

# OU2 Human Health Risk Addendum

**Kerr-McGee Chemical Corp.—Navassa Superfund Site**

**Navassa, North Carolina**

**EPA ID #NCD980557805**

*Prepared for*

**Greenfield Environmental Multistate Trust LLC  
Trustee of the Multistate Environmental Response Trust**



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## ACRONYMS AND ABBREVIATIONS

ADAF	age-dependent adjustment factor
BaP	benzo[ <i>a</i> ]pyrene
bgs	below ground surface
COC	constituent of concern
COPC	constituent of potential concern
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
Integral	Integral Engineering, P.C.
IRIS	Integrated Risk Information System
MDL	method detection limit
Multistate Trust	Greenfield Environmental Multistate Trust LLC
NCDEQ	North Carolina Department of Environmental Quality
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCP	pentachlorophenol
PDI	pre-design investigation
RfD	reference dose
RfC	reference concentration
RSL	regional screening level
Site	Kerr-McGee Chemical Corp.—Navassa Superfund site
TCDD	2,3,7,8-tetrachlorodibenzo- <i>p</i> -dioxin
TEQ	toxic equivalency

# 1 INTRODUCTION

This report presents a Human Health Risk Assessment (HHRA) Addendum for Operable Unit 2 (OU2), which encompasses 15.6 acres of the Kerr-McGee Chemical Corp.–Navassa Superfund site, located in Navassa, North Carolina (U.S. Environmental Protection Agency [EPA] ID# NCD980557805]), referred to herein as “the Site.” This report, hereinafter referred to as the “OU2 HHRA Addendum,” presents an update to risk calculations in the September 2021 OU2 HHRA (Integral 2021a), hereinafter referred to as the “2021 OU2 HHRA,” for nine OU2 parcels based on follow-up sampling conducted in September/October 2021 as OU2 pre-design investigation (PDI) sampling. The OU2 PDI sampling results were used to update risk calculations for the nine OU2 parcels. This report presents both the revised final risk estimates for these nine parcels and the unchanged risk estimates for the other 82 parcels that were presented in the 2021 OU2 HHRA (Integral 2021a). The risk estimates summarized in this OU2 HHRA Addendum will be the basis for remedial actions proposed in the OU2 Feasibility Study (Integral 2021b) and EPA’s OU2 Proposed Plan. The detailed results for the September/October 2021 OU2 PDI sampling are documented in the approved OU2 PDI and Eastern Upland 2021 Soil Sampling Report (Integral 2021c).

This report is being submitted by Integral Engineering, P.C. (Integral) on behalf of Greenfield Environmental Multistate Trust LLC, not individually but solely in its representative capacity as Trustee of the Multistate Environmental Response Trust (the Multistate Trust).

## 1.1 SITE HISTORY

The Site operated as a creosote-based wood treating facility from 1936 to 1974. The Site location is shown on Figure 1-1. A Site overview showing the property boundary, Site operable units (OUs), Process Area, Pond Area, Wood Storage Areas, and other prominent features associated with former wood treatment operations at the Site is provided as Figure 1-2. OU2 is located north of the Process Area, south of OU1, and west of the Eastern Upland Area in an area previously used to store treated and untreated wood. Previous investigations have indicated that soil, groundwater, and sediment at the Site were impacted by historical operations at the facility (EarthCon 2019a). Data collected through 2017 for the Site remedial investigation (EarthCon 2019a) were incorporated into the analyses performed for the 2019 HHRA and the subsequent 2019 HHRA Addendum (EarthCon 2019b,c).

Sampling in OU2 continued between 2017 and 2021. Data through May 2021 were used to estimate human health risks for OU2 in the 2021 OU2 HHRA (Integral 2021a), which was approved by EPA and the North Carolina Department of Environmental Quality (NCDEQ) on September 30, 2021. The 2021 OU2 HHRA estimated risks from exposure to OU2 soils based on a range of future land uses (Integral 2021a). For the purposes of risk evaluation for a residential

use scenario, and described further in the 2021 OU2 HHRA, OU2 was divided into parcels no larger than 0.25 acre using Thiessen polygon methodology (Figure 1-3). The 2021 OU2 HHRA identified a total of 19 of 91 parcels with chemicals present in surface soils (0–1 ft below ground surface [bgs]) that represent a potential unacceptable risk to potential future residents (i.e., excess lifetime cancer risk [ELCR] greater than  $1.0 \times 10^{-4}$  or noncancer risk hazard index [HI] greater than 1.0).

## 1.2 DATA NEEDS IDENTIFIED IN 2021 OU2 HHRA

Based on discussions with EPA and NCDEQ, additional data were collected as part of the OU2 PDI (Integral 2021d) to address data needs identified in the 2021 OU2 HHRA for nine OU2 parcels and to refine the risk estimates for these parcels. The nine parcels are as follows: CS-66, SS-110, SS-119, TB-05, TB-08, TB-11, TB-12, TB-17, and TB-18. The specific data needs that were identified are described in further detail below.

Following review of the 2021 OU2 HHRA, the Multistate Trust, EPA, and NCDEQ agreed that more representative polycyclic aromatic hydrocarbon (PAH) and pentachlorophenol (PCP) data were needed for eight OU2 parcels: SS-110, SS-119, TB-05, TB-08, TB-11, TB-12, TB-17, and TB-18. The 2021 OU2 HHRA estimated risks from PAHs and PCP in each of these parcels based on the concentration results of a single sample location (the maximum concentration of discrete samples in the parcel), rather than a composite sample, which would better represent the average soil concentration for the parcel. In each of these eight parcels, the ELCR was within the rounding error of the  $1.0 \times 10^{-4}$  threshold. A five-point composite sample of surface soil was collected for PAH and PCP analysis for each of these eight OU2 parcels as part of the OU2 2021 PDI sampling (Integral 2021d).

In addition, the Multistate Trust, EPA, and NCDEQ identified an inconsistency between the 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) toxic equivalency (TEQ)<sup>1</sup> concentration from the August 2020 five-point composite sample for parcel CS-66 (142 pg/g TCDD TEQ) and the sample split concentrations from the discrete samples that were used to create the five-point composite sample (CS-66a,b,c,d,e collected August 2020, with TCDD TEQ ranging from 1.01 to 9.43 pg/g) (Integral 2021a). A five-point composite sample of surface soil was collected as part of the OU2 2021 PDI sampling from parcel CS-66 for dioxins/furans analysis.

A summary of OU2 PDI activities pertinent to this OU2 HHRA Addendum and the methodology for updating the risk assessment are presented in Section 2 of this document. The OU2 HHRA Addendum results and conclusions are presented in Section 3.

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<sup>1</sup> Consistent with previous reporting at the Site, and as documented in the 2021 OU2 HHRA, dioxin/furan results were converted to TCDD TEQ concentrations using TCDD as the index compound.

## 2 METHODOLOGY

Human health risks for OU2 were previously evaluated and presented in the 2021 OU2 HHRA (Integral 2021a). This section presents a brief overview of the OU2 PDI sampling and the methodology used to incorporate these data. The approach undertaken for this update to the risk assessment is consistent with that documented in the 2021 OU2 HHRA, as well as discussions between the Multistate Trust, EPA, and NCDEQ.

