-10	1	0.13	1	M		1.4E-08	1.9E-09	4.5E-05	1.9E-09	1.5E-12	2.1E-10	7.5E-07	1.3E-13	2.8E-08	4.0E-09	9.3E-05	4.0E-09	1E-04	6E-09
Benzo(b)fluoranthene		0.12992		0.1		0.00006	7.35294E-10	1	0.13	1	M		2.1E-08	2.9E-09		2.9E-10	2.3E-12	3.2E-10		1.9E-14	4.2E-08	6.0E-09		6.0E-10		9E-10
Dibenzo(a,h)anthracene		0.03416		1		0.0006	7.35294E-10	1	0.13	1	M		5.4E-09	7.7E-10		7.7E-10	6.0E-13	8.5E-11		5.1E-14	1.1E-08	1.6E-09		1.6E-09		2E-09
Total																									**1E-01**	**9E-07**

Table 7-18b
Hazard/Risk Calculations - Soil Adolescent Trespasser (Future) - CTE

Parameter		Soil EPC	RfDo	SFo	RfC	IUR	1/VF + 1/PEF	GIABS	ABS	RBA	M	V	Ingestion				Inhalation				Dermal				Total	
		(mg/kg)	(mg/kg/d)	(mg/kg/d)-1	(mg/m3)	(µg/m3)-1	(m3/kg)-1						ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	ADC (mg/m^3)	LAC (µg/m^3)	Hazard	Risk	ADD (mg/kg-d)	LADD (mg/kg-d)	Hazard	Risk	Hazard	Risk
Arsenic		0.18522	0.0003	1.5	0.000015	0.0043	7.35294E-10	1	0.03	0.6			4.1E-10	5.8E-11	1.4E-06	8.7E-11	3.7E-13	7.1E-20	2.5E-08	3.1E-22	5.6E-10	8.0E-11	1.9E-06	1.2E-10	3E-06	2E-10
Chromium	VI	1.13092	0.003	0.5	0.0001	0.084	7.35294E-10	0.025		1	M		4.1E-09	5.9E-10	1.4E-06	3.0E-10	2.3E-12	4.3E-19	2.3E-08	3.6E-20					1E-06	3E-10
Cobalt		0.2716	0.0003		0.000006	0.009	7.35294E-10	1		1			9.9E-10	1.4E-10	3.3E-06		5.5E-13	1.0E-19	9.1E-08	9.4E-22					3E-06	9E-22
Iron		695.94	0.7				7.35294E-10	1		1			2.5E-06	3.6E-07	3.6E-06		1.4E-09	2.7E-16							4E-06	
Mercury	salts	12.586	0.0003		0.0003		7.35294E-10	0.07		1			4.6E-08	6.6E-09	1.5E-04		2.5E-11	4.8E-18	8.5E-08						2E-04	
Aroclor-1254		0.20258	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	7.4E-10	1.1E-10	3.7E-05	2.1E-10	6.6E-10	1.3E-16		7.2E-20	2.8E-09	4.1E-10	1.4E-04	8.1E-10	2E-04	1E-09
Aroclor-1260		0.38178		2		0.00057	7.64094E-07	1	0.14	1		V	1.4E-09	2.0E-10		4.0E-10	8.0E-10	1.5E-16		8.7E-20	5.4E-09	7.7E-10		1.5E-09		2E-09
Aroclor-1268		5.2612	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	1.9E-08	2.7E-09	9.6E-04	5.5E-09	1.7E-08	3.3E-15		1.9E-18	7.4E-08	1.1E-08	3.7E-03	2.1E-08	5E-03	3E-08
Benzo(a)anthracene		0.06986		0.1		0.00006	2.27493E-07	1	0.13	1	M	V	2.6E-10	3.6E-11		3.6E-12	4.4E-11	8.3E-18		5.0E-22	9.1E-10	1.3E-10		1.3E-11		2E-11
Benzo(a)pyrene		0.08568	0.0003	1	0.000002	0.0006	7.35294E-10	1	0.13	1	M		3.1E-10	4.5E-11	1.0E-06	4.5E-11	1.7E-13	3.3E-20	8.6E-08	2.0E-23	1.1E-09	1.6E-10	3.7E-06	1.6E-10	5E-06	2E-10
Benzo(b)fluoranthene		0.12992		0.1		0.00006	7.35294E-10	1	0.13	1	M		4.7E-10	6.8E-11		6.8E-12	2.6E-13	5.0E-20		3.0E-24	1.7E-09	2.4E-10		2.4E-11		3E-11
Dibenzo(a,h)anthracene		0.03416		1		0.0006	7.35294E-10	1	0.13	1	M		1.2E-10	1.8E-11		1.8E-11	6.9E-14	1.3E-20		7.9E-24	4.5E-10	6.4E-11		6.4E-11		8E-11
Total																									**5E-03**	**3E-08**

V: Volatile; inhalation only calculated if volatile

HQ > 0.1 or ELCR > 10^{-6}

Table 7-19a

Hazard/Risk Calculations - Soil Hypothetical Resident - RME

Parameter	Form	Soil EPC (mg/kg)	RfDo (mg/kg/d)	SFo (mg/kg/d)-1	RfC (mg/m3)	IUR (µg/m3)-1	1/VF + 1/PEF (m3/kg)-1	GIABS	ABS	RBA	M	V	Ingestion ADD (mg/kg-d) Child	Ingestion ADD (mg/kg-d) Adult	Ingestion LADD (mg/kg-d) Adjusted	Ingestion Hazard Child	Ingestion Hazard Adult	Ingestion Risk Adjusted	Inhalation ADC (mg/m^3) Child	Inhalation ADC (mg/m^3) Adult	Inhalation LAC (µg/m^3) Adjusted	Inhalation Hazard Child	Inhalation Hazard Adult	Inhalation Risk Adjusted	Dermal ADD (mg/kg-d) Child	Dermal ADD (mg/kg-d) Adult	Dermal LADD (mg/kg-d) Adjusted	Dermal Hazard Child	Dermal Hazard Adult	Dermal Risk Adjusted	Total Hazard Child	Total Hazard Adult	Risk
Arsenic		0.18522	0.0003	1.5	0.000015	0.0043	7.35294E-10	1	0.03	0.6			1.4E-06	1.3E-07	1.6E-07	4.7E-03	4.4E-04	2.4E-07	1.3E-10	1.3E-10	4.9E-08	8.7E-06	8.7E-06	2.1E-10	1.7E-07	2.8E-08	2.2E-08	5.6E-04	9.4E-05	3.4E-08	5E-03	5E-04	3E-07
Chromium	VI	1.13092	0.003	0.5	0.0001	0.084	7.35294E-10	0.025		1	M		1.4E-05	1.4E-06	7.4E-06	4.8E-03	4.5E-04	3.7E-06	8.0E-10	8.0E-10	8.2E-07	8.0E-06	8.0E-06	6.9E-08							5E-03	5E-04	4E-06
Cobalt		0.2716	0.0003		0.000006	0.009	7.35294E-10	1		1			3.5E-06	3.3E-07	3.9E-07	1.2E-02	1.1E-03		1.9E-10	1.9E-10	7.1E-08	3.2E-05	3.2E-05	6.4E-10							1E-02	1E-03	6E-10
Iron		695.94	0.7				7.35294E-10	1		1			8.9E-03	8.3E-04	1.0E-03	1.3E-02	1.2E-03		4.9E-07	4.9E-07	1.8E-04										1E-02	1E-03	
Mercury	salts	12.586	0.0003		0.0003		7.35294E-10	0.07		1			1.6E-04	1.5E-05	1.8E-05	5.4E-01	5.0E-02		8.9E-09	8.9E-09	3.3E-06	3.0E-05	3.0E-05								5E-01	5E-02	
Aroclor-1254		0.20258	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	2.6E-06	2.4E-07	2.9E-07	1.3E-01	1.2E-02	5.8E-07	2.3E-07	2.3E-07	8.6E-05			4.9E-08	8.6E-07	1.4E-07	1.1E-07	4.3E-02	7.2E-03	2.3E-07	2E-01	2E-02	9E-07
Aroclor-1260		0.38178		2		0.00057	7.64094E-07	1	0.14	1		V	4.9E-06	4.6E-07	5.5E-07			1.1E-06	2.8E-07	2.8E-07	1.0E-04			5.9E-08	1.6E-06	2.7E-07	2.2E-07			4.3E-07			2E-06
Aroclor-1268		5.2612	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	6.7E-05	6.3E-06	7.6E-06	3.4E+00	3.2E-01	1.5E-05	6.0E-06	6.0E-06	2.2E-03			1.3E-06	2.2E-05	3.7E-06	3.0E-06	1.1E+00	1.9E-01	6.0E-06	4E+00	5E-01	2E-05
Benzo(a)anthracene		0.06986		0.1		0.00006	2.27493E-07	1	0.13	1	M	V	8.9E-07	8.4E-08	4.6E-07			4.6E-08	1.5E-08	1.5E-08	1.6E-05			9.4E-10	2.8E-07	4.6E-08	1.5E-07			1.5E-08			6E-08
Benzo(a)pyrene		0.08568	0.0003	1	0.000002	0.0006	7.35294E-10	1	0.13	1	M		1.1E-06	1.0E-07	5.6E-07	3.7E-03	3.4E-04	5.6E-07	6.0E-11	6.0E-11	6.2E-08	3.0E-05	3.0E-05	3.7E-11	3.4E-07	5.6E-08	1.9E-07	1.1E-03	1.9E-04	1.9E-07	5E-03	6E-04	7E-07
Benzo(b)fluoranthene		0.12992		0.1		0.00006	7.35294E-10	1	0.13	1	M		1.7E-06	1.6E-07	8.5E-07			8.5E-08	9.2E-11	9.2E-11	9.4E-08			5.7E-12	5.1E-07	8.5E-08	2.8E-07			2.8E-08			1E-07
Dibenzo(a,h)anthracene		0.03416		1		0.0006	7.35294E-10	1	0.13	1	M		4.4E-07	4.1E-08	2.2E-07			2.2E-07	2.4E-11	2.4E-11	2.5E-08			1.5E-11	1.3E-07	2.2E-08	7.4E-08			7.4E-08			3E-07
Total																															5E+00	6E-01	3E-05

Table 7-19b

Hazard/Risk Calculations - Soil Hypothetical Resident - CTE

Parameter	Form	Soil EPC (mg/kg)	RfDo (mg/kg/d)	SFo (mg/kg/d)-1	RfC (mg/m3)	IUR (µg/m3)-1	1/VF + 1/PEF (m3/kg)-1	GIABS	ABS	RBA	M	V	Ingestion ADD (mg/kg-d) Child	Ingestion ADD (mg/kg-d) Adult	Ingestion LADD (mg/kg-d) Adjusted	Ingestion Hazard Child	Ingestion Hazard Adult	Ingestion Risk Adjusted	Inhalation ADC (mg/m^3) Child	Inhalation ADC (mg/m^3) Adult	Inhalation LAC (µg/m^3) Adjusted	Inhalation Hazard Child	Inhalation Hazard Adult	Inhalation Risk Adjusted	Dermal ADD (mg/kg-d) Child	Dermal ADD (mg/kg-d) Adult	Dermal LADD (mg/kg-d) Adjusted	Dermal Hazard Child	Dermal Hazard Adult	Dermal Risk Adjusted	Total Hazard		Risk
Arsenic		0.18522	0.0003	1.5	0.000015	0.0043	7.35294E-10	1	0.03	0.6			7.1E-07	6.7E-08	1.6E-07	2.4E-03	2.2E-04	2.4E-07	1.3E-10	1.3E-10	1.7E-08	8.7E-06	8.7E-06	7.2E-11	1.3E-07	2.2E-08	2.2E-08	4.3E-04	7.5E-05	3.4E-08	3E-03	3E-04	3E-07
Chromium	VI	1.13092	0.003	0.5	0.0001	0.084	7.35294E-10	0.025		1	M		7.2E-06	6.8E-07	1.6E-06	2.4E-03	2.3E-04	8.1E-07	8.0E-10	8.0E-10	1.0E-07	8.0E-06	8.0E-06	8.6E-09							2E-03	2E-04	8E-07
Cobalt		0.2716	0.0003		0.000006	0.009	7.35294E-10	1		1			1.7E-06	1.6E-07	3.9E-07	5.8E-03	5.4E-04		1.9E-10	1.9E-10	2.5E-08	3.2E-05	3.2E-05	2.2E-10							6E-03	6E-04	2E-10
Iron		695.94	0.7				7.35294E-10	1		1			4.4E-03	4.2E-04	1.0E-03	6.4E-03	6.0E-04		4.9E-07	4.9E-07	6.3E-05										6E-03	6E-04	
Lead		0					7.35294E-10	1		1			0.0E+00	0.0E+00	0.0E+00				0.0E+00	0.0E+00	0.0E+00												
Mercury	salts	12.586	0.0003		0.0003		7.35294E-10	0.07		1			8.0E-05	7.5E-06	1.8E-05	2.7E-01	2.5E-02		8.9E-09	8.9E-09	1.1E-06	3.0E-05	3.0E-05								3E-01	3E-02	
Aroclor-1254		0.20258	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	1.3E-06	1.2E-07	2.9E-07	6.5E-02	6.1E-03	5.8E-07	2.3E-07	2.3E-07	3.0E-05			1.7E-08	6.5E-07	1.1E-07	1.1E-07	3.3E-02	5.7E-03	2.3E-07	1E-01	1E-02	8E-07
Aroclor-1260		0.38178		2		0.00057	7.64094E-07	1	0.14	1		V	2.4E-06	2.3E-07	5.5E-07			1.1E-06	2.8E-07	2.8E-07	3.6E-05			2.1E-08	1.2E-06	2.2E-07	2.2E-07			4.3E-07			2E-06
Aroclor-1268		5.2612	0.00002	2		0.00057	1.18697E-06	1	0.14	1		V	3.4E-05	3.2E-06	7.6E-06	1.7E+00	1.6E-01	1.5E-05	6.0E-06	6.0E-06	7.7E-04			4.4E-07	1.7E-05	3.0E-06	3.0E-06	8.5E-01	1.5E-01	6.0E-06	3E+00	3E-01	2E-05
Benzo(a)anthracene		0.06986		0.1		0.00006	2.27493E-07	1	0.13	1	M	V	4.5E-07	4.2E-08	1.0E-07			1.0E-08	1.5E-08	1.5E-08	2.0E-06			1.2E-10	2.1E-07	3.7E-08	3.7E-08			3.7E-09			1E-08
Benzo(a)pyrene		0.08568	0.0003	1	0.000002	0.0006	7.35294E-10	1	0.13	1	M		5.5E-07	5.1E-08	1.2E-07	1.8E-03	1.7E-04	1.2E-07	6.0E-11	6.0E-11	7.8E-09	3.0E-05	3.0E-05	4.7E-12	2.6E-07	4.5E-08	4.5E-08	8.5E-04	1.5E-04	4.5E-08	3E-03	4E-04	2E-07
Benzo(b)fluoranthene		0.12992		0.1		0.00006	7.35294E-10	1	0.13	1	M		8.3E-07	7.8E-08	1.9E-07			1.9E-08	9.2E-11	9.2E-11	1.2E-08			7.1E-13	3.9E-07	6.8E-08	6.8E-08			6.8E-09			3E-08
Dibenzo(a,h)anthracene		0.03416		1		0.0006	7.35294E-10	1	0.13	1	M		2.2E-07	2.0E-08	4.9E-08			4.9E-08	2.4E-11	2.4E-11	3.1E-09			1.9E-12	1.0E-07	1.8E-08	1.8E-08			1.8E-08			7E-08
Total																															3E+00	3E-01	3E-05

V: Volatile; inhalation only calculated if volatile

HQ > 0.1 or ELCR > 10^{-6}

Table 7-20
Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas

U.S. EPA Technical Review Workgroup for Lead
Version date 06/14/2017

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 2009-2014	GSDi and PbBo from Analysis of NHANES 2007-2010	GSDi and PbBo from Analysis of NHANES 2004-2007	GSDi and PbBo from Analysis of NHANES III (Phases 1&2)
PbS	Soil lead concentration	µg/g or ppm	2520	2740	2240	1235
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4	0.4
GSD_i	Geometric standard deviation PbB	--	1.8	1.7	1.8	2.1
PbB_0	Baseline PbB	µg/dL	0.6	0.7	1.0	1.5
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	0.050	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	--	--
K_{SD}	Mass fraction of soil in dust	--	--	--	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	PbB of adult worker, geometric mean	µg/dL	4.2	4.6	4.2	3.3
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	µg/dL	10.0	10.0	10.0	10.0
PbB_t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	**10**	**10**	**10**	**10**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB exceeds target PbB, assuming lognormal distribution**	**%**	**5.0%**	**5.0%**	**5.0%**	**5.0%**

Table 7-21a. Risk Calculations - Golf Course Receptors, Redevelopment Area (FI=0.70)

Receptor	Parameter	CAS	Soil EPC	Ingestion		Inhalation		Dermal		Total	
			(mg/kg)	Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
Golfer: Adolescent											
	4,6-Dinitro-2-methylphenol	534521	22	3E-01				9E-02		4E-01	
	Aldrin	309002	0.0020	7E-05	6E-09		1E-10			7E-05	7E-09
	Aluminum	7429905	3151	3E-03						3E-03	
	Antimony	7440360	1.0	3E-03						3E-03	
	Aroclor 1221	11104282	0.19		7E-08		1E-08		3E-08		1E-07
	Aroclor 1254	11097691	0.56	3E-02	2E-07		9E-09	1E-02	8E-08	4E-02	3E-07
	Aroclor 1260	11096825	1.0		4E-07		1E-08		2E-07		6E-07
	Aroclor 1268	11100144	1.5	8E-02	6E-07		3E-08	3E-02	2E-07	1E-01	8E-07
	Arsenic	7440382	1.3	3E-03	2E-07			4E-04	3E-08	3E-03	3E-07
	Benz[a]anthracene	56553	0.49		2E-08		4E-10		8E-09		3E-08
	Benzene	71432	0.0026	7E-07	3E-11	4E-06	1E-10			4E-06	2E-10
	Benzo[a]pyrene	50328	0.56	2E-03	3E-07			8E-04	9E-08	3E-03	3E-07
	Benzo[b/k]fluoranthene	NA	0.35		2E-08				6E-09		2E-08
	Benzo[b]fluoranthene	205992	0.51		2E-08				8E-09		3E-08
	Benzo[k]fluoranthene	207089	0.09		4E-10				2E-10		6E-10
	Bis(2-ethylhexyl)phthalate	117817	0.37	2E-05	1E-09			6E-06	3E-10	3E-05	1E-09
	Cadmium	7440439	0.08	9E-05				1E-05		1E-04	
	Carbazole	86748	0.033		1E-10				4E-12		1E-10
	Chloroform	67663	0.0024	3E-07	1E-11	1E-06	5E-10			2E-06	5E-10
	Chromium	7440473	5.1	2E-03	1E-06					2E-03	1E-06
	Chrysene	218019	0.77		4E-10				1E-10		5E-10
	Cobalt	7440484	0.54	2E-03						2E-03	
	DDT	50293	0.059	1E-04	4E-09			1E-05	3E-10	1E-04	4E-09
	Dibenz[a,h]anthracene	53703	0.16		7E-08				3E-08		1E-07
	Dibenzofuran	132649	0.013	1E-05						1E-05	
	Dibromochloromethane	124481	0.035	2E-06	6E-10					2E-06	6E-10
	Dichlorobenzene, 1,4-	106467	0.00014	2E-09	1E-13	2E-09	4E-12			5E-09	4E-12
	Dieldrin	60571	0.0015	3E-05	4E-09			9E-06	1E-09	4E-05	6E-09
	Endrin	72208	0.0036	1E-05				4E-06		2E-05	
	Ethylbenzene	100414	0.0044	5E-08	9E-12	1E-07	5E-11			2E-07	6E-11
	Hexachlorocyclohexane, Alpha-	319846	0.00013	2E-08	1E-10			5E-09	4E-11	2E-08	2E-10
	Indeno[1,2,3-cd]pyrene	193395	0.37		2E-08				6E-09		2E-08
	Iron	7439896	4148	6E-03						6E-03	
	Manganese	7439965	32	4E-04						4E-04	
	Mercury	7487947	7.0	3E-02						3E-02	
	Methylene Chloride	75092	0.011	2E-06	1E-11	1E-06	3E-12			3E-06	1E-11
	Naphthalene	91203	0.13	7E-06	3E-09	1E-04	2E-09	3E-06	1E-09	1E-04	6E-09
	Naphthalene, 1-Methyl	90120	0.71	1E-05	4E-09			4E-06	1E-09	2E-05	5E-09
	Naphthalene, 2-Methyl	91576	0.46	1E-04				5E-05		2E-04	
	Nitrobenzene	98953	0.12	7E-05		3E-05	2E-09			9E-05	2E-09
	n-butylbenzene	104518	0.26	6E-06						6E-06	

Table 7-21a. Risk Calculations - Golf Course Receptors, Redevelopment Area (FI=0.70)

Receptor	Parameter	CAS	Soil EPC (mg/kg)	Ingestion		Inhalation		Dermal		Total	
				Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
	n-Propylbenzene	103651	0.016	2E-07		3E-07				5E-07	
	Pyrene	129000	0.40	1E-05				5E-06		2E-05	
	Tetrachloroethene	127184	0.0010	2E-07	4E-13	2E-06	3E-12			2E-06	3E-12
	Thallium	7440280	0.028	3E-03						3E-03	
	Trimethylbenzene, 1,2,4-	95636	0.25	3E-05		8E-05				1E-04	
	Trimethylbenzene, 1,3,5-	108678	0.27	3E-05		1E-04				1E-04	
	Vanadium	7440622	10	2E-03						2E-03	
	Zinc	7440666	107	4E-04						4E-04	
	Total			**0.5**	**3E-06**	**0.0003**	**6E-08**	**0.1**	**7E-07**	**0.6**	**4E-06**
Golfer: Adult											
	4,6-Dinitro-2-methylphenol	534521	22	1E-01				4E-02		1E-01	
	Aldrin	309002	0.0020	2E-05	5E-09		8E-11			2E-05	5E-09
	Aluminum	7429905	3151	1E-03						1E-03	
	Antimony	7440360	1.0	9E-04						9E-04	
	Aroclor 1221	11104282	0.19		5E-08		7E-09		3E-08		9E-08
	Aroclor 1254	11097691	0.56	1E-02	1E-07		5E-09	6E-03	9E-08	2E-02	2E-07
	Aroclor 1260	11096825	1.0		3E-07		6E-09		2E-07		4E-07
	Aroclor 1268	11100144	1.5	3E-02	4E-07		1E-08	2E-02	2E-07	4E-02	7E-07
	Arsenic	7440382	1.3	9E-04	2E-07			2E-04	3E-08	1E-03	2E-07
	Benz[a]anthracene	56553	0.49		1E-08		1E-10		6E-09		2E-08
	Benzene	71432	0.0026	2E-07	2E-11	9E-07	8E-11			1E-06	1E-10
	Benzo[a]pyrene	50328	0.56	7E-04	1E-07			4E-04	7E-08	1E-03	2E-07
	Benzo[b/k]fluoranthene	NA	0.35		8E-09				4E-09		1E-08
	Benzo[b]fluoranthene	205992	0.51		1E-08				6E-09		2E-08
	Benzo[k]fluoranthene	207089	0.09		2E-10				1E-10		3E-10
	Bis(2-ethylhexyl)phthalate	117817	0.37	7E-06	7E-10			3E-06	3E-10	9E-06	1E-09
	Cadmium	7440439	0.08	3E-05				5E-06		3E-05	
	Carbazole	86748	0.033		9E-11				4E-12		9E-11
	Chloroform	67663	0.0024	8E-08	1E-11	3E-07	3E-10			4E-07	3E-10
	Chromium	7440473	5.1	6E-04	6E-07					6E-04	6E-07
	Chrysene	218019	0.77		2E-10				1E-10		3E-10
	Cobalt	7440484	0.54	6E-04						6E-04	
	DDT	50293	0.059	4E-05	3E-09			5E-06	3E-10	5E-05	3E-09
	Dibenz[a,h]anthracene	53703	0.16		4E-08				2E-08		6E-08
	Dibenzofuran	132649	0.013	5E-06						5E-06	
	Dibromochloromethane	124481	0.035	6E-07	4E-10					6E-07	4E-10
	Dichlorobenzene, 1,4-	106467	0.00014	7E-10	1E-13	6E-10	2E-12			1E-09	2E-12
	Dieldrin	60571	0.0015	1E-05	3E-09			4E-06	1E-09	1E-05	4E-09
	Endrin	72208	0.0036	4E-06				2E-06		6E-06	
	Ethylbenzene	100414	0.0044	2E-08	6E-12	3E-08	3E-11			4E-08	3E-11
	Hexachlorocyclohexane, Alpha-	319846	0.00013	6E-09	1E-10			2E-09	4E-11	8E-09	1E-10
	Indeno[1,2,3-cd]pyrene	193395	0.37		8E-09				4E-09		1E-08

Table 7-21a. Risk Calculations - Golf Course Receptors, Redevelopment Area (FI=0.70)

Receptor	Parameter	CAS	Soil EPC	Ingestion		Inhalation		Dermal		Total	
			(mg/kg)	Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
	Iron	7439896	4148	2E-03						2E-03	
	Manganese	7439965	32	1E-04						1E-04	
	Mercury	7487947	7.0	8E-03						8E-03	
	Methylene Chloride	75092	0.011	7E-07	5E-12	3E-07	1E-12			1E-06	6E-12
	Naphthalene	91203	0.13	2E-06	2E-09	3E-05	1E-09	1E-06	1E-09	4E-05	4E-09
	Naphthalene, 1-Methyl	90120	0.71	4E-06	3E-09			2E-06	1E-09	6E-06	4E-09
	Naphthalene, 2-Methyl	91576	0.46	4E-05				2E-05		6E-05	
	Nitrobenzene	98953	0.12	2E-05		6E-06	9E-10			3E-05	9E-10
	n-butylbenzene	104518	0.26	2E-06						2E-06	
	n-Propylbenzene	103651	0.016	6E-08		8E-08				1E-07	
	Pyrene	129000	0.40	5E-06				3E-06		7E-06	
	Tetrachloroethene	127184	0.0010	6E-08	3E-13	4E-07	1E-12			4E-07	2E-12
	Thallium	7440280	0.028	1E-03						1E-03	
	Trimethylbenzene, 1,2,4-	95636	0.25	9E-06		2E-05				3E-05	
	Trimethylbenzene, 1,3,5-	108678	0.27	1E-05		2E-05				3E-05	
	Vanadium	7440622	10	7E-04						7E-04	
	Zinc	7440666	107	1E-04						1E-04	
	Total			**0.2**	**2E-06**	**0.0001**	**3E-08**	**0.1**	**7E-07**	**0.2**	**3E-06**
Groundskeeper											
	4,6-Dinitro-2-methylphenol	534521	22	3E-01				9E-02		4E-01	
	Aldrin	309002	0.0020	8E-05	1E-08		4E-10			8E-05	1E-08
	Aluminum	7429905	3151	4E-03						4E-03	
	Antimony	7440360	1.0	3E-03						3E-03	
	Aroclor 1221	11104282	0.19		2E-07		4E-08		6E-08		3E-07
	Aroclor 1254	11097691	0.56	3E-02	4E-07		3E-08	1E-02	2E-07	4E-02	7E-07
	Aroclor 1260	11096825	1.0		8E-07		3E-08		3E-07		1E-06
	Aroclor 1268	11100144	1.5	9E-02	1E-06		8E-08	3E-02	5E-07	1E-01	2E-06
	Arsenic	7440382	1.3	3E-03	5E-07			4E-04	7E-08	3E-03	5E-07
	Benz[a]anthracene	56553	0.49		2E-08		5E-10		7E-09		3E-08
	Benzene	71432	0.0026	7E-07	6E-11	5E-06	4E-10			6E-06	5E-10
	Benzo[a]pyrene	50328	0.56	2E-03	2E-07			8E-04	8E-08	3E-03	3E-07
	Benzo[b/k]fluoranthene	NA	0.35		1E-08				5E-09		2E-08
	Benzo[b]fluoranthene	205992	0.51		2E-08				8E-09		3E-08
	Benzo[k]fluoranthene	207089	0.09		4E-10				1E-10		5E-10
	Bis(2-ethylhexyl)phthalate	117817	0.37	2E-05	2E-09			6E-06	6E-10	3E-05	3E-09
	Cadmium	7440439	0.08	9E-05				1E-05		1E-04	
	Carbazole	86748	0.033		3E-10				8E-12		3E-10
	Chloroform	67663	0.0024	3E-07	3E-11	2E-06	2E-09			2E-06	2E-09
	Chromium	7440473	5.1	2E-03	1E-06					2E-03	1E-06
	Chrysene	218019	0.77		3E-10				1E-10		4E-10
	Cobalt	7440484	0.54	2E-03						2E-03	
	DDT	50293	0.059	1E-04	8E-09			1E-05	7E-10	1E-04	9E-09

Table 7-21a. Risk Calculations - Golf Course Receptors, Redevelopment Area (FI=0.70)

Receptor	Parameter	CAS	Soil EPC	Ingestion		Inhalation		Dermal		Total	
			(mg/kg)	Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
	Dibenz[a,h]anthracene	53703	0.16		6E-08				2E-08		9E-08
	Dibenzofuran	132649	0.013	1E-05						1E-05	
	Dibromochloromethane	124481	0.035	2E-06	1E-09					2E-06	1E-09
	Dichlorobenzene, 1,4-	106467	0.00014	2E-09	3E-13	3E-09	1E-11			6E-09	1E-11
	Dieldrin	60571	0.0015	3E-05	9E-09			9E-06	3E-09	4E-05	1E-08
	Endrin	72208	0.0036	1E-05				4E-06		2E-05	
	Ethylbenzene	100414	0.0044	5E-08	2E-11	2E-07	1E-10			2E-07	2E-10
	Hexachlorocyclohexane, Alpha-	319846	0.00013	2E-08	3E-10			5E-09	9E-11	2E-08	4E-10
	Indeno[1,2,3-cd]pyrene	193395	0.37		1E-08				5E-09		2E-08
	Iron	7439896	4148	7E-03						7E-03	
	Manganese	7439965	32	4E-04						4E-04	
	Mercury	7487947	7.0	3E-02						3E-02	
	Methylene Chloride	75092	0.011	2E-06	9E-12	2E-06	4E-12			4E-06	1E-11
	Naphthalene	91203	0.13	7E-06	6E-09	2E-04	7E-09	3E-06	2E-09	2E-04	2E-08
	Naphthalene, 1-Methyl	90120	0.71	1E-05	8E-09			4E-06	3E-09	2E-05	1E-08
	Naphthalene, 2-Methyl	91576	0.46	1E-04				5E-05		2E-04	
	Nitrobenzene	98953	0.12	7E-05		4E-05	5E-09			1E-04	5E-09
	n-butylbenzene	104518	0.26	6E-06						6E-06	
	n-Propylbenzene	103651	0.016	2E-07		5E-07				6E-07	
	Pyrene	129000	0.40	2E-05				6E-06		2E-05	
	Tetrachloroethene	127184	0.0010	2E-07	9E-13	2E-06	8E-12			2E-06	9E-12
	Thallium	7440280	0.028	3E-03						3E-03	
	Trimethylbenzene, 1,2,4-	95636	0.25	3E-05		1E-04				1E-04	
	Trimethylbenzene, 1,3,5-	108678	0.27	3E-05		1E-04				2E-04	
	Vanadium	7440622	10	2E-03						2E-03	
	Zinc	7440666	107	4E-04						4E-04	
	Total			**0.5**	**5E-06**	**0.0005**	**2E-07**	**0.1**	**1E-06**	**0.6**	**6E-06**

Hazard = Intake / RfD (or RfC) Risk = Intake x SF (or IUR)

Table 7-21b. Risk Calculations - Golf Course Receptors, Redevelopment Area (FI=1)

Receptor	Parameter	CAS	Soil EPC	Ingestion		Inhalation		Dermal		Total	
			(mE/kE)	Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
Golfer: Adolescent											
	4,6-Dinitro-2-methylphenol	534521	32	4E-01				1E-01		6E-01	
	Aldrin	309002	0.0029	1E-04	9E-09		2E-10			1E-04	9E-09
	Aluminum	7429905	4502	5E-03						5E-03	
	Antimony	7440360	1.4	4E-03						4E-03	
	Aroclor 1221	11104282	0.27		1E-07		2E-08		4E-08		2E-07
	Aroclor 1254	11097691	0.80	4E-02	3E-07		1E-08	2E-02	1E-07	6E-02	4E-07
	Aroclor 1260	11096825	1.5		6E-07		2E-08		2E-07		8E-07
	Aroclor 1268	11100144	2.2	1E-01	8E-07		4E-08	5E-02	3E-07	2E-01	1E-06
	Arsenic	7440382	1.9	4E-03	3E-07			6E-04	5E-08	5E-03	4E-07
	Benz[a]anthracene	56553	0.70		3E-08		6E-10		1E-08		4E-08
	Benzene	71432	0.0038	1E-06	4E-11	5E-06	2E-10			6E-06	2E-10
	Benzo[a]pyrene	50328	0.79	3E-03	4E-07			1E-03	1E-07	4E-03	5E-07
	Benzo[b/k]fluoranthene	NA	0.50		2E-08				8E-09		3E-08
	Benzo[b]fluoranthene	205992	0.72		3E-08				1E-08		4E-08
	Benzo[k]fluoranthene	207089	0.14		6E-10				2E-10		8E-10
	Bis(2-ethylhexyl)phthalate	117817	0.53	3E-05	1E-09			8E-06	4E-10	4E-05	2E-09
	Cadmium	7440439	0.12	1E-04				2E-05		1E-04	
	Carbazole	86748	0.047		2E-10				5E-12		2E-10
	Chloroform	67663	0.0034	4E-07	2E-11	2E-06	7E-10			2E-06	7E-10
	Chromium	7440473	7.3	3E-03	2E-06					3E-03	2E-06
	Chrysene	218019	1.11		5E-10				2E-10		7E-10
	Cobalt	7440484	0.78	3E-03						3E-03	
	DDT	50293	0.084	2E-04	5E-09			2E-05	5E-10	2E-04	6E-09
	Dibenz[a,h]anthracene	53703	0.23		1E-07				4E-08		1E-07
	Dibenzofuran	132649	0.019	2E-05						2E-05	
	Dibromochloromethane	124481	0.050	3E-06	8E-10					3E-06	8E-10
	Dichlorobenzene, 1,4-	106467	0.00020	3E-09	2E-13	3E-09	5E-12			7E-09	5E-12
	Dieldrin	60571	0.0021	5E-05	6E-09			1E-05	2E-09	6E-05	8E-09
	Endrin	72208	0.0052	2E-05				5E-06		2E-05	
	Ethylbenzene	100414	0.0063	7E-08	1E-11	2E-07	7E-11			2E-07	8E-11
	Hexachlorocyclohexane, Alpha-	319846	0.00018	2E-08	2E-10			7E-09	6E-11	3E-08	3E-10
	Indeno[1,2,3-cd]pyrene	193395	0.52		2E-08				8E-09		3E-08
	Iron	7439896	5925	9E-03						9E-03	
	Manganese	7439965	46	6E-04						6E-04	
	Mercury	7487947	10.0	4E-02						4E-02	
	Methylene Chloride	75092	0.016	3E-06	1E-11	2E-06	5E-12			5E-06	2E-11
	Naphthalene	91203	0.18	1E-05	4E-09	2E-04	3E-09	4E-06	2E-09	2E-04	9E-09
	Naphthalene, 1-Methyl	90120	1.01	2E-05	6E-09			6E-06	2E-09	2E-05	8E-09
	Naphthalene, 2-Methyl	91576	0.65	2E-04				7E-05		2E-04	
	Nitrobenzene	98953	0.17	9E-05		4E-05	2E-09			1E-04	2E-09
	n-butylbenzene	104518	0.38	8E-06						8E-06	

Table 7-21b. Risk Calculations - Golf Course Receptors, Redevelopment Area (FI=1)