### 2.1 OU2 PDI Data Collection and Results

OU2 PDI field activities were performed in September 2021 and conducted in general accordance with the EPA- and NCDEQ-approved OU2 Pre-design Investigation, OU4, and Eastern Upland 2021 Soil Sampling Work Plan (Integral 2021d) and the most recent EPA Region 4 Laboratory Services and Applied Science Division operating procedures (USEPA 2020). The OU2 PDI and Eastern Upland 2021 Soil Sampling Report (Integral 2021c) presents the field activities, laboratory analysis, data validation, and results of the investigation. A summary of the OU2 PDI activities as they pertain to the risk assessment calculations presented in this document is provided below.

The OU2 PDI included the collection of five-point composite samples of surface soils (0–1 ft bgs) in eight parcels for PAH and PCP analysis: SS-110, SS-119, TB-05, TB-08, TB-11, TB-12, TB-17, and TB-18. The OU2 PDI PAH and PCP results for these parcels are reported in Table 3-1 of the OU2 PDI and Eastern Upland 2021 Soil Sampling Report. Calculated benzo[*a*]pyrene (BaP) TEQ<sup>2</sup> concentrations for the OU2 PDI composite samples ranged from 1.40 to 28.6 mg/kg (Integral 2021c). PCP was not detected in the OU2 PDI composite samples; the method detection limit (MDL) for PCP in the OU2 PDI composite samples ranged from 0.023 to 0.061 mg/kg (Integral 2021c). Per discussions with the Multistate Trust, EPA, and NCDEQ, the OU2 PDI composite sample PCP and PAH results were used for the exposure point concentrations (EPCs) for parcels SS-110, SS-119, TB-05, TB-08, TB-11, TB-12, TB-17, and TB-18 in this OU2 HHRA Addendum.

In addition, a five-point composite sample of surface soil was collected from parcel CS-66. Dioxin/furan results and calculated TCDD TEQ concentrations are presented in Table 3-2 of the OU2 PDI and Eastern Upland 2021 Soil Sampling Report (Integral 2021c). The OU2 PDI composite sample, CS-66-2, had a TCDD TEQ concentration of 3.79 pg/g and is consistent with the sample split results from the discrete samples collected in 2020 (TCDD TEQ ranging from 1.01 to 9.43 pg/g) (Integral 2021a). Per discussions with the Multistate Trust, EPA, and NCDEQ,

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<sup>2</sup> Consistent with previous reporting at the Site, and as documented in the OU2 HHRA (Integral 2021a), soil data for carcinogenic PAHs were converted to BaP TEQ using BaP as the index PAH (USEPA 1993).



the OU2 PDI composite sample CS-66-2 dioxin/furan results were used to calculate the TCDD TEQ EPC for parcel CS-66 in this OU2 HHRA Addendum.

## 2.2 RECEPTORS AND EXPOSURE PATHWAYS EVALUATED

On March 10, 2020, the Navassa Town Council provided a “Letter of Position” to EPA, stating that the Town Council would like to pursue redevelopment scenarios in the northernmost portion of the Site, including the north end of OU2, which could include residential uses. The future land use for the remainder of OU2 is not clear, and as such, the risk assessment conducted for this area (Integral 2021a) considered a range of land uses, including residential, commercial/ industrial, and recreational.

The potential exposure of residents to surface soil is the focus of the quantitative risk evaluation presented in this OU2 HHRA Addendum. The 2021 OU2 HHRA documented no unacceptable risk for all other receptors evaluated, including commercial/industrial workers, construction workers, trespassers, recreational youth sports players, and site visitors/trail walkers.

This OU2 HHRA Addendum considers the following potential exposure pathways for hypothetical future residents: incidental ingestion and dermal contact with surface soil, and inhalation of volatiles and particulates (i.e., outdoor dust) emitted from surface soil and present in outdoor air. The potential for exposure to subsurface soil and groundwater is discussed in the 2021 OU2 HHRA and is not included in this evaluation.

## 2.3 CONSTITUENTS OF POTENTIAL CONCERN

The constituents of potential concern (COPCs) selected in the 2021 OU2 HHRA were adopted for this evaluation. Briefly, to select surface soil COPCs, the maximum “representative” concentrations<sup>3</sup> of detected chemicals in OU2 surface soil (from Table 3-1 of the 2021 OU2 HHRA) were compared to EPA’s regional screening levels (RSLs) for residential soils (USEPA 2021a). The RSLs used are based on a noncancer hazard quotient (HQ) of 0.1 and a cancer risk level of  $1 \times 10^{-6}$ . The COPCs identified for OU2 surface soil are:

- PAHs
  - BaP TEQ
  - BaP

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<sup>3</sup> A representative soil result for each contaminant of interest was identified for each parcel in the 2021 OU2 HHRA. Section 2.6 and Figure 2-4 of the 2021 OU2 HHRA present the data evaluation process and decision framework for the identification of the representative soil result. This framework was agreed upon by EPA and NCDEQ during discussions in February and May 2021.

- Fluoranthene
- Naphthalene
- Phenanthrene
- Pyrene
- PCP
- TCDD TEQ.

## 2.4 EXPOSURE ASSESSMENT

This section presents the assumptions used in the risk evaluation including the exposure areas and exposure point concentrations (EPCs), and exposure parameter values.

### 2.4.1 Exposure Areas and Exposure Point Concentrations

Exposure areas for the residential scenario were defined as the 0.25-acre (or less) parcels created by Thiessen polygon methodology, as shown in Figure 1-3 and described in Section 2.2.1 of the 2021 OU2 HHRA. Table 2-1 presents the EPCs for the nine parcels evaluated in this OU2 HHRA Addendum. The EPCs used for the residential exposure evaluation presented in this OU2 HHRA Addendum are:

- For parcels SS-110, SS-119, TB-05, TB-08, TB-11, TB-12, TB-17, and TB-18, the September 2021 five-point composite sample PAH and PCP results were selected as the EPCs. This replaced the single discrete sample used for the EPC in the 2021 OU2 HHRA. Five-point composite samples for dioxins/furans were collected in 2020 from these parcels (Integral 2021a) and the 2020 results are still used as the EPC for this evaluation.
- For parcel CS-66, the September 2021 five-point composite sample dioxin/furan data were used to calculate TCDD TEQ (Integral 2021c) and the calculated TCDD TEQ concentration was used as the EPC. PAHs and PCP were not analyzed for OU2 PDI sample CS-66-2 because a composite sample was collected in 2020 (Integral 2021a) and those results were used as the EPCs for PAHs and PCP for CS-66.

Concentration values for nondetected analytes are presented as the full MDL in the OU2 PDI result summary tables, Table 3-1 and Table 3-2 of the OU2 PDI and Eastern Upland 2021 Soil Sampling Report (Integral 2021c). The calculation of TEQs is consistent with the 2021 OU2 HHRA: for BaP TEQ, results for non-detected PAHs were treated as one-half the MDL; and for TCDD TEQ, results for non-detected dioxin/furan constituents were treated as the full MDL. Consistent with the analysis presented in the 2021 OU2 HHRA, concentration values for nondetected individual PAHs and PCP were treated at one-half of the MDL for the EPC.

## 2.4.2 Exposure Parameter Values

Consistent with the 2021 OU2 HHRA, exposure to both child and adult future residents was evaluated. Residents were assumed to come into contact with soil 350 days per year for a residential exposure tenure of 26 years. The full set of exposure parameters used to evaluate future residents and the source for each parameter is summarized in Table 3-6 of the 2021 OU2 HHRA. Chemical-specific factors are presented in Table 3-7 of the 2021 OU2 HHRA.

## 2.5 TOXICITY EVALUATION

The toxicity criteria used in the 2021 OU2 HHRA were adopted for this Addendum. Toxicity criteria used for cancer and noncancer endpoints are based on different assumptions and methodologies. Specifically, cancer slope factors are used in the risk characterization to estimate potential cancer risk and represent the upper-bound probability of carcinogenic response per unit of daily intake of a substance over a lifetime. Noncancer effects represented by a reference dose (RfD) or reference concentration (RfC) indicate a toxicological threshold below which adverse effects are not expected.

Toxicity values were selected following the EPA recommended hierarchy (USEPA 2003). Specifically, toxicity values from the Tier 1, Integrated Risk Information System (IRIS; USEPA 2021b) were selected where available. If no toxicity value was available from IRIS, Tier 2 and Tier 3 sources were reviewed and selected. Chronic RfDs and RfCs were used for evaluating residential exposures. The toxicity values used are provided in Tables 3-8 and 3-9 of the 2021 OU2 HHRA.

Some chemicals can operate through a mutagenic mode of action for carcinogenesis. These chemicals exhibit a greater effect in early-life as compared to later-life exposures; therefore, EPA has developed age-dependent adjustment factors (ADAFs) to evaluate cancer risk resulting from early-life exposures (USEPA 2005). ADAFs were combined with age-specific exposure estimates when assessing cancer risks for BaP TEQ because the PAH components of BaP TEQ have been identified as mutagenic by EPA. For risks assessed during the first 2 years of life for residents, an ADAF of 10 was applied. For residents aged 2 to 16 years, an ADAF of 3 was applied.

## 2.6 RISK CHARACTERIZATION

Human health risks were calculated using the approach from the 2021 OU2 HHRA. Excess lifetime cancer risks (ELCRs) and noncancer HIs were calculated for each COPC and summed. At the direction of NCDEQ, ELCRs and HIs are presented to two significant figures. The equations used for calculating ELCRs and HIs are shown on the tables that present the risk results.

ELCRs were compared to  $1.0 \times 10^{-4}$ , which is the upper end of EPA's cancer risk range of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ . To evaluate cumulative noncancer effects, HQs were summed for all COPCs and across all relevant exposure pathways to determine a noncancer HI. Following EPA guidance (USEPA 1989), if the total HI for a particular receptor exceeded 1.0 for all COPCs combined and across all exposure pathways, consideration was given as to whether the COPCs affect the same target organ or endpoint. In this case, endpoint-specific HIs were calculated by summing the HIs for constituents that act at the same target organ or endpoint provided in Table 3-9 of the 2021 OU2 HHRA.

## 3 RESULTS

This section presents the results of the risk characterization and the identification of COCs for OU2, and summarizes the updated risk estimates for nine parcels and the unchanged risk estimates for the other 82 parcels from the 2021 OU2 HHRA. The risk estimates discussed in this section will be the basis for the OU2 Feasibility Study and EPA's OU2 Proposed Plan.

### 3.1 RISK CHARACTERIZATION

Updated ELCRs and HIs for potential future residents for the nine parcels assessed in this Addendum are presented in Table 3-1, and summarized below:

- The ELCR ranged from  $6.1 \times 10^{-6}$  at parcel CS-66 to  $2.5 \times 10^{-4}$  at parcel TB-05.
- Two of the nine parcels evaluated had an ELCR greater than  $1.0 \times 10^{-4}$ . These are TB-05 and TB-17.
- The total noncancer child HI ranged from 0.10 at parcel CS-66 to 1.2 at parcel TB-05.
- The total resident child HI for all noncancer endpoints is 1.2 at parcel TB-05. However, the COPCs do not affect the same target organ or endpoint and the endpoint-specific noncancer HI for this parcel does not exceed 1.0.
  - The maximum endpoint-specific HI is 0.99 for developmental endpoints (attributable to BaP [all pathways] and TCDD TEQ [inhalation]).<sup>4</sup>
  - All other target organ endpoint HIs at this parcel are less than 1.
  - Because cancer risk in TB-05 exceeds the acceptable risk range, TB-05 will be addressed by the OU2 Feasibility Study (Integral 2021b) and EPA's OU2 Proposed Plan.

Table 3-2 presents the summary of risks and hazards for future residential receptors for all 91 OU2 parcels, including the updated calculations for the nine parcels assessed in this Addendum. Table 3-2 updates and replaces Table 4-1 from the 2021 OU2 HHRA.

Table 3-3 summarizes the risks and hazards for only the 12 parcels in OU2 that exceed EPA's acceptable risk range. The 12 parcels in Table 3-3 are highlighted in Figure 3-1.

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<sup>4</sup> See Table 3-9 of the OU2 HHRA for toxic endpoints associated with all COPCs.

### **3.2 CONSTITUENTS OF CONCERN AND SITE-SPECIFIC REMEDIATION GOALS**

Constituents of concern (COCs) were updated using the approach from the 2021 OU2 HHRA. COCs are COPCs that significantly contribute to an exposure pathway that exceeds EPA's acceptable risk range (USEPA 2018). The selection of COCs for the 12 parcels based on residential use is summarized in Table 3-4.

The 2021 OU2 HHRA presented Site-specific remediation goals for each COC, which are summarized in Table 3-18 of the 2021 OU2 HHRA and again in Table 3-5 of this Addendum as Table 3-5.

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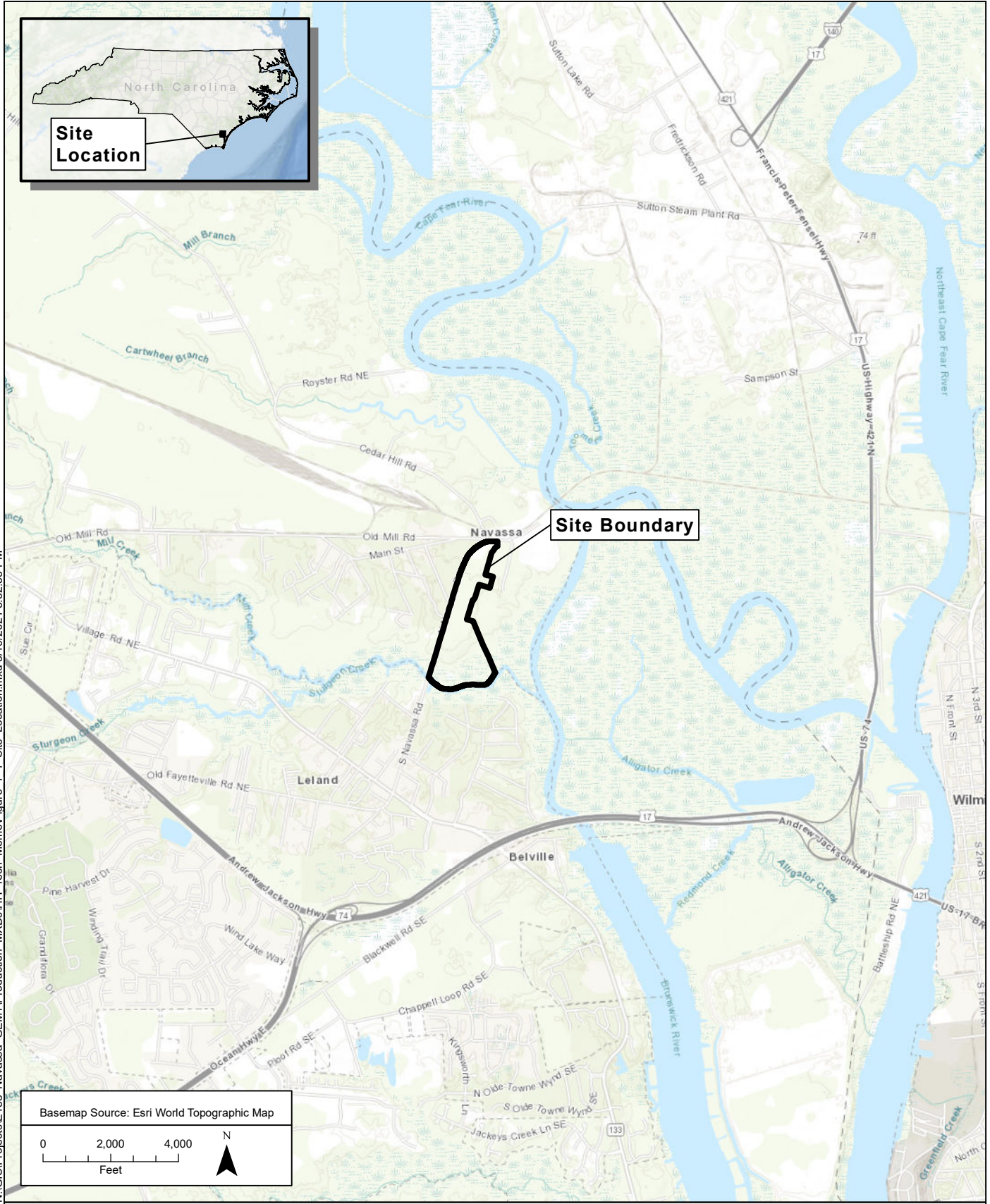
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## **Figures**