Receptor	Parameter	CAS	Soil EPC	Ingestion		Inhalation		Dermal		Total	
			(mE/kE)	Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
	n-Propylbenzene	103651	0.022	2E-07		5E-07				7E-07	
	Pyrene	129000	0.57	2E-05				8E-06		3E-05	
	Tetrachloroethene	127184	0.0015	3E-07	6E-13	2E-06	4E-12			2E-06	5E-12
	Thallium	7440280	0.040	4E-03						4E-03	
	Trimethylbenzene, 1,2,4-	95636	0.36	4E-05		1E-04				1E-04	
	Trimethylbenzene, 1,3,5-	108678	0.39	4E-05		1E-04				2E-04	
	Vanadium	7440622	14	3E-03						3E-03	
	Zinc	7440666	153	6E-04						6E-04	
	Total			**0.7**	**4E-06**	**0.0005**	**9E-08**	**0.2**	**1E-06**	**0.9**	**5E-06**
Golfer: Adult											
	4,6-Dinitro-2-methylphenol	534521	32	1E-01				6E-02		2E-01	
	Aldrin	309002	0.0029	3E-05	7E-09		1E-10			3E-05	7E-09
	Aluminum	7429905	4502	2E-03						2E-03	
	Antimony	7440360	1.4	1E-03						1E-03	
	Aroclor 1221	11104282	0.27		7E-08		1E-08		4E-08		1E-07
	Aroclor 1254	11097691	0.80	1E-02	2E-07		7E-09	8E-03	1E-07	2E-02	3E-07
	Aroclor 1260	11096825	1.5		4E-07		9E-09		2E-07		6E-07
	Aroclor 1268	11100144	2.2	4E-02	6E-07		2E-08	2E-02	3E-07	6E-02	9E-07
	Arsenic	7440382	1.9	1E-03	2E-07			3E-04	5E-08	2E-03	3E-07
	Benz[a]anthracene	56553	0.70		2E-08		2E-10		9E-09		2E-08
	Benzene	71432	0.0038	3E-07	3E-11	1E-06	1E-10			2E-06	1E-10
	Benzo[a]pyrene	50328	0.79	9E-04	2E-07			5E-04	1E-07	1E-03	3E-07
	Benzo[b/k]fluoranthene	NA	0.50		1E-08				6E-09		2E-08
	Benzo[b]fluoranthene	205992	0.72		2E-08				9E-09		3E-08
	Benzo[k]fluoranthene	207089	0.14		3E-10				2E-10		5E-10
	Bis(2-ethylhexyl)phthalate	117817	0.53	9E-06	1E-09			4E-06	4E-10	1E-05	1E-09
	Cadmium	7440439	0.12	4E-05				7E-06		5E-05	
	Carbazole	86748	0.047		1E-10				5E-12		1E-10
	Chloroform	67663	0.0034	1E-07	1E-11	5E-07	4E-10			6E-07	4E-10
	Chromium	7440473	7.3	9E-04	8E-07					9E-04	8E-07
	Chrysene	218019	1.11		2E-10				1E-10		4E-10
	Cobalt	7440484	0.78	9E-04						9E-04	
	DDT	50293	0.084	6E-05	4E-09			8E-06	5E-10	7E-05	4E-09
	Dibenz[a,h]anthracene	53703	0.23		5E-08				3E-08		8E-08
	Dibenzofuran	132649	0.019	7E-06						7E-06	
	Dibromochloromethane	124481	0.050	9E-07	6E-10					9E-07	6E-10
	Dichlorobenzene, 1,4-	106467	0.00020	1E-09	1E-13	9E-10	3E-12			2E-09	3E-12
	Dieldrin	60571	0.0021	1E-05	4E-09			6E-06	2E-09	2E-05	6E-09
	Endrin	72208	0.0052	6E-06				3E-06		9E-06	
	Ethylbenzene	100414	0.0063	2E-08	9E-12	4E-08	4E-11			6E-08	5E-11
	Hexachlorocyclohexane, Alpha-	319846	0.00018	8E-09	2E-10			3E-09	6E-11	1E-08	2E-10
	Indeno[1,2,3-cd]pyrene	193395	0.52		1E-08				6E-09		2E-08

Table 7-21b. Risk Calculations - Golf Course Receptors, Redevelopment Area (FI=1)

Receptor	Parameter	CAS	Soil EPC	Ingestion		Inhalation		Dermal		Total	
			(mE/kE)	Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
	Iron	7439896	5925	3E-03						3E-03	
	Manganese	7439965	46	2E-04						2E-04	
	Mercury	7487947	10.0	1E-02						1E-02	
	Methylene Chloride	75092	0.016	1E-06	7E-12	4E-07	2E-12			1E-06	9E-12
	Naphthalene	91203	0.18	3E-06	3E-09	5E-05	2E-09	2E-06	2E-09	5E-05	6E-09
	Naphthalene, 1-Methyl	90120	1.01	5E-06	4E-09			3E-06	2E-09	8E-06	6E-09
	Naphthalene, 2-Methyl	91576	0.65	6E-05				3E-05		9E-05	
	Nitrobenzene	98953	0.17	3E-05		9E-06	1E-09			4E-05	1E-09
	n-butylbenzene	104518	0.38	3E-06						3E-06	
	n-Propylbenzene	103651	0.022	8E-08		1E-07				2E-07	
	Pyrene	129000	0.57	7E-06				4E-06		1E-05	
	Tetrachloroethene	127184	0.0015	9E-08	4E-13	6E-07	2E-12			6E-07	3E-12
	Thallium	7440280	0.040	1E-03						1E-03	
	Trimethylbenzene, 1,2,4-	95636	0.36	1E-05		3E-05				4E-05	
	Trimethylbenzene, 1,3,5-	108678	0.39	1E-05		4E-05				5E-05	
	Vanadium	7440622	14	1E-03						1E-03	
	Zinc	7440666	153	2E-04						2E-04	
	Total			**0.2**	**3E-06**	**0.0001**	**5E-08**	**0.1**	**1E-06**	**0.3**	**4E-06**
Groundskeeper											
	4,6-Dinitro-2-methylphenol	534521	32	5E-01				1E-01		6E-01	
	Aldrin	309002	0.0029	1E-04	2E-08		6E-10			1E-04	2E-08
	Aluminum	7429905	4502	5E-03						5E-03	
	Antimony	7440360	1.4	4E-03						4E-03	
	Aroclor 1221	11104282	0.27		2E-07		6E-08		9E-08		4E-07
	Aroclor 1254	11097691	0.80	4E-02	6E-07		4E-08	2E-02	3E-07	6E-02	9E-07
	Aroclor 1260	11096825	1.5		1E-06		5E-08		5E-07		2E-06
	Aroclor 1268	11100144	2.2	1E-01	2E-06		1E-07	5E-02	7E-07	2E-01	3E-06
	Arsenic	7440382	1.9	4E-03	7E-07			6E-04	1E-07	5E-03	8E-07
	Benz[a]anthracene	56553	0.70		3E-08		7E-10		1E-08		4E-08
	Benzene	71432	0.0038	1E-06	8E-11	7E-06	6E-10			8E-06	7E-10
	Benzo[a]pyrene	50328	0.79	3E-03	3E-07			1E-03	1E-07	4E-03	4E-07
	Benzo[b/k]fluoranthene	NA	0.50		2E-08				7E-09		3E-08
	Benzo[b]fluoranthene	205992	0.72		3E-08				1E-08		4E-08
	Benzo[k]fluoranthene	207089	0.14		5E-10				2E-10		7E-10
	Bis(2-ethylhexyl)phthalate	117817	0.53	3E-05	3E-09			9E-06	9E-10	4E-05	4E-09
	Cadmium	7440439	0.12	1E-04				2E-05		1E-04	
	Carbazole	86748	0.047		4E-10				1E-11		4E-10
	Chloroform	67663	0.0034	4E-07	4E-11	3E-06	2E-09			3E-06	2E-09
	Chromium	7440473	7.3	3E-03	1E-06					3E-03	1E-06
	Chrysene	218019	1.11		4E-10				2E-10		6E-10
	Cobalt	7440484	0.78	3E-03						3E-03	
	DDT	50293	0.084	2E-04	1E-08			2E-05	1E-09	2E-04	1E-08

Table 7-21b. Risk Calculations - Golf Course Receptors, Redevelopment Area (FI=1)

Receptor	Parameter	CAS	Soil EPC	Ingestion		Inhalation		Dermal		Total	
			(mE/kE)	Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
	Dibenz[a,h]anthracene	53703	0.23		9E-08				3E-08		1E-07
	Dibenzofuran	132649	0.019	2E-05						2E-05	
	Dibromochloromethane	124481	0.050	3E-06	2E-09					3E-06	2E-09
	Dichlorobenzene, 1,4-	106467	0.00020	3E-09	4E-13	5E-09	2E-11			8E-09	2E-11
	Dieldrin	60571	0.0021	5E-05	1E-08			1E-05	4E-09	6E-05	2E-08
	Endrin	72208	0.0052	2E-05				6E-06		2E-05	
	Ethylbenzene	100414	0.0063	7E-08	3E-11	2E-07	2E-10			3E-07	2E-10
	Hexachlorocyclohexane, Alpha-	319846	0.00018	3E-08	5E-10			7E-09	1E-10	3E-08	6E-10
	Indeno[1,2,3-cd]pyrene	193395	0.52		2E-08				8E-09		3E-08
	Iron	7439896	5925	1E-02						1E-02	
	Manganese	7439965	46	6E-04						6E-04	
	Mercury	7487947	10.0	4E-02						4E-02	
	Methylene Chloride	75092	0.016	3E-06	1E-11	3E-06	5E-12			6E-06	2E-11
	Naphthalene	91203	0.18	1E-05	9E-09	3E-04	1E-08	4E-06	3E-09	3E-04	2E-08
	Naphthalene, 1-Methyl	90120	1.01	2E-05	1E-08			6E-06	4E-09	2E-05	2E-08
	Naphthalene, 2-Methyl	91576	0.65	2E-04				7E-05		3E-04	
	Nitrobenzene	98953	0.17	1E-04		5E-05	7E-09			1E-04	7E-09
	n-butylbenzene	104518	0.38	8E-06						8E-06	
	n-Propylbenzene	103651	0.022	3E-07		7E-07				9E-07	
	Pyrene	129000	0.57	2E-05				8E-06		3E-05	
	Tetrachloroethene	127184	0.0015	3E-07	1E-12	3E-06	1E-11			3E-06	1E-11
	Thallium	7440280	0.040	5E-03						5E-03	
	Trimethylbenzene, 1,2,4-	95636	0.36	4E-05		2E-04				2E-04	
	Trimethylbenzene, 1,3,5-	108678	0.39	4E-05		2E-04				2E-04	
	Vanadium	7440622	14	3E-03						3E-03	
	Zinc	7440666	153	6E-04						6E-04	
	Total			**0.7**	**7E-06**	**0.0007**	**3E-07**	**0.2**	**2E-06**	**0.9**	**9E-06**

Hazard = Intake / RfD (or RfC)   Risk = Intake x SF (or IUR)

Table 7-22 Risk Calculations - Golf Course Receptors, CBA Only

Receptor	Parameter	CAS	Soil EPC (mg/kg)	Ingestion		Inhalation		Dermal		Total	
				Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
Golfer: Adolescent											
	Aluminum	7429905	802	9E-04						9E-04	
	Antimony	7440360	0.039	1E-04						1E-04	
	Aroclor 1254	11097691	0.18	1E-02	7E-08		3E-09	4E-03	3E-08	1E-02	1E-07
	Aroclor 1260	11096825	0.46		2E-07		5E-09		7E-08		2E-07
	Aroclor 1268	11100144	5.7	3E-01	2E-06		9E-08	1E-01	9E-07	4E-01	3E-06
	Arsenic	7440382	0.22	5E-04	4E-08			7E-05	5E-09	5E-04	4E-08
	Benz[a]anthracene	56553	0.10		4E-09		8E-11		2E-09		6E-09
	Benzo[a]pyrene	50328	0.11	4E-04	5E-08			2E-04	2E-08	6E-04	7E-08
	Benzo[b]fluoranthene	205992	0.17		8E-09				3E-09		1E-08
	Benzo[k]fluoranthene	207089	0.046		2E-10				7E-11		3E-10
	Cadmium	7440439	0.032	4E-05				4E-06		4E-05	
	Chloroform	67663	0.00136	1E-07	8E-12	8E-07	3E-10			9E-07	3E-10
	Chromium	7440473	1.2	4E-04	3E-07					4E-04	3E-07
	Chrysene	218019	0.18		8E-11				3E-11		1E-10
	Cobalt	7440484	0.23	8E-04						8E-04	
	Dibenz[a,h]anthracene	53703	0.047		2E-08				8E-09		3E-08
	Dibenzofuran	132649	0.014	2E-05						2E-05	
	Indeno[1,2,3-cd]pyrene	193395	0.073		3E-09				1E-09		4E-09
	Iron	7439896	722	1E-03						1E-03	
	Manganese	7439965	7.2	9E-05						9E-05	
	Mercury	7487947	11	4E-02						4E-02	
	Mercury	7487947	11			2E-01				2E-01	
	Naphthalene	91203	0.034	2E-06	8E-10	3E-05	6E-10	7E-07	3E-10	4E-05	2E-09
	Naphthalene, 1-Methyl	90120	0.016	2E-07	9E-11			9E-08	3E-11	3E-07	1E-10
	Naphthalene, 2-Methyl	91576	0.026	7E-06				3E-06		1E-05	
	Pyrene	129000	0.22	8E-06				3E-06		1E-05	
	Tetrachloroethene	127184	0.00032	6E-08	1E-13	5E-07	9E-13			5E-07	1E-12
	Thallium	7440280	0.0074	8E-04						8E-04	
	Vanadium	7440622	1.7	4E-04						4E-04	
	Zinc	7440666	19	7E-05						7E-05	
	Total (Hg salts)			0.4	3E-06	0.00004	1E-07	0.1	1E-06	0.5	4E-06
	Total (elemental Hg)			0.3	3E-06	0.15	1E-07	0.1	1E-06	0.6	4E-06

Table 7-22 Risk Calculations - Golf Course Receptors, CBA Only

Receptor	Parameter	CAS	Soil EPC (mg/kg)	Ingestion Hazard	Ingestion Risk	Inhalation Hazard	Inhalation Risk	Dermal Hazard	Dermal Risk	Total Hazard	Total Risk
Golfer: Adult											
	Aluminum	7429905	802	3E-04						3E-04	
	Antimony	7440360	0	3E-05						3E-05	
	Aroclor 1254	11097691	0	3E-03	5E-08		2E-09	2E-03	3E-08	5E-03	8E-08
	Aroclor 1260	11096825	0		1E-07		3E-09		7E-08		2E-07
	Aroclor 1268	11100144	6	1E-01	2E-06		5E-08	6E-02	9E-07	2E-01	2E-06
	Arsenic	7440382	0	2E-04	3E-08			3E-05	5E-09	2E-04	3E-08
	Benz[a]anthracene	56553	0		2E-09		3E-11		1E-09		3E-09
	Benzo[a]pyrene	50328	0	1E-04	2E-08			7E-05	1E-08	2E-04	4E-08
	Benzo[b]fluoranthene	205992	0		4E-09				2E-09		6E-09
	Benzo[k]fluoranthene	207089	0		1E-10				6E-11		2E-10
	Cadmium	7440439	0	1E-05				2E-06		1E-05	
	Chloroform	67663	0	5E-08	6E-12	2E-07	2E-10			2E-07	2E-10
	Chromium	7440473	1	1E-04	1E-07					1E-04	1E-07
	Chrysene	218019	0		4E-11				2E-11		6E-11
	Cobalt	7440484	0	3E-04						3E-04	
	Dibenz[a,h]anthracene	53703	0		1E-08				6E-09		2E-08
	Dibenzofuran	132649	0	5E-06						5E-06	
	Indeno[1,2,3-cd]pyrene	193395	0		2E-09				9E-10		3E-09
	Iron	7439896	722	4E-04						4E-04	
	Manganese	7439965	7	3E-05						3E-05	
	Mercury	7487947	11	1E-02						1E-02	
	Mercury	7487947	11			4E-02				4E-02	
	Naphthalene	91203	0	6E-07	5E-10	9E-06	3E-10	3E-07	3E-10	1E-05	1E-09
	Naphthalene, 1-Methyl	90120	0	8E-08	6E-11			4E-08	3E-11	1E-07	9E-11
	Naphthalene, 2-Methyl	91576	0	2E-06				1E-06		4E-06	
	Pyrene	129000	0	3E-06				1E-06		4E-06	
	Tetrachloroethene	127184	0	2E-08	9E-14	1E-07	5E-13			1E-07	6E-13
	Thallium	7440280	0	3E-04						3E-04	
	Vanadium	7440622	2	1E-04						1E-04	
	Zinc	7440666	19	2E-05						2E-05	
	Total (Hg salts)			0.1	2E-06	0.00001	6E-08	0.1	1E-06	0.2	3E-06
	Total (elemental Hg)			0.1	2E-06	0.04	6E-08	0.1	1E-06	0.2	3E-06

Table 7-22 Risk Calculations - Golf Course Receptors, CBA Only

Receptor	Parameter	CAS	Soil EPC (mg/kg)	Ingestion Hazard	Ingestion Risk	Inhalation Hazard	Inhalation Risk	Dermal Hazard	Dermal Risk	Total Hazard	Total Risk
Groundskeeper											
	Aluminum	7429905	802	9E-04						9E-04	
	Antimony	7440360	0.039	1E-04						1E-04	
	Aroclor 1254	11097691	0.18	1E-02	1E-07		9E-09	4E-03	6E-08	1E-02	2E-07
	Aroclor 1260	11096825	0.46		4E-07		1E-08		1E-07		5E-07
	Aroclor 1268	11100144	5.7	3E-01	5E-06		3E-07	1E-01	2E-06	4E-01	7E-06
	Arsenic	7440382	0.22	5E-04	8E-08			7E-05	1E-08	6E-04	9E-08
	Benz[a]anthracene	56553	0.10		4E-09		1E-10		1E-09		5E-09
	Benzo[a]pyrene	50328	0.11	4E-04	4E-08			2E-04	2E-08	6E-04	6E-08
	Benzo[b]fluoranthene	205992	0.17		7E-09				2E-09		9E-09
	Benzo[k]fluoranthene	207089	0.046		2E-10				7E-11		3E-10
	Cadmium	7440439	0.032	4E-05				4E-06		4E-05	
	Chloroform	67663	0.00136	2E-07	2E-11	1E-06	9E-10			1E-06	9E-10
	Chromium	7440473	1.2	4E-04	2E-07					4E-04	2E-07
	Chrysene	218019	0.18		7E-11				3E-11		1E-10
	Cobalt	7440484	0.23	9E-04						9E-04	
	Dibenz[a,h]anthracene	53703	0.047		2E-08				7E-09		3E-08
	Dibenzofuran	132649	0.014	2E-05						2E-05	
	Indeno[1,2,3-cd]pyrene	193395	0.073		3E-09				1E-09		4E-09
	Iron	7439896	722	1E-03						1E-03	
	Manganese	7439965	7.2	9E-05						9E-05	
	Mercury	7487947	11	4E-02						4E-02	
	Mercury	7487947	11			2E-01				2E-01	
	Naphthalene	91203	0.034	2E-06	2E-09	5E-05	2E-09	7E-07	6E-10	5E-05	4E-09
	Naphthalene, 1-Methyl	90120	0.016	3E-07	2E-10			9E-08	7E-11	3E-07	3E-10
	Naphthalene, 2-Methyl	91576	0.026	7E-06				3E-06		1E-05	
	Pyrene	129000	0.22	8E-06				3E-06		1E-05	
	Tetrachloroethene	127184	0.00032	6E-08	3E-13	7E-07	3E-12			8E-07	3E-12
	Thallium	7440280	0.0074	8E-04						8E-04	
	Vanadium	7440622	1.7	4E-04						4E-04	
	Zinc	7440666	19	7E-05						7E-05	
	Total (Hg salts)			0.4	5E-06	0.00005	3E-07	0.1	2E-06	0.5	8E-06
	Total (elemental Hg)			0.3	5E-06	0.22	3E-07	0.1	2E-06	0.7	8E-06

Hazard = Intake / RfD (or RfC) Risk = Intake x SF (or IUR)

Table 7-23
Summary of Site-Wide Groundwater Hazard/Risk Calculations

Receptor	EU	Exposure Medium	HI		ELCR	
			RME	CTE	RME	CTE
South Satilla						
Excavation Worker	South Satilla	Vapor	0.6	0.6	6E-06	3E-06
Child Resident	South Satilla	Groundwater	30	20	3E-03	1E-03
Adult Resident	South Satilla	Groundwater	20	9		
North Satilla						
Excavation Worker	North Satilla	Vapor	6	6	3E-05	1E-05
Child Resident	North Satilla	Groundwater	60	40	2E-03	5E-04
Adult Resident	North Satilla	Groundwater	40	30		
South Ebenezer						
Child Resident	South Ebenezer	Groundwater	20	9	2E-03	7E-04
Adult Resident	South Ebenezer	Groundwater	10	5		

Values rounded to one significant figure

HQ > 1 or ELCR > 10^{-6}

Table 7-24
Summary of CBA Soil Hazard/Risk Calculations

Receptor	Exposure Medium	HI		ELCR	
		RME	CTE	RME	CTE
Surface Soil					
Child Resident	Surface Soil	5	3	3E-05	3E-05
Adult Resident	Surface Soil	0.6	0.3		
Trespasser Current	Surface Soil	0.1	0.005	4E-07	3E-08
Trespasser Future	Surface Soil	0.1	0.005	9E-07	3E-08
Industrial Worker	Surface Soil	0.4	0.08	6E-06	5E-07
Mixed Soil					
Excavation Worker	Mixed Soil*	8	2	5E-06	6E-07

Values rounded to one significant figure

* Values assuming toxicity values for mercury salts

[shaded] HQ > 1 or ELCR > 10^{-6}

Table 7-25
Remedial Goal Objectives Summary - Groundwater

				Resident								Excavation Worker (Vapor)			
		Groundwater MCL (µg/L)	Groundwater EPC (µg/L)	Calculated HQ	RGO at Target HQ of			Calculated ELCR	RGO at Target ELCR of			Calculated HQ	RGO at Target HQ of		
Exposure Unit	COC				0.1	1	3		1E-06	1E-05	1E-04		0.1	1	3
North Satilla															
	Aluminum		125100	6.3	1997	19967	59901								
	Antimony	6	0.80	0.1	~~0.8~~	8	23								
	Arsenic	10	35.4	5.9	~~0.6~~	~~6~~	18	7E-04	~~0.1~~	~~1~~	~~5~~				
	Barium	2000	860	0.2	~~377~~	3773	11320								
	Beryllium	4	3.63	0.1	~~2.5~~	25	74								
	Cobalt		7.65	1.3	0.6	6	18								
	Iron		15990	1.1	1398	13977	41931								
	Manganese		722	1.7	43	434	1301								
	Nickel		59.9	0.2	39	392	1177								
	Thallium	2	0.15	0.8	~~0.02~~	~~0.2~~	~~1~~								
	Vanadium		888	10.4	9	86	257								
	1,4-Dichlorobenzene	75	3.54					2E-06	~~2~~	~~16~~	160				
	1-Methyl Naphthalene		57.6					5E-05	1	11	113				
	2-Methylnaphthalene		88.2	2.5	4	36	108								
	Benzo(a)anthracene		0.094					1E-06	0.1	1	9				
	Benzo(a)pyrene	0.2	0.075					3E-06	~~0.03~~	0.25	3				
	Dibenzo(a,h)anthracene		0.17					7E-06	0.03	0.25	3				
	Naphthalene		121	5.5	2	22	66								
	1,1,2-Trichloroethane	5	22	14.0	~~0.2~~	~~2~~	~~5~~	3E-05	~~0.7~~	7	66	1.3	~~2~~	17	51
	1,2,3-Trichloropropane		0.46	0.2	0.2	2	7	6E-04	0.001	0.007	0.075	0.9	0.1	1	2
	1,2,4-Trimethylbenzene		205	2.5	8	83	249					0.7	28	278	835
	1,2-Dibromoethane	0.05	0.15					8E-06	~~0.02~~	0.2	2				
	1,2-Dichloropropane	5	2.96					2E-06	~~1.4~~	14	145	0.5	~~1~~	5	16
	1,3,5-Trimethylbenzene		57.4	0.6	9	94	281					0.2	28	277	832
	Benzene	5	20.7	0.4	5	55	164	2E-05	~~0.9~~	8.6	86	0.2	9	90	270
	Bromodichloromethane		0.56					1E-06	0.4	4	39				
	Ethyl benzene	700	267	0.2	~~113~~	1130	3389	9E-05	~~3~~	~~30~~	~~296~~				
	Isopropylbenzene		21									0.2	12	125	374
	m&p-Xylene	10	1052	1.7	61	611	1832					2.0	52	522	1567
	o-Xylene	10	63.1	0.1	62	617	1851					0.1	52	524	1572
	Toluene	1000	265	0.2	~~119~~	1195	3585								
South Satilla															
	Aluminum		29000	1.5	1997	19967	59901								
	Arsenic	10	22.1	3.7	~~1~~	~~6~~	18	4E-04	~~0.1~~	~~1~~	~~5~~				
	Barium	2000	529	0.1	~~377~~	3773	11320								
	Beryllium	4	19.4	0.8	~~2~~	25	74								
	Chromium VI		65.8	1.5	4	44	133	2E-03	0.03	0.3	3				
	Cobalt		3.18	0.5	1	6	18								
	Iron		10920	0.8	1398	13977	41931								
	Manganese		178	0.4	43	434	1301								
	Methyl mercury		0.22	0.1	0.2	2	6								
	Nickel		53.2	0.1	39	392	1177								

Table 7.25
Remedial Goal Objectives Summary - Groundwater

				Resident								Excavation Worker (Vapor)			
		Groundwater MCL (µg/L)	Groundwater	Calculated	RGO at Target HQ of			Calculated	RGO at Target ELCR of			Calculated	RGO at Target HQ of		
Exposure Unit	COC		EPC (µg/L)	HQ	0.1	1	3	ELCR	1E-06	1E-05	1E-04	HQ	0.1	1	3
	Thallium	2	0.24	1.2	~~0.02~~	~~0.2~~	~~1~~								
	Vanadium		1116	13.0	9	86	257								
	1,2,4-Trichlorobenzene	70	1.29					1E-06	~~1~~	~~12~~	115				
	1,4-Dichlorobenzene	75	7.46					5E-06	~~2~~	~~16~~	160				
	1-Methyl Naphthalene		4.36					4E-06	1	11	113				
	2-Methylnaphthalene		5.13	0.1	4	36	108								
	Benzo(a)anthracene		0.25					3E-06	0.1	1	9				
	Benzo(a)pyrene	0.2	0.078					3E-06	~~0.03~~	0.3	3				
	Naphthalene		5.61	0.3	2	22	66								
	1,2,4-Trimethylbenzene		56	0.7	8	83	249					0.2	28	278	835
	1,2-Dibromo-3-chloropropane	0.2	0.27	0.2	~~0.1~~	1	3	2E-04	~~0.001~~	~~0.01~~	~~0.1~~				
	Benzene	5	2.15					3E-06	~~1~~	9	86				
	Chlorobenzene	100	46.5	0.3	~~17~~	173	520								
	Ethyl benzene	700	3.38					1E-06	~~3~~	~~30~~	~~296~~				
	Vinyl chloride		0.37	0.01				2E-05	0.02	0.2	2				
South Ebenezer															
	Arsenic	10	30.1	5.0	~~1~~	~~6~~	18	6E-04	~~0.1~~	~~1~~	~~5~~				
	Chromium VI		39.99	0.9	4	44	133	1E-03	0.03	0.3	3				
	Nickel		27.8												
	Selenium	50	11.5	0.1	~~10~~	100	300								
	Vanadium		385	4.5	9	86	257								
	Benzo(a)anthracene		0.14					2E-06	0.1	1	9				
	Benzo(a)pyrene	0.2	0.16					6E-06	~~0.03~~	0.3	3				
	Dibenzo(a,h)anthracene		0.59					2E-05	0.03	0.3	3				
	Benzene	5	0.91					1E-06	~~1~~	9	86				

Numbers struck through are lower than the MCL.

Table 7-26
Remedial Goal Objectives Summary - Soil

COC	Form	Soil EPC (mg/kg)	Hypothetical Resident Calculated HQ	Hypothetical Resident RGO (mg/kg) at Target HQ of 0.1	1	3	Hypothetical Resident Calculated ELCR	Hypothetical Resident RGO at Target ELCR of 1E-06	1E-05	1E-04	Industrial Worker Calculated ELCR	Industrial Worker RGO at Target ELCR of 1E-06	1E-05	1E-04
CBA Surface Soil														
Chromium	VI	1.1					4E-06	0.3	3	30				
Mercury	Salts	13	0.5	2	23	70								
Aroclor-1254		0.2	0.2	0.12	1	4								
Aroclor-1260		0.38					2E-06	0.2	2	24				
Aroclor-1268		5.3	4.5	0.12	1	4	2E-05	0.2	2	24	5E-06	1.1	11	108

COC	Form	Soil EPC (mg/kg)	Excavation Worker Calculated HQ	Excavation Worker RGO (mg/kg) at Target HQ of 0.1	1	3	Excavation Worker Calculated ELCR	Excavation Worker RGO at Target ELCR of 1E-06	1E-05	1E-04
CBA Mixed Soil										
Mercury	Elemental	119	60	0.2	2	6				
Mercury	Salts	119	0.2	68	679	2036				
Aroclor-1254		12.3	1.8	1	7	21				
Aroclor-1268		41.5	5.9	1	7	21	3E-06	16	161	1612

Table 12-1
Summary of Comparative Analysis of Remedial Alternatives

Remedial Alternative	Overall Protection of Human Health and Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume via Treatment	Short-term Effectiveness	Implementability	Total Present Worth
1: No Further Action	**No**	**No ARARs for no action**	⊕	⊕	⊕	●	$225,000
2: In-situ Biological Treatment and Soil Dermal Cover	**Yes**: for alternatives 2 and 3 Prevents direct contact because the Hg^0 condition is beneath concrete foundation slabs and the soil cover. Additionally, treatment of the Hg^0 further reduces the mercury vaporization potential.	**Yes**: for Alternatives 2 and 3	◑ Biological treatment may convert mercury to species that are retained in the biomass or are more easily removed from water by another technology, such as adsorption or precipitation. In situ treatment application of this technology is considered innovative and not yet proven.	◑ Unknown and requiring testing to verify efficacy	◔ It is assumed that maintenance injection at some point into the future will be necessary to revitalize the applied microbial population	◕ The technology would be implemented by direct injection into the soil and shallow aquifer through conventional means. It is able to perform this function in the presence of the dense array of subsurface pilings present beneath the CBA.	$5,903,000
3: In-Situ Chemical Sequestration and Soil Dermal Cover			◕ The ICS approach for Hg^0 at full-scale is novel compared to more traditional approaches, and data for the technology is generally limited to bench-scale or pilot-scale evaluations. The bench-scale work has reported effective conversion of Hg^0 that will be evaluated under Site-specific condition in bench-scale and maybe pilot scale studies to established design parameters.	◕ Yes The ICS approach is innovative. While the available data indicates it will be effective, Site specific testing will be necessary to verify full efficacy.	◕ It is assumed that the initial ICS injections will be sufficient.	◕ This technology is readily implemented through direct injection where the liquid reagent is able to effectively mix and disperse through the aquifer matrix, mineralizing the outer surface of the Hg^0 beads (as an insoluble mercuric sulfide mineral). It is able to perform this function in the presence of the dense array of subsurface pilings present beneath the CBA. It is highly unlikely the mineral form will be reversed in the current/future geochemical environment. Periodic groundwater monitoring is already planned to confirm that this will be the case and the final remedy for OU2 will take the results of the groundwater monitoring into consideration.	$5,434,000

Notes: ⊕ ◔ ◑ ◕ ●

Not acceptable ⟶ More acceptable

Note: information in this table has been updated based on the approval of the FFS

LOCATION-SPECIFIC ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
Wetlands			
Presence of wetlands	Requires Federal agencies to evaluate action to minimize the destruction, loss or degradation of wetlands and to preserve and enhance beneficial values of wetlands.	Actions that involve potential impacts to, or take place within, wetlands – **TBC**	Executive Order 11990 – *Protection of Wetlands* Section 1.(a)
Floodplains			
Presence of floodplain designated as such on a map	Shall consider alternatives to avoid, to the extent possible adverse effects and incompatible development in the floodplain. Design or modify its action in order to minimize potential harm to or within the floodplain. Shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.	Federal actions that involve potential impacts to, or take place within, floodplains – **TBC**	Executive Order 11988 – *Floodplain Management* Section 2.(a)(2)
Aquatic Resources and Coastal Zone Areas			
Presence of marshlands and estuarine area	There is a 50-foot marshlands buffer applicable to the upland component of the project as measured horizontally inland from the coastal marshland- upland interface, which is the Coastal Marshland Protection Act jurisdiction line, so as to ensure the project does not result in the filling or other alteration of the coastal marshlands.	Upland component of the project as defined in GA Rule 391-2-3-.02(2)(i) in *coastal marshlands* as defined in GA Rule 391-2-3-.02(2)(b) – **Applicable**	GA Rule 391-2-3-.02(4)(a)
Presence of marshlands and estuarine area	Except as provided in subparagraph 2. of this paragraph and paragraphs (d) and (g) below, no land-disturbing activities within the project boundaries shall be conducted within the 50-foot marshlands buffer, and such marshlands buffer shall remain in its natural, undisturbed state of vegetation, so as to naturally treat stormwater during both construction and post construction phases of the upland component of the project.	Upland component of the project as defined in GA Rule 391-2-3-.02(2)(i) in *coastal marshlands* as defined in GA Rule 391-2-3-.02(2)(b) – **Applicable**	GA Rule 391-2-3-.02(4)(b)(1)

LOCATION-SPECIFIC ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
	Land disturbance and construction of structures within the 50-foot marshlands buffer in the upland component of the project shall be limited to the following: (i) Construction and maintenance of temporary structures necessary for construction of the marshlands component of the project; (ii) Construction and maintenance of permanent structures that are required for the functionality of and/or provide permanent access to the marshlands component of the project; and (iii) Planting and grading with vegetated materials within the marshlands buffer to enhance stormwater management, such as erosion and sediment control measures, and to allow pedestrian access for passive recreation.		GA Rule 391-2-3-.02(4)(b)(2)
Presence of marshlands and estuarine area	After such land disturbing activities associated with (b)2.(i) above are completed, and except as allowed for in (b)2.(ii) and (iii) above, the marshlands buffer must be restored to and maintained in a natural vegetated state or in a vegetated state at least as protective or better than pre-construction conditions, subject to hand trimming and thinning as authorized in the permit. *NOTE:* Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit.	Upland component of the project as defined in GA Rule 391-2-3-.02(2)(i) in *coastal marshlands* as defined in GA Rule 391-2-3-.02(2)(b) – **Applicable**	GA Rule 391-2-3-.02(4)(c)
	Already existing impervious surfaces and structures within the marshlands buffer area may remain and be maintained, provided the replacement, modification or upgrade does not increase any encroachment upon the required marshlands buffer in effect at the time of the replacement, modification or upgrade.		GA Rule 391-2-3-.02(4)(d)

LOCATION-SPECIFIC ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
	Marshlands buffers shall be designed, installed and/or maintained sufficiently such that stormwater discharge to coastal marshlands from the marshlands buffer is managed according to the policy, criteria, and information including technical specifications and standards in the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual, 1st Edition, April 2009.		GA Rule 391-2-3-.02(4)(e)
Georgia Shore Protection	No person shall construct or erect any structure or construct, erect, conduct, or engage in any shoreline engineering activity or engage in any land alteration which alters the natural topography or vegetation of any area within the jurisdiction of this part except in accordance with the terms and conditions of a permit. *NOTE:* Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit.	Activities that affect beaches and dynamic dune fields located on Georgia's barrier islands and the submerged shoreline lands adjacent to such beaches and dynamic dune fields seaward – **Relevant and Appropriate**	Georgia Shore Protection Act O.C.G.A. § 12-5-237(a)
Submerged Cultural Resources	All findings of submerged cultural resources shall be reported to the Georgia Department of Natural Resources within two days of discovery, Saturday, Sundays, and legal holidays excluded.	Discovery of prehistoric or historic sites, ruins, artifacts, treasure, treasure-trove, and shipwrecks or vessels and their cargo or tackle, which have remained on the bottom for more than 50 years, and similar sites and objects found in the Atlantic Ocean within the three-mile territorial limit of the State of Georgia or within its navigable waters – **Relevant and Appropriate**	O.C.G.A. § 12-3-81

LOCATION-SPECIFIC ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
Threatened and Endangered Species			
Presence of Threatened and Endangered Wildlife listed in 50 CFR 17.11(h) – or critical habitat of such species	Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary of Interior, after consultation as appropriate with affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to subsection (h) of this section. NOTE: Despite that consultation may be considered an administrative requirement, it should be performed to ensure activities are in compliance with substantive provisions of the Endangered Species Act and regulations.	Agency action that may jeopardize listed wildlife species, or destroy or adversely modify critical habitat – **Applicable**	16 U.S.C. § 1536 (a)(2) – or Section 7(a)(2) of *the Endangered Species Act of 1973*
Presence of Threatened and Endangered Wildlife listed in 50 CFR 17.11(h)	It is unlawful to take threatened or endangered wildlife in the United States. *NOTE:* Under 50 CFR 10.12 *Definitions* the term *Take* means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.	Action that may jeopardize listed wildlife species – **Applicable**	50 CFR Part 17.21(c) 50 CFR Part 17.31(a) 50 CFR Part 17.42(a)(2)

Table 13-1
Location-Specific ARARs/TBCs

LOCATION-SPECIFIC ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
ARAR = applicable or relevant and appropriate requirement CFR = *Code of Federal Regulations* CWA = Clean Water Act of 1972 DEACT = deactivation DOT = U.S. Department of Transportation EPA = U.S. Environmental Protection Agency EPD = Georgia Environmental Protection Division of the Georgia Department of Natural Resources HMR = Hazardous Materials Regulations HMTA = Hazardous Materials Transportation Act GA Rule = *Rules and Regulations* , Section as noted LDR = Land Disposal Restrictions NPDES = National Pollutant Discharge Elimination System O.C.G.A. = *Official Code of Georgia Annotated* , Chapter as noted POTW = Publicly Owned Treatment Works RCRA = Resource Conservation and Recovery Act of 1976 TBC = to be considered TCLP = Toxicity Characteristic Leaching Procedure U.S. = United States USCOE = U.S. Corps of Engineers UTS = Universal Treatment Standard WWTU = Waste Water Treatment Unit			

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
General Construction Standards – All Land-disturbing Activities (i.e., excavation, clearing, grading, etc.)			
Managing stormwater runoff from land- disturbing activities	Shall implement best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, as provided in O.G.C.A. § 12-7-6(b), during excavation activity.	Land-disturbing activity (as defined in O.C.G.A. §12-7-3(9)) of more than one acre of land **– Applicable**	GA Erosion and Sedimentation Act O.G.C.A. § 12-7-6(b)
	Shall control turbidity of stormwater runoff discharges to the extent the limits in O.C.G.A. § 12-7-6 shall not be exceeded.	Land-disturbing activity (as defined in O.C.G.A. §12-7-3(9)) of more than one acre of land **– Applicable**	GA Rule 391-3-7-.06
Managing stormwater runoff from upland area	There shall be no discharge of untreated stormwater from developed or disturbed areas, whether surface or piped, to coastal marshlands from the upland component of the project. The Committee is authorized to waive this requirement if the Committee finds that the site or project characteristics prohibit treatment, there is no practicable alternative, and it has minimal adverse impact.	Upland component of the project as defined in GA Rule 391-2-3-.02(2)(i) in coastal marshlands as defined in GA Rule 391-2-3-.02(2)(b) – **Applicable**	GA Rule 391-2-3-.02(5)(a)
	In addition to the requirements of Section (5)(a) above, discharged stormwater from the upland component of the project shall be managed according to the policy, criteria, and information including technical specifications and standards in the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual, 1st Edition, April 2009.		GA Rule 391-2-3-.02(5)(b)
Managing discharge of wastewater	No person shall discharge, allow, or cause to be discharged into the CS4 or watercourses any materials, other than stormwater, including but not limited to pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards.	Discharge of wastewater other than stormwater – **Relevant and Appropriate**	Glynn County Ordinance 2-27-11

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Managing fugitive dust emissions	Shall take all reasonable precautions to prevent fugitive dust from becoming airborne, including the following precautions: (i) use of water or chemicals for dust control; (ii) application of asphalt, water, or chemicals on surfaces that can give rise to airborne dusts; (iii) installation of hoods, fans, and filters to enclose and vent the handling of dusty materials; (iv) covering, at all times when in motion, open bodied trucks transporting materials likely to give rise to airborne dusts; and (v) prompt removal of earth or other material from paved streets onto which it has been deposited.	Operations, processes, handling, transportation or storage which may result in fugitive dust – **Relevant and Appropriate**	Georgia Air Quality Control Regulations Rule 391-3-1-.02(2)(n)(1)
	Shall not allow the percent opacity from any fugitive dust source to equal or exceed 20 percent.		Georgia Air Quality Control Regulations Rule 391-3-1-.02(2)(n)(2)

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Waste Characterization – Primary Wastes (e.g., excavated soil/sediment) and Secondary Wastes (e.g., wastewaters and spent treatment			
Characterization of ***solid waste*** (all primary and secondary wastes) and listed hazardous waste determination	Must make an accurate determination as to whether that waste is a hazardous waste in order to ensure wastes are properly managed according to applicable RCRA regulations. A hazardous waste determination is made using the following steps: (a) Must be made at the point of waste generation, before any dilution, mixing, or other alteration of the waste occurs, and at any time in the course of its management that it has, or may have, changed its properties as a result of exposure to the environment or other factors that may change the properties of the waste such that the RCRA classification of the waste may change (b) Must determine whether the waste is excluded from regulation under 40 CFR § 261.4 (c) Must use the knowledge of the waste to determine whether waste meets any of the listing descriptions under subpart D of 40 CFR Part 261. Acceptable knowledge that may be used in making an accurate determination as to whether the waste is listed may include waste origin, composition, the process producing the waste, feedstock, and other reliable and relevant information	Generation of solid waste as defined in 40 CFR § 261.2 – **Applicable**	40 CFR § 262.11(a), (b) and © GA Rule 391-3-11-.08
Determination of characteristic hazardous waste	The person then must also determine whether the waste exhibits one or more hazardous characteristics as identified in subpart C of 40 CFR part 261 by following the procedures in paragraph (d)(1) or (2) of this section, or a combination of both.	Generation of solid waste which is not excluded under 40 CFR § 261.4(a) – **Applicable**	40 CFR § 262.11(d) GA Rule 391-3-11-.08

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Determination of characteristic hazardous waste through knowledge	The person must apply knowledge of the hazard characteristic of the waste in light of the materials or the processes used to generate the waste. Acceptable knowledge may include process knowledge (e.g., information about chemical feedstocks and other inputs to the production process); knowledge of products, by-products, and intermediates produced by the manufacturing process; chemical or physical characterization of wastes; information on the chemical and physical properties of the chemicals used or produced by the process or otherwise contained in the waste; testing that illustrates the properties of the waste; or other reliable and relevant information about the properties of the waste or its constituents. A test other than a test method set forth in subpart C of 40 CFR part 261, or an equivalent test method approved by the Administrator under 40 CFR 260.21, may be used as part of a person's knowledge to determine whether a solid waste exhibits a characteristic of hazardous waste. However, such tests do not, by themselves, provide definitive results. Persons testing their waste must obtain a representative sample of the waste for the testing, as defined at 40 CFR 260.10.		40 CFR § 262.11(d)(1) GA Rule 391-3-11-.08

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Determination of characteristic hazardous waste through testing	When available knowledge is inadequate to make an accurate determination, the person must test the waste according to the applicable methods set forth in subpart C of 40 CFR part 261 or according to an equivalent method approved by the Administrator under 40 CFR § 260.21; or and in accordance with the following: (i) Persons testing their waste must obtain a representative sample of the waste for the testing, as defined at 40 CFR § 260.10. (ii) Where a test method is specified in subpart C of 40 CFR part 261, the results of the regulatory test, when properly performed, are definitive for determining the regulatory status of the waste.	Generation of solid waste which is not excluded under 40 CFR § 261.4(a) – **Applicable**	40 CFR § 262.11(d)(2) GA Rule 391-3-11-.08
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous – **Applicable**	40 CFR 262.11(e) GA Rule § 391-3-11-.08
Identifying hazardous waste numbers for small and large quantity generators	Must identify all applicable EPA hazardous waste numbers (EPA hazardous waste codes) in subparts C and D of part 261 of this chapter. Prior to shipping the waste off site, the generator also must mark its containers with all applicable EPA hazardous waste numbers (EPA hazardous waste codes) according to § 262.32.		40 CFR § 262.11(g) GA Rule 391-3-11-.08
General Waste Analysis	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 CFR §§ 264 and 268.	Generation of RCRA hazardous waste or nonhazardous wastes if applicable under § 264.113(d) for storage, treatment or disposal – **Applicable**	40 CFR § 264.13(a)(1) GA Rule 391-3-11-.10

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Special rules for characteristic hazardous waste	Must determine each EPA Hazardous Waste Number (waste code) applicable to the waste in order to determine the applicable treatment standards under subpart D of this part. This determination may be made concurrently with the hazardous waste determination required in § 262.11 of this chapter. For purposes of part 268, the waste will carry the waste code for any applicable listed waste (40 CFR part 261, subpart D). In addition, where the waste exhibits a characteristic, the waste will carry one or more of the characteristic waste codes (40 CFR part 261, subpart C), except when the treatment standard for the listed waste operates in lieu of the treatment standard for the characteristic waste, as specified in paragraph (b) of this section.	Generation of characteristic hazardous waste for storage, treatment, or disposal – **Applicable**	40 CFR § 268.9(a) GA Rule 391-3-11-.16
	Must determine the underlying hazardous constituents [as defined in 40 CFR § 268.2(i)] in the characteristic waste.	Generation of RCRA characteristic hazardous waste (and is not D001 nonwastewaters treated by CMBST, RORGS, or POLYM of § 268.42 Table 1) for storage, treatment, or disposal – **Applicable**	40 CFR § 268.9(a) GA Rule 391-3-11-.16

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Determinations for land disposal of hazardous waste	Must determine if the waste has to be treated before it can be land disposed. This is done by determining if the hazardous waste meets the treatment standards in §268.40, 268.45, or §268.49. This determination can be made concurrently with the hazardous waste determination required in §262.11 of this chapter, in either of two ways: testing the waste or using knowledge of the waste. If the generator tests the waste, testing would normally determine the total concentration of hazardous constituents, or the concentration of hazardous constituents in an extract of the waste obtained using test method 1311 in ''Test Methods of Evaluating Solid Waste, Physical/Chemical Methods,'' EPA Publication SW–846, (incorporated by reference, see §260.11 of this chapter), depending on whether the treatment standard for the waste is expressed as a total concentration or concentration of hazardous constituent in the waste's extract. (Alternatively, the generator must send the waste to a RCRA-permitted hazardous waste treatment facility, where the waste treatment facility must comply with the requirements of §264.13 of this chapter and paragraph (b) of this section.)	Generation of hazardous waste for storage, treatment, or disposal – **Applicable**	40 CFR § 268.7(a) GA Rule 391-3-11-.16
	Must comply with the special requirements of 40 CFR §268.9 in addition to any applicable requirements in 40 CFR § 268.7.	Generation of waste or soil that displays a hazardous characteristic of ignitability, corrosivity, reactivity, or toxicity for storage, treatment or disposal **– Applicable**	40 CFR § 268.7(a)(1) GA Rule 391-3-11-.16

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Management of PCB waste (e.g., contaminated soil, PPE, equipment, wastewater)	Any person storing or disposing of PCB waste must do so in accordance with 40 CFR 761, Subpart D.	Generation of waste containing PCBs at concentrations ≥ 50 ppm – **applicable**	40 CFR § 761.50(a)
	Any person cleaning up and disposing of PCBs shall do so based on the concentration at which the PCBs are found.	Generation of PCB remediation waste as defined in 40 CFR 761.3 – **applicable**	40 CFR § 761.61
Temporary Storage of Wastes – Primary Wastes (contaminated media) and Secondary Wastes (e.g., wastewaters, contaminated equipment)			
Temporary on–site accumulation of hazardous waste in containers	A small quantity generator may accumulate hazardous waste on site without a permit or interim status, and without complying with the requirements of parts 124, 264 through 267, and 270 of this chapter, or the notification requirements of section 3010 of RCRA, provided that all the substantive conditions for exemption listed in this section are met.	Accumulation of RCRA hazardous waste on site as defined in 40 CFR § 260.10 – **Applicable**	40 CFR § 262.16(a) GA Rule 391-3-11-.08
Condition of containers	If a container holding hazardous waste is not in good condition, or if it begins to leak, the small quantity generator must immediately transfer the hazardous waste from this container to a container that is in good condition, or immediately manage the waste in some other way that complies with the conditions for exemption of this section.		40 CFR § 262.16(b)(2)(i) GA Rule 391-3-11-.08
Compatibility of waste with container	Must use a container made of or lined with materials that will not react with, and are otherwise compatible with, the hazardous waste to be accumulated, so that the ability of the container to contain the waste is not impaired.		40 CFR § 262.16(b)(2)(ii) GA Rule 391-3-11-.08

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Management of containers	(A) A container holding hazardous waste must always be closed during accumulation, except when it is necessary to add or remove waste. (B) A container holding hazardous waste must not be opened, handled, or accumulated in a manner that may rupture the container or cause it to leak.		40 CFR § 262.16(b)(2)(iii) GA Rule 391-3-11-.08
Special conditions for accumulation of incompatible wastes	(A) Incompatible wastes, or incompatible wastes and materials, (see appendix V of part 265 for examples) must not be placed in the same container, unless § 265.17(b) of this chapter is complied with. (B) Hazardous waste must not be placed in an unwashed container that previously held an incompatible waste or material (see appendix V of part 265 for examples), unless § 265.17(b) of this chapter is complied with. (C) A container accumulating hazardous waste that is incompatible with any waste or other materials accumulated or stored nearby in other containers, piles, open tanks, or surface impoundments must be separated from the other materials or protected from them by means of a dike, berm, wall, or other device.	Accumulation of incompatible wastes, or incompatible wastes and materials on site **– Applicable**	40 CFR § 262.16(b)(2)(v) GA Rule 391-3-11-.08

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Labeling and marking of containers	A small quantity generator must mark or label its containers with the following: (A) The words "Hazardous Waste"; (B) An indication of the hazards of the contents (examples include, but are not limited to, the applicable hazardous waste characteristic(s) (*i.e.*, ignitable, corrosive, reactive, toxic); hazard communication consistent with the Department of Transportation requirements at 49 CFR part 172 subpart E (labeling) or subpart F (placarding); a hazard statement or pictogram consistent with the Occupational Safety and Health Administration Hazard Communication Standard at 29 CFR § 1910.1200; or a chemical hazard label consistent with the National Fire Protection Association code 704); and (C) The date upon which each period of accumulation begins clearly visible for inspection on each container.	Accumulation of RCRA hazardous waste on site as defined in 40 CFR §260.10 **– Applicable**	40 CFR § 262.16(b)(6)(i) GA Rule 391-3-11-.08
Condition of container	If a container holding hazardous waste is not in good condition, or if it begins to leak, the owner or operator must transfer the hazardous waste from this container to a container that is in good condition, or manage the waste in some other way that complies with the requirements of this part.	Storage of RCRA hazardous waste in containers – **Applicable**	40 CFR § 265.171 GA Rule 391-3-11-.10
Compatibility of waste with container	Must use a container made of or lined with materials which will not react with, and are otherwise compatible with, the hazardous waste to be stored, so that the ability of the container to contain the waste is not impaired.		40 CFR § 265.172 GA Rule 391-3-11-.10

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
	Containers must always be closed during storage, except when necessary to add or remove waste. Container must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak.		40 CFR § 265.173(a) and (b) GA Rule 391-3-11-.10
Storage of hazardous waste in container area	Area must have a containment system designed and operated in accordance with 40 CFR 264.175(b).	Storage of RCRA hazardous waste in containers with *free liquids* – **Applicable**	40 CFR § 264.175(a) GA Rule 391-3-11-.10
	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or Containers must be elevated or otherwise protected from contact with accumulated liquid.	Storage of RCRA hazardous waste in containers that *do not contain free liquids* (other than F020, F021, F022, F023,F026 and F027)	40 CFR § 264.175(c)(1) and (2) GA Rule 391-3-11-.10
Treatment and Disposal of PCBs			
Disposal of decontamination wastes and residues	Such waste shall be disposed of at their existing PCB concentration unless otherwise specified in 40 CFR 761.79(g)(1-6).	Decontamination waste and residues – **Applicable**	40 CFR 761.79(g)
Disposal of bulk PCB remediation waste off-site (self-implementing option)	May be sent off-site for decontamination or disposal provided the waste is either dewatered on-site or transported off-site in containers meeting the requirements of DOT HMR at 49 CFR parts 171-180.	Generation of bulk PCB remediation waste (as defined in 40 CFR 761.3) for disposal – **Relevant and Appropriate**	40 CFR 761.61(A)(5)(i)(B)
	Must provide written notice including the quanitity to be shipped and highest concentration of PCBs [using extraction EPA Method 3500B/3540C or Method 8082 in SW-846 or methods validated under 40 CFR 761.320-26 (Subpart Q)] at least 15 days before the first shipment of waste to each off-site facility.	Generation of bulk PCB remediation waste (as defined in 40 CFR 761.3) for disposal at an off-site facility where the waste is destined for an area not subject to a TSCA PCB Disposal Approval – **Relevant and Appropriate**	40 CFR 761.61(A)(5)(i)(B)(2)(iv)

Table 13-2
Action-Specific ARARs/TBCs

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
	Shall be disposed of in accordance with the provisions for Cleanup wastes at 40 CFR 761.61(a)(5)(v)(A).	Bulk PCB remediation waste which has been dewatered and with a PCB concentration < 50 ppm – **Relevant and Appropriate**	40 CFR 761.61(A)(5)(i)(B)(2)(ii)
	Shall be disposed of: • In a hazardous waste landfill permitted by EPA under §3004 of RCRA; • In a hazardous waste landfill permitted by a State authorized under §3006 of RCRA; or • In a PCB disposal facility approved under 40 CFR 761.60.	Bulk PCB remediation waste which has been dewatered and with a PCB concentration ≥ 50 ppm – **relevant and appropriate**	40 CFR 761.61(A)(5)(i)(B)(2)(iii)
Performance-based disposal of PCB remediation waste	Shall dispose by one of the following methods: • In a high-temperature incinerator approved under 40 CFR 761.70(b); • By an alternate disposal method approved under 40 CFR 761.60(e); • In a chemical waste landfill approved under 40 CFR 761.75; • In a facility with a coordinated approval issed under 40 CFR 761.77; or • Through decontamination in accordance with 40 CFR 761.79.	Disposal of non-liquid PCB remediation waste (as defined in 40 CFR 761.3) –**relevant and appropriate**	40 CFR 761.61(b)(2) 40 CFR 761.61(b)(2)(i) 40 CFR 761.61(b)(2)(ii)
Disposal of PCB cleanup wastes (e.g., PPE, rags, non-liquid cleaning materials) (self-implementing option)	Shall be disposed of either: • In a facility permitted, licensed, or registered by a State to manage municipal solid waste under 40 CFR 258 or non-municipal, non-hazardous waste subject to 40 CFR 257.5 thru 257.30; or • In a RCRA Subtitle C landfill permitted by a State to accept PCB waste; or • In an approved PCB disposal facility; or • Through decontamination under 40 CFR 761.79(b) or (c).	Generation of non-liquid PCBs at any concentration during and from the cleanup of PCB remediation waste – **relevant and appropriate**	40 CFR 761.61(a)(5)(v)(A)(1)-(4)

Table 13-2
Action-Specific ARARs/TBCs

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Decontamination of PCB contaminated water	For discharge to a treatment works as defined in 40 CFR 503.9(aa), or discharge to navigable waters, meet standard of < 3 ppb PCBs; or For unrestricted use, meet standard of ≤ 0.5 ppb PCBs	Water containing PCBs regulated for disposal – **applicable**	40 CFR 761.61(b)(1)(ii) 40 CFR 761.61(b)(1)(iii)
Underground Injection Well - Installation, Operation and Abandonment			
Construction of injection well(s) for *in-situ* treatment of groundwater	Shall not construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under Georgia's Rules for Safe Drinking Water, Chapter 391-3-5, or may otherwise adversely affect the health of persons.	Installation of Class V underground injection well**— Applicable**	GA Rule 391-3-6-.13(5)(a); 391-3-6-.13(11)(h)
Location of injection well(s) for *in-situ* treatment of groundwater	Shall be sited so that the injection fluid does not contaminate an underground source of drinking water.	Installation of Class V underground injection wells **— Applicable**	GA Rule 391-3-6-.13(12)(b)
Construction of injection well(s) for *in-situ* treatment of groundwater	Shall follow the procedures and requirements specified in Georgia Rule 391-3-6-.13(12)(e) for the construction of Class V wells.	Construction of Class V underground injection wells – **Applicable**	GA Rule 391-3-6-.13(12)(e)
Plugging and Abandonment of injection well(s) for *in-situ* treatment of groundwater	Shall be abandoned in accordance with the requirements of Georgia Rule 391-3-6-.13(12)(h).	Abandonment of Class V underground injection well – **Applicable**	GA Rule 391-3-6-.13(12)(h)
Mechanical Integrity of injection wells for *in-situ* treatment of groundwater	Shall meet the requirements of Georgia Rule 391-3-6-.13(13) regarding the mechanical integrity of injection wells.	Operation of Class V underground injection wells – **applicable**	GA Rule 391-3-6-.13(13)
	No new drainage wells may be constructed unless they have been designed by a professional geologist or professional engineer registered in the State of Georgia and the injected fluid does not contain any chemical constituent that exceeds any Maximum Contaminant Level identified in Rule 391-3-5-.18	Installation of Class V underground injection well**— Applicable**	GA Rule 391-3-6-.13(16)(b)

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Design criteria for all injection wells	No person shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water if the presence of that contaminant may cause a violation of any applicable groundwater quality standard specified in Subchapter 02L or may otherwise adversely affect human health.	Design, construction, or operation of any injection well – **Applicable**	40 CFR § 144.12
Injection of remediation amendments into groundwater	An injection activity cannot allow the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of the primary drinking water standards under 40 CFR part 141 or other health-based standards, or may otherwise adversely affect the health of persons.	Class V wells [as defined in 40 CFR § 144.6(e)] – **Relevant and Appropriate**	40 CFR § 144.82(a)(1)
	This prohibition applies to well construction, operation, maintenance, conversion, plugging, closure, or any other injection activity.		
	Wells must be closed in a manner that complies with the above prohibition of fluid movement. Also, any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well must be disposed or otherwise managed in accordance with substantive applicable federal, state, and local regulations and requirements.		40 CFR § 144.82(b)

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Waste Treatment and Disposal – Primary Wastes (contaminated media) and Secondary Wastes (e.g., wastewater, contaminated equipment)			
Disposal of RCRA-hazardous waste in a land-based unit	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste – **Applicable**	40 CFR 268.40(a) GA Rule 391-3-11-.16
	Must be treated according to the alternative treatment standards of 40 CFR 268.49(c) <u>or</u> Must be treated according to the UTSs [specified in 40 CFR 268.48 Table UTS] applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils – **Applicable**	40 CFR 268.49(b) GA Rule 391-3-11-.16
	All underlying hazardous constituents [as defined in 40 CFR § 268.2(i)] must meet the Universal Treatment Standards, found in 40 CFR § 268.48 Table UTS prior to land disposal.	Land disposal of restricted RCRA characteristic wastes (D001-D043) that are not managed in a wastewater treatment system that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well **— Applicable**	40 CFR § 268.40(e) GA Rule 391-3-11-.16
Disposal of RCRA–*hazardous waste soil* in a land–based unit	To determine whether a hazardous waste identified in this section exceeds the applicable treatment standards of 40 CFR § 268.40, the initial generator must test a sample of the waste extract or the entire waste, depending on whether the treatment standards are expressed as concentration in the waste extract or waste, or the generator may use knowledge of the waste. If the waste contains constituents (including UHCs in the characteristic wastes) in excess of the applicable UTS levels in 40 CFR § 268.48, the waste is prohibited from land disposal, and all requirements of part 268 are applicable, except as otherwise specified.	Land disposal of RCRA toxicity characteristic wastes (D004-D011) that are newly identified (i.e., wastes, soil, or debris identified by the TCLP but not the Extraction Procedure) **— Applicable**	40 CFR § 268.34(f) GA Rule 391-3-11-.16

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Treatment of RCRA *hazardous waste soil*	Prior to land disposal, all "constituents subject to treatment" as defined in 40 CFR § 268.49(d) must be treated as follows: • **For non–metals** (except carbon disulfide, cyclohexanone, and methanol), treatment must achieve a 90 percent reduction in total constituent concentrations, except as provided in 40 CFR § 268.49(c)(1)(C) • **For metals** and carbon disulfide, cyclohexanone, and methanol, treatment must achieve a 90 percent reduction in total constituent concentrations as measured in leachate from the treated media (tested according to TCLP) or 90 percent reduction in total constituent concentrations (when a metal removal technology is used), except as provided in 40 CFR § 268.49(c)(1)(C) When treatment of any constituent subject to treatment to a 90 percent reduction standard would result in a concentration less than 10 times the Universal Treatment Standard for that constituent, treatment to achieve constituent concentrations less than 10 times the universal treatment standard is not required. Universal Treatment Standards are identified in 40 CFR § 268.48 Table UTS.	Treatment of restricted hazardous waste soils – **Applicable**	40 CFR § 268.49(c)(1)(A)-(C) GA Rule 391-3-11-.16
	In addition to the treatment requirement required by paragraph (c)(1) of this section, prior to land disposal, soils must be treated to eliminate these characteristics.	Soils that exhibit the characteristic of ignitability, corrosivity or reactivity intended for land disposal – **Applicable**	40 CFR § 268.49(c)(2) GA Rule 391-3-11-.16
	Provides methods on how to demonstrate compliance with the alternative treatment standards for contaminated soils that will be land disposed.	On-site treatment of restricted hazardous waste soils following alternative soil treatment of 40 CFR 268.49(c) – **TBC**	*Guidance on Demonstrating Compliance with the LDR Alternative Soil Treatment Standards* [EPA 530 –R –02 –003, July 2002]

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Constituents subject to treatment	When applying the soil treatment standards in paragraph (c) of this section, constituents subject to treatment are any constituents listed in § 268.48 Table UTS-Universal Treatment Standards that are reasonably expected to be present in any given volume of contaminated soil, except fluoride, selenium, sulfides, vanadium, zinc, and that are *present at concentrations greater than 10 times the universal treatment standard* . PCBs are not constituents subject to treatment in any given volume of soil that exhibits the toxicity characteristic solely because of presence of metals.		40 CFR § 268.49(d) GA Rule 391-3-11-.16
Disposal of RCRA characteristic wastewaters in an NPDES permitted WWTU	Are not prohibited, if the wastes are managed in a treatment system which subsequently discharges to waters of the U.S. pursuant to a permit issued under 402 of CWA (i.e., NPDES permitted), unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or D003 reactive cyanide. *NOTE* : For purposes of this exclusion, a CERCLA on- site wastewater treatment unit that meets all of the identified CWA NPDES ARARs for point source discharges from such system, is considered wastewater treatment system that is NPDES permitted.	Land disposal of RCRA restricted hazardous wastewaters that are hazardous only because they exhibit a characteristic and not otherwise prohibited under 40 CFR 268 – **Applicable**	40 CFR § 268.1(c)(4)(i) GA Rule 391-3-11-.16
Disposal of RCRA characteristic wastewaters in a POTW	Are not prohibited, if wastes are treated for purposes of the pretreatment requirements of Section 307 of the CWA, unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or are D003 reactive cyanide.	Land disposal of hazardous wastewaters that are hazardous only because they exhibit a characteristic and are not otherwise prohibited under 40 CFR 268 – **Applicable**	40 CFR § 268.49(b) GA Rule 391-3-11-.16

Table 13-2
Action-Specific ARARs/TBCs

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Discharge of Wastewaters			
Discharge of wastewater from treatment unit or de-watering	All pollutants shall receive such treatment or corrective action so as to ensure compliance with the terms and conditions of the issued permit and with the following, whenever applicable: • Effluent limitations established by EPA pursuant to Sections 301, 302, 303 and 316 of the Federal CWA; • Effluent limitations and prohibitions and pretreatment standards established by the EPA pursuant to Section 307 of the Federal CWA; • Notwithstanding the above, more stringent effluent limitations may be required as deemed necessary by the EPD (a) to meet any other existing Federal laws or regulations, or (b) to ensure compliance with any applicable State water quality standards, effluent limitations, treatment standards, or schedules of compliance. NOTE: Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit.	Discharge of any pollutant into the waters of the State – **Applicable**	GA Rule 391-3-6-.06(4)(a)(1),(3) and (10) Degree of Waste Treatment Required

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Discharge of wastewater from treatment unit or de-watering *Cont'd*	Until such time as such criteria, standards, limitations, and prohibitions are promulgated pursuant to Sections 301, 302, 303, 304(e), 306, 307 and 405 of the Federal CWA, the EPD shall apply such standards, limitations and prohibitions necessary to achieve the purposes of said sections of the Federal Act. With respect to individual point sources, such limitations, standards, or prohibitions shall be based upon an assessment of technology and processes, to-wit: 1. To existing point sources, other than publicly owned treatment works, effluent limitations based on application of the best practicable control technology currently available; 2. To publicly owned treatment works, effluent limitations based upon the application of secondary treatment or treatment equivalent to secondary treatment in accordance with Federal Regulations, 40 C.F.R. 133.102 and .105; 3. To any point source, other than publicly owned treatment works, whose construction commences after the initial effective date of this Paragraph, and for which there are not new source performance standards, effluent limitations which reflect the greatest degree of effluent reduction which the EPD determines to be achievable through application of the best available demonstrated control technology, processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants, consistent with 40 C.F.R. 125.3(c)(2);		GA Rule 391-3-6-.06(4)(d) Degree of Waste Treatment Required

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
	4. To any point source, as appropriate, effluent limitations or prohibitions designed to prohibit the discharge of toxic pollutants in toxic amounts or to require pretreatment of pollutants which interfere with, pass through, or otherwise are incompatible with the operation of publicly owned treatment works; and 5. To any point source, as appropriate, more stringent effluent limitations as are required to ensure compliance with applicable State water quality standards, including those to prohibit the discharge of toxic pollutants in toxic amounts. Where necessary, NPDES Permits issued or reissued after the adoption of this paragraph shall include numeric criteria based upon the following procedures to ensure that toxic substances and other priority pollutants are not discharged to surface waters in harmful amounts. *NOTE:* Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit.		
Monitoring of discharges into surface water	The monitoring requirements of any discharge authorized by any such permit shall be consistent with Federal Regulations, 40 C.F.R. 122.41, 122.42, and 122.44 and applicable State laws. *NOTE:* Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit. Monitoring parameters including frequency will be included in a CERCLA document such as a Remedial Action Work Plan that is reviewed by EPD.	Discharge of any pollutant into the waters of the State – **Applicable**	GA Rule 391-3-6-.06(11)(a)

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Technology-based treatment requirements for wastewater discharge	To the extent that EPA promulgated effluent limitations are inapplicable, State shall develop on a case-by-case basis under § 402(a)(1)(B) of the CWA, technology based effluent limitations by applying the factors listed in 40 CFR § 125.3(d) and shall consider: the appropriate technology for this category or class of point sources; and any unique factors relating to the discharger.	Discharge of pollutants to surface waters from other than a POTW – **Applicable**	40 CFR § 125.3(c)(2)
Water quality based- effluent limits for wastewater discharge	Must develop water quality-based effluent limits that ensure that: The level of water quality to be achieved by limits on point sources(s) established under this paragraph is derived from, and complies with all applicable water quality standards; and Effluent limits developed to protect narrative or numeric water quality criteria are consistent with the assumptions and any available waste load allocation for the discharge prepared by the State and approved by EPA pursuant to 40 CFR § 130.7.	Discharge of pollutants to surface waters that causes, or has reasonable potential to cause, or contributes to an instream excursion above a narrative or numeric criteria within a State water quality standard established under § 303 of the CWA – **Applicable**	40 CFR § 122.44(d)(1)(vii)
Decontamintation of PCB contaminated water	For discharge to a treatment works as defined in 40 CFR 503.9(aa), or discharge to navigable waters, meet standard of < 3 ppb PCBs; or For unrestricted use, meet standard of ≤ 0.5 ppb PCBs.	Water containing PCBs regulated for disposal – **Applicable**	40 CFR § 761.61(b)(1)(ii) 40 CFR § 761.61(b)(1)(iii)
Transportation of Wastes			
Transportation of hazardous waste *on-site*	The generator manifesting requirements of 40 CFR 262.20–262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 CFR 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way – **Applicable**	40 CFR § 262.20(f) GA Rule 391-3-11-.08

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Transportation of hazardous waste *off-site*	Must comply with the generator requirements of 40 CFR 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding, Sect. 262.40, 262.41(a) for record keeping requirements, and Sect.262.12 to obtain EPA ID number.	Preparation and initiation of shipment of hazardous waste off site – **Applicable**	40 CFR § 262.10(h) GA Rule 391-3-11-.08
	Must comply with the requirements of 40 CFR 263.11-263.31. A transporter who meets all applicable requirements of 49 CFR 171-179 and the requirements of 40 CFR 263.11 and 263.31 will be deemed in compliance with 40 CFR 263.	Transportation of hazardous waste within the United States requiring a manifest – **applicable**	40 CFR § 263.10(a) GA Rule 391-3-11-.09
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and DOT HMR at 49 CFR 171- 180 related to marking, labeling, placarding, packaging, emergency response, etc. In addition to any specific requirements set forth in GA Rule 672-10, all hazardous materials shall be packaged, marked, labeled, handled, loaded, unloaded, stored, detained, transported, pacarded, and monitored in compliance with 40 CFR.	Any person, who under contract with a department or agency of the federal government, transports "in commerce", or causes to be transported or shipped, a hazardous material – **Applicable**	49 CFR § 171.1(c) GA Rule 672-10
Transportation of samples (i.e. contaminated soils and wastewaters)	Are not subject to any requirements of 40 CFR Parts 261 through 268 or 270 when: • the sample is being transported to a laboratory for the purpose of testing; or • the sample is being transported back to the sample collector after testing. • the sample is being stored by sample collector before transport to a lab for testing	Samples of solid waste <u>or</u> a sample of water, soil for purpose of conducting testing to determine its characteristics or composition **– Applicable**	40 CFR § 261.4(d)(1)(i)–(iii) GA Rule 391-3-11-.07

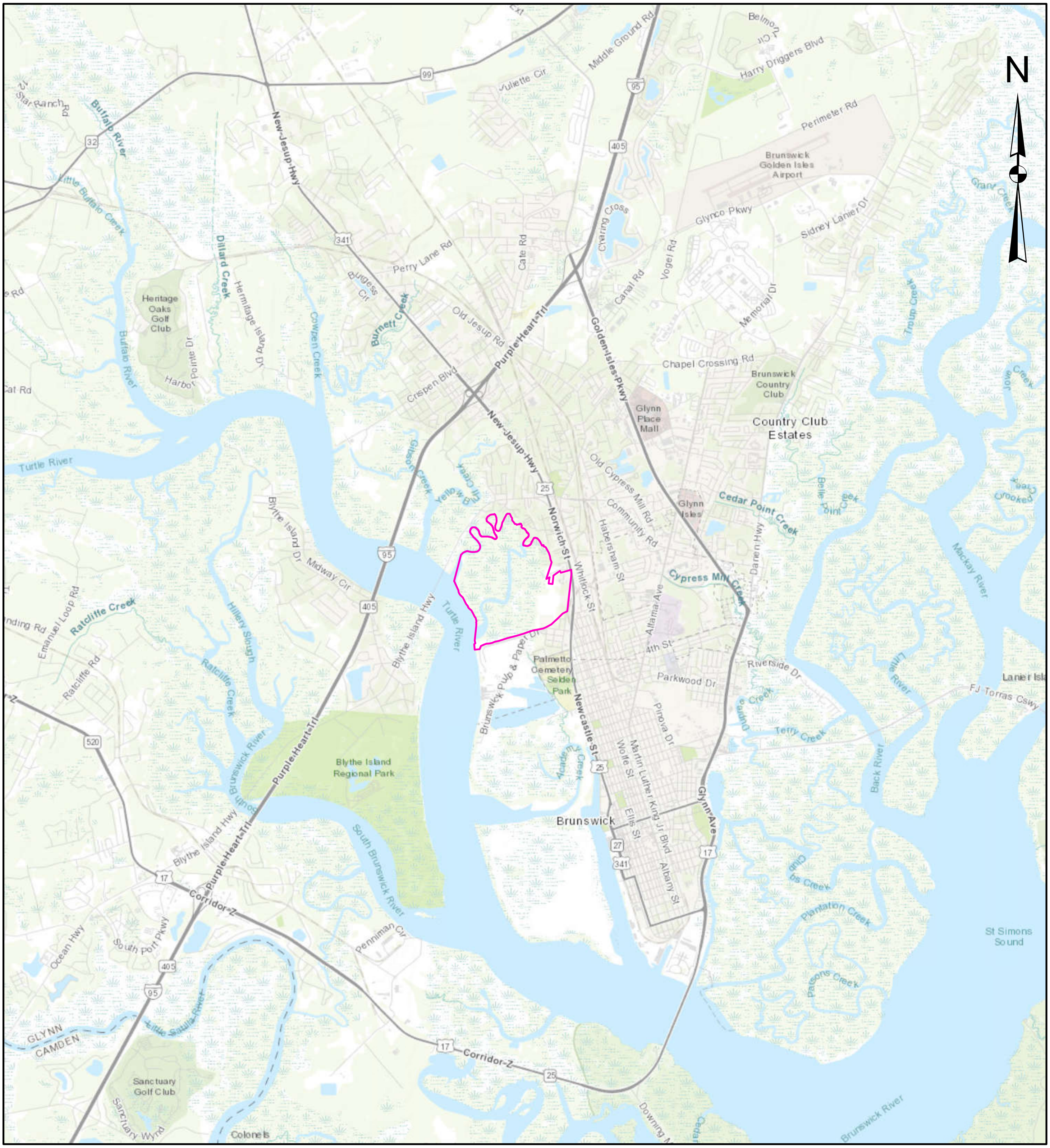
ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
	In order to qualify for the exemption in paragraphs (d)(1)(i) and (ii), a sample collector shipping samples to a laboratory must: • Comply with U.S. DOT, U.S. Postal Service, or any other applicable shipping requirements • Assure that the information provided in (1) thru (5) of this section accompanies the sample. • Package the sample so that it does not leak, spill, or vaporize from its packaging.	Samples of solid waste or a sample of water, soil for purpose of conducting testing to determine its characteristics or composition **– Applicable**	40 CFR § 261.4(d)(2)(i)(A) and (B) GA Rule 391-3-11-.07
Transportation and handling of solid waste	No person shall engage in solid waste or special solid waste handling in Georgia or construct or operate a solid waste handling facility in Georgia, except those individuals exempted from this part under Code Section 12-8-30.10, without first obtaining a permit from the director authorizing such activity.	Management of solid waste in Georgia – **Applicable**	Georgia Solid Waste Management Act of 1990 O.C.G.A. §12-8-24