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N:\GIS\Projects\E158 Navassa GEMT\Production\_MXD\HH Tech Memo\Figure 1 Site Location.mxd 3/19/2021 5:32:53 PM




Basemap Source: Esri World Topographic Map

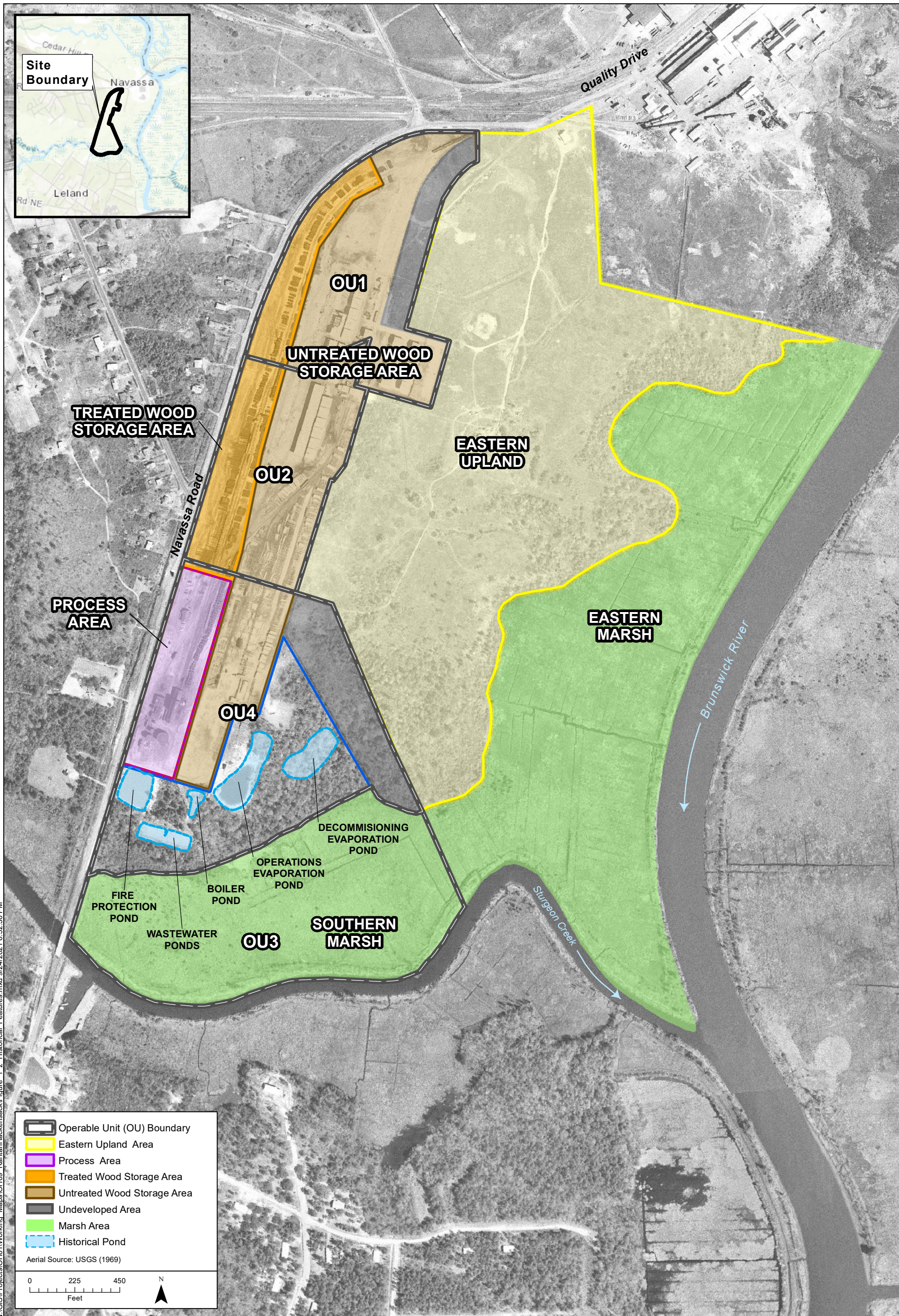
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Prepared for:  Greenfield Environmental Multistate Trust LLC  
Trustee of the Multistate Environmental Response Trust