ARAR = applicable or relevant and appropriate requirement
CFR = *Code of Federal Regulations*
CWA = Clean Water Act of 1972
DEACT = deactivation
DOT = U.S. Department of Transportation
EPA = U.S. Environmental Protection Agency
EPD = Georgia Environmental Protection Division of the Georgia Department of Natural Resources
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
GA Rule = *Rules and Regulations* , Section as noted
LDR = Land Disposal Restrictions
NPDES = National Pollutant Discharge Elimination System
O.C.G.A. = *Official Code of Georgia Annotated* , Chapter as noted
POTW = Publicly Owned Treatment Works
RCRA = Resource Conservation and Recovery Act of 1976
TBC = to be considered
TCLP = Toxicity Characteristic Leaching Procedure
U.S. = United States

Table 13-2
Action-Specific ARARs/TBCs

ACTION-SPECIFIC ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
USCOE = U.S. Corps of Engineers			
UTS = Universal Treatment Standard			
WWTU = Waste Water Treatment Unit			

FIGURES



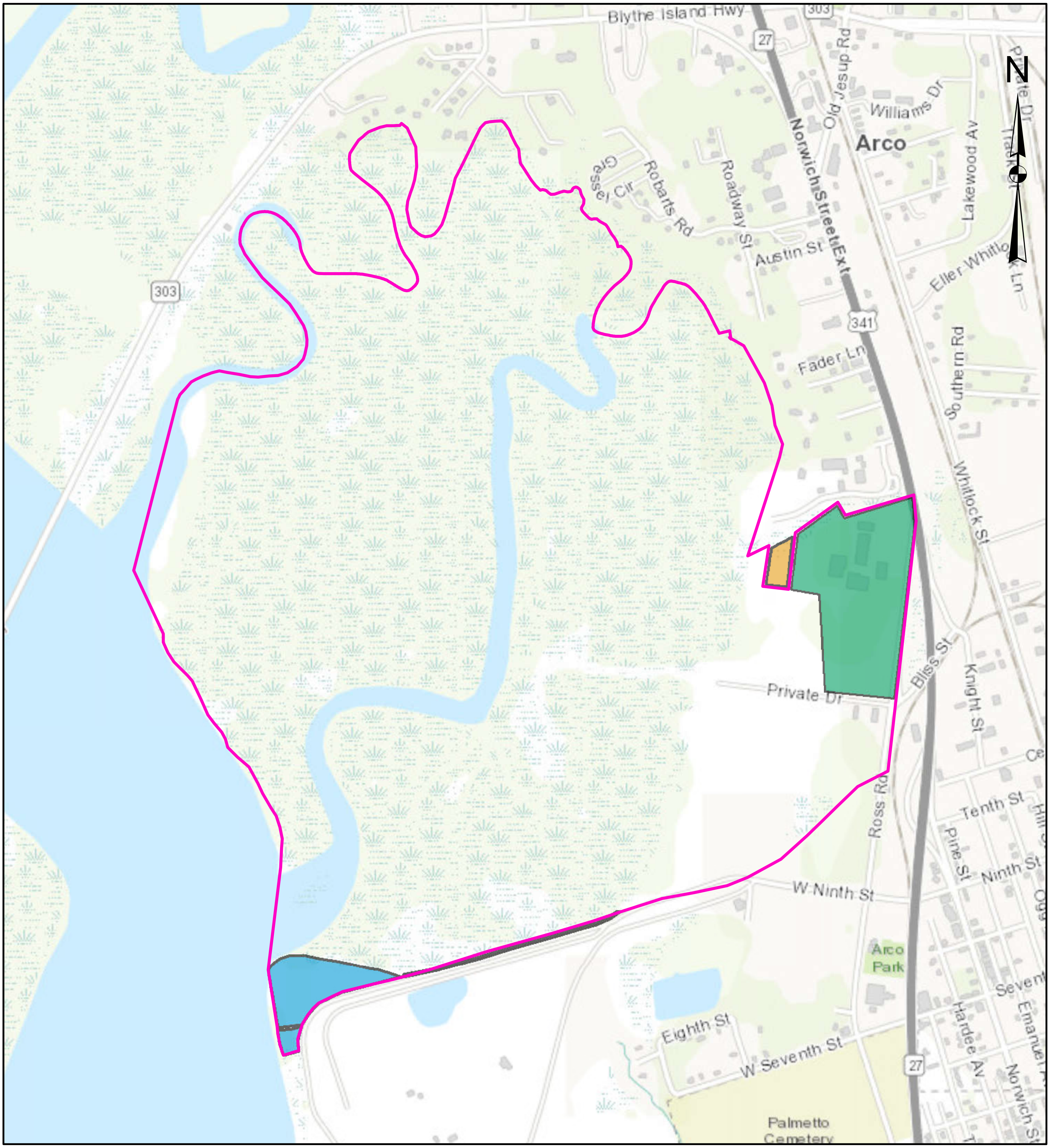
0 0.5 1 2
Miles

Original Site Boundary

Site Location
LCP Chemicals Site
Brunswick, GA

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure No.1-1



0 0.125 0.25 0.5

Miles

Original Site Boundary

Former Georgia Power Parcel (Now Honeywell)

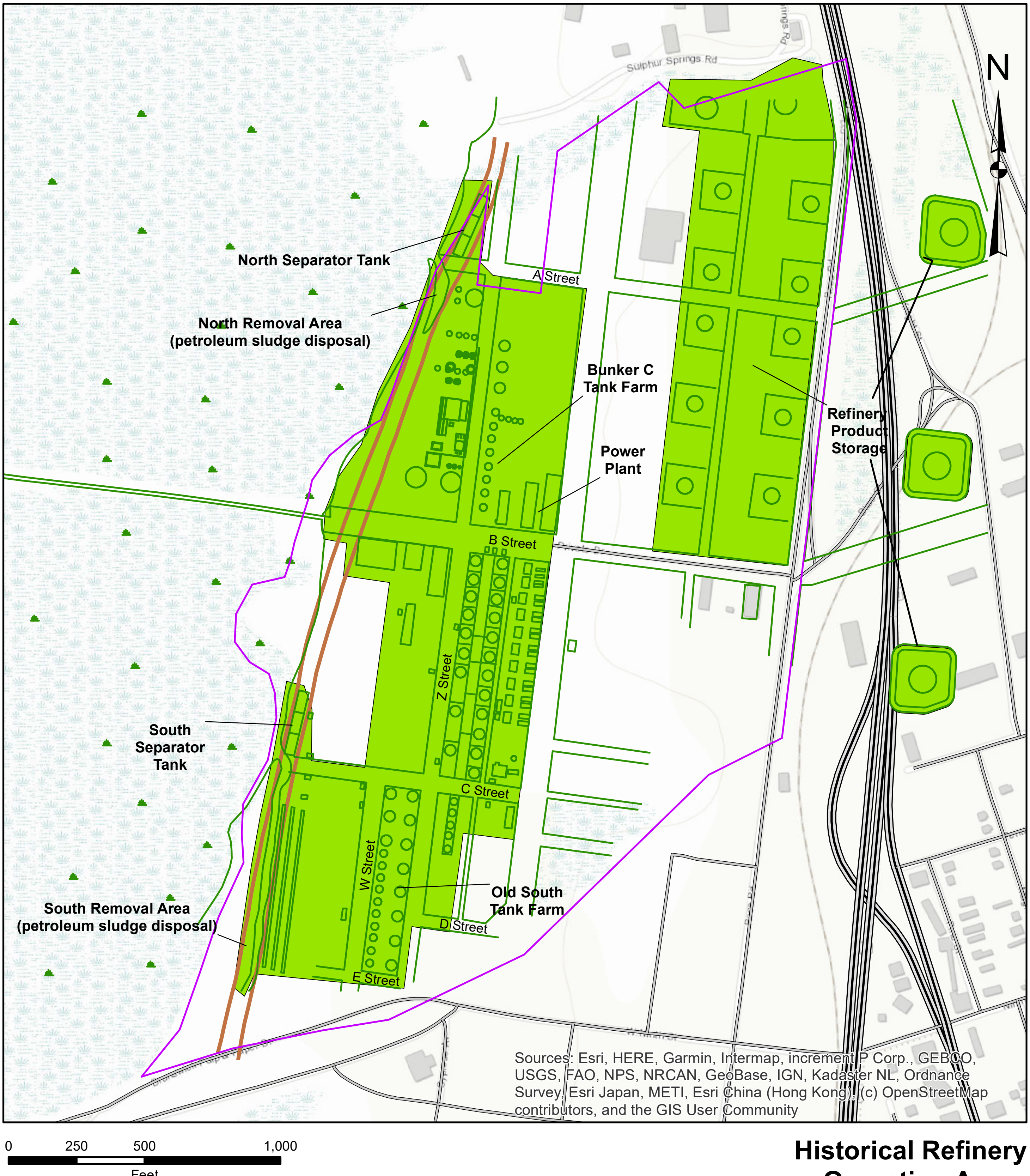
Georgia Pacific Parcel (Former Salt Dock)

Glynn County Parcel

Property Boundary
LCP Chemicals Site
Brunswick, GA

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure No.1-2



Site Features

Upland Boundary

Historic Operation Areas

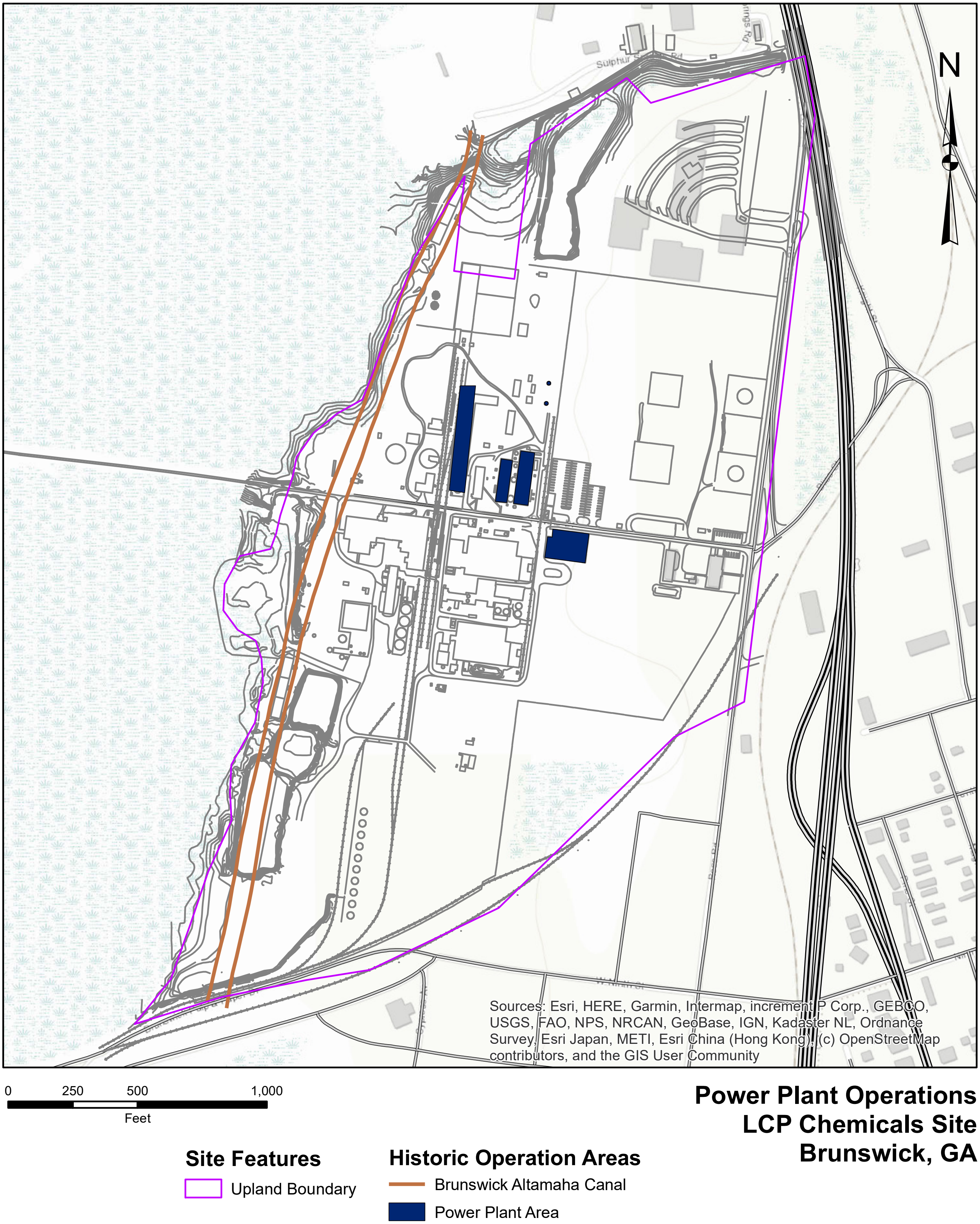
Refinery Features (tanks)

Brunswick Altamaha Canal

Refinery Operations

Historical Refinery Operation Areas LCP Chemicals Site Brunswick, GA

Figure No. 2-1

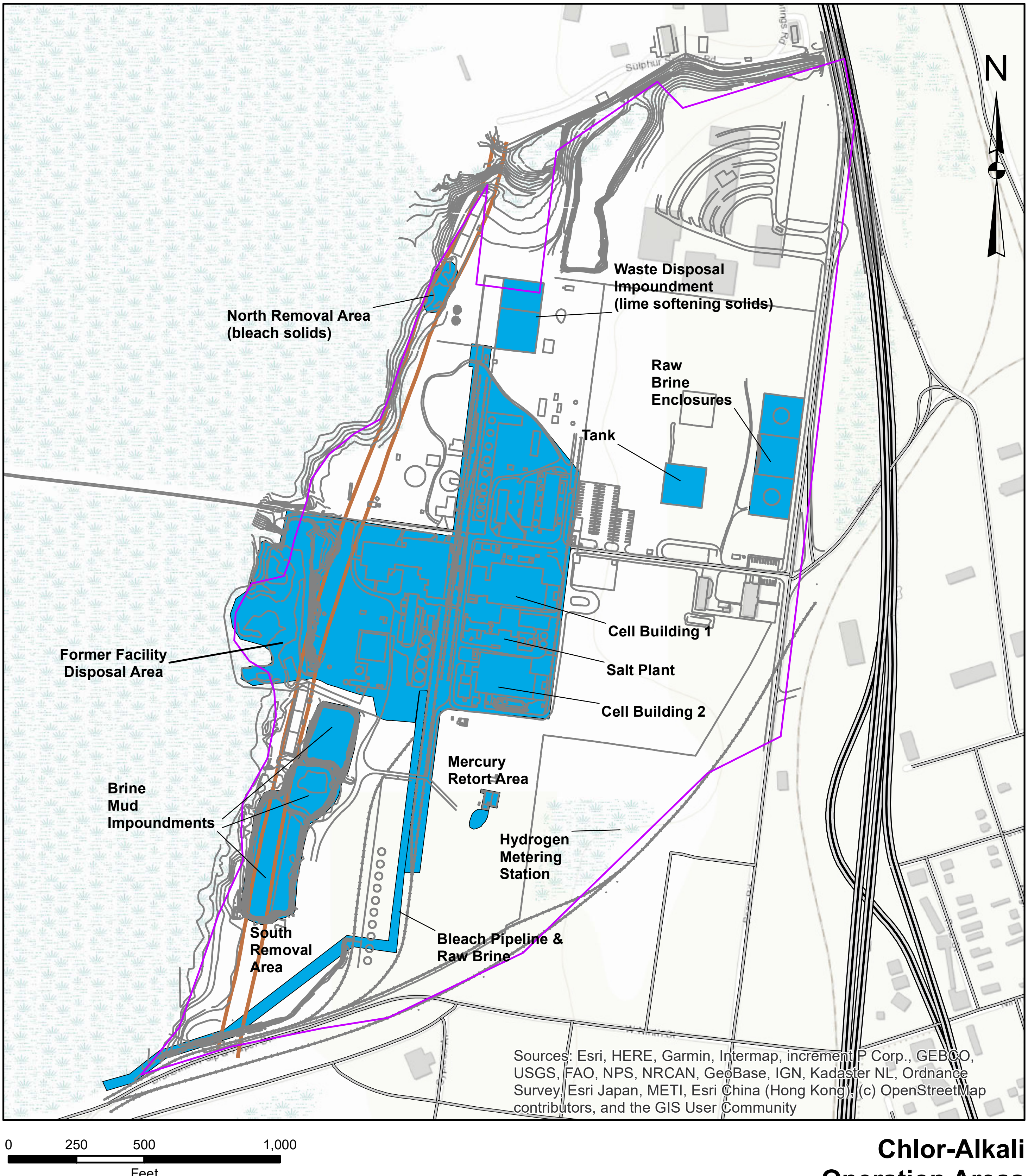


Power Plant Operations
LCP Chemicals Site
Brunswick, GA

Figure No. 2-2

Dixe Paint & Varnish Company
Operation Areas
LCP Chemicals Site
Brunswick, GA

Figure No. 2-3



Site Features

Upland Boundary

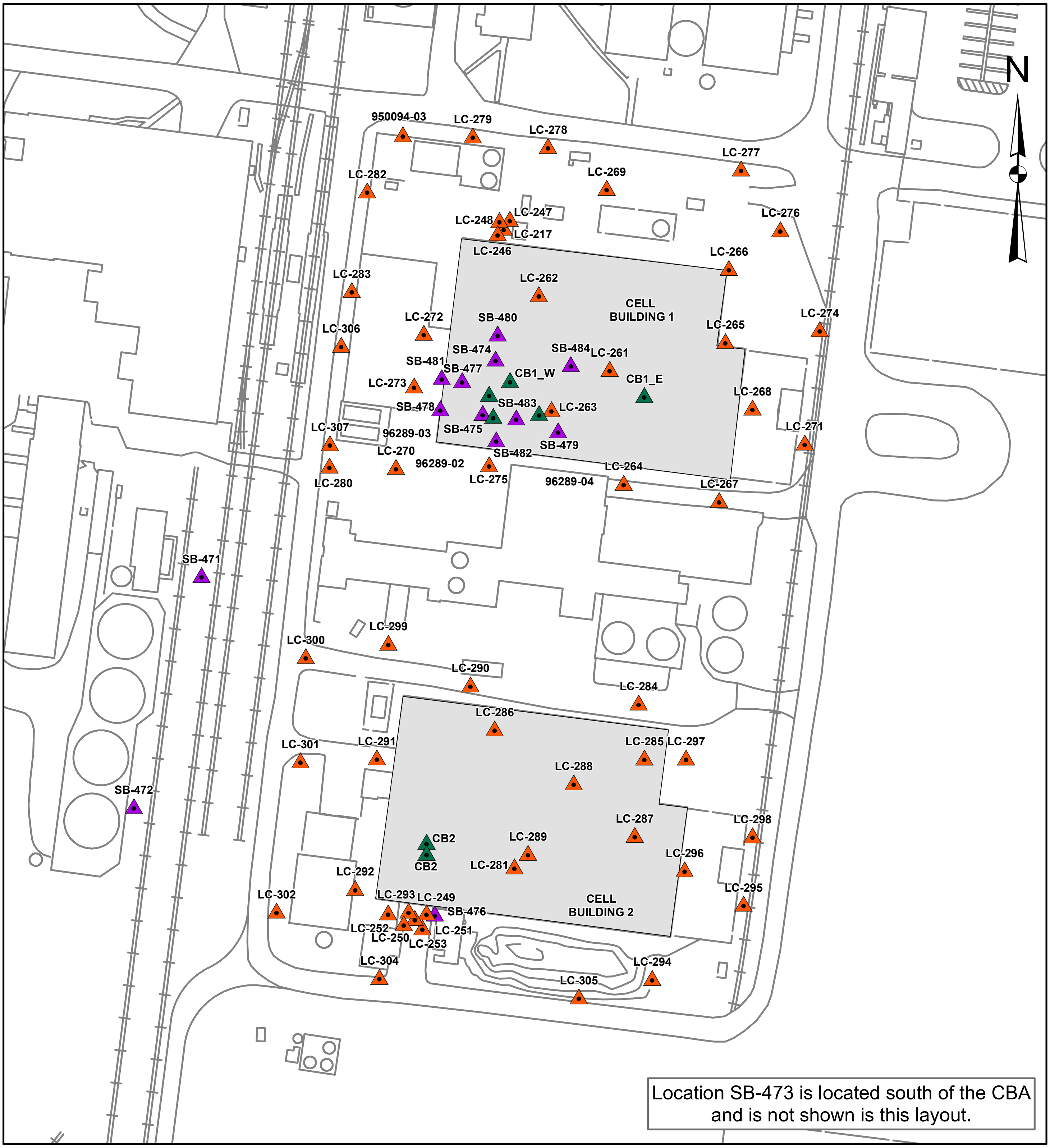
Historic Operation Areas

Brunswick Altamaha Canal

Chlor-Alkali Operations

Chlor-Alkali Operation Areas LCP Chemicals Site Brunswick, GA

Figure No. 2-4



0 50 100 200
Feet

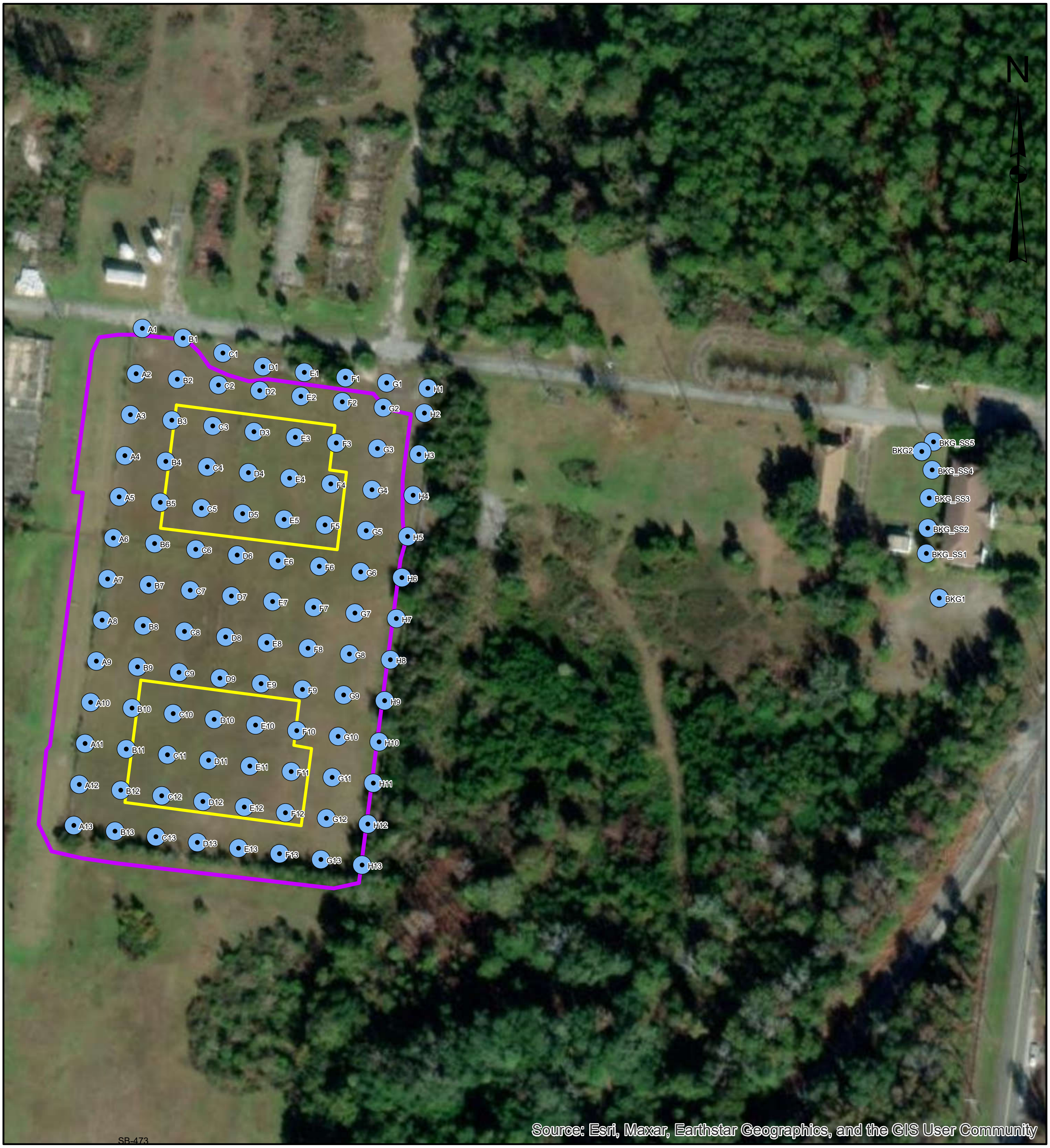
Hg Cell Buildings (former)

Investigation Phase

- 1994 Hand Auger Boring
- 1996 Test Pit Study
- 1997 SB Soil

CBA Investigations
Soil Borings and Test Pits
LCP Chemicals Site
Brunswick, GA

Figure No. 2-5



0 80 160 320
Feet

Lumex-RA 915+ Measurement Location

Hg Cell Buildings (former)

CBA Soil Cover

CBA & Background Mercury Vapor Measurement Locations
LCP Chemicals Site
Brunswick, GA

Figure No. 2-6

Figure 5-1
Human Health Conceptual Site Model - Groundwater

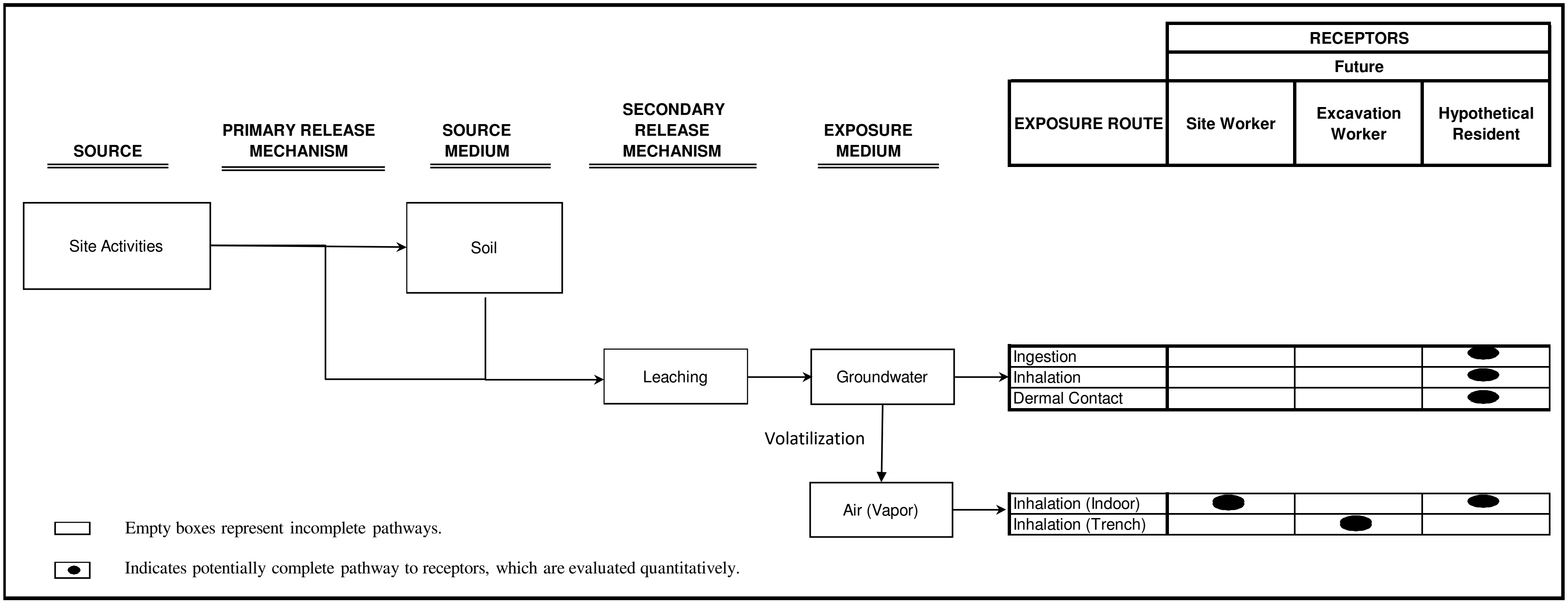
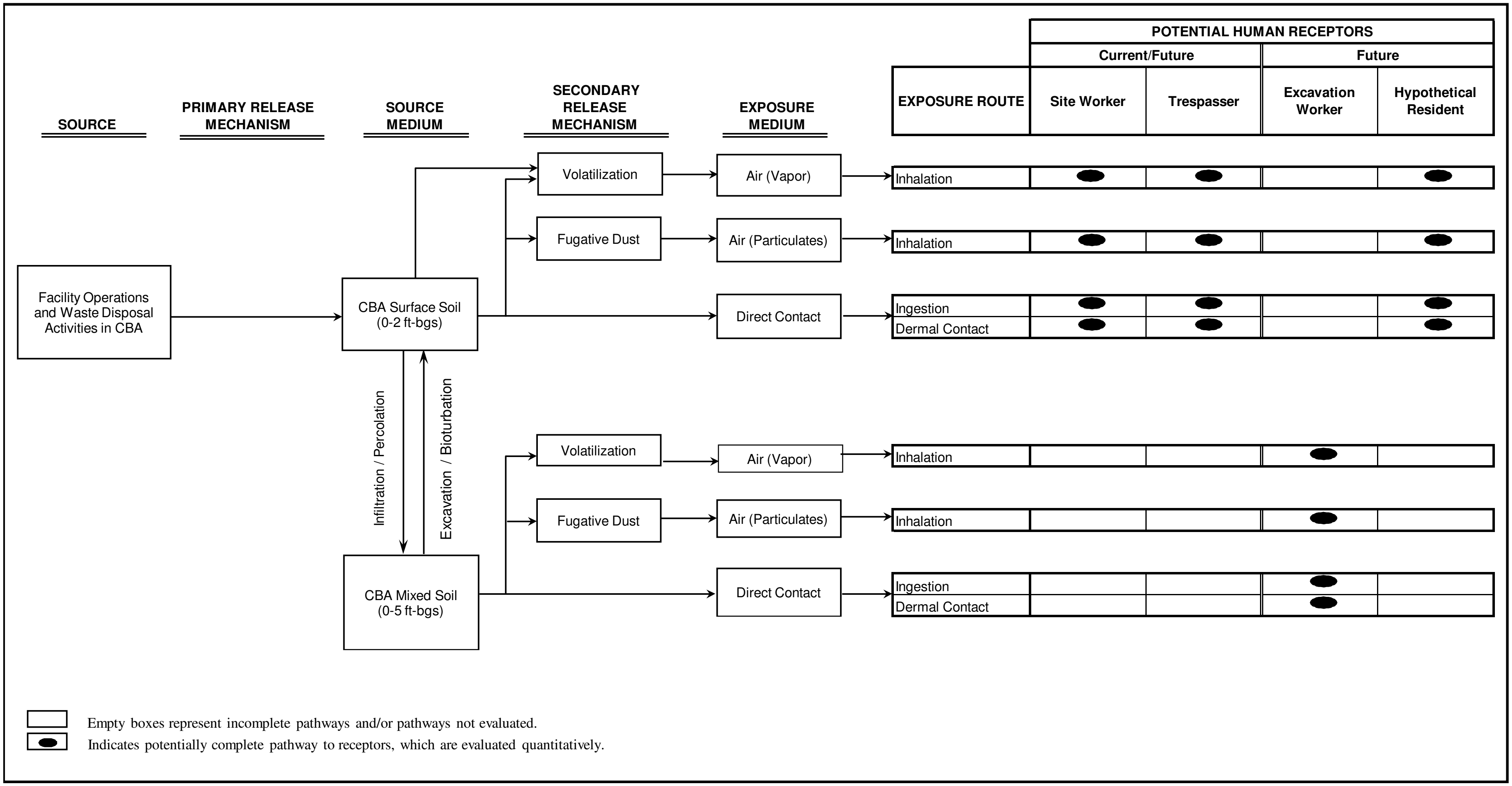
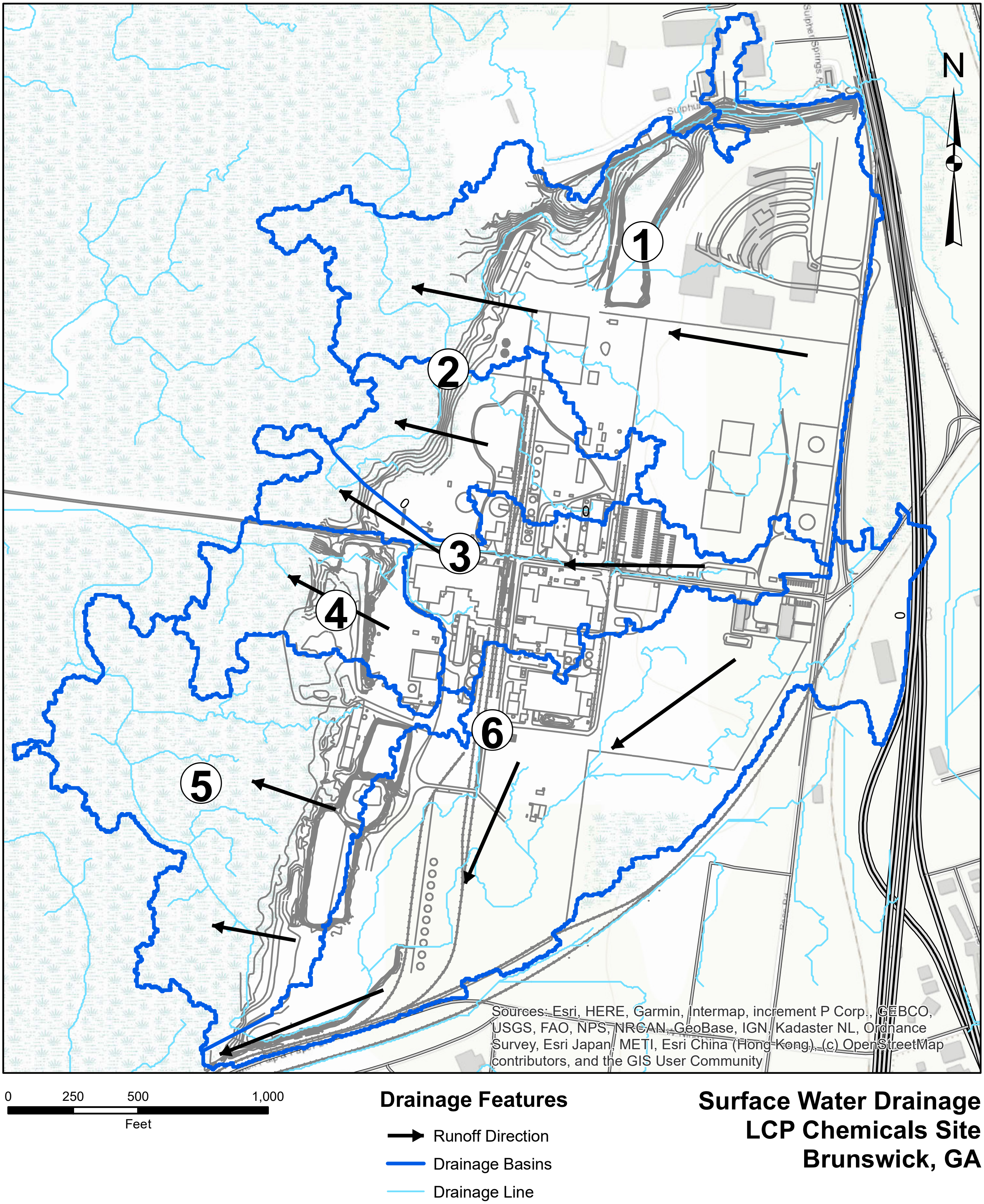