Prepared by:  integral  
engineering pc

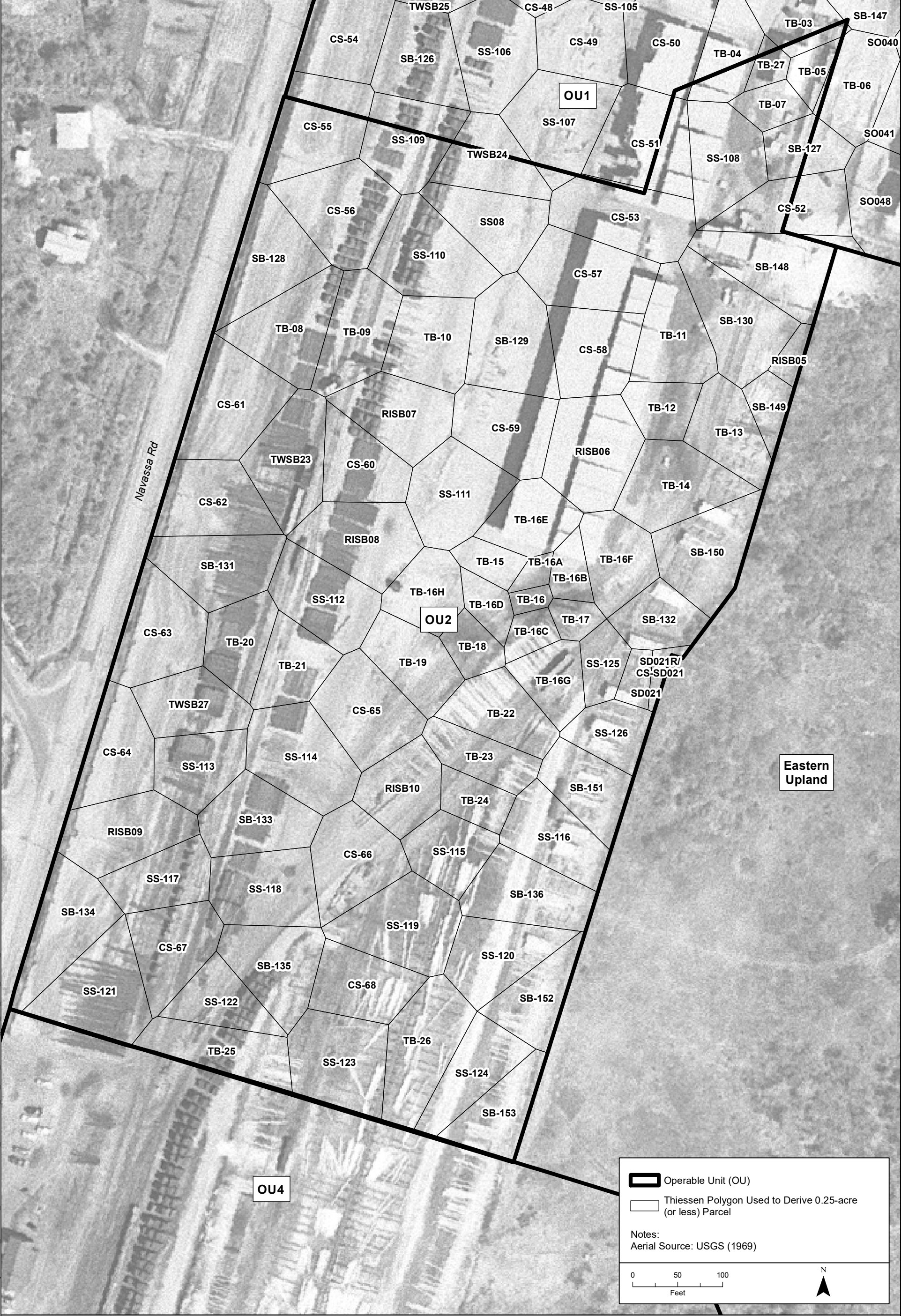
**Figure 1-1.**  
Site Location  
Kerr-McGee Chemical Corp. - Navassa Superfund Site  
Navassa, North Carolina  
December 2021



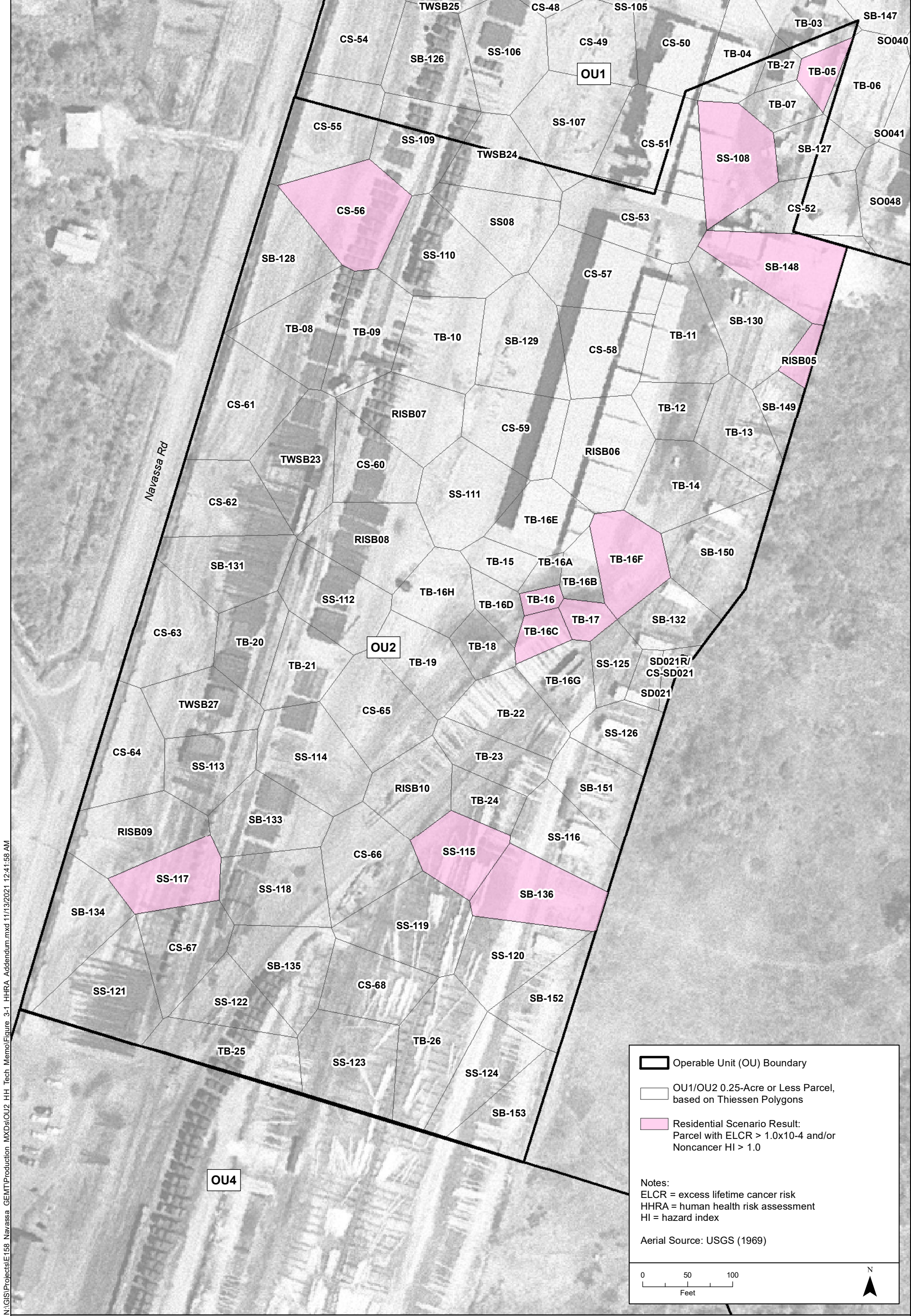
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**Figure 1-2.**  
Historical Site Features and Operable Units  
Kerr-McGee Chemical Corp. - Navassa Superfund Site  
Navassa, North Carolina  
December 2021

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**Figure 1-3.**  
 OU2 Parcels for HHRA Residential Scenario  
 Kerr-McGee Chemical Corp. - Navassa Superfund Site  
 Navassa, North Carolina  
 December 2021



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**Figure 3-1.**  
 OU2 Parcels Identified in the 2021 OU2 HHRA and OU2 HHRA Addendum as Having Unacceptable Risk to Future Residential Receptors  
 Kerr-McGee Chemical Corp. - Navassa Superfund Site  
 Navassa, North Carolina  
 December 2021

## **Tables**

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Table 2-1. Revised Final Surface Soil EPCs for Individual Parcels Including OU2 PDI Composite Data