Figure 5-2
Human Health Conceptual Site Model - CBA Soil





Surface Water Drainage
LCP Chemicals Site
Brunswick, GA

Figure No. 5-3

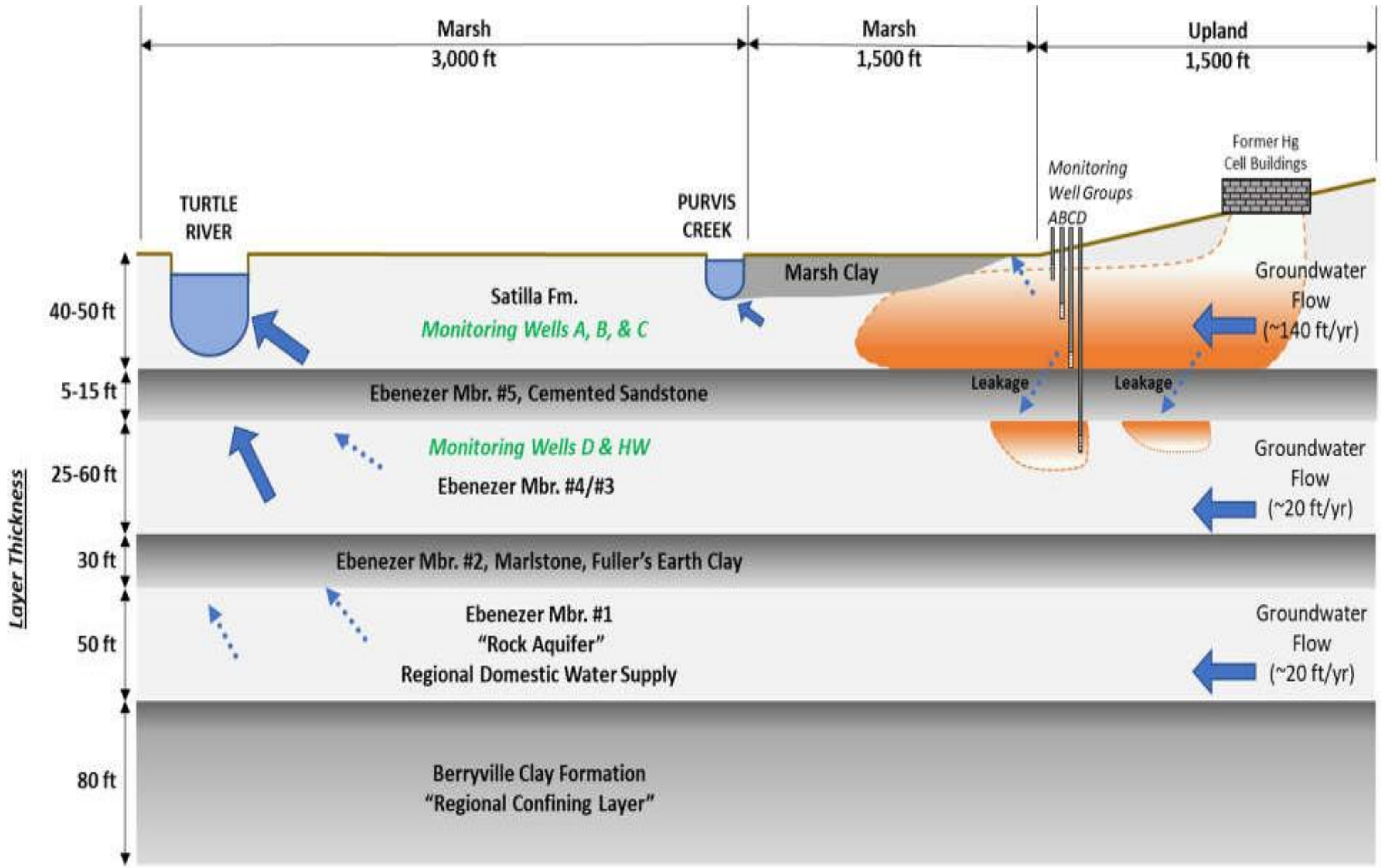
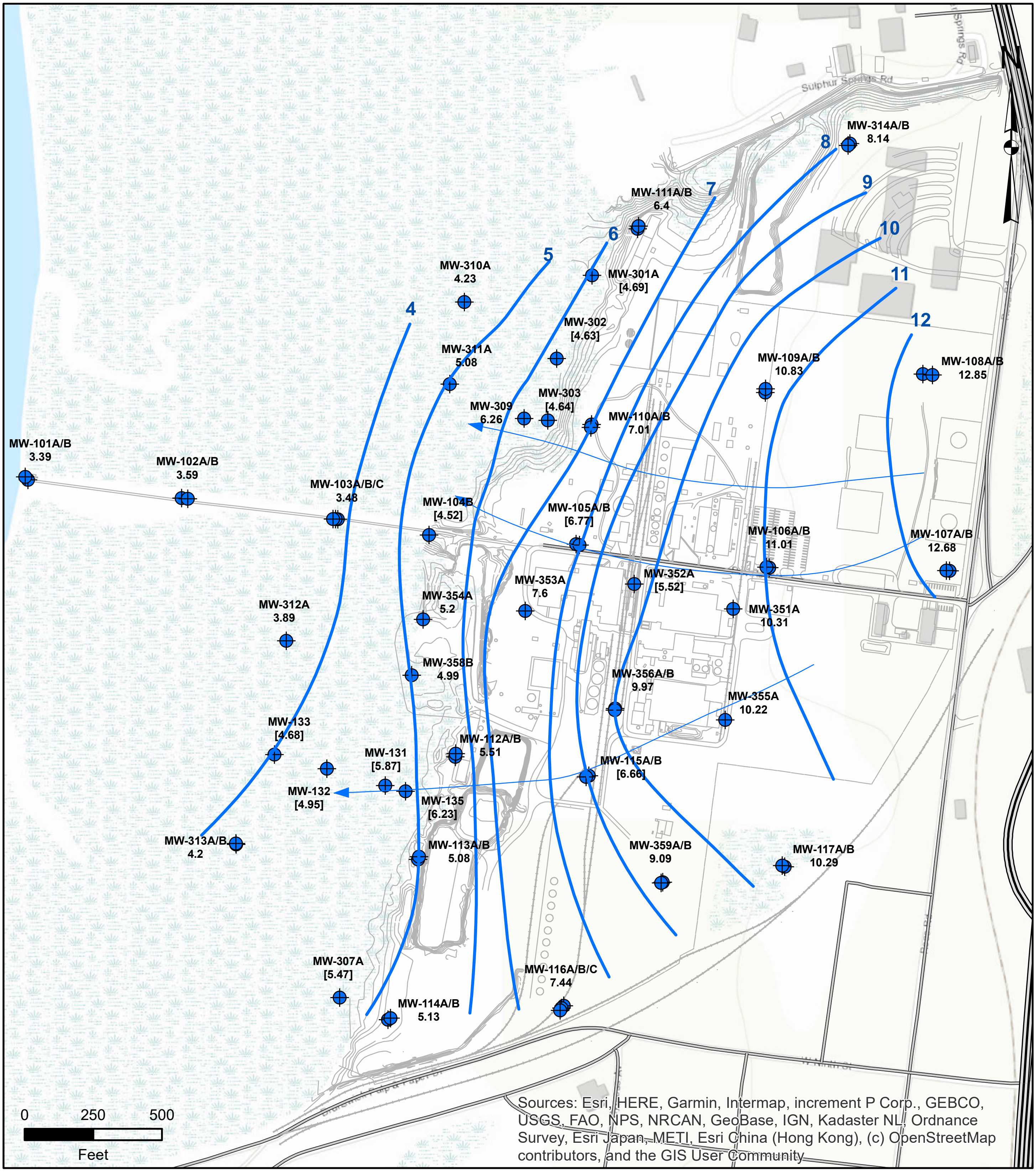


Figure 5-4 Generalized Hydrogeologic Setting Surficial Aquifer System



Notes:
(1) Only wells screened in upper and middle Satilla Formation depicted.
(2) Bracketed groundwater elevations were omitted from the potentiometric surface interpretation.

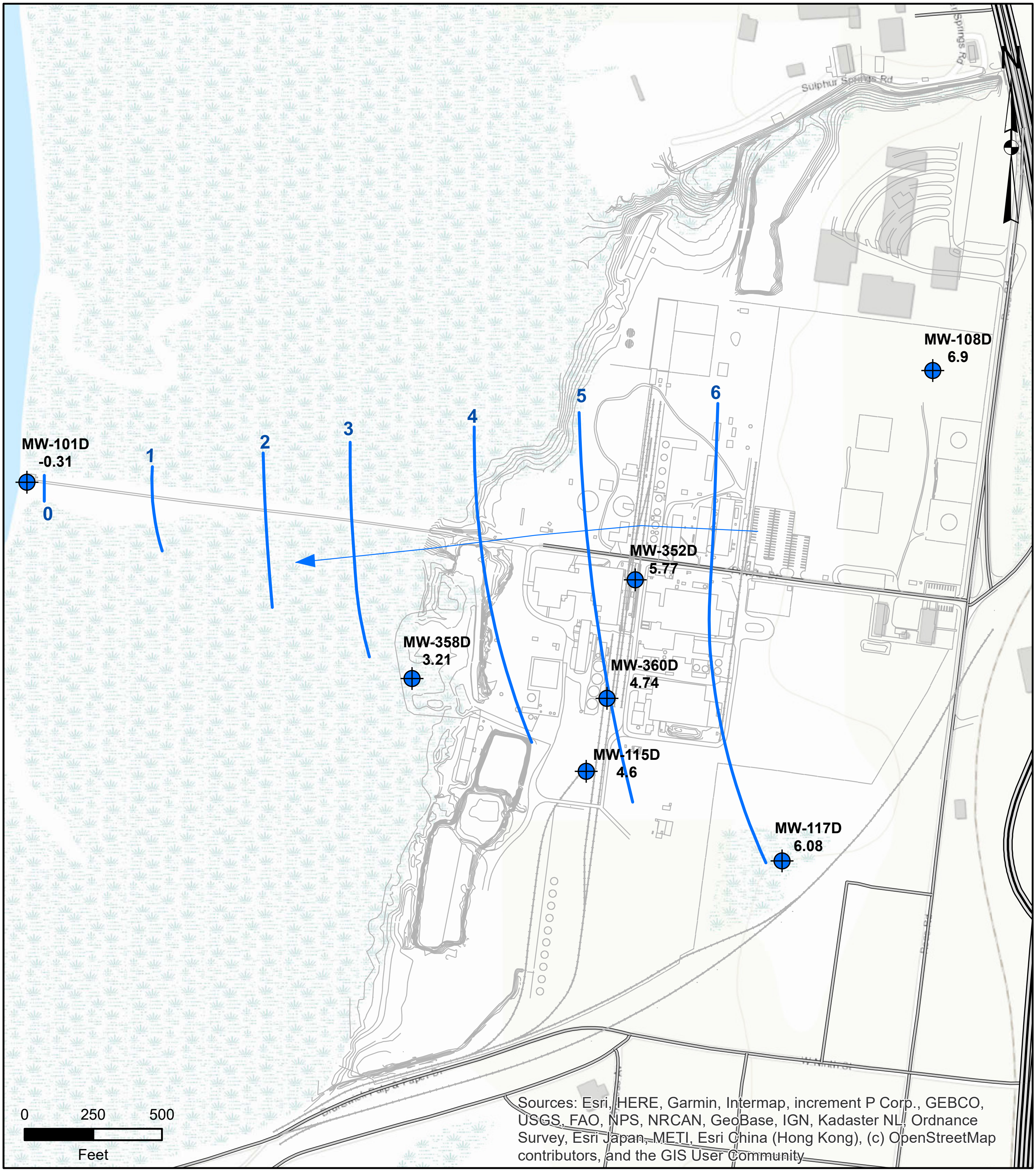
Potentiometric Surface and Groundwater Flow:
Satilla Formation
LCP Chemicals Site
Brunswick, GA

Monitoring Well

Groundwater Surface Elevation Contour (ft amsl)

Groundwater Flow Direction

Figure No. 5-5



Notes:
(1) "D" wells are depicted.

Potentiometric Surface and Groundwater Flow: Ebenezer Formation
LCP Chemicals Site
Brunswick, GA

Monitoring Well

Groundwater Surface Elevation Contour (ft amsl)

Groundwater Flow Direction

Figure No. 5-6

0 50 100 200
Feet

Elemental Hg Observed
No
Yes

Hg Cell Buildings (former)
CBA Soil Cover

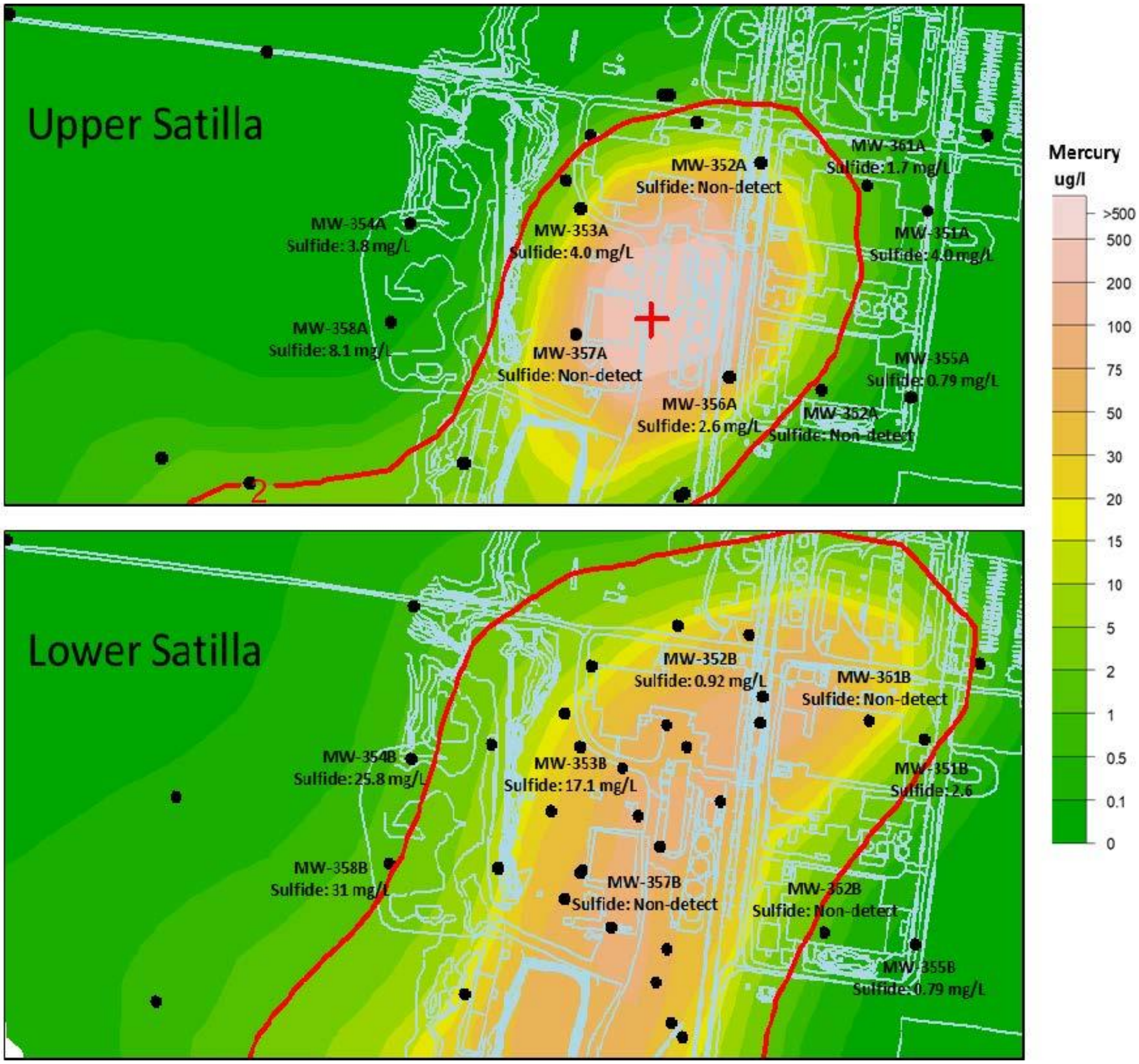
Summary of Hg^0 Observations
LCP Chemicals Site
Brunswick, GA

Figure No. 5-7a

Summary of Hg^0 Observations by Depth

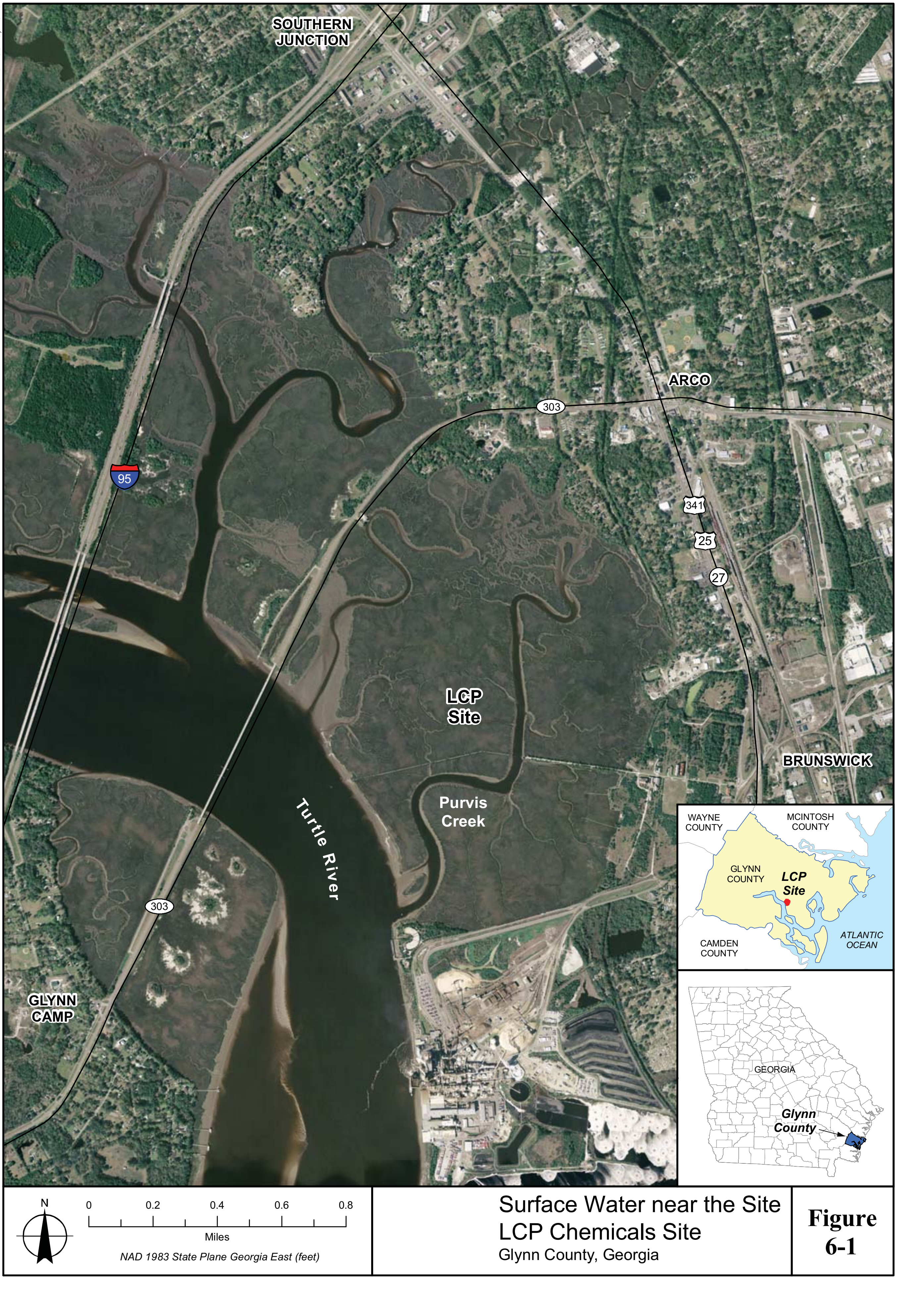
LCP Chemicals Site
Brunswick, GA

Figure No. 5-7b



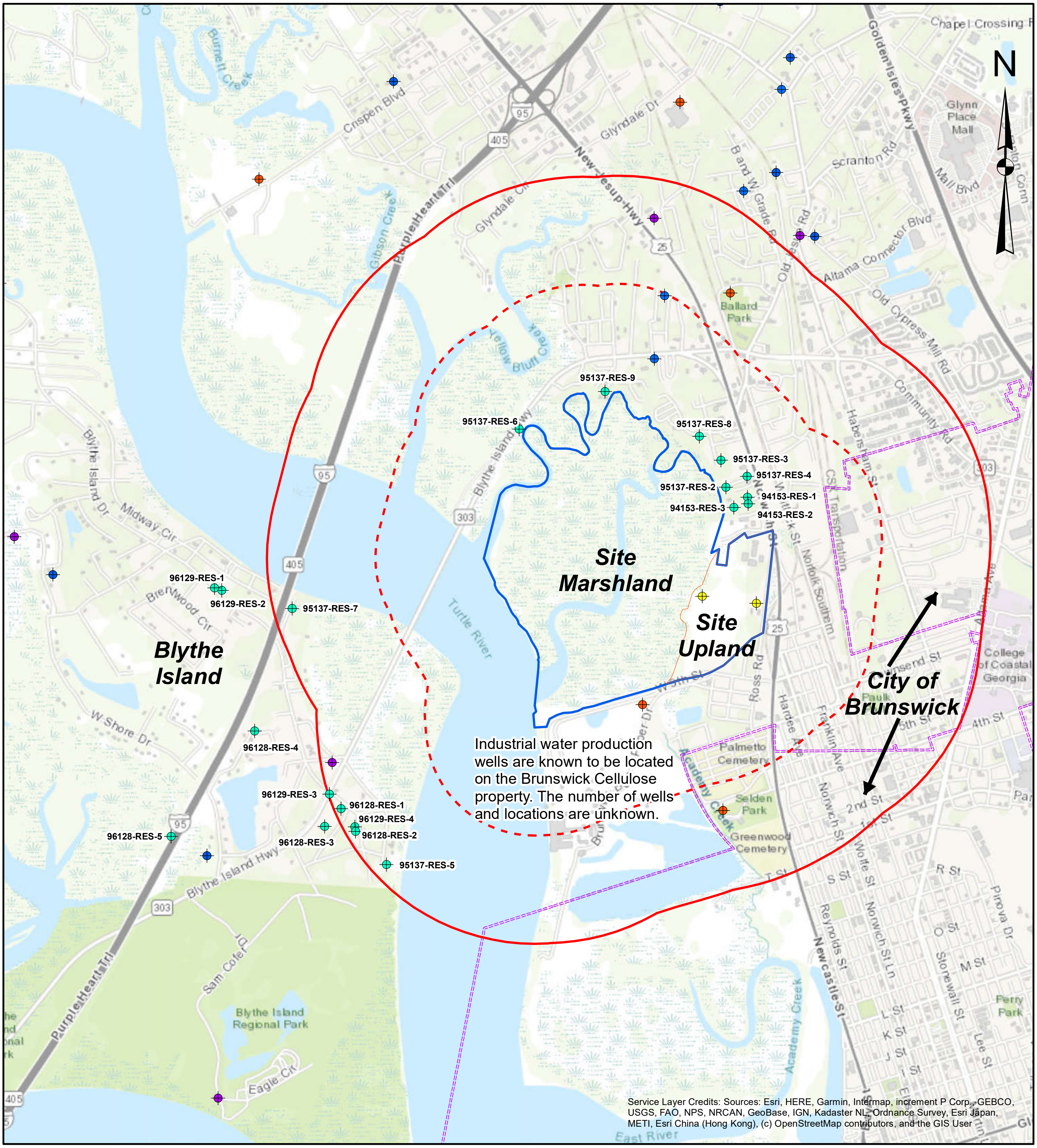
This series of figures depicts the last dissolved mercury concentration profile in the Upper and Lower Satilla in 2012 prior to commencing CO_2 sparging and the most recent data set for dissolved sulfide. Note the historical concentration drop in dissolved mercury occurred near the marsh-upland border west of the CBA . Corresponding to the marsh-upland boundary is a historical increase in the dissolved sulfide typically increasing from a few mg/L or less to greater than 20 mg/L in the Lower Satilla. Sulfide concentration is provided in the well label. The intersection of high sulfide and the dissolved mercury front is interpreted to be one pathway for the attenuation of mercury with potential formation of HgS. Mercury MCL of 2 μg/L shown as red line.

Figure 5-8 Dissolved Mercury Concentration Profile (Pre-CO_2 Sparge)



Surface Water near the Site
LCP Chemicals Site
Glynn County, Georgia

Figure 6-1



0 0.325 0.65 1.3

Miles

Areas

- Site Upland Boundary
- Site Boundary
- Brunswick City Limit

Site Radius

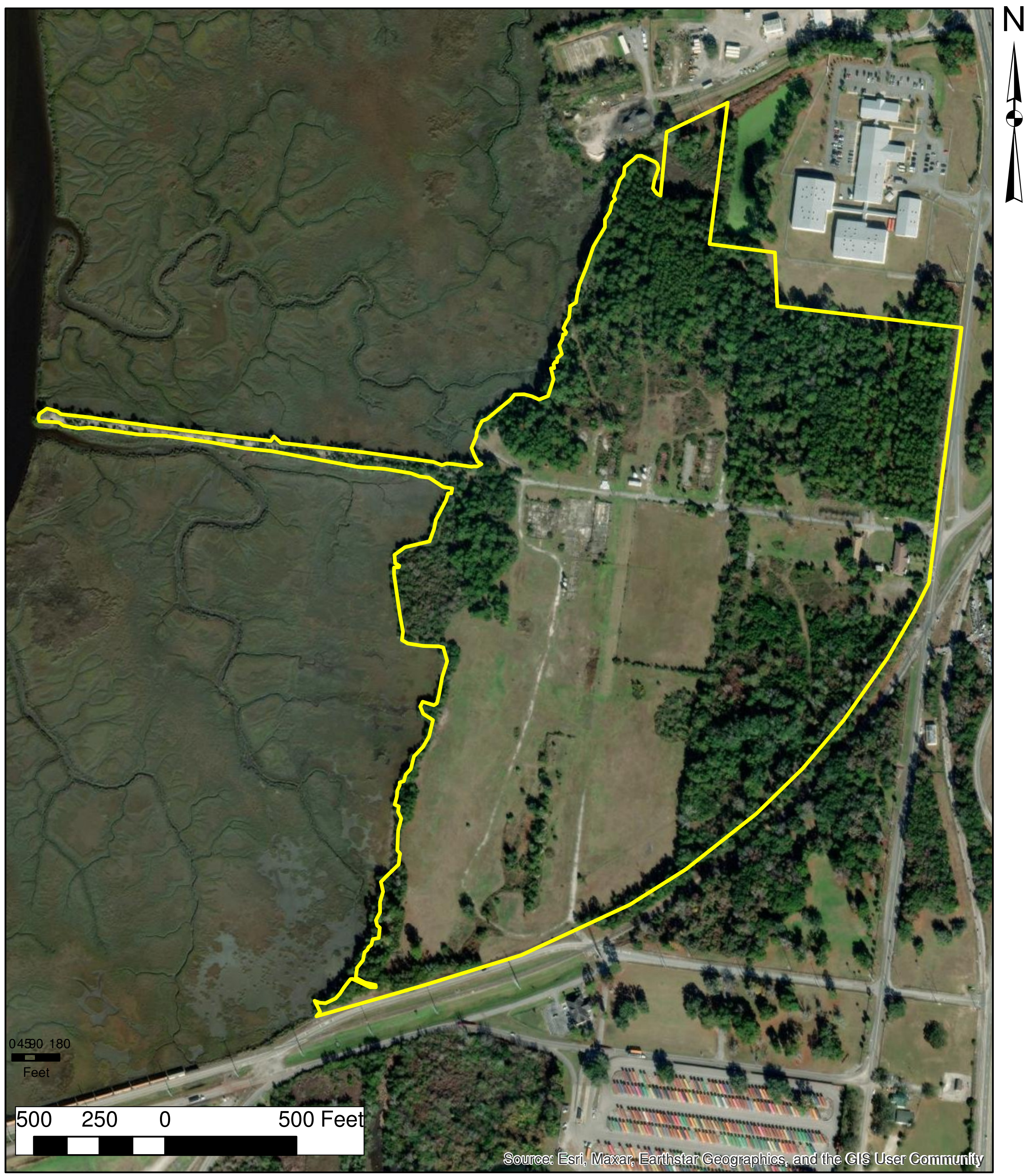
- 0.5 Mile
- 1.0 Mile

Well Type

- Residential (Single Home)
- Residential (Mobile Home Park)
- Site Well
- Commercial
- Industrial

Area Water Supply Wells
LCP Chemicals Site
Brunswick, GA

Figure No. 6-2

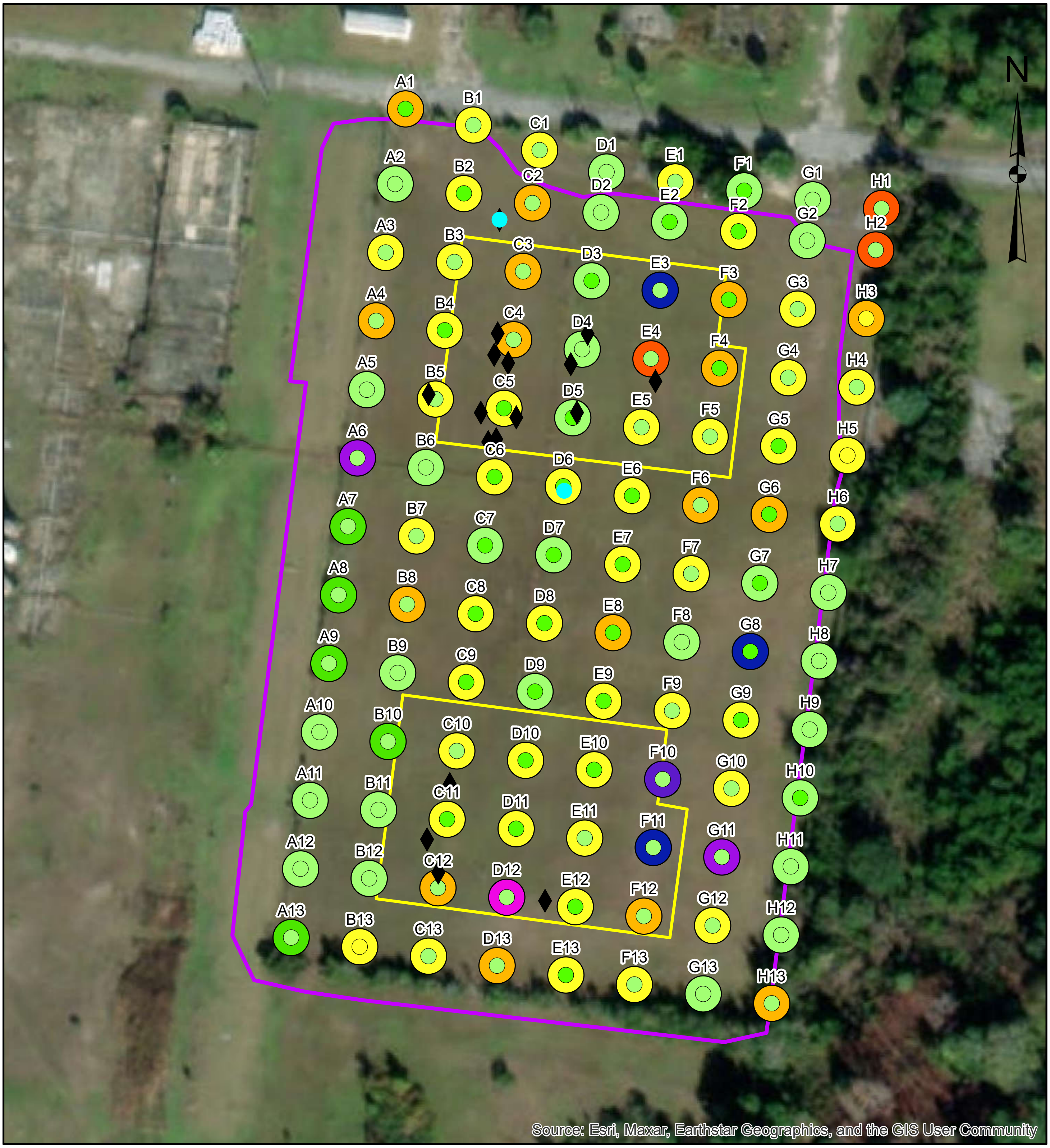


Redevelopment Exposure Area

CBA Exposure Area

Golf Course Redevelopment Exposure Areas LCP Chemicals Site Brunswick, GA

Figure No. 7-1



0 50 100 200

Feet

Hg Cell Buildings (former)

CBA Soil Cover

Elemental Hg Observed

Yes

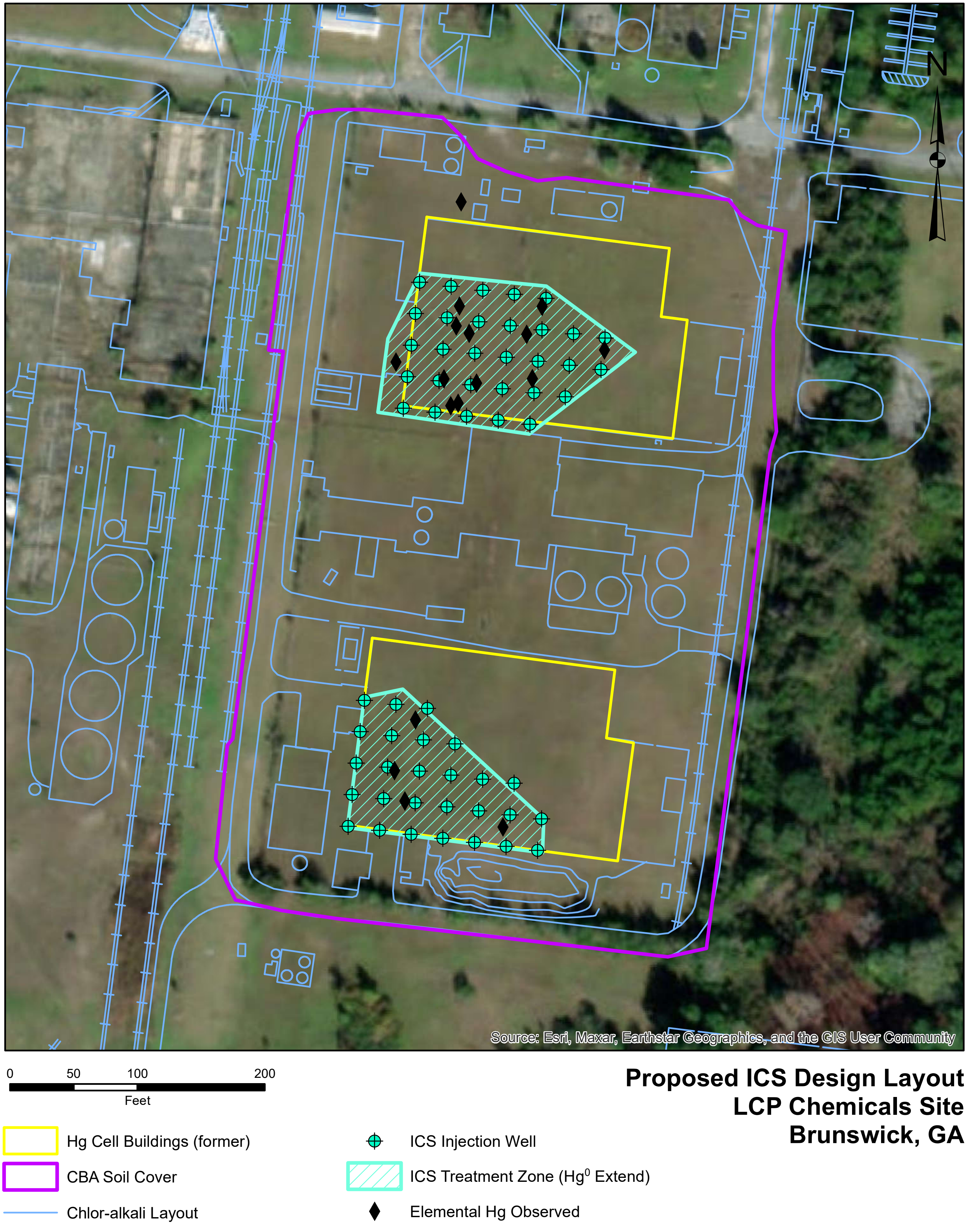
Hg Vapor Concentration (ng/m3)

- < 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 150
- 150 - 250
- 250 - 500
- 500 - 3,000
- 3,000 - 6,000
- 6,000 - 12,470

Subsurface measurements denoted by large circle markers; ground surface measurements denoted by smaller circle markers.

Mercury Vapor Concentrations above the CBA Soil Cover
LCP Chemicals Site
Brunswick, GA

Figure No. 7-2



Proposed ICS Design Layout
LCP Chemicals Site
Brunswick, GA

Figure No. 12-1

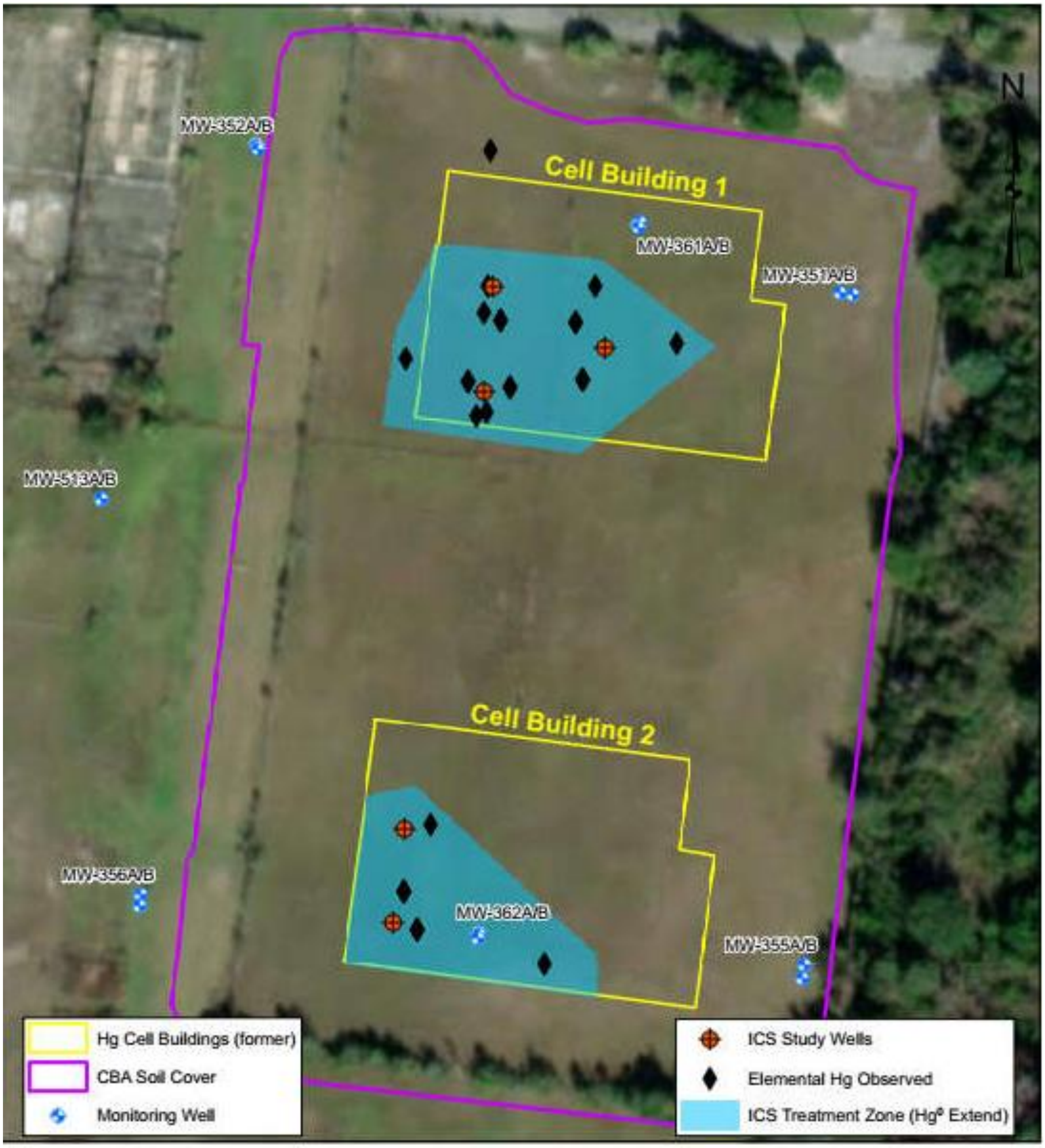


Figure 12-2 Proposed ICS Study Monitoring Wells

APPENDIX A

Responsiveness Summary for the Interim Early Action Proposed Plan for the LCP Chemicals Superfund Site Operable Unit 2 Brunswick, Glynn County, Georgia

APPENDIX A – RESPONSIVENESS SUMMARY

1. OVERVIEW

This responsiveness summary provides a summary of the public's comments submitted to the U.S. Environmental Protection Agency (EPA) regarding the Proposed Plan for Operable Unit 2 (OU2) of the LCP Chemical Superfund Site (Site), and the EPA's responses to the comments. A responsiveness summary is required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 Code of Federal Regulation (CFR) § 300.430(f)(3)(F). All comments summarized in this document have been considered in EPA's interim early action decision for the selection of the remedy for OU2.

The EPA has worked closely with community members and other stakeholders throughout the development of the remedial investigation, focused feasibility study, and Interim Early Action Proposed Plan for OU2. Community participation played an essential role in the development of the Interim Early Action Proposed Plan and ROD for OU2 at the Site.

The original public comment period was held from July 5, 2024 to August 5, 2024. During that comment period EPA received stakeholder requests for an extension and extended the comment period for an additional 30 days to September 5, 2024. EPA held a public meeting to present the Proposed Plan and preferred alternative to stakeholders and receive public comment directly on July 18,2024 during the original public comment period. The comments received during the meeting and the responses provided by EPA are summarized below. In addition, the official court recorder transcript of the public meeting is attached to this ROD as an appendix. EPA received many individual comment submissions about the Interim Early Action Proposed Plan during the comment period from July 5, 2024 through September 5, 2024. However, many of the comments received were worded the same or in a very similar manner. EPA has summarized these comments and provided responses to address the major points of the comments. In addition, EPA received comments from two community organizations. Due to the detailed nature of the comments received from the organizations, EPA has developed direct responses to their comments. Comments were received by mail, email and submission of oral comment at public meetings (stenographer's transcript). Each submission was given a sequential individual comment ID number. Names of individuals who submitted comments are not available to the public due to EPA's Privacy Policy and commitment to protect personally identifiable information. Names of organizations submitting comments are listed below.

- General Public: multiple comments were submitted by email during the public comment period and stated during the July 18, 2024, Proposed Plan Public Meeting. In addition, one comment was provided by mail.
- One Hundred Miles (OHM): 6 comments submitted on September 4, 2024
- Glynn Environmental Coalition (GEC): 6 comments submitted on September 5, 2024

2. PROPOSED PLAN COMMENTS

Items 2.1 through 2.9 are the comments and responses summarized from the public meeting held on July 18, 2024. Items 2.10 and higher were received from individuals or stakeholder organizations during the public comment period.

2.1 **Comment:** One citizen asked about the price of the polysulfide injection amendment.

Response: EPA explained that the price presented on the presentation table has a typo; it is missing a zero.

2.2 **Comment:** One citizen asked about the Climate Vulnerability Assessment (CVA).

Response: EPA indicated that the CVA is prepared by an EPA Headquaters contractor and reviewed by EPA Headquarters with input from EPA Region 4 staff. Weather patterns, sea levels, wetlands, wind directions, and flood zones, are considered. Statistical models of storm intensity are evaluated. The impact of these factors on the remedy is considered. On some sites, older remedies have to changed based on the assessment. The results of the CVA will be shared with stakeholders and will be used to ensure the implemented remedy addresses vulnerabilities.

2.3 **Comment:** One citizen asked whether excess polysulfide would be a toxin also requiring cleanup.

Response: EPA explained that polysulfides are unstable and the expectation is that excess polysulfides would transform to sulfate which is common in the environment, particularly the salt marsh.

2.4 **Comment:** One citizen asked whether any released mercury is unaccounted for.

Response: EPA described how a lot of the mercury was taken off site during the removals that occurred in the 1990s, but there was not an accurate accounting for what had been left on site based on the initial release. Estimates of the mercury volume are based on limited details, so broad assumptions have to be made.

2.5 **Comment:** One citizen asked about evidence of elemental mercury in the Ebenezer formation.

Response: EPA indicated that elemental mercury has been detected in soil samples upper part of the surficial aquifer (Satilla), but soil samples haven’t been collected from the lower part (Ebenezer) in the Cell Building Area (CBA). EPA doesn’t want to puncture the cemented sandstone layer between the Ebeneezer and the Satilla which could potentially spread the elemental mercury to the Ebenezer. In Ebenezer wells outside the CBA, dissolved mercury has been detected in groundwater. This dissolved mercury in the Ebenezer will have to be addressed in the final site remedy. But the presence of elemental mercury in the Ebenezer has not been confirmed.

2.6 **Comment:** One citizen asked whether the Ebenezer formation would be monitored to evaluate impacts from the remedy.

Response: EPA explained that the current remedy proposed in the FFS is focused on the elemental mercury in the Satilla, so the Ebenezer monitoring will occur in a later phase. Once a legal agreement is reached with other responsible parties, the final site remedy will be implemented. This will include the impacts to the Ebenezer. EPA hopes that the Ebenezer monitoring can get started during the FFS proposed remedy, especially for the wells near the sub-building portion of the CBA. The Ebenezer data from the 2020 RI Report, 2021 Site Characterization Report, and the 2021 CBA Data Report show two areas where leakage through the cemented sandstone is apparent. Future sampling plans for the Ebenezer will focus on these areas as part of evaluating a final site remedy.

2.7 **Comment:** One citizen asked whether any of the older wells in the Ebenezer located outside the CBA could be used as injection wells as part of the final site remedy.

Response: EPA explained that injection remedies are possible, but older monitoring wells are often not built for injection or flow as desired. If an injection remedy is selected, EPA doesn’t want to puncture the cemented sandstone layer between the Ebeneezer and the Satilla in the CBA which could potentially spread the elemental mercury to the Ebenezer. Injection wells could be installed outside the CBA using drilling methods to seal the sandstone layer from the Satilla. Other remedies include flow through walls to treat contaminated groundwater or slurry walls to contain contaminated groundwater. All of these remedial options are on the table.

2.8 **Comment:** One citizen asked about elemental mercury along the pilings that were driven in the CBA.

Response: EPA agreed that it is possible that LCP unknowingly smeared elemental mercury by driving the piles in the CBA. Elemental mercury has a high surface tension and doesn’t like to move. There are other ways the mercury could have migrated, but the pile driving is a possibility.

2.9 **Comment:** One citizen suggested that the Record of Decision (ROD) be clear that the proposed remedy is for the Satilla and that issues in the Ebenezer are not addressed now.

Response: EPA stated that Proposed Plan is focused on the proposed remedy in the Satilla. The ROD will be a more detailed document and will indicate that the proposed remedy is only for the contaminant source in the Satilla and that the final remedy will address all OU2 groundwater. The source area will be addressed first so that the remaining contamination can be addressed later.

2.10 **Comment:** Generally, I am supportive of the implementation of In-situ Chemical Sequestration (ICS) remedial alternative as long as the results of the anticipated pilot studies are clearly communicated to the community and the remedy is proven to be effective in eliminating risks to human health and the environment.

Response: EPA notes the support for the ICS alternative. The pilot study report will be included in the administrative record for public information and EPA will continue to hold public availability sessions during the pilot study and Remedial Action to communicate with the public regarding progress at the site.

2.11 **Comment:** EPA needs to provide regular updates to the community, preferably in a hybrid setting and no less than once a year, throughout the remedial process (before and after ICS pilot studies, before and after ICS injection network installation and injections).

Response: EPA plans on additional public availability sessions prior to and after the implementation of the interim early action ICS injections. EPA will also work with the community stakeholders to participate in updates in a hybrid setting.

2.12 **Comment:** The installation of a multi-layer hazardous waste-type cap would be more protective of human health and environment than only a soil cover. It reduces infiltration of precipitation into underground wastes and also enhances the redevelopment potential of the CBA.

Response: "Multi-layer hazardous waste-type" caps are typically used to prevent adsorbed soil contamination leaching from the vadose zone to the water table. The depth to groundwater is approximately 3 to 4 feet below ground surface, so most of the mercury contamination is already below the water table. Elemental mercury (Hg) is the primary CBA contaminant of concern (COC) to be addressed by the remedial action and dissolved Hg concentrations are already present in the aquifer under current conditions. Such a cap would not reduce dissolved Hg concentrations appreciably. A multi-layer hazardous waste-type cap would not significantly reduce mercury leaching or improve redevelopment potential. Potential construction activities on a multi-layer cap are just as restrictive as the current soil dermal cover. The soil cover satisfies Remedial Action Objective 1. (Prevent human exposure by direct contact to the surficial and subsurface soil across the CBA to mercury through ingestion and dermal contact above levels protective of commercial, industrial, and recreational use of the area.) EPA may re-evaluate capping during the final remedy selection process for Operable Unit 2.

2.13 Comment: The EPA needs to address the observed Elemental Mercury in shallow soil north of the Cell Buildings Area either through removal or the addition of injection wells.

Response: The Hg observed north of the CBA in shallow soil will be confirmed during the Interim/Early Action and addressed (if needed) during the Interim/Early Action or as part of the Site-wide OU2 Feasibility Study (FS) and Record of Decision (ROD).

2.14 Comment: The current plan must eliminate risks to human health and the environment based on the current zoning of the property (industrial).

Response: The National Contingency Plan (NCP) requires that remedial actions protect human health and the environment according to applicable exposure pathways. The selected interim early action protects human health and the environment for industrial and recreational exposure pathways. Residential use of the Site is currently prohibited and will continue to be prohibited through existing institutional controls.

2.15 Comment: Generally, GEC supports the implementation of In-situ Chemical Sequestration (ICS) remedial alternative as long as the anticipated pilot studies proves to be successful in achieving the defined remedial objectives and eliminating potential risks to human health and the environment. Based on the information provided by EPA staff and information from technical experts consulted by community partners, ICS has the best chance for success.

On June 22, at the invitation of EPA Staff numerous community organizations (Altamaha Riverkeeper, Environmental Justice Advisory Board, Glynn Environmental Coalition, One Hundred Miles, and Satilla Riverkeeper) were invited to present information to the National Remedy Review Board (NRRB). During community stakeholder presentations that were provided to the NRRB, removal of the concrete slab under where the cell buildings stood and removal of the sands in which the Mercury has been documented was recommended.

GEC acknowledges that three removal alternatives were considered during the Focused Feasibility Study, but EPA did not move forward with any of them. Two of the three alternatives considered would have met Remedial Acton Objectives (RAOs) (Thermal Desorption/Retorting and Excavation/Offsite Disposal). GEC understands the complications with construction and implementation of these alternatives, however, if ICS proves unsuccessful in the pilot study stages and EPA is required to reconsider remedial alternatives, EPA needs to consider the fact that the community's preferred solution is removal. GEC would not be comfortable moving forward with biological treatment because of the extreme uncertainties and unknowns around implementation of biological treatment. Though it poses implementation challenges (not insurmountable challenges), excavation would be successful in meeting all three RAO's set out in the FFS. Georgia Power successful excavated, dewatered and treated, an 18-acre coal ash pond in Glynn County. Honeywell has the financial capacity and EPA/Potentially Responsible Party's (PRPs) staff and contractors have the engineering expertise to develop a plan to remove and dispose of Mercury contaminated sediment underneath the Cell Building area (less than 5 acres) in the event that ICS is not effective at achieving RAO's.

This also brings up the question as to why the FFS has three RAO's and the proposed plan only has two. Can EPA provide clarification on the fact that RAO3 from the FFS is not included in the Proposed Plan?

Response: Should the ICS Pilot test prove unsuccessful, other options, including removal, will be evaluated for implementation.

As noted in the comment, RAO3 in the FFS was eliminated in the Proposed Plan. However, this was explained in the RAO section of the Proposed Plan (Page 30) which includes the following note at the end: "The FFS listed RAO3 to address potential Hg^0 emissions from the CBA. However, additional sampling for mercury vapor as reported in the FFS has indicated this is not an ongoing or potential future risk that needs to be addressed based on soil gas and ambient air sampling results." This is further discussed in the Proposed Plan "This remedial approach involves maintaining the existing soil cover that exists across the CBA. Additional soil cover material could be added to portions of the existing cover to increase the thickness to a minimum of two feet. This remedial option adequately meets RAO1 by preventing direct contact with the surficial and subsurface soil across the CBA when combined with a UEC to maintain the soil cover. The existing soil cover also mitigates Hg vapor emissions [if any were present] based on direct testing and thus addresses RAO3. Therefore, this remedial approach is retained for the surface soil component of the CBA technologies screening."

2.16 **Comment:** EPA needs to consider how they are going to determine if ICS treatment is successful in sequestering elemental Mercury that may be present in the Ebenezer formation. The surficial aquifer, Satilla Formation, is separated by a variably cemented sandstone layer (semi-confining layer) which means it is likely that elemental Mercury, like the Mercury contaminated groundwater, has migrated downward into the Ebenezer formation. GEC understands that the current proposed plan focuses on remediation of elemental Mercury within the surficial aquifer (Satilla Formation). However, there is an opportunity for there to be a residual positive impact of the ICS on potential sequestration of elemental Mercury in the Ebenezer Formation. Efforts are needed to attempt to document that. Can EPA articulate how they could observe sequestration of elemental Mercury in the Ebenezer formation?

EPA is working with Honeywell to develop a regular groundwater sampling plan. There is a tremendous opportunity to add properly located monitoring wells to further delineate the extent of contamination in the Ebenezer. Specifically, the

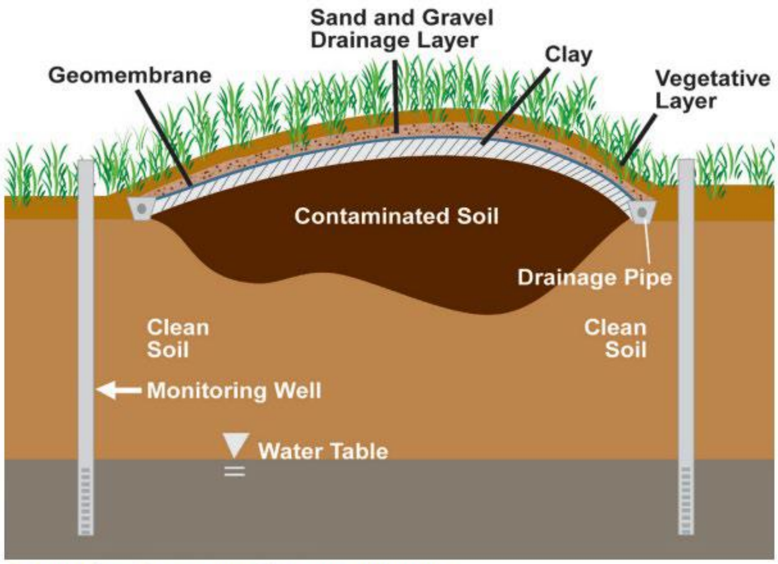
EPA and PRPs should be working to delineate to the greatest extent possible the groundwater contamination in both the Satilla and the Ebenezer Formations between the Site and Purvis Creek and the Turtle River. Additionally, monitoring wells should be installed to determine if the contaminated groundwater in the surficial aquifers is communicating with Purvis creek (as the Generalized Hydrogeologic Setting Surficial Aquifer System suggests).

Response: As stated in the FFS, the Hg^0 occurs at depths up to 50 ft, confined vertically by the cemented sandstone layer at the top of the Ebenezer. However, the groundwater in the Ebenezer member of the surficial aquifer will be sampled before, during, and after the Interim/Early Action to confirm the concentrations of dissolved mercury in the near term and beyond. Based on the lower concentrations of dissolved mercury detected in groundwater in the Ebenezer member of the surficial aquifer, elemental mercury is unlikely to be present in the Ebenezer. In addition, the amendments that will be added to the Satilla will have residual amounts remaining in the Satilla member of the aquifer in the near term. As groundwater from the Satilla member of the surficial aquifer under the CBA migrates, the residual amendments are also expected to migrate and continue to diffuse through the aquifer and even into the Ebenezer member if there is continuing connection through the cemented sandstone in the near term. As noted during the public meeting for the Proposed Plan, the expected amendments that are residual will eventually change state into other salts that are already prevalent in salt marsh environments and are expected to disperse.

The OU2 FS and Final OU2 ROD will address groundwater communication between the Site and Purvis Creek/Turtle River. As noted in the comment, EPA has directed the PRPs to conduct periodic groundwater sampling. EPA will use the data gathered during the sampling as well as previous groundwater sampling results to make determinations regarding additional wells for the final OU2 remedy.

2.17 **Comment:** The installation of a Resource Conservation and Recovery Act (RCRA) multi-layer hazardous waste cap over the Cell Building Area would be more protective of human health and the environment than the proposed improvements to the soil dermal cover. A cap enhances the redevelopment potential of the Cell Building Area by creating a land surface that can support vegetation or be used for other purposes and significantly reduces potential risks to human health and the environment.

In addition to the soil cover improvements, a cap should be installed that includes several layers, such as asphalt/concrete, a vegetative layer, drainage layer, geomembrane, and/or clay layer. Installing a multi-layer cap over the Cell Building Area will prevent future vertical infiltration of rain water into groundwater contaminated with Mercury. Reducing infiltration will reduce mobilization and mitigate future migration of Mercury contaminated groundwater and groundwater contaminated with other chemicals of concern at the Site (VOCs, PAHs, cPAHs, metals, etc.). The In-situ Chemical Sequestration (ICS) alone will not have any impact on groundwater that is already contaminated with Mercury from continuing to migrate.



Example of a cover with several layers.

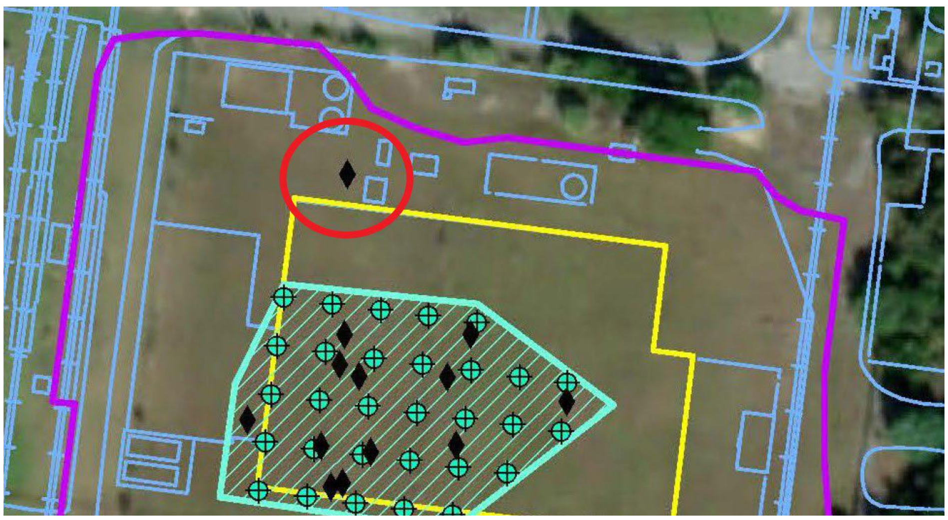
Reference: U.S. Environmental Protection Agency's "A Citizens Guide To Capping", September 2012.

The multi-layer cap will also ensure protection of human health and the environment in the event all Mercury is not sequestered through ICS injections. The Mercury droplets observed at the site were 20 micrometers to 2 millimeters in size. Due to the small size of the droplets, even if the ICS proves to be successful through the pilot studies and monitoring thereafter, there is a high likelihood that not all the Mercury at the site will be sequestered. Any remaining Mercury will continue to have potential to leach into the surficial aquifer (Remedial Action Objective 2). A cap will also minimize exposure to humans and or wildlife through direct contact at the Cell Buildings Area (Remedial Action Objective 1). Lastly, the addition of an asphalt or concrete component to the cap creates a land surface with minimal risks of exposure when plans for use are made and implemented.

Institutional Controls should require the maintenance of an impervious surface (asphalt or concrete) over the Cell Building Area for the same reasons outlined above.

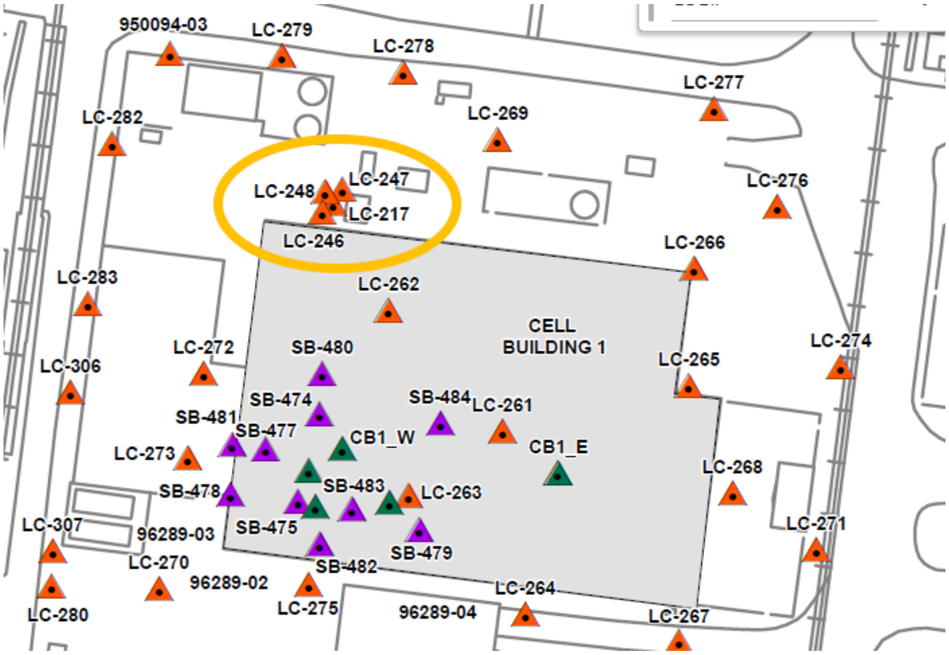
Response: "Multi-layer hazardous waste-type" caps are typically used to prevent adsorbed soil contamination leaching from the vadose zone to the water table. The depth to groundwater is approximately 3 to 4 feet below ground surface, so most of the mercury contamination is already below the water table. Elemental Hg is the primary CBA COC to be addressed by the remedial action and dissolved Hg concentrations are already present under current conditions. Such a cap would not reduce dissolved Hg concentrations appreciably. A multi-layer hazardous waste-type cap would not significantly reduce mercury leaching or improve redevelopment potential. Potential construction activities on a multi-layer cap are just as restrictive as the current soil dermal cover. The soil cover satisfies Remedial Action Objective 1. (Prevent human exposure by direct contact to the surficial and subsurface soil across the CBA to mercury through ingestion and dermal contact above levels protective of commercial, industrial, and recreational use of the area.) EPA may re-evaluate capping during the final remedy selection process for Operable Unit 2.

2.18 Comment: Elemental Mercury was observed in two areas outside of the boundaries of the Cell Building Area, however only one area is in the proposed ICS design layout (shown below).



Reference: Focused Feasibility Study, September 2023: Figure 6-1 – Proposed ICS Design Layout.

During the community meeting on the evening of August 29th, it was discussed that the observation of elemental Mercury in this northwest location would have been from historical Mercury. GEC reviewed the September 2022 Remedial Investigation and has provided a summary of pertinent data/figures related to the observed elemental Mercury below.



Reference: Remedial Investigation, September 2022: Figure No.4.7 – CBA Investigations, Soil Borings and Test Pits.

Due to the relatively shallow depth of Mercury observed in this area (from Table P-1, 2.6 to 6.6 feet bgs) and the fact that cement slabs were not observed in this area, it would not be challenging or costly to prompt soil removal in this area to be conservative and protective of human health and the environment. If EPA is unsure about the existence of elemental Mercury in this area, further investigations should be prompted to delineate that to the greatest extent possible. If investigations are prompted and elemental Mercury is identified, EPA needs to include plans to remediate the Mercury through removal or the addition of ICS injection wells where elemental Mercury is observed. We suspect, due to the shallow nature of the previously observed Mercury, that removal would be the most cost-effective approach. EPA should not ignore the presence of elemental Mercury in this area.

Response: The Hg observed north of the CBA in shallow soil will be confirmed during the field work for the Interim/Early Remedial Action for OU2 and if confirmed will be addressed during the Interim/Early Action, as appropriate, or will be finally addressed as part of the Site-wide OU2 FS and ROD if additional actions are determined to be needed.

2.19 **Comment:** GEC supports the State of Georgia’s determination that all groundwater is drinking water and requests that the EPA continue to hold drinking water standards as the standard for cleanup through the remainder of the remedial decision-making processes at Operable Unit 2. Future remedial actions for the remaining COC's should be developed to restore groundwater at the site to drinking water standards.

Response: EPA acknowledges the state's determination of the groundwater at the LCP Brunswick NPL Site as potential drinking water. It is EPA's intention to identify the Safe Drinking Water Act Maximum Contaminant Levels as relevant and appropriate for use as cleanup levels for the Site in the final ROD for OU2. As stated in the NCP, Superfund sites that do not meet clean-up levels for residential groundwater use cannot be classified as unlimited use and unrestricted exposure (UU/UE). Sites that are not classified as UU/UE are subject to institutional controls such as deed and zoning restrictions and five-year reviews. For the LCP Chemical Site, a Uniform Environmental Covenant has been recorded with Georgia that prohibits groundwater use as drinking water and residential use of the site.

2.20 **Comment:** The GEC acknowledges and commends community involvement efforts made by EPA Remedial Project Manager Robert Pope. GEC has facilitated community involvement at the LCP Chemicals Superfund Site since before the site was designated a Superfund Site in 1994. Though we are 'boots on the ground' in Brunswick, residents continue to ask for opportunities to meet with EPA staff themselves. GEC plans to continue to facilitate community involvement throughout the year, but often times EPA staff only visit once a year. We have appreciated the additional visits and hope that EPA staff will continue to make themselves available to the general public.

GEC requests that these efforts continue to the greatest extent possible throughout the remedial process, prompting community engagement even when it is not required by law. EPA should plan to provide regular updates, preferably more than once a year, to the community through in-person and virtual (hybrid setting preferred) community events. Based on the proposed schedule shared in the PowerPoint during the public engagement sessions in July and August, we suggest the EPA makes plans to visit Brunswick:

- Spring 2025 – Release of Record of Decision
- Fall 2025 – Release of Consent Decree
- 2026 and beyond – After finalization of pilot study plans and before implementation (community involvement before implementation of pilot study); after pilot study completion and analysis (to report back to the community the success or lack thereof); after finalization of Remedial Design and Remedial Action plan (before full-scale installation and implementation of ICS); after implementation/construction.

GEC recognizes that key documents are released as remedial progress is made at the site and that some remedial stages administratively require EPA to provide community involvement. However, some critical steps, like finalizing the pilot study work plan, final pilot study analysis/conclusions, and the finalization of the site wide groundwater sampling plan (in progress now) don't necessarily require visits from EPA. The community continues to request EPA presence. Even short visits (like the visits scheduled in August) or hybrid visits that allow for content to be recorded and distributed after the fact, significantly increases the community's ability to stay informed and meaningfully participate in the EPA cleanup process.

Response: EPA acknowledges the supportive comment regarding EPA's community engagement efforts for the LCP Brunswick NPL Site. It is EPA's intention to continue holding regular community availability sessions as the work proceeds at the LCP Brunswick NPL Site. EPA notes the suggested schedule and will coordinate with community stakeholders and host sessions to continue to gather community input as the cleanup moves forward.

2.21 **Comment:** In June 2024, the Union of Concerned Scientists released a report identifying ten sites in Georgia that will flood, on average, 26 times per year by 2050 due to sea level rise. The list of ten includes the LCP Superfund site. We recommend that US EPA and the responsible parties thoroughly evaluate the impact that rising seas and increasing storm regularity and intensity will have on the groundwater, the incapsulated mercury, and the interface between the treated contaminants, groundwater, and changing local environment.

Response: EPA has performed a Climate Vulnerability Assessment (CVA) for the entire LCP Site. The potential effects of climate change on the interim early action ICS remedy proposed for the CBA are included in the CVA which is available to the public. EPA will use the results of the CVA to evaluate the Early Interim Action and to evaluate alternatives for the Final OU2 Remedial Action.

2.22 **Comment:** Elemental mercury is found unevenly dispersed through OU2 and other contaminants are scattered throughout the groundwater in/around CBA. We recommend a robust monitoring program to capture the location of all harmful chemicals and modeling to document the anticipated movement of the mercury and other chemicals within the aquifers and through the groundwater. Monitoring is critical especially to capture the effectiveness of the interim action plan and, as necessary, adjust to ensure human health is not at risk.

Response: EPA directed the PRPs to submit a Groundwater Sampling and Analysis and Monitoring Plan which is currently under review and will be finalized to complete part of the work to gather information for evaluating alternatives for the final remedy for OU2. This plan includes Site-wide monitoring to track the progress of the CBA remedy and overall changes in Site groundwater for all contaminants.

2.23 **Comment:** During the August 29, 2024, public meeting held at Howard Coffin Park in Brunswick, a Honeywell representative confirmed that the corporation had been approached by a nonprofit interested in using the site as a golf course. US EPA toxicologist then responded that since the OU3 record of decision was adopted in 2020 (finalizing the remediation plan for the uplands over the groundwater area of OU2), an additional risk assessment had been conducted by Honeywell. After reviewing the risk assessment for OU3, US EPA determined that the site was safe for adolescents and adults to use for recreational purposes.

OHM recommends that if the site is expected to be used for public recreation, it must be safe for all ages, including children under ten (10) years of age. Golf, soccer, and other sports complexes support play of all ages in Glynn County. We recommend that new exposure scenarios be conducted to include children under ten (10) years of age. And that US EPA consider additional remediation actions needed for the land to be used by adults and children of all ages.

Response: While EPA encourages redevelopment of NPL sites appropriate with the cleanup of the sites, it is not EPA's decision regarding future redevelopment of the privately owned LCP property. It is EPA's understanding that the potential golf course redevelopment will be part of a restricted access golf course and will not be open to children under seven (7) years of age. Therefore, the revised risk assessment for recreational use of the property for adolescents and adults is appropriate. If it appears that the use of the property is going to include children under the age of seven (7), the risk assessment will have to be updated and additional remediation actions may be needed.

2.24 Comment: If the Superfund uplands are to be used as a recreational golf course, OHM recommends that additional protections be added to the interim early action plan. Specifically, we recommend the installation of a multi-layer hazardous waste-type cap over the area contaminated with elemental mercury. This additional measure will be more protective of human health and the environment than the proposed two feet of soil cover as regardless of the future use. This extra step will also minimize infiltration of precipitation into the area treated by the in-situ chemicals, enhancing the possibility of the redevelopment potential of the CBA and reducing the impacts of rising seas and increase storm events.

Response: "Multi-layer hazardous waste-type" caps are typically used to prevent adsorbed soil contamination leaching from the vadose zone to the water table. The depth to groundwater is approximately 3 to 4 feet below ground surface, so most of the mercury contamination is already below the water table. Elemental Hg is the primary CBA COC to be addressed by the remedial action and dissolved Hg concentrations are already present under current conditions. Such a cap would not reduce dissolved Hg concentrations appreciably. A multi-layer hazardous waste-type cap would not significantly reduce mercury leaching or improve redevelopment potential. Potential construction activities on a multi-layer cap are just as restrictive as the current soil dermal cover. Climate impacts such as larger and more frequent storms could cause even less vadose zone further reducing the purpose of such a cap. The soil cover satisfies Remedial Action Objective 1. (Prevent human exposure by direct contact to the surficial and subsurface soil across the CBA to mercury through ingestion and dermal contact above levels protective of commercial, industrial, and recreational use of the area.) EPA may re-evaluate capping during the final remedy selection process for Operable Unit 2.

2.25 **Comment:** OHM recommends that the US EPA and the responsible party share information with the public about possible uses of the superfund site. The first time the public learned of the possible use of this property as recreational was the release of this proposed interim action plan. If the responsible party and US EPA host meetings to share the vision of the anticipated future use, it will facilitate a public dialogue and the landowners will gain valuable feedback from the public.

During these public discussions, it will be important for the regulatory agencies – US EPA and the Georgia Environmental Protection Division (GA EPD) – to explain the role of restrictive covenants affecting the possible use of OU2 and OU3. During the public meeting on August 29, a GA EPD representative stated that existing state-level covenants restrict the use of groundwater of any sort throughout OU3 – even for irrigation and non-potable uses. This type of information is important for the public to know if the site is to be reused for recreation.

Currently, the local zoning code identifies the area as area is "basic industrial" (BI). A BI zone only allows recreational use if the use is "incidental to" the permitted use. Recreation cannot be the primary use of a property zoned BI. As such, Honeywell will be required to get approval from the Glynn County Commission to re-zone the property to pursue recreational use. Public meetings and informational sessions prior to that governmental process will help the public better understand the extent of the remediation, any risks to public or environmental health, and offer feedback to the partners involved in the future use of the property.