Parcel	PAH/PCP Sample Type	COPC								
		BaP TEQ (mg/kg)	BaP (mg/kg)	Fluoranthene (mg/kg)	Naphthalene (mg/kg)	PCP (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)	Dioxin/Furan Sample Type	TCDD TEQ (mg/kg)
CS-66	2020 Composite	0.612	0.350	0.683	0.0100 U	0.00500 U	0.0838 J	0.880	2021 PDI Composite	3.79E-06
SS-110	2021 PDI Composite	2.98	1.81	3.20	0.0600 U	0.0120 U	0.0600 U	7.61	2020 Composite	2.95E-05
SS-119	2021 PDI Composite	4.34	2.75	4.10	0.0600 U	0.0295 U	0.0600 U	5.56	2020 Composite	2.79E-05
TB-05	2021 PDI Composite	28.6	17.8	11.4	0.0550 U	0.0275 U	0.402 J	29.1	2020 Composite	7.55E-06
TB-08	2021 PDI Composite	5.63	3.43	5.83	0.0600 U	0.0300 U	0.998 J	7.70	2020 Composite	2.70E-05
TB-11	2021 PDI Composite	1.40	0.882 J	1.05 J	0.0550 U	0.0105 U	0.0550 U	1.46	2020 Composite	8.77E-06
TB-12	2021 PDI Composite	5.99	3.86	6.16	0.0500 U	0.0260 U	0.0500 U	11.5	2020 Composite	2.59E-06
TB-17	2021 PDI Composite	17.7	10.1	18.3	0.0600 U	0.0305 U	3.59	22.3	2020 Composite	9.45E-06
TB-18	2021 PDI Composite	11.3	7.13	14.4	0.0600 U	0.0115 U	0.0600 U	18.0	2020 Composite	2.73E-06

Notes:

- = data not available
- BaP = benzo[a]pyrene
- COPC = constituent of potential concern
- EPC = exposure point concentration
- PCP = pentachlorophenol
- PDI = pre-design investigation
- TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
- TEQ = toxic equivalency

Data Qualifiers:

- J = estimated result
- U = constituent not detected, 1/2 the method detection limit is adopted for the EPC

Table 3-1. Revised Final Excess Lifetime Cancer Risk and Noncancer Hazards for Hypothetical Future Residents with Assumed Exposure to Surface Soils for Parcels Including OU2 PDI Composite Data

Parcel	COPC	EPC (mg/kg)	Excess Lifetime Cancer Risk				Child Noncancer HI				Adult Noncancer HI			
			ELCR <sub>o</sub>	ELCR <sub>d</sub>	ELCR <sub>i</sub>	Total Risk <sup>a</sup>	HQ <sub>o</sub>	HQ <sub>d</sub>	HQ <sub>i</sub>	Total HI <sup>a,b</sup>	HQ <sub>o</sub>	HQ <sub>d</sub>	HQ <sub>i</sub>	Total HI <sup>a,b</sup>
			Oral	Dermal	Inhalation		Oral	Dermal	Inhalation		Oral	Dermal	Inhalation	
CS-66	<b>PAHs</b>													
	BaP TEQ	6.12E-01	4.0E-06	1.3E-06	8.9E-12	5.3E-06	–	–	–	–	–	–	–	–
	BaP	3.50E-01	–	–	–	–	1.5E-02	4.6E-03	4.1E-06	2.0E-02	1.4E-03	7.7E-04	4.1E-06	2.2E-03
	Fluoranthene	6.83E-01	–	–	–	–	2.2E-04	6.7E-05	–	2.9E-04	2.0E-05	1.1E-05	–	3.2E-05
	Naphthalene	1.00E-02	1.7E-09	6.3E-10	3.7E-09	6.0E-09	6.4E-06	2.0E-06	9.7E-05	1.1E-04	6.0E-07	3.3E-07	9.7E-05	9.8E-05
	Phenanthrene	8.38E-02	–	–	–	–	3.6E-05	1.1E-05	–	4.7E-05	3.3E-06	1.8E-06	–	5.2E-06
	Pyrene	8.80E-01	–	–	–	–	3.8E-04	1.2E-04	–	4.9E-04	3.5E-05	1.9E-05	–	5.4E-05
	<b>Pesticides</b>													
	Pentachlorophenol	5.00E-03	2.9E-09	2.0E-09	2.2E-16	4.9E-09	1.3E-05	7.6E-06	–	2.0E-05	1.2E-06	1.3E-06	–	2.5E-06
	<b>Dioxins/Furans</b>													
TCDD TEQ	3.79E-06	7.1E-07	6.0E-08	3.7E-08	8.1E-07	6.9E-02	4.9E-03	6.5E-05	7.4E-02	6.5E-03	8.2E-04	6.5E-05	7.4E-03	
<b>Total<sup>c</sup></b>					6.1E-06				0.095				0.010	
SS-110	<b>PAHs</b>													
	BaP TEQ	2.98E+00	1.9E-05	6.5E-06	4.3E-11	2.6E-05	–	–	–	–	–	–	–	–
	BaP	1.81E+00	–	–	–	–	7.7E-02	2.4E-02	2.1E-05	1.0E-01	7.2E-03	4.0E-03	2.1E-05	1.1E-02
	Fluoranthene	3.20E+00	–	–	–	–	1.0E-03	3.2E-04	–	1.3E-03	9.6E-05	5.3E-05	–	1.5E-04
	Naphthalene	6.00E-02	1.0E-08	3.8E-09	2.2E-08	3.6E-08	3.8E-05	1.2E-05	5.8E-04	6.3E-04	3.6E-06	2.0E-06	5.8E-04	5.9E-04
	Phenanthrene	6.00E-02	–	–	–	–	2.6E-05	7.9E-06	–	3.3E-05	2.4E-06	1.3E-06	–	3.7E-06
	Pyrene	7.61E+00	–	–	–	–	3.2E-03	1.0E-03	–	4.2E-03	3.0E-04	1.7E-04	–	4.7E-04
	<b>Pesticides</b>													
	Pentachlorophenol	1.20E-02	6.9E-09	4.9E-09	5.3E-16	1.2E-08	3.1E-05	1.8E-05	–	4.9E-05	2.9E-06	3.0E-06	–	5.9E-06
	<b>Dioxins/Furans</b>													
TCDD TEQ	2.95E-05	5.5E-06	4.7E-07	2.9E-07	6.3E-06	5.4E-01	3.8E-02	5.1E-04	5.8E-01	5.1E-02	6.4E-03	5.1E-04	5.8E-02	
<b>Total<sup>c</sup></b>					3.2E-05				0.69				0.070	
SS-119	<b>PAHs</b>													
	BaP TEQ	4.34E+00	2.8E-05	9.5E-06	6.3E-11	3.8E-05	–	–	–	–	–	–	–	–
	BaP	2.75E+00	–	–	–	–	1.2E-01	3.6E-02	3.2E-05	1.5E-01	1.1E-02	6.0E-03	3.2E-05	1.7E-02
	Fluoranthene	4.10E+00	–	–	–	–	1.3E-03	4.0E-04	–	1.7E-03	1.2E-04	6.7E-05	–	1.9E-04
	Naphthalene	6.00E-02	1.0E-08	3.8E-09	2.2E-08	3.6E-08	3.8E-05	1.2E-05	5.8E-04	6.3E-04	3.6E-06	2.0E-06	5.8E-04	5.9E-04
	Phenanthrene	6.00E-02	–	–	–	–	2.6E-05	7.9E-06	–	3.3E-05	2.4E-06	1.3E-06	–	3.7E-06
	Pyrene	5.56E+00	–	–	–	–	2.4E-03	7.3E-04	–	3.1E-03	2.2E-04	1.2E-04	–	3.4E-04
	<b>Pesticides</b>													
	Pentachlorophenol	2.95E-02	1.7E-08	1.2E-08	1.3E-15	2.9E-08	7.5E-05	4.5E-05	–	1.2E-04	7.1E-06	7.5E-06	–	1.5E-05
	<b>Dioxins/Furans</b>													
TCDD TEQ	2.79E-05	5.2E-06	4.4E-07	2.7E-07	5.9E-06	5.1E-01	3.6E-02	4.8E-04	5.5E-01	4.8E-02	6.1E-03	4.8E-04	5.4E-02	
<b>Total<sup>c</sup></b>					4.4E-05				0.71				0.073	