As long as the property is adequately cleaned up and does not pose harm to humans or wildlife, OHM believes that reusing the property for recreation could vastly improve the quality of life for surrounding neighbors, generate revenue for the county, and result in positive public relations for the responsible parties. Responsible reuse and public access to the property could be a win-win for the agencies, the responsible parties, and the community.

Response: EPA concurs that information should continue to be shared with the regarding possible redevelopment of the property. It will be the property owner's responsibility to address any zoning concerns appropriately so that the property can be utilized for the best intended purpose. EPA will continue to host public availability sessions regarding progress of the cleanup and welcomes community input. While the re-use of the property is not the focus of the Early/Interim Action for OU2, EPA did add the information regarding the updated risk assessment for recreational use to the proposed plan to inform the public that the document was completed and added to the Administrative Record to be as transparent as possible for community stakeholders. A representative of the PRPs was present at the last community availability session and was able to address some of the questions of the community at that time regarding possible reuse. While the representative stated that their current focus is the selection of the Early Interim Action and implementation of the action, future conversations regarding reuse are likely. EPA will work with the PRPs and the community to facilitate such conversations as much as possible as reuse is considered in the future.

2.26 **Comment:** Lastly, we recommend that US EPA begin immediately assessing the other known contaminants in the groundwater at OU2. While these chemicals may not be as immediately harmful to human health as elemental mercury, they pose significant risk. We recommend the agency work with the responsible parties to assess and begin aggressive planning to remediate the risk of the other toxicants impacting groundwater quality at the Honeywell/LCP Superfund site.

Response: EPA directed the PRPs to submit a groundwater sampling and analysis plan for periodic groundwater sampling in order complete the evaluation of other contaminants in groundwater throughout OU2 at the Site. Combined with the previous investigations, the data will be used to evaluate additional actions at OU to address the contamination. EPA has directed that the groundwater sampling be done concurrent with the work to implement the Early/Interim Action to address the elemental mercury contamination in the CBA in order continue to progress the site work and select a final remedy for OU2 in the near future.

2.27 **Comment**: I worked at LCP here in Brunswick from around 1981 till its closing in 1994. During that time, I had the opportunity to talk with the EPA on site Reps and hear their concerns about dealing with mercury deposits in the ground under the cell buildings. It was their concern to be cautious about disturbing these deposits because of possible migrating down into the Floridan Aquifer. My question is: Does this new process being proposed have the same concerns about possible migration? Maybe this could be explained in greater detail on the 18 July meeting.

Response: Unfortunately, this letter was not received by the EPA RPM before the meeting held on July 18, 2025. However, the topic was discussed during the meeting. As discussed, elemental mercury in the form of small beads is already present in the surficial aquifer to a depth of 50 feet below the land surface. The selected remedy of addition amendments to transform the mercury to a less mobile and less toxic form is not planned to go beyond the depth of the surficial aquifer and should not impact the mercury in a way to cause it to become more mobile and to migrate further in the aquifer. EPA's understanding of the aquifers beneath the site has advanced since the early days of the response. As we now know, due to the Floridan aquifer being very deep and separated from the surficial aquifer by multiple layers of very low permeability materials such as clay, it is EPA's position that the Floridan Aquifer should not be negatively impacted by the selected alternative.

APPENDIX B

Official Transcript of the Public Meeting for the Interim Early Action Proposed Plan for the LCP Chemicals Superfund Site Operable Unit 2 Brunswick, Glynn County, Georgia

U.S. ENVIRONMENTAL PROTECTION AGENCY
STATE OF GEORGIA

IN THE MATTER OF:)
)
SPECIAL MEETING OF INTERIM)
EARLY ACTION CLEANUP PLAN FOR)
THE LCP CHEMICALS SUPERFUND)
SITE IN BRUNSWICK, GEORGIA)
)
)
)
)
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Special Meeting - the interim early action proposed plan of the Environmental Protection Agency (EPA), Region 4, taken pursuant to notice, under the Georgia Civil Practice Act, reported by [redacted], CCR-2492, in the offices of Zion Rock Baptist Church, 3200 Gordon Street, Brunswick, Georgia, on Thursday, July 18, 2024, commencing at 5:39 p.m.

APPEARANCES OF COUNSEL

ON BEHALF OF THE ENVIRONMENTAL PROTECTION AGENCY REGION 4:

ROBERT POPE
ANGELA R. MILLER, Community Involvement Coordinator
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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INDEX

(Reporter's disclosure statement attached to back of transcript.)

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EXHIBITS

(No Exhibits were marked.)

MS. MILLER: Hello everyone. First of all, thank you so much for coming out tonight. I know the weather was absolutely horrible so thank you so much for coming out. We're going to be talking about LCP also known as unit two, a proposed plan comment hearing started July the 5th and this is our third meeting this week where we just kind of talk to you a little bit about what the proposed plan is and give you some information so that you'll be able to submit your comments.

And we'll talk about how do to all of that and when to do it. Everything is in this fact sheet as well. I would like to ask the Pastor to come up, it's his church. I would like for him to come up and welcome everybody and kick us off and turn it over to Rob.

We'll have a presentation, if you would, hold all your questions to the end. We'll go through the entire presentation and then we'll open up the floor and it will be yours for question and answers; okay? Thank you. Thank y'all, again, so much or coming.

THE PASTOR: Good evening everyone. I do want to say welcome, welcome, welcome. I look forward to you for a productive meeting, amen, and everyone we're here because we are concerned. We're going to be active, we want to be proactive not only just with the waste cleanup of the chemical site but also Pinova, myself and several other pastors started a collaborative ESC, Environmental Safety Coalition of, give or take, a month or so after the situation with Pinova last year.

So we've been working putting things doing things into play but I'm just thankful for this opportunity that I can sit in with y'all and listen, gain something. We all add, take and go back and get running that we can make a change in our community and city and state as a whole. I won't prolong the time. I'll talk all night so you'll have to catch me on Sunday.

So we'll open with prayer and then we'll turn it back over.

(The pastor is administering the opening prayer.)

MS. MILLER: Thank you so much.

THE PASTOR: Thank you.

MR. POPE: Good evening. As Angela said, this is our third session this week. We've been a couple of times earlier talking about this process and have the information sessions. This is a little different. This is former proposed plan public meeting so we do have a court reporter that will take everything down.

As Angela said, we'd like you to hold all your questions until the end of the presentation. We can go back to any slide you have a question about or anything but we want to get all the way through it first and then start answering questions.

My name is Robert Pope, Rob, and I'm the project manager from EPA for LCP Brunswick. There are a few LCP facilities across the country but this is the one in Brunswick. I want to -- Angela already introduced herself but she's our community involvement coordinator, Angela Miller.

Also I'm lucky enough to have Stacey here, who is my site attorney. We have some other great people here tonight. We have Mr. Frederick in the background who is here as a toxicologist who can help us if we have any types of those questions. I have Jim Carerra here from our hydrogeology group at region 4 as well as Brett Wilson, who is a research hydrogeologist from our research and development lab.

We also have two other wonderful attorneys here. We have Dave Ruffin, who is in our office for region 4 in Atlanta and Walter Risk, who is also with us, so I have a crew of folks that can answer questions whether you have legal questions or hydrogeology questions or toxicology questions, I've got people that are much smarter than I am to answer those.

Next slide, please. So we're here to talk about interim action early proposed plan for the LCP site in Brunswick, and what we're trying to do tonight is get the community and the folks here tonight to understand a little bit about the process that we go through and where we are now in that process.

A little bit of background about the site: The site has been around a while. There have been several of these meetings so hopefully you know some of the background already. We'll talk about the investigations that have been performed as well as the work because this site has had a great deal of work done to it over the years.

We'll talk about risks remaining at the site. We'll talk about the proposal to address those risks and the impact of the site, so this is going to be EPA preferred alternative on how to address some of those risks. Please feel free to come and sit wherever you want. You get free chocolate if you sit in the front row. Go back one more. And then at the end we'll talk about how to participate and provide feedback to this proposed plan.

Next slide. Thank you. So this is where we are in the process. Normally with the sites that we've never heard about before and discovered we do an evaluation, we list that site on what we call the national priorities list, which is our list of all the worst hazardous waste sites that we see in the country. LCP is on that list.

And then we move into investigating the sites, doing a study on what would be best to address the contamination of that site and then doing a proposed plan where we say this is what EPA Agency proposes we do at this site. That is where we are at with the groundwater at LCP today.

We finished the feasibility study and now we've moved into this proposed plan. After the proposed plan we'll look at all the comments that we have received and we will put together a record of decision and a remedy selection where we will address all those comments and then say this is what the LCP is going to do. It may be what we proposed to do, it may be something we get from the public, it may be other information that we get that leads us to do something else and it may be different but, if so, we'll explain all that in the record of decision and possibly everyone have more bullets views.

Then we'll go into the design but because this site has potentially responsible parties they have the responsibility to address the contamination. There is a big step in between there and that step is stick down with those responsible parties and negotiate a legal agreement on how they will inform the record of decision, that's called a consent agreement, that then has to go in front of a judge and EPA works with the Department of Justice and the potentially responsible parties attorneys to put that in court to lodge the consent agreed in a court.

So that is a process we don't have there but it does have to happen before we get a plan from the potential responsible parties on how they are going implement this decision and then go into the remedial design. Once that legal agreement is place we do the remedial design and then we move into legal action where they actually go out and implement it. So, as you can see, this does have some steps left to do.

And then once we get remedial action implemented that actually has an operation and maintenance phase, we wait and see how it's working. If we build like a cap, we make sure that cap is in place, we build something like a pump and treatment for groundwater, we make sure that system is running and working and then we maintain it.

So that is where we are with the salt marsh. That is a separate operable unit from the groundwater and we have done all of that and the remedy has been implemented and we're now in the OEM phase where there is going to be long term monitoring to make sure that remedy is working like we all think it should.

And then we get into the MPL regional site as we finish these remedial actions and the contaminants are addressed. It can be a bleak regional, we can take it up with the MPL so it's no longer on that national priorities list; however, that doesn't mean that we all go away and nothing else happens.

Everything that we've implemented where we left waste in place, we will continue to monitor and make sure their systems are working and we will review at least every five years to make sure that's happening and we'll issue a five year renewal report to make sure it's all working like it's supposed to.

We haven't done one of those LCP's yet because we have only implemented the first remedial action at unit one in the recent past but we will be doing one about four years, I believe that's where we are.

So next slide, please. So a little bit about LCP. I know it's in your community and you probably know that it' on Ross Road in Glynn County obviously and just outside the city limits. In the city of Brunswick. It is bordered on salt marsh on one side, it has the paper plant on another side, it has a Glynn County Sheriff facility on this like road facility along the other side and then Ross Road and then, of course, a five lane highway and then you get into the suburban neighborhoods across the highway. So that's how it's all kind of set up. There is a nice outline of it so it includes those wetlands and all the uplands that were part of the facility.

Next slide, please. So it began a long time ago in 1836 the canal was built, the Brunswick Altamaha Canal and uplands and then Arco ran a refinery here and ran the site from 1919 to 1929. Georgia Power had an oil fire power plant from '37 to 1950. In '41 Dixie Paint and Varnish was there and operated on part of the site until 1955.

Next slide, please. Then Allied Chemical purchased the site in '55. They constructed and operated a chlor-alkali facility utilizing the Mercury cell process. The main products that they made were chlorine gas, hydrogen gas, caustic solution. They did release contaminants to groundwater.

We've considered those to be Mercury and then this toxic solution that changed the groundwater a good bit. There were other things released, the salt marsh as well but those have been addressed. LCP Chemicals then purchased almost all the sites in 1979 and continued to operate that same facility until '94.

So that facility started in '55, ran through '94, operations were discontinued. And then in May of 1988 Allied Signal, which is the descendant of Allied Chemical, purchased the LCP property because it was in bankruptcy. LCP went bankrupt and the state had the property, Allied Signal bought it.

Honeywell acquired Allied Signal at some point through a corporate merger and so now Honeywell is also one of the potentially responsible parties as well as Arco, which is now B.P. Arco, British Petroleum Arco, and Georgia Power. All three of those are potentially responsible parties for the site and they all share some liability.

This is an aerial photograph from 2019. So it's a little while ago but this is kind of how the site looked at that point. OU2 is this nice grass rectangle in the foreground there. OU1 is the salt marsh in the background there, so uplands, trees in the grassy areas and mostly what you see out there are not buildings, but there are a few trailers. And then there is some concrete floors and platforms that are still out there.

There is not much in the way of buildings. Closer to Ross Road, of course, is the old LCP office building now with a little garage behind that. So that is what is there in the picture. You can see the paper plant property off to the left there, which is the south, and then you can see the little causeway they had that went out straight from the LCP property. That's their main road, which goes all the way out to Purvis Creek.

All right. Next slide, please. So after the facilities closed down EPA on scene coordinators, and these are what we consider our emergency removal folks. They came out and oversaw a cleanup that the potentially responsible parties did through a removal process, so there were excavations sitewise, a lot of soil, a lot of sediment going very deep down ten to 13 feet in some places, only down to one to two feet in other places. Near the salt marsh, headed to the salt marsh to the uplands. They took out 167,000 cubic yards of contaminated soil from 26 separate areas.

Now, this soil was taken to two different landfills, one here in Georgia and one in Alabama, so it was taken out of the community and put in those landfills. Some of them are considered hazardous waste and some of them considered less than hazardous waste. As this work was going on, the facility was also placed on the national priorities list in 1996 so the work actually started before it went on the MPL. These removals and then those removals went all the way through '97 then we entered a phase of investigation to see what else was out there besides what had already been removed.

The removal also took almost all of the buildings down. Much of the building material was contaminated and it all was disposed of in landfills. They had a lot of concrete on the site but left some behind. And then in 2024 we got to the point where we had finished investigations out of the salt marsh. We had come to agreement about what would be done out there and the remedial action phase was actually completed. The salt marsh has been addressed.

As far as the remedies we implemented it. I should say that the potentially responsible parties implemented the EPA oversight. All the uplands except for the cell building area and the groundwater we decided that the previous work done under the removals did not require any additional work for the rest of the uplands. It's called a no action decision in 2020 on the rest of the uplands.

Now, an operable unit two, the cell phone carrier, the groundwater we weren't just sitting around on our hands, we have a very big problem with the groundwater. The release of a toxic fluid during operation and right after operations had changed the groundwater tremendously.

It had made the pH very, very alkaline, very, very basic so basic that it was putting things in the solution, dissolving metals and putting them into the groundwater that would not normally be there so it was really having a big effect.

Different types of studies and implementations of pilot studies have been tried to see if we can address that situation, none of them were very successful. The investigation continued as we were doing this as well and eventually they came up with this idea of injecting carbon dioxide into the subsurface where it made a very weak acid, a carbonic acid and that made the alkaline groundwater and brought the pH down to a neutral, what we would want it to be, a natural state.

That has caused a really big change in the groundwater. We've seen a lot of things that we thought were major problems drop out of the groundwater and the water seems to have problems and the way they become problems again was it became super alkaline again or it became super acidic.

I don't see that is going to happen. We're going to try hard not to allow that to happen. It would have to happen from large industrial injections like it happened before so and then we continued after we got that work done we can really start looking at the cell building area and the groundwater in trying to decide what to do about it.

So we completed a feasibility study in 2023 and what we came to the conclusion was we could focus down on just beneath the cell building and do something about that now and then really the short term, and then if you continue looking at the bigger groundwater picture, which is a little more complicated and try to decide what to do about it in the future.

So now we're at this point where we have a proposed plan and we're thinking about this is what we want to do here and we're proposing it to the general public. Next slide, please. So just a little bit about operable unit one, I'm not going to dwell on this too much because we're here to talk about our operable unit two, but major dredging operations as well as a thin layer cover were done out there in the past year and so I wanted to show a little bit of that work.

Really a lot of good work at removing the sediments in the channels out there, which is salt water in the LCP property as well as a thin layer cover over some contamination in the salt marshes, so without killing the salt marsh.

Next slide, please. So let's talk a little bit about operable unit two in the cell building area. All the cell buildings and all their ancillary facilities were demolished occurring in the 1990s. The floors of the building, however, were left in place and there are some double floors that exist under the soil cover. So we have some double concrete slabs that are under our cover and the reason is these buildings were subsiding during operations so the company was trying desperately to keep the facility operating and they poured additional floors to make that happen.

They also because there are subsiding puts pilings in the ground under the buildings trying to support them; unfortunately, although we know they did it, we've had the kind of the work orders for it. We don't have any blueprints of how they put them in. We don't know exactly where they are. We know that they did and occasionally when we're trying to put a hole in the ground or sample we do encounter them but they are out there and continue to be a problem.

Next slide, please. So the groundwater on site basically flows away from Ross road towards the salt marsh and really under the salt marsh towards Turtle River. That is where the groundwater is drawn to. In this post service, the very first level of groundwater and so we don't -- this is data we've had for a long time where we've had lots of groundwater and sampled them over the years. That's what we've seen in both the upper surficial aquifer and the lower surficial aquifer those areas we call the Satilla and Ebenezer and things like that, and this is groundwater right underneath the surface.

Next slide, please. So this is kind of our tune. This is not reality but this is how we kind of try to project what we've seen out there. So the site has definitely impacted the superficial aquifer. That is in the superficial aquifer under the sites. We see contamination under the old cell buildings were and we see contamination beyond that as well.

And that's the superficial aquifer which we'll hear is called the Satilla. Also the superficial aquifer it's connected but not clearly connected but there is a little cemented sand cone it's near. It's called the Ebenezer and we see the contamination we have some wells in the Ebenezer as well and we see the contamination to Ebenezer; however, the data we have does not indicate that the contamination is well into the salt marsh. It doesn't indicate going very far into the salt marsh or below it but it is out there. Don't take it as this is the way it is exactly, this is a cartoon trying to represent how we see it today.

Some reminders is that under the superficial aquifer we do get to the Brunswick aquifer sometimes called the rock aquifer. There is a plain layer between those three things that keeps the superficials from going down into the clay, the Brunswick aquifer, the rock aquifer we do know there is some withdrawals from that aquifer mainly for industrial uses.

Beneath that you get into the Berryville clay formation, it's very thick and that gets down below that Florida aquifer so we don't see any contamination from the site really getting down into the rock aquifer, the Brunswick aquifer, more going down to the Florida aquifer.

Now, the Florida aquifer is where almost everybody understands there is drinking water from the major Florida water system. It's also where most of the majority industrial withdrawals come from and it's also the one that to be honest is worried about salt water intrusion as those withdrawals are happening.

So the state has a pretty close watch on how much withdrawals are from it and certainly try to. So that's what we see in the site today and what we're concerned about is very long term.

This contamination is not being addressed and continuing to flow underground and getting out to the Turtle River that's what we would be concerned about in the long term.

Next slide, please. So a little bit about this CO2 removal action. So this is going on as we're trying to do the investigations as well. This was going on while they were looking at the salt marsh deciding what to do. This is what when we get the OU3 uploading to deciding what to do there.

Very high H groundwater the cost the facility used. We rejected that carbon dioxide to get that down lower down again. We went through four phases of this subjection and we did this in a step wide manner. Three of these phases happened before I started working on the site but they started kind of at the end of the plume to make sure it would work and then as they saw it was going to work, they expanded it and did most o the plume and they kept stepping back towards the source where you had your highest concentrations to be addressed and it worked in every phase.

We considered it to be very successful at lowering that pH and really addressing that alkaline groundwater. Again, that was done as a removal action under a removal order so it was a little different setup in operable unit two and operable unit one. We're very successful.

Next slide. Just to show you how successful so, again, this is that rectangle that was the former scale building area, going to zoom in on it. On the left you see everywhere we have color we have high pH. So what you really want is green. There is -- I don't think there is any green on the left so this is before the fourth phase of this and everything is yellow, red, orange or even worse, purple so that's over 12 pH. That's very, very strong, much stronger than Clorox, for instance.

And after the injection this is what we have. All of our samples are green except for two, that are yellow that we're keeping an eye on but we do this is he carbonic acid in the aquifer and we'll continue to address this as we're going to take more samples, we are fairly confident that we will see those levels also get down, down into the neutral area. Seven is not bad, seven is pretty good and we would like to see seven. If we are up nine then, yeah, we need to get them a little better.

Next slide, please. Not only did it address pH, but in addressing pH it addressed also metals because those metals are being forced in solution by that very high pH. So this is a graph that shows you we're just talking about two phases but the Mercury was very high before we did any injections and then as we seeing the nexus happen you drop that for the first injection and then it was higher before the second injection, dropped again after the second injection.

Now, these are not getting us down to safe drinking water levels but we are starting to get there, so it worked really well, very good success for the whole team. And so, again, we did four phases starting at phase 14 going all the way through 2020 before it was all done and, as I said, they stepped back starting the least contaminated and moving towards the most contaminated to make sure that it was going to work.

OU2 is only where the former cell living area was and then the groundwater underneath the surface of the hole. RI is determined that there are multiple contaminants of concern. The RI is our remedial investigation to determine their contaminants of concern to be addressed so all of them have to -- we're going to have to address all of them in the long term and figure out how we're going to do that; however, we saw elemental Mercury, so little silver Mercury in the subsurface under the cell living area.

Elemental items released from the facility during and after, right after operations and we believe that it represents a stability risk and needs to be active on first before we try to get the site wide groundwater. The site wide groundwater is contaminated but the contamination levels are not as high as they are in the subbuilding area, so that's what we're looking at is trying to get at that cell building area first.

Next slide, please. So this is, again, that rectangle is the cell building area. This is an aerial shot when we're doing investigations in the cell buildings and they are out there taking soil samples and taking groundwater samples.

You can see there is a couple of water units out there. One white van where they have a mobile lab in place so as they were taking the samples, they were doing analysis there and that's a great system to really make sure that, you know, we're getting information very quickly.

And then on the left here you'll see actually been using the drilling rig going down and take it for groundwater samples and you can see the workers doing this work. It's marked off, there they are fully suited up in case they come in contact with Mercury and making sure it's all being done safe.

Next slide, please. So what did we find? We found what we call little beads of Mercury in the subsurface, so this picture everywhere you see a white dot, we do the borings and tried to see what we had down in the subsurface. Everywhere you see a dark grey dot, I know that they may be a little hard to see but they are up there.

That's where we actually saw elemental Mercury in the subsurface so it's not everywhere but it is fairly wide spread and you see it as beads, it looks like and we'll talk a little bit about what that means. Next slide, please. So here is that same information basically. It's three dimensions, so all of these little silver rods are what we call points and where you see black on those rods is where we encountered elementary Mercury.

So you can see that some of it is not that deep, five, ten feet deep, some of it is in the middle, 20, 30 feet deep, some of it is down at the bottom, now you're getting down to 40 to 50 feet deep so it's kind of spread out. It's not the same in any of these borings, it's a little different in different borings so that tells us a lot, tells us we don't have a giant pool at 15 feet; all right?

That would sound horrible but to be honest that might be easier to deal with. When it's spread out like this, it's different depths and different places it becomes a bigger problem sometimes.

Next side, please. A little bit about the site and where it is today. Honeywell owns the property. They maintain it is open space basically when they are engaged in cleanup action, which is zoned thus by Glynn County. There are certain restrictions on what it's supposed to be used for, basic industrial. And zoning it would have been from the get-go as it operated as a refinery, a Georgia Power facility has LCP itself.

The basic industrial zoning is really for main industrial uses, manufacturing, processing the assembly, supposed to be for large employment centers it's also signed by Glynn County so it doesn't restrict some other uses that might be possible but it does clearly say that no residential; right?

A portion of the property was sold to Brunswick paper, it's called the cell block. It's a clean piece in the southwest corner. We also had a clean parcel that was sold to Glynn County that's a shared facility in the northeast corner what we considered clean parcels.

Next slide. So in the groundwater here is what we found: We looked at a hazard index number for noncancer risk. An EPA likes to set a limit of one when we generate this number looking at the contaminants and what level and concentration they are at and what level we would think would be a concern to human health.

With noncancer we say one and you can see we did a hazard index for salts. If they use the groundwater in aquifers. These are all superficial aquifers and we did one for children. Well over one, right? So there is obviously a problem in adults or children where the use of groundwater in the superficial aquifer.

We also look at excess lifetime cancer risks so everybody has some risk for cancer in this country. The current statistics are about one in three for the US population getting cancer, one in two if you're male, a little better if you're female but on average adults are one and three.

This is cancer risk that's in addition to that and is a lifetime cancer risk so look at exposure over your lifetime and EPA says in our regulations is: If your risk is between one and 10,000, extra chances of excess lifetime cancer risk and one in million, you're in a range that we think is okay.

Site specific determination, though, we may look at some sites and say one in 10,000 and it's in the middle of a well field where everybody drinks and evaluate that a little differently, just kind of depends. But that's our general range, that comes directly out of our regulations and we say less than one million you're certainly okay according to our regulations and how we evaluate risks.

Next slide. So here are all the contaminants of concern that we had. There is Mercury, we see it dissolved in the groundwater, we see superficial aquifer matrix and we see elemental Mercury. We also have arsonic, Caladium, lead, so those are our metals. Benzine, chlorobenzene, naphthaline, benzo and Antrizine. I'm not going to read all of these but we have a number of other contaminants that we think are more likely associated with finery operations.

We can't say that for sure but these are things we often see at site operations so these are all organic chemicals and semivolatile chemicals. All of these things are there. They are not all the same concentration. They don't all represent exactly the same risk so we do consider them contaminants of concern that do all offer some risks, not offer but pose some risks to the general public.

So there are all things that we're looking at and we're concerned about but we're certainly concerned about the Mercury, which we see present until dissolved, bound to the aquifer matrix which is little particles, so that's what that means basically underneath the ground and elemental Mercury where it's still in elemental metal form.

Next slide, please. So kind of make this a little more straightforward, we just look at Mercury, not looking at all the other contaminants just Mercury, we're worried about it because if you were dig into that soil underneath that soil cover, you can have direct contact with it.

If it were to become in somebody's yard and they decide to plant their trees, their children that would be an issue. We don't want that to happen. We want the soil cover to stay in place and not be used for residential property.

The Mercury in the surface and the subsurface and groundwater and there is always some Mercury in the groundwater. That could be released again out towards the Turtle River and surface water and it could also get into drinking water once it's released and further down in the groundwater.

So we're concerned about it being in surface water and being in drinking water. We don't see that happening right now but we're concerned about it possibly happening in the future.

Next slide, please. For ecological risk in the salt marsh are being addressed by the operable remedial action, so all the soil sediment that's been excavated and dredged out in the salt marsh and within there we see all the ecological risks out there and they certainly were present and now being addressed.

We didn't find ecological risk in operable unit three and uplands. That is mainly due to all the actions that took place in the 90s where removing all that contaminated soil and sediment and building and materials.

Ecological risk in the other operable units is not really impacted by the former cell building area for the groundwater contamination at OU2. You see that groundwater contamination causing an ecological problem it's beneath the ground. We also don't see a former cell building up offering or posing an ecological problem because it has a soil cover on top of it so there is no direct contact for organisms.

Next slide, please. Now, we have looked at an industrial scenario for this site. The potentially responsible parties are looking at possible redevelopment of the site and so in our conversations with them we said, well, the only thing we can do right now is industrial because that's the type of assessment that has been done for the site so they did take the time to put together a recreation use scenario.

EPA and state of Georgia did look at this or review it, comment on it and it has been modified some due to the comments, but basically what we see is great efforts, a recreational user and then looking at a potential golf course use here.

Both looking at an adolescent golfer and an adult golfer and looking at a maintenance worker, somebody like a groundskeeper that's very much more often that's working on, you know, with the golf course and doing upkeep and so they are more often there than a golfer is; right?

Your groundskeepers are there everyday for their job. They're much more like an industrial worker whereas the folks that come and play golf depending on how good they are they are not there very long, right? Risk evaluating it in our risk range there is accessible risk so low it accounts ten mice for cancer, one in 10,000 risk for cancer and below the noncancer hazard index of one for both the adolescent and adult golfer and the groundskeeper. So that -- that seems okay the way you see all those things that Georgia reviewed it, they felt the same way.

So that indicates the site would be acceptable for this possible -- for this possible type of redevelopment. Now, EPA doesn't own the land, they don't know what's going to happen with the land. We're happy. We're actually very much encouraged with potentially responsible parties to try and get land redeveloped, turn it back into the use of some type so that's seems to be what they are looking at and other than that I don't know what will happen.

Next slide, please. When we put together how we're going to address contamination, we come up with objectives so those are words about what we're trying to do. We want to prevent you from exposure in the cell building area. To Mercury you keep people from ingesting it, coming in contact with it with their skin.

We want to make sure that's protected from commercial and industrial users of the property and also now recreational users. We also want to treat the releasability of the aquifer matrix, the superficial aquifer and all the Mercury in the soil by 90 percent. So we're trying to reduce it by 90 percent so we're looking at what's dissolved in the ground longer and what Mercury in the soil and trying to reduce it by 90 percent. That's our goal right now.

Next slide, please. So we have to remember the sites zoned industrial right now. We already have what we call institution controlling on the sites. Zoning is one of those. Also there is an existing state of Georgia environmental covenant so enforcing the state laws.

It says we may not have to use this site for residential use, so that is a good strong control. It has some other words in it that they would do if they did use a predeveloped site, but what we were looking for was no residential use, very strong.

We are also looking at specific impacts to whatever we do climate change. However you want to look at this, could there be sea level rise, could we have more storm events, more hurricanes that are stronger because of this area.

So we are looking at that and we're

looking at what we're proposing to do and doing what's called a climate vulnerability assessment that was initiated last year and later this year so it will help us to understand what we're doing if they could be really impacted by climate. We don't think that we're doing and what we're proposing to do would actually be that impacted by climate change but there are other things that we might look at in the future that I think would have big impacts or would be impacted in a big way if climate issues, weather issues.

When we look at elemental Mercury, the disposal element of Mercury in the United States currently is very problematic. There are virtually no places you could take elemental Mercury to have it disposed. It's stored at this point and there is a big recycling program.

But the Mercury we see at LCP is a small amount overall. It's spread out like little microbeads and very difficult to try to recycle. In that respect, if we started sampling and seeing, again, a pool of Mercury at five feet below the ground, that would have been a lot easier thing to try and reflect on our customers but that's not what we have.

These subsurface pilings present an enormous engineering challenge. Not knowing where they are, not knowing exactly how big they are, not knowing in depth they started at, what depth they end at, that is a big problem. There are many remedies we might look at, the deep things would stop us in our tracks and might destroy the equipment we're dealing with because the metal pilings are not good when you're trying to work below the surface. They present a large problem.

The water table here is only five feet below the land surface as a cell building area. Y'all can come on in and grab a chair. Don't feel like you got to stand back there.

And as you move towards the salt marsh, of course, the water table and groundwater gets more and more shallow as the land goes away and goes towards the saltwater marsh. So anything that we do where we dig down into the land, we're going to have lots of water and that's happened all of this week.

When you dig a hole even when it fills with water and you got a thunderstorm, then you have warm water. So that's always an issue when we have to look at doing something like that, not that we can't overcome, nothing you can get engineering to deal with that but it is something that you look at where the management of the water becomes much more difficult than actually implementing what the remedy you're trying to implement.

Next slide, please. So this is what it looks like. Elemental Mercury, again, is present in droplets of the soil so this is a pour, just an empty tube pushed down into the ground and pulled back out. So you can see it pretty much looks like sand, it is pretty much like sand like everything in the Brunswick area and a little white to silver dots you see that is elemental Mercury.

Now, the symbol for Mercury is HG and we'll put that little zero next to it representing elemental Mercury. It's not Mercury bound to any other salt or anything like that, so that's HG0 means. So these droplets are very small. They're like 250 micrometers. Don't ask what a micrometer is unless you're in that field where you're looking at sizes of things.

But two millimeters, very, very small; right? That's smaller than BBs. BBs are not that small. It's really actually a little smaller than a shotgun shot; right? Bird shot. We don't see any pulled Mercury. Now, I'm not unhappy that we didn't see pulled Mercury but, like I said before, that would represent a different problem for us. All right. So that would reflect core from 2018 as we're doing those investigations in the subbuilding area so this is a core from the cell building area.

Next slide, please. So we focus down on just trying to address the Mercury in the cell building area. We will have to come back and look at all of the groundwater and address all of the groundwater as well, but now we're looking at what's under the cell area.

Where The cells are set up we always look at no action. What would it be if we did nothing? That's just the way we have the remedy. You're going to see from EPA is a superfund, cleanup program always looks at no action first.

And then start looking at other things because it's focused and the elemental Mercury you don't have a wide variety of things to treat it. So we looked at biological treatment and the soil dermal cover, so that's keeping the covers there, and then actually enhancing that cover to make sure it's a good thickness all the way across.

And then your sequestration and then keeping that soil covered. Now, both of these also keep the institutional controls that already exist. They keep that environmental covenant keeping that in place. That's all included in this.

Next slide, please. Oh, before we get there, so we looked at the things that we might do and we kind of screened them with nine criteria. That's the way our law regulations are set up. So we looked at this is going to be protected of human health in the environment. Will it comply with the applicable and relevant and appropriate requirements?

So basically these are other laws and regulations, things like the Clean Air Act and the Clean Water Act and Safe Cleaning Water Act, so would it comply with those things. And then we also look at long term effectiveness and firmaments.

So when we look at these, we felt that psychological and the chemical treatment would be protective in a healthy environment and they would decline with those other regulations and requirements; however, would they be effective in the long term and will they be prudent? They are both innovative and chemicals have been used before but never not as far as we could tell exactly like this, so it would be innovative.

We know it has worked in the lab, we know it has worked in what we call safe scale when it is a little beyond the labs. We will have used sulfur to treat Mercury in other places in other ways so we have a good feel for that with the biological.

So wastewater treatment plants have a biological place they deal with Mercury and wastewater. That is the technology we kind of would be looking at, but if you're really innovative to do it in the ground in the soil in the cell building area, and it requires some pretty heavy duty labwork as well as fieldwork and big scale work to make sure it would work. So it's not as proven as the chemical.

Next slide, please. We also look at will he reducing the toxicity or the mobility or the volume by treatment and so we think that the biological one you would have to test it to make sure that it would. We know that the chemical would. The chemistry works but at this site we have to do some site specific testing to make sure it works here in Brunswick at the LCP site.

So there is a short term method so we kind of look at how long will it take to impact in the short term. We think a biological work for a short term effect of this but nothing will work as well. We've talked about multiple injections and we would have to monitor it for a longer period of time.

With the chemical sequestration we think the initial injections would be sufficient. We would monitor it for a shorter period of time to make sure and if we needed to look at any extra ones, but we think that they would work.

Can we supplement both of them? These are injection technologies. The EPA has used a lot of injection technologies at sites across the country at all types of different sites becoming very effective and then we know how they work and how to do this and how to deliver things on the subsurface. So as far as implementing them we think that would work.

When we look at cost, there is actually

cause for no action, which seems strange, so there is a cost of keeping those controls in place and there is the cost of maintaining existing covers, so that wouldn't be anything extra but there would be a cost that continues to go through that. For the biological it's 5.9 million basically.

Now, and then for the chemical it's 4.7. That extra 1.2 million is basically because the biological of that would be monitored, have more than one injection, might have three or four or five and make it work the way it ought to work, so that's why it cost more because we think the delivery system is going to be the same. You know, the system of how to store it and getting into the ground, that's going to be the solution those costs are very close.

Next slide, please. So that was only seven. I don't know if you were counting but that was only seven criteria. There are two more criteria that are very important to us. Will the state accept the remedy or does the community accept the remedy?

So the state in the form of the Georgia Environmental Protection Division of the Department of Natural Resources have been working with us all along. They have reviewed all the documents with us, they have commented on all the documents, we've resolved their comments and so they did the next step. Every time I issue a comment letter or EPA issues a comment letter to the potential responsible parties, there are state comments that in that comment letter and they have the same weight as ours do, so they have been there working with us so we feel like and they talked about it and asked about it and they're on board with this.

I'm not going to say they will be in the very end of the day because I'm not with the state and that's for them to say but we're trying really hard to make sure we address any concerns. Community acceptance, we decide after we get all of our comments from the public comment period and we try to address all those comments during this public comment period and the comments on this proposed plan and we'll do those responses and put them in the record decision as a response to this summary when we issue that record decision.

Unless there is -- to be honest, unless there is a whole bunch of comments in some way that makes us go, oh, we should re-evaluate part of this or we should look at something else, so that is the role of public comments. And we say public comments but anybody can comment; right? Sometimes we get comments from people never seen the site but it's just out there for public comments.

Sometimes we get comments from potential responsible parties, sometimes we get comments from elected officials that really are engaged on the site but have an opinion. We look at the comments the same and we try to respond to all of them adequately.

Next slide, please. So this is our preferred alternative. We think that the interstitial sequestration, the improvement in maintenance of the existing soil cover and the existing installational controls are the best option and so this would include keeping that soil cover in place, using the chemical treatment to mitigate the elemental Mercury and minimizes the use of groundwater in the future.