Table 3-1. Revised Final Excess Lifetime Cancer Risk and Noncancer Hazards for Hypothetical Future Residents with Assumed Exposure to Surface Soils for Parcels Including OU2 PDI Composite Data

Parcel	COPC	EPC (mg/kg)	Excess Lifetime Cancer Risk				Child Noncancer HI				Adult Noncancer HI			
			ELCR <sub>o</sub>	ELCR <sub>d</sub>	ELCR <sub>i</sub>	Total Risk <sup>a</sup>	HQ <sub>o</sub>	HQ <sub>d</sub>	HQ <sub>i</sub>	Total HI <sup>a,b</sup>	HQ <sub>o</sub>	HQ <sub>d</sub>	HQ <sub>i</sub>	Total HI <sup>a,b</sup>
			Oral	Dermal	Inhalation		Oral	Dermal	Inhalation		Oral	Dermal	Inhalation	
TB-05	<b>PAHs</b>													
	BaP TEQ	2.86E+01	1.9E-04	6.2E-05	4.2E-10	2.5E-04	–	–	–	–	–	–	–	–
	BaP	1.78E+01	–	–	–	–	7.6E-01	2.3E-01	2.1E-04	9.9E-01	7.1E-02	3.9E-02	2.1E-04	1.1E-01
	Fluoranthene	1.14E+01	–	–	–	–	3.6E-03	1.1E-03	–	4.8E-03	3.4E-04	1.9E-04	–	5.3E-04
	Naphthalene	5.50E-02	9.5E-09	3.5E-09	2.0E-08	3.3E-08	3.5E-05	1.1E-05	5.3E-04	5.8E-04	3.3E-06	1.8E-06	5.3E-04	5.4E-04
	Phenanthrene	4.02E-01	–	–	–	–	1.7E-04	5.3E-05	–	2.2E-04	1.6E-05	8.8E-06	–	2.5E-05
	Pyrene	2.91E+01	–	–	–	–	1.2E-02	3.8E-03	–	1.6E-02	1.2E-03	6.4E-04	–	1.8E-03
	<b>Pesticides</b>													
	Pentachlorophenol	2.75E-02	1.6E-08	1.1E-08	1.2E-15	2.7E-08	7.0E-05	4.2E-05	–	1.1E-04	6.6E-06	7.0E-06	–	1.4E-05
	<b>Dioxins/Furans</b>													
TCDD TEQ	7.55E-06	1.4E-06	1.2E-07	7.3E-08	1.6E-06	1.4E-01	9.8E-03	1.3E-04	1.5E-01	1.3E-02	1.6E-03	1.3E-04	1.5E-02	
<b>Total<sup>c</sup></b>					<b>2.5E-04</b>				<b>1.2</b>				<b>0.128</b>	
TB-08	<b>PAHs</b>													
	BaP TEQ	5.63E+00	3.7E-05	1.2E-05	8.2E-11	4.9E-05	–	–	–	–	–	–	–	–
	BaP	3.43E+00	–	–	–	–	1.5E-01	4.5E-02	4.0E-05	1.9E-01	1.4E-02	7.5E-03	4.0E-05	2.1E-02
	Fluoranthene	5.83E+00	–	–	–	–	1.9E-03	5.7E-04	–	2.4E-03	1.7E-04	9.6E-05	–	2.7E-04
	Naphthalene	6.00E-02	1.0E-08	3.8E-09	2.2E-08	3.6E-08	3.8E-05	1.2E-05	5.8E-04	6.3E-04	3.6E-06	2.0E-06	5.8E-04	5.9E-04
	Phenanthrene	9.98E-01	–	–	–	–	4.3E-04	1.3E-04	–	5.6E-04	4.0E-05	2.2E-05	–	6.2E-05
	Pyrene	7.70E+00	–	–	–	–	3.3E-03	1.0E-03	–	4.3E-03	3.1E-04	1.7E-04	–	4.8E-04
	<b>Pesticides</b>													
	Pentachlorophenol	3.00E-02	1.7E-08	1.2E-08	1.3E-15	2.9E-08	7.7E-05	4.6E-05	–	1.2E-04	7.2E-06	7.6E-06	–	1.5E-05
	<b>Dioxins/Furans</b>													
TCDD TEQ	2.70E-05	5.0E-06	4.3E-07	2.6E-07	5.7E-06	4.9E-01	3.5E-02	4.6E-04	5.3E-01	4.6E-02	5.8E-03	4.6E-04	5.2E-02	
<b>Total<sup>c</sup></b>					<b>5.5E-05</b>				<b>0.73</b>				<b>0.075</b>	
TB-11	<b>PAHs</b>													
	BaP TEQ	1.40E+00	9.1E-06	3.1E-06	2.0E-11	1.2E-05	–	–	–	–	–	–	–	–
	BaP	8.82E-01	–	–	–	–	3.8E-02	1.2E-02	1.0E-05	4.9E-02	3.5E-03	1.9E-03	1.0E-05	5.5E-03
	Fluoranthene	1.05E+00	–	–	–	–	3.4E-04	1.0E-04	–	4.4E-04	3.1E-05	1.7E-05	–	4.9E-05
	Naphthalene	5.50E-02	9.5E-09	3.5E-09	2.0E-08	3.3E-08	3.5E-05	1.1E-05	5.3E-04	5.8E-04	3.3E-06	1.8E-06	5.3E-04	5.4E-04
	Phenanthrene	5.50E-02	–	–	–	–	2.3E-05	7.2E-06	–	3.1E-05	2.2E-06	1.2E-06	–	3.4E-06
	Pyrene	1.46E+00	–	–	–	–	6.2E-04	1.9E-04	–	8.1E-04	5.8E-05	3.2E-05	–	9.0E-05
	<b>Pesticides</b>													
	Pentachlorophenol	1.05E-02	6.0E-09	4.2E-09	4.7E-16	1.0E-08	2.7E-05	1.6E-05	–	4.3E-05	2.5E-06	2.7E-06	–	5.2E-06
	<b>Dioxins/Furans</b>													
TCDD TEQ	8.77E-06	1.6E-06	1.4E-07	8.5E-08	1.9E-06	1.6E-01	1.1E-02	1.5E-04	1.7E-01	1.5E-02	1.9E-03	1.5E-04	1.7E-02	
<b>Total<sup>c</sup></b>					<b>1.4E-05</b>				<b>0.22</b>				<b>0.023</b>	

Table 3-1. Revised Final Excess Lifetime Cancer Risk and Noncancer Hazards for Hypothetical Future Residents with Assumed Exposure to Surface Soils for Parcels Including OU2 PDI Composite Data