It is really is injecting a type of sulfide, polysulfides into the groundwater, which would physically isolate the beads of Mercury that are down there and also interact with the Mercury that's in solution and we think the Mercury and soil makers is well and turn it into Mercury sulfide, which is insoluble.

It won't dissolve in groundwater and it's immobile, it's not moving in the groundwater. This is bound into the soil forever and the only way to get it to unbind is to, again, change that chemistry subsurface and make it very acidic or making it very basic.

So that's how we see that it's the chemical sequestration keep it going in the solution again and it would minimize this elemental Mercury this HG0 to being source to groundwater or more convenient risk is to contact of anybody that got down to that contaminated material.

Next slide. So this is just another way of saying what I just said. It's a form of chemical treatment. Now, we have modified it a little bit since we issued the focus feasibility study. So we listed this same alternative in the focus feasibility study and we're also going to do a monitored continuation evaluation as part of this alternative.

Actually, we said that's a biological

one as well, the same evaluation. But since that time we've had discussions with the potential responsible parties and we've asked them to a site wide groundwater sampling under the terms of our old administrative order by consent or consent order that we have in place to do the investigation to begin with and that has been implemented in that they have suggested we'll do this.

They have submitted a work plan, which is currently under review by the EPA and the state of Georgia and we're looking at it. That sampling will then be used to help us decide what we're going to do for the rest of operable unit two.

So basically just put that out of this alternative and did it a different way to the existing legal agreements and that's what we're looking at now the potential responsible parties are willing to do it, we say or how to get that done that way, but it is a little change from the focus feasibility study.

Next slide, please. All right. So this is what it kind of looks like. I'll be remiss in pointing out we have some posters against the wall that do have kind of show some of these processes and things done in the past. So what we have here is the purple line is the old cell building area that has a soil cover on it, so everything in that purple line; the yellow lines represent the old cell building areas that are no longer there except for foundations are present under the soil cover.

This green polygons, shapes are where we would inject material. And, actually, this would be fairly close if we had chose the biological very much the same, but from chemistry sequestration, this is what we look at, that area, so each one of those green circles represents an injection point.

The black diamonds you see here are what we actually saw elemental Mercury in the subsurface, so this is a direct reflection of the investigation done in the cell building area and this is the area we would treat. So it's focused right on the elemental Mercury areas and that's what we'll be going after with this alternative.

Next slide. So our path forward it's to do this what we call source control. This is the source of contamination and try to get that record decision out in the year term, which basically means next year. That would address Mercury in this area. We use this sequestration technology to transform elemental Mercury to a Mercury sulfide. We're already requiring the periodic groundwater sampling to set up a new baseline of what's in the groundwater going through the whole site.

And then, as I said, that would allow us to look at what we're going to do for all that groundwater and make that decision in the future. We're going to be doing that at the same time as we're doing this alternative in the source area so that we can get some things done more quickly and overlap.

Next slide, please. So here is our schedule. We started this public comment period on July 5th and currently we have the few info sessions this week and we're having a proposed plan meeting tonight obviously.

The comment period ends on August 5th, 2004. You may send comments directly to my e-mail. I'm just going to talk a little more about that, aren't you? Did you know Angela is going to talk a little more about that?

MS. MILLER: A piece of chocolate. I

never -- I didn't get one.

MR. POPE: And then, again, we try to get that record decision done where we answer all those comments that we receive in the spring of 2025. That means that we would be sitting, then, with the potential responsible parties and negotiating that legal agreement that can be later in 2025. We should be done by the fall; all right?

Looking attorneys; right? That would allow us to then go into actually implementing the work. We'll do a pilot study to make sure it's going to work as they think it is and then do remedial by fall of 2026.

Now, I do want to talk a little bit, you know, this is my last slide and then there is questions, talk a little bit about we had received multiple requests to extend the public comment period beyond the 30 days, which is, to be honest, something we expected the Brunswick community and has happened in all of our previous proposed plans at the sites in Brunswick and so it wasn't a surprise to us and we're certainly entertaining it.

The one thing I want to talk a little

bit is the request to extend it for 60 days past the initial 30 days, which will give us a 90 day public comment period. That is a long time. We have done it before. What it does for this project, though, is it pushes everything by quarter and we start pushing things by an entire quarter of a year, sometimes that pushes other things beyond that one more quarter into two quarters and it could be that we push this remedial action all the way out into 2027, which is not what I think this community wants but y'all just tell me if y'all want to do it later.

Certainly the EPA wants to do interestingly enough what the potential responsible parties want to do, they would like to give to the field center as well. So EPA is looking at that. I will tell you tonight that we're going to extend the public comment period.

Looking at where we are and what we'd like to do and request we'll do a 30 day initial extension for a total of 60 days. In addition to that, in talking to our nongovernmental organizations in the Brunswick area, we are also going to come back and offer two more information sessions in August as we extend that public comment period so people have more time to come in and talk to us in person and ask any individual questions they want to do at those sessions as well.

So we hope that that is a middle ground of not giving so much time as we start moving things out into other years but giving more time and providing us and it will not just be me and I'll bring these great experts with me as much as I can depending on their schedules and getting them to answer questions as well.

That is where we are. We're actually looking at August 15th and will have two sessions, one in the morning/afternoon and one in the afternoon/evening, and they would be informal sessions where we set up the posters and you can come and talk to us and we just answer them one on one. So that is the end of my presentation.

I'm happy to answer questions as I may and if I have to go back through these slides that you have a question about. We do ask, we have a court reporter here taking it, that you stand up and say your name and ask your question clearly, as clearly as you can.

I may repeat your name and repeat the

question to make sure we get it down, but that's what we ask. And this is the formal portion for public comments, so, you know, kind of hold their hands and Angela will probably pick you and you try to ask people to kind of keep it to five minutes or less and if you need more time than that or multipart question may exceed your time, come back and ask it after somebody else has asked some of their questions so we, you know, everybody has a fair chance to ask questions. So try to stay around five minutes but if you need ten or 15, maybe get five and we'll give you a few more minutes. That's just a request.

MS. MILLER: And your comments tonight will be part of the comments received. You can e-mail them. If you get one of the fact sheets, you can e-mail your comment to Rob or you can mail it in. If you want to take all that ridiculous money for the new stamp which came out, then the address is on the back of the fact sheet.

So I'll come to you if you're in facebook live, so I'll come to you with the mike whoever has the first question. Don't be afraid. Don't be scared. Thank you, sir.

[redacted]: And then my name is [redacted]

[redacted] with the University of Georgia, I was going to ask the chemical injection you never mentioned what the chemical they're injecting, Rob.

MR. POPE: We'll be using polysulfides.

[redacted]: And just based on your table option one it said $225. May it be missing a zero?

MR. POPE: You're right. Thank you. It's a typo. I noticed it, unfortunately, that table is not legible.

[redacted]: [redacted], also University of Georgia. Here in Brunswick related to the climate vulnerability assessment, is that conducted by EPA and what does that involve?

MR. POPE: It is conducted by EPA. In all honesty, we go through our headquarters office. They have that capability for us and so it will be going through our headquarters office in Washington DC. They have a contractor that does these with site stations on it when requested, so EPA but it's a contractor for EPA.

They look at preparing weather patterns, they look at sea level, they look at possible flood zones, they look at hemazones, they look at -- you know, weather could be impacted, they look at the impacts of different remedies. They go over every detail.

I'm not the expert in that so, you know, we have gone to headquarters to get an expert to look at that. You know, that's the -- our specific than what you are doing. So, you know, if we were proposing a cap, for instance, they would look at it differently as opposed to injections or proposing, you know, or we're going to make a giant hole and then build a treatment system on site, then we look at that differently long term treatment system or something like that.

So they will look at weather patterns and, again, wetlands and flood planes. They will look at prevailing wind directions, you know, not a storm so they will also look at predictions of how intense your storm is going to be in the future and how many are likely to hit this area.

So that's statistics, right, which, you know I'm -- a very good friend of mine that is a statistical model, since all statistics lie but some are useful, so that's -- that's how they will look at it. Once it is done we will build the part of the record and we will share it with the general public, so you guys can certainly look at it, too.

You know, I'll offer this because it's not going to be a secret or anything, but if it shows us that we have a major problem, we certainly would be looking at what we can do to modify the remedy or even change the remedy so that it doesn't have a major problem.

And what I've seen in previous ones at other sites is that they will certain come with a set of recommendations, if they see issues and then we'll work to get those recommendations to make the remedy a better remedy.

Most of the time we'll do it. You know, sometimes these remedies were built in the 80s and 90s and we didn't do vulnerability studies like that back then and so we do them much later those remedies to make them a less vulnerable impact.

[redacted]: I think you said hearing more about that we have a C plant project as well that is supposed to get later more results.

MR. POPE: Yeah. Definitely can. In fact, I think we've got an e-mail from you today or yesterday.

[redacted]: You did. Thanks, Rob.

MR. POPE: My pleasure.

[redacted]: My name is [redacted]. My question is concerning the polysulfides. When you inject them and yet they do let's assume that they were totally successful in encapsulating the Mercury and making it unearthed.

If there were then polysulfides remaining, would that be considered a toxin that has to be cleaned up as well.

MR. POPE: I'm going to ask [redacted], one of the two chemists to talk a little about that and about polysulfides that are left over.

[redacted]: So it's a good question. The expectation is that the polysulfides transform to sulfate which is very common and the salt marsh is loaded with salt and so polysulfates are fairly unstable and not stick around for very long and the next step would be a long term fix, I suppose.

MR. POPE: Thank you, Rick. Does that answer your question, [redacted]?

[redacted]: Yes. Thank you.

[redacted]: My name is [redacted], I work at LCP. I understand that there is accountability for Mercury. Would you go on record and touch on how it is unaccounted for on the LCP site?

MR. POPE: I mean, that has been looked into before how much is unaccounted for. A lot of it, however, went out with the removals that happened in the 90s and we did not try to account ounce for ounce what went out and what we found in soils and sediments that then left the site. We did a mass site and accounting for what's already been addressed.

It's really impossible but people have looked at it before and I won't discuss on it exactly, but it has been looked at before but there is a certain amount of Mercury that's unaccounted for. We haven't tried to balance that with what we've already taken away and what's already there.

And, you know, we can't tell you from these samples exactly what the volume of Mercury is either. We take more details, we find out the borings and tells us something about the subsurface but we still have to make other assumptions because, you know, we're not doing millions and millions of things, we're doing what we can.

[redacted]: The other question I think

I mailed to you already but you can answer that when you get around to it.

MR. POPE: Okay.

[redacted]: I sent you a letter.

MR. POPE: I'll look for it. Thank you.

[redacted]: Is there any evidence -- my name is [redacted]. Sorry, I forgot. My question is is there any evidence of elemental Mercury in the Ebenezer and is this action only addressing the elemental Mercury in the superficial aquifers above the Ebenezer?

MR. POPE: So we don't have any evidence that the elemental Mercury in the lower part of the superficial aquifer; however, we also have taken samples of the Ebenezer and there is various reasons because there is sandstones between the Ebenezer and Satilla and we don't want to puncture it.

We could puncture it by the need to drawing Mercury down into this so we have not taken soil borings but there are wells to go into the Ebenezer outside of the cell building area and horizontal wells that go down the Ebenezer and, yes, we have detected Mercury solution so we know that Mercury is down there, we just don't know for sure that no Mercury is there. What's the second part?

[redacted]: I'm not even sure I'm making -- the second question is is there anything on the elemental Mercury above that cemented sandstone?

MR. POPE: And, yes, it is focused on the upper part of the superficial aquifer and we call the Satilla and that's where the mass of it is and, again, if we were to try and puncture that sandstone and try to get below that to the Ebenezer, we run the risk of puncturing it and making things worse in the Ebenezer so we don't really want to try to remedy, that would make it worse.

But, again, we know that there is dissolved Mercury or even Ebenezer in the lower part of the superficial aquifer and I'm going to say that the horizontal wells are going at an angle and coming back but and that will continue to be a problem but really that's a problem that we will have to address in the final run for aquifer. We won't be getting to this but if we stop this and whatever is done to the Ebenezer will be better off.

MS. MILLER: We got about 15 minutes left so don't be shy.

MR. POPE: I can answer any question. You guys are just between me and some seafood. That's all.

[redacted]: I'm not going to be lone. Hello. I'm [redacted] and I'm a hydrogeologist and a technical advisor. We're the community group retained the coalition thanks to money from the FDA. So I had a question to follow up about the deeper zone, the Ebenezer. Will the groundwater sampling program that the air are proposing to you now you're reviewing, will that include Ebenezer and aquifer monitoring wells so you can possibly see an impact from -- from the chemical sequestration for remediation that you're doing because that's only going to address the shallow Satilla, do you suspect anything to go into the Ebenezer and would you be looking for it in the part of this monitoring sampling program y'all are doing?

MR. POPE: Those are great questions. So the additional sampling will be site wide. Will they include sampling in the Ebenezer and we will be sampling Mercury for sure as well as the other concerns in the Ebenezer as well as that are near the subbuilding area as wells that are further away from the cell building areas.

So, yes, the first parts of your question we are going to include that in the sampling and that will be part of the final remedy for just the superficial but for the Ebenezer as well. So all we have right now -- can you flip back to the slide that's got the layout of the proposal projects, almost the very last slide?

Well, that poster too. I hope people can see that. And before we go any further I introduced all these people from the EPA and I was horribly rude. Don't portion who is another remedial project manager from the EPA and is working with us on the site, so I apologize, Porsche.

As you can see, she's helping me because she's a much younger, smarter and savvier person than I am to run all these slides. But this is what we're looking at for the injections and I got to figure how to tie these to your questions, [redacted].

I apologize and we'll be monitoring around this but as far as monitoring in the

Ebenezer while we do this, it will be happening because the other periodic sampling will be happening in conjunction but this is all we have for a plan right now, to be honest.

I mean, there is we have some beginnings of a plan in the focus feasibility study and actually we have more than we had at the beginning and we asked for more potential responsible parties put more together. But until we get our real plan put together after the legal agreement is negotiated, I don't have a solid answer about any wells whether we'll be sampling them.

We're not looking for a huge impact in the Ebenezer. That's not the goal we started out with. We're really going after elemental Mercury, Satilla and superficial. So we will be sampling at the same time or overlapping samplings and we'll see if there is an impact. That's not the first group but that's a good question and maybe it's something we can look at even more.

I'd like to follow up just a little bit about that. I think and I have a feeling it's in y'all's mind that the importance of this and the chance to get, gather important information for the next phase, which is looking at, which is what do we do with the groundwater and other contaminants and I'm sure would include the Ebenezer groundwater because whenever you start collecting those new samples, looking at that as this remediation will be possibly really helpful.

And then we've already got half a dozen wells. I can look in the data. You've got a half a dozen needs wells in the Ebenezer that are near the subliving area and the rest, which would be like surface area where water would be flowing after those remediations.

So those wells probably would be included and we look today because there are concerns about the Ebenezer were brought up in the last couple days. Today I looked through the previous data. There is two reports, the RIFS report and the daily report. Those were both in 2020 and in 2022.

And they have summaries of the data and it shows the defects in the Ebenezer in these six overall in the deeper zone over time since 2007 and the data seems to really show a consistent couple of, two areas where it looks like there is a leakage through the sandstone into the Ebenezer.

The area is and the data persist over

this 15 year period and so I encourage y'all to look at that, which I'm sure you're going to look at that and try to make sure that the groundwater samplings are going to implement, will capture and look closely in those areas because in the future the next step looks to me like you got a significant leakage through that cement sandstone and it looks like two specific areas.

Those figures in the report will show that that will probably be, you know, a pretty important element of future to evaluate because to evaluate that as an important element to find out and determine what you're going to do with the groundwater overall.

[redacted]: Definitely. I do agree. I mean, we do know, of course, that's the groundwater that will represent dissolved Mercury that's already in the solution, not the elemental Mercury. And, again, this is really the focus.

MR. POPE: All that is dissolved in the cell building area and we have Mercury in the soil matrix as well. We're really focused on that elemental Mercury that this remedy goes after. So and, yeah, then the cemented sandstone as part of the materials we're careful to cemented sandstone and not like an aquifer that confines the layer that separates these things.

It's not perfect. It's there. It makes a difference and we don't want to make it worse by punching holes in it, but it's not perfect and certainly the data shows that. I mean, this is a cartoon but it does show that we've had contamination get to the Ebenezer and then happens to address it, so you're absolutely right. Thank you for that.

And we'll be looking at that. That's all part of the groundwater sampling under the terms of the consent order to determine what we do for the final remedy of operable unit two. It's not the just top it's always the superficial aquifer and Ebenezer not Satilla but thank you. Anything else? Okay.

[redacted]: [redacted] again with the Environmental Coalition. So back in the early 90s they did drill some wells through that the cemented sandstone and this is totally my own ignorance. I don't know, but would it be possible or is it possible from a technical standpoint to use the infrastructure of those wells as injection wells?

Like I don't know if that's something that can happen but there have been already a handful, I think there is seven there were solved in '95 and '96 so there are a few little areas that have already punctured through and so just thinking --

MR. POPE: I think those are the cell building area.

[redacted]: You're correct, they are outside of it.

MR. POPE: On purpose.

[redacted]: I'm thinking about future --

MR. POPE: Right.

[redacted]: Future cleanup. There is some infrastructure that is already through there and, you know, because I do know that from the community standpoint, you know, a lot of times citizens are looking for the best, best option, best outcome for, you know, one of the nations most complex, not the most but it's up there, complex environmental disasters and so just kind of thinking a little outside the box that there is infrastructure through the sandstone and can we consider options in the future to use that maybe help clean up layers. It's already punctured through.

MR. POPE: So whether we can use those or not in the long run how they are constructed and what they are like now, old wells often have issues where, you know, they don't flow like you would want the, to and they are not built for injection.

So that's something we have to look at for those wells in particular but right now as we look at what we'll do for all the groundwater beyond the cell building areas, all options are on the table so we don't want to puncture the cemented sandstone underneath the cell building area for sure.

Whether or not we can do well outside of there then you go through the sandstone. We have done it in the past. There are ways to go through things like that so you seal them off as you're going through them but what we're more worried about is the cell building area dragging contamination down with us.

But outside of the cell building area we have more options things we have been looking at from a perspective and, like I said, all options are on the table right now for operable unit two and there are injection remedies that are out there, there are remedies where we build flow through walls so they can be treated that flow through the walls, there are remedies where we build slurring walls and keep the contamination from flowing anywhere. So all those things that are out there if possible we haven't started looking yet.

[redacted]: [redacted] again. Can you discuss a little bit about what effect on the Mercury? Mercury is contaminated already and then you're taking it driving, piling. Wouldn't that cause the Mercury to migrate and that's where you'll find it all along from a foot to two feet?

MR. POPE: That's certainly a possible scenario.

[redacted]: Thank you.

MR. POPE: We are doing that and, you know, we weren't there and they weren't making things because they didn't really know so we don't know. But certainly driving the piles, you know, with Mercury and then a pile through the Mercury it's a good chance they smeared it down, smeared it down, it could have been done that way.

Mercury has very high surface it doesn't like to move very much and, you know, finding it, moving down through here is that's one possible way it's down there. There are other things that will make it move but that's certainly one of them.

So, yeah, that's a possibility so they could be, you know, a pathway for the Mercury to get smeared down and, you know, that's another problem with those piles to be honest.

[redacted]: Thank you.

[redacted]: Sorry, I moved. My last comment for the evening. Rachel Thompson, Environmental Coalition. I would just suggest as you guys continue to move through the record decisions and consent decree process, it's very clear that when we're talking about the superficial aquifer, talking about the Satilla and acknowledging that we understand there is issues with Ebenezer but they are not going to be addressed now.

I think that proposed plan doesn't totally acknowledge that there are issues there and that they are not being addressed by this faction so if there is an opportunity to make that a little bit more clear, we would appreciate that.

MR. POPE: Yes. That's a good point. I mean, we are very focused in this proposed plan on what's going on in the Satilla portion of the superficial aquifer and that the document is put together. The record decision will be a bigger, thicker, longer document with a lot more information in it and certainly we will talk more about the rest of the site.

I'm trying to keep the proposed plan focused on what we're proposing: The record decision it's bigger but I will struggle to keep it not too much bigger but it will be larger. I think, too, we want to think before dealing with the source of your -- take care of the source area first before you address anything else.

You're addressing now you're going to have more coming in so you want to take care of your main source area first, which is what this plan is all about then we can address the groundwater issues when we address OU2 groundwater and that's why we're trying to address this right now is to get this source area today or in the near future and then come back and address everything else afterwards.

I want just want to make sure everybody realizes that we're not neglecting the groundwater, we're trying to take care of the source sooner than later and then come back and take of the source water once we get rid of the contamination.

MS. MILLER: The time is 7:06 and one more question. If not, he gets a break unless the pastor starts passing plates. Thank y'all so much for coming out tonight. I know the weather was not in our favor. Again, pick up a fact sheet. It has all the information you need, it has all the information you need.

My e-mail, Rob's e-mail we're going to extend the comment period, we're going to be back so if you signed in on the sign-in sheet, you'll get a notification of when we're coming back and where we're going to be and we'd like for y'all to come on back and let's talk about this some more; okay?

MR. POPE: You said if I do want to exercise, Frank brought up a couple of documents about the remedial investigation and the site characterization report. They are in our online administrative record so if you go to the EPA website for LCP Brunswick, there will be a link to all those documents online as well, so...

MS. MILLER: And it will say administrative record for, and if you can't find what you're looking for, call me and I'll walk you through.

MR. POPE: And those two reports, one is in 2020 and that's the site characterization report, and then there is the remedial investigation and feasibility study that's in 2022. Now, those are the most two recent thorough documents and have a lot of information and a lot of good graphics, lots of stuff.

MS. MILLER: And they are very interesting so please refer to them.

MR. POPE: Thank you very much for coming.

MS. MILLER: And thank you facebook live.

(EPA meeting concluded at 7:11 p.m.)

CERTIFICATE

STATE OF GEORGIA:

COUNTY OF CHATHAM:

I, [redacted], Certified Court Reporter for the State of Georgia, do hereby certify:

That the foregoing deposition was taken before me on the date and at the time and location stated on Page 1 of this transcript; that the witness was duly sworn to testify to the truth, the whole truth and nothing but the truth; that the testimony of the witness and all objections made at the time of the examination were recorded stenographically by me and were thereafter transcribed by computer-aided transcription; that the foregoing deposition, as typed, is a true, accurate and complete record of the testimony of the witness and of all objections made at the time of the examination.

I further certify that I am neither related to nor counsel for any party to the cause pending or interested in the events thereof.

Witness my hand, I have hereunto affixed my official seal this 3rd day of September 2024, at Savannah, Chatham County, Georgia.

____

[redacted] CCR-2492

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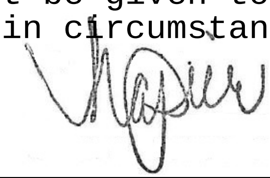

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FIRM REPRESENTATIVE

APPENDIX C

Cost Estimate for the Selected Remedy for the Interim Early Action for the LCP Chemicals Superfund Site Operable Unit 2 Brunswick, Glynn County, Georgia

Table B1
Remedial Alternative 3: ICS
Cost Analysis

Remedial Alternative 3: ICS, with IC and Soil Dermal Cover						
Cost Summary		**Est. Field Work Duration**				**Alternative Summary**
Capital Cost:	$4,150,000	Pilot Studies	6-9	Months		ICS Pilot Studies and Remedial Action
2-year ICS Monitoring:	$352,000	Site Preparations:	1	Months		Soil Dermal Cover Enhancement
Total Capital Cost:	**$4,502,000**	Inj. Well Network:	2	Months		2 years ICS Performance Monitoring
		Inj. Sys. Setup/Testing:	1	Months		
30 Year O&M Cost:	**$210,000**	Inj. Process:	3	Months		+50/-30 Cost Estimate Process (EPA, 1988)

CAPITAL COST						
ICS PHASE 1: PILOT STUDY						
Item	**Task**	**Quantity**	**Units**	**Unit Cost**	**Total Cost**	**Comment**
1.1	Pilot Study Design Plan	1	LS	$50,000	$50,000	Amendment options review, process design, calculations
1.2	Treatability Study Media Collection (Soil Cores)	1	LS	$55,000	$55,000	Cell building slab coring, direct push sampling
1.3	Detailed CBA Groundwater Assessment	1	LS	$200,000	$200,000	15 MWs, sampling, analytical testing
1.4	Geochemical/Amendment Modeling	1	LS	$30,000	$30,000	Refine CBA geochemical model, desktop amendment evaluation
1.5	Bench-scale Amendment/Dosing Study	1	LS	$210,000	$210,000	Amendment testing, microscopy, and reporting
1.6	Sequestration Analysis	1	LS	$35,000	$35,000	Hg speciation, mineralogy testing, sequential extraction
1.7	ICS Design Parameters	1	LS	$25,000	$25,000	Amendment selection
1.8	Contingency/Modifications	15%			$90,000	Retests, validation, dosing adjustments
				Total:	**$695,000**	
ICS PHASE 2: PLANNING/REMEDIAL DESIGN						
Item	**Task**	**Quantity**	**Units**	**Unit Cost**	**Total Cost**	**Comment**
2.1	System Design/Construction Plan	10%			$290,000	10% ICS Implementation/Soil Cover Construction Costs
2.2	Contracting - RFB	5	LS	$15,000	$75,000	Request for Bid (RFP)Preparation; Contractor site visit
2.3	Contracting - Review/Award	1	LS	$15,000	$15,000	RFB review, COI verification, Contract management
2.4	Permits	1	LS	$20,000	$20,000	UIC Permit
2.5	Health & Safety	1	LF	$20,000	$20,000	Inspection, meetings, safety supplies and equipment
2.6	Contingency	10%			$40,000	
				Total:	**$460,000**	
ICS PHASE 3: SITE PREPARATIONS						
Item	**Task**	**Quantity**	**Units**	**Unit Cost**	**Total Cost**	**Comment**
3.1	Field management/oversight	1	Months	$43,000	$43,000	
3.2	Survey and survey controls	1	LS	$30,000	$30,000	Survey and markers
3.3	CBA Structure Clearing: Fencing	2100	LF	$6	$12,600	Demo and dispose of perimeter fencing
3.4	Concrete Coring/Boring Preparations	57	Locations	$3,300	$188,100	Remove soil cover, stage on-site, 18" core @ 36" depth, restore area
3.5	Erosion-Stormwater Management	3,000	LF	$3.00	$9,000	Sediment fencing and controls; surface drainage checks
3.6	Construction Oversight - Field	1	Months	$43,000	$43,000	
3.7	Construction Oversight - Office Support	1	Months	$20,000	$20,000	
3.8	Contingency	25%			$90,000	
				Total:	**$440,000**	
ICS PHASE4: INJECTION WELL NETWORK						
Item	**Task**	**Quantity**	**Units**	**Unit Cost**	**Total Cost**	**Comment**
4.1	Contractor mobilization	1	LS	$25,000	$25,000	Based on sonic rig
4.2	Contractor rig/crew rate	45	Day	$6,500	$292,500	Based on sonic rig, 57 injection well pairs, 25ft spacing
4.3	Monitoring well materials	6,042	LF	$12.00	$73,000	2" Injection wells (3 nested wells per location)
4.4	IDW Management	1	LS	$30,000	$30,000	IDW Disposal
4.5	Off-hours Security	2	Months	$20,000	$40,000	
4.6	Construction Oversight - Field	2	Months	$43,000	$86,000	Assume 22 days per month (10/4 Schedule)
4.7	Construction Oversight - Office Support	2	Months	$15,000	$30,000	
4.8	Contingency	25%			$144,000	
				Total:	**$720,000**	

Table B1
Remedial Alternative 3: ICS
Cost Analysis

Remedial Alternative 3: ICS, with IC and Soil Dermal Cover						
Cost Summary		**Est. Field Work Duration**				**Alternative Summary**
Capital Cost:	$4,150,000	Pilot Studies		6-9	Months	ICS Pilot Studies and Remedial Action
2-year ICS Monitoring:	$352,000	Site Preparations:		1	Months	Soil Dermal Cover Enhancement
Total Capital Cost:	**$4,502,000**	Inj. Well Network:		2	Months	2 years ICS Performance Monitoring
		Inj. Sys. Setup/Testing:		1	Months	
30 Year O&M Cost:	**$210,000**	Inj. Process:		3	Months	+50/-30 Cost Estimate Process (EPA, 1988)
ICS PHASE 5: IN SITU SEQUESTRATION SETUP						
Item	**Task**	**Quantity**	**Units**	**Unit Cost**	**Total Cost**	**Comment**
5.1	Injection System: Design/Drawings	1	LS	$25,000	$25,000	
5.2	Injection System: Procurement	1	LS	$35,000	$35,000	Mixing tanks, pumps, lines, fittings
5.3	Storage Containers - Rental	3	Months	$1,500	$4,500	Lockable shipping containers (2)
5.4	Generator/Power	3	Months	$1,000	$3,000	
5.5	Consumables/General Supplies	1	LS	$25,000	$25,000	
5.6	Construction Oversight - Field	1	Months	$78,000	$78,000	Assume 22 days per month (10/4 Schedule), 3 Field Crew & per diem
5.7	Construction Oversight - Office Support	1	Months	$15,000	$15,000	
5.8	Contingency	25%			$46,000	
				Total:	**$232,000**	
ICS PHASE 6: IN SITU SEQUESTRATION INJECTIONS						
Item	**Task**	**Quantity**	**Units**	**Unit Cost**	**Total Cost**	**Comment**
6.1	Sequestration Chemistry	1.0	LS	$500,000	$500,000	See Table E3 Attachment
6.2	Sequestration Shipping	1.0	LS	$30,000	$30,000	
6.2	Sequestration Injections	3	Months	$80,000	$240,000	Assume 22 days per month (10/4 Schedule), 3 Field Crew & per diem
6.4	Contingency	25%			$193,000	
				Total:	**$963,000**	
SOIL DERMAL COVER ENHANCEMENT						
Item	**Task**	**Quantity**	**Units**	**Unit Cost**	**Total Cost**	**Comment**
7.1	Survey and survey controls	1	LS	$15,000	$15,000	Survey and markers
7.2	Contractor mobilization	1	LS	$35,000	$35,000	
7.3	--Topsoil Cover	9,680	CY	$30.00	$290,400	Off-site source, transport, spreading, and compaction; 6 acres x 1 foot
7.4	--Vegetative Cover	6.0	Acres	$5,000	$30,000	6 acres
7.5	Erosion-Stormwater Management	3,000	LF	$3.50	$10,500	Sediment fencing and controls; surface drainage checks
7.6	Off-hours Security	1.2	Months	$15,000	$18,000	
7.7	Construction Oversight - Field	1.2	Months	$43,000	$51,600	Assume 22 days per month (10/4 Schedule)
7.8	Construction Oversight - Office Support	1.2	Months	$15,000	$18,000	
7.9	Contingency	25%			$117,000	
				TOTAL:	**$590,000**	
SUPPORTING TASKS						
Item	**Task**	**Quantity**	**Units**	**Unit Cost**	**Total Cost**	**Comment**
8.1	Completion Report	1	LS	$50,000	$50,000	As-builts, ICS Quantities, Activity Rates, Measurements
				Total:	**$50,000**	
				TOTAL:	**$4,150,000**	

Table B1
Remedial Alternative 3: ICS
Cost Analysis

Remedial Alternative 3: ICS, with IC and Soil Dermal Cover

Cost Summary		**Est. Field Work Duration**			**Alternative Summary**
Capital Cost:	$4,150,000	Pilot Studies	6-9	Months	ICS Pilot Studies and Remedial Action
2-year ICS Monitoring:	$352,000	Site Preparations:	1	Months	Soil Dermal Cover Enhancement
Total Capital Cost:	**$4,502,000**	Inj. Well Network:	2	Months	2 years ICS Performance Monitoring
		Inj. Sys. Setup/Testing:	1	Months	
30 Year O&M Cost:	**$210,000**	Inj. Process:	3	Months	+50/-30 Cost Estimate Process (EPA, 1988)

O&M COST

SOIL DERMOAL COVER INSPECTION (30 YEARS)

Item	Task	Quantity	Unit	Unit Cost	Total Cost	Comment
9.1	Field Inspection	30	Event	$5,000	$150,000	Verify Site Controls; Land Use
9.2	Reporting	30	Event	$2,000	$60,000	Reporting
				TOTAL:	**$210,000**	

O&M COST - MONITORING

Item	Task	Quantity	Unit	Unit Cost	Total Cost	Comment
10.1	Groundwater Sampling	8	Quarter	$15,000	$120,000	15 well Program; $750 estimated sampling cost per well
10.2	Laboratory Services	8	Event	$4,000	$32,000	15 well Program; $183 lab cost (metals+Hg) per well
10.3	Data Evaluation & Reporting	8	Event	$25,000	$200,000	
				TOTAL:	**$352,000**	

EPA, 1998. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA

Table B1 Attachment
Preliminary ICS Amendment Cost Evaluation

Estimate of Available Hg^0 (Reactive Hg^0).
Hg^0 bead size range 0.02 mm to 2.0 mm

Avg Hg^0 bead (dia.)	**0.2**	**mm**
Hg^0 Bead Volume	0.0042	mm^3
Hg^0 Bead Surface Area	0.1256	mm^2
Reactive Thickness	0.01	mm
Reactive Hg:Total Hg	0.30	ratio

Hg^0 Volume @ Assumed Pore Saturation

Low:	**0.01%**
Medium:	**0.05%**
High:	**0.10%**

Sodium Polysulfide Synthesis Profile

$$Na_2S + 4S \rightarrow Na_2S_5$$

	Na_2S	S	Na_2S_5
Moles	1	4	1
MW (g/mol)	78.045	128.26	206.31

Amendment Ratio (Hg:S): Sodium Polysulfide

$$Na_2S_5 + Hg^0 \rightarrow HgS + Na_2S_4$$

	Hg^0	Na_2S_5	Ratio
Polysulfide:	1	1	1

Treatment zone	**Cell Building 1**	**Cell Building 2**
Area (ft^2)	15,000	12,000
Depth (ft)	50	50
Volume (ft^3)	750,000	600,000
Porosity (n)	0.3	0.3
Pore Volume (ft^3)	225,000	180,000
Pore Volume (L)	6,371,280	5,097,024

Constants	
Compound	MW (g/mol)
Hg^0	200.59
Na_2S_5	206.31
Na_2S	78.045
S	32.065
Hg^0 Density (20°C)	Units
13.5336	g/cm3
13,533.6	g/L

Liters Hg^0 Volume @ Assumed Pore Saturation (L)

% Pore Saturation	**Cell Building 1**	**Cell Building 2**
0.01%	637	510
0.05%	3,186	2,549
0.10%	6,371	5,097

Moles Na_2S_5 @ Assumed Pore Saturation				**Na_2S_5 Synthesis Input**	
% Pore Saturation	**Cell Building 1**	**Cell Building 2**	**Total Na_2S_5**	Na_2S	S
0.01%	12,896	10,317	23,213	23,213	92,851
0.05%	64,480	51,584	116,063	116,063	464,253
0.10%	128,959	103,167	232,126	232,126	928,506

Liters Reactive Hg^0 Volume @ Assumed Pore Saturation (L)

% Pore Saturation	**Cell Building 1**	**Cell Building 2**
0.01%	191	153
0.05%	956	765
0.10%	1,911	1,529

Mass Na_2S_5 @ Assumed Pore Saturation (kg)				**Na_2S_5 Synthesis Input**	
% Pore Saturation	**Cell Building 1**	**Cell Building 2**	**Total Na_2S_5**	Na_2S	S
0.01%	2,661	2,128	4,789	1,812	2,977
0.05%	13,303	10,642	23,945	9,058	14,886
0.10%	26,606	21,284	47,890	18,116	29,773

Mass Reactive Hg^0 @ Assumed Pore Saturation (kg)

% Pore Saturation	**Cell Building 1**	**Cell Building 2**
0.01%	2,587	2,069
0.05%	12,934	10,347
0.10%	25,868	20,694

Synthesis (lbs.)		**Cost/lb.**		**Cost**		**TOTAL**
Na_2S	S	Na_2S	S	Na_2S	S	
3,994	6,564	\$8.90	\$2.50	\$35,546	\$16,409	\$51,955
19,970	32,819	\$8.90	\$2.50	\$177,731	\$82,046	\$259,777
39,940	65,637	\$8.90	\$2.50	\$355,462	\$164,093	\$519,555

Moles Reactive Hg^0 @ Assumed Pore Saturation

% Pore Saturation	**Cell Building 1**	**Cell Building 2**
0.01%	12,896	10,317
0.05%	64,480	51,584
0.10%	128,959	103,167

Sodium Sulfide:

Wintersun Chemical \$268/50lbs (60% Na_2S = \$445/50lbs or \$8.90/lb. for corrected mass)

Spectrum Chemical Mfg. Corp

High purity sulfur pellets (>99%):

Range \$2.00-\$3.00/lb