Parcel	COPC	EPC (mg/kg)	Excess Lifetime Cancer Risk				Child Noncancer HI				Adult Noncancer HI				
			ELCR <sub>o</sub> Oral	ELCR <sub>d</sub> Dermal	ELCR <sub>i</sub> Inhalation	Total Risk <sup>a</sup>	HQ <sub>o</sub> Oral	HQ <sub>d</sub> Dermal	HQ <sub>i</sub> Inhalation	Total HI <sup>a,b</sup>	HQ <sub>o</sub> Oral	HQ <sub>d</sub> Dermal	HQ <sub>i</sub> Inhalation	Total HI <sup>a,b</sup>	
TB-12	<b>PAHs</b>														
	BaP TEQ	5.99E+00	3.9E-05	1.3E-05	8.7E-11	5.2E-05	--	--	--	--	--	--	--	--	
	BaP	3.86E+00	--	--	--	--	1.6E-01	5.1E-02	4.5E-05	2.2E-01	1.5E-02	8.5E-03	4.5E-05	2.4E-02	
	Fluoranthene	6.16E+00	--	--	--	--	2.0E-03	6.1E-04	--	2.6E-03	1.8E-04	1.0E-04	--	2.9E-04	
	Naphthalene	5.00E-02	8.6E-09	3.2E-09	1.8E-08	3.0E-08	3.2E-05	9.9E-06	4.8E-04	5.3E-04	3.0E-06	1.6E-06	4.8E-04	4.9E-04	
	Phenanthrene	5.00E-02	--	--	--	--	2.1E-05	6.6E-06	--	2.8E-05	2.0E-06	1.1E-06	--	3.1E-06	
	Pyrene	1.15E+01	--	--	--	--	4.9E-03	1.5E-03	--	6.4E-03	4.6E-04	2.5E-04	--	7.1E-04	
	<b>Pesticides</b>														
	Pentachlorophenol	2.60E-02	1.5E-08	1.1E-08	1.2E-15	2.5E-08	6.6E-05	3.9E-05	--	1.1E-04	6.2E-06	6.6E-06	--	1.3E-05	
	<b>Dioxins/Furans</b>														
TCDD TEQ	2.59E-06	4.9E-07	4.1E-08	2.5E-08	5.5E-07	4.7E-02	3.4E-03	4.4E-05	5.1E-02	4.4E-03	5.6E-04	4.4E-05	5.1E-03		
<b>Total<sup>c</sup></b>															
					5.3E-05				0.28					0.030	
TB-17	<b>PAHs</b>														
	BaP TEQ	1.77E+01	1.2E-04	3.9E-05	2.6E-10	1.5E-04	--	--	--	--	--	--	--	--	
	BaP	1.01E+01	--	--	--	--	4.3E-01	1.3E-01	1.2E-04	5.6E-01	4.0E-02	2.2E-02	1.2E-04	6.3E-02	
	Fluoranthene	1.83E+01	--	--	--	--	5.8E-03	1.8E-03	--	7.7E-03	5.5E-04	3.0E-04	--	8.5E-04	
	Naphthalene	6.00E-02	1.0E-08	3.8E-09	2.2E-08	3.6E-08	3.8E-05	1.2E-05	5.8E-04	6.3E-04	3.6E-06	2.0E-06	5.8E-04	5.9E-04	
	Phenanthrene	3.59E+00	--	--	--	--	1.5E-03	4.7E-04	--	2.0E-03	1.4E-04	7.9E-05	--	2.2E-04	
	Pyrene	2.23E+01	--	--	--	--	9.5E-03	2.9E-03	--	1.2E-02	8.9E-04	4.9E-04	--	1.4E-03	
	<b>Pesticides</b>														
	Pentachlorophenol	3.05E-02	1.8E-08	1.2E-08	1.4E-15	3.0E-08	7.8E-05	4.6E-05	--	1.2E-04	7.3E-06	7.7E-06	--	1.5E-05	
	<b>Dioxins/Furans</b>														
TCDD TEQ	9.45E-06	1.8E-06	1.5E-07	9.1E-08	2.0E-06	1.7E-01	1.2E-02	1.6E-04	1.9E-01	1.6E-02	2.0E-03	1.6E-04	1.8E-02		
<b>Total<sup>c</sup></b>															
					1.6E-04				0.77					0.084	
TB-18	<b>PAHs</b>														
	BaP TEQ	1.13E+01	7.4E-05	2.5E-05	1.6E-10	9.8E-05	--	--	--	--	--	--	--	--	
	BaP	7.13E+00	--	--	--	--	3.0E-01	9.4E-02	8.4E-05	4.0E-01	2.8E-02	1.6E-02	8.4E-05	4.4E-02	
	Fluoranthene	1.44E+01	--	--	--	--	4.6E-03	1.4E-03	--	6.0E-03	4.3E-04	2.4E-04	--	6.7E-04	
	Naphthalene	6.00E-02	1.0E-08	3.8E-09	2.2E-08	3.6E-08	3.8E-05	1.2E-05	5.8E-04	6.3E-04	3.6E-06	2.0E-06	5.8E-04	5.9E-04	
	Phenanthrene	6.00E-02	--	--	--	--	2.6E-05	7.9E-06	--	3.3E-05	2.4E-06	1.3E-06	--	3.7E-06	
	Pyrene	1.80E+01	--	--	--	--	7.7E-03	2.4E-03	--	1.0E-02	7.2E-04	3.9E-04	--	1.1E-03	
	<b>Pesticides</b>														
	Pentachlorophenol	1.15E-02	6.6E-09	4.7E-09	5.1E-16	1.1E-08	2.9E-05	1.7E-05	--	4.7E-05	2.8E-06	2.9E-06	--	5.7E-06	
	<b>Dioxins/Furans</b>														
TCDD TEQ	2.73E-06	5.1E-07	4.3E-08	2.6E-08	5.8E-07	5.0E-02	3.5E-03	4.7E-05	5.3E-02	4.7E-03	5.9E-04	4.7E-05	5.3E-03		
<b>Total<sup>c</sup></b>															
					9.9E-05				0.47					0.052	

Notes:

-- = not applicable  
 BaP = benzo[a]pyrene  
 COPC = constituent of potential concern  
 ELCR = excess lifetime cancer risk

EPC = exposure point concentration  
 HI = hazard index  
 HQ = hazard quotient  
 NCDEQ = North Carolina Department of Environmental Quality

PAH = polycyclic aromatic hydrocarbon  
 TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin  
 TEQ = toxic equivalency

Table 3-1. Revised Final Excess Lifetime Cancer Risk and Noncancer Hazards for Hypothetical Future Residents with Assumed Exposure to Surface Soils for Parcels Including OU2 PDI Composite Data

Parcel	COPC	EPC (mg/kg)	Excess Lifetime Cancer Risk				Child Noncancer HI				Adult Noncancer HI			
			ELCR <sub>o</sub>	ELCR <sub>d</sub>	ELCR <sub>i</sub>	Total	HQ <sub>o</sub>	HQ <sub>d</sub>	HQ <sub>i</sub>	Total	HQ <sub>o</sub>	HQ <sub>d</sub>	HQ <sub>i</sub>	Total
			Oral	Dermal	Inhalation	Risk <sup>a</sup>	Oral	Dermal	Inhalation	HI <sup>a,b</sup>	Oral	Dermal	Inhalation	HI <sup>a,b</sup>

<sup>a</sup> At the direction of NCDEQ, ELCRs and HIs are presented to two significant figures.

<sup>b</sup> Total HI across all endpoints is presented. For receptors with an HI greater than 1.0, endpoint specific HIs are discussed in the text.

<sup>c</sup> Total ELCR results greater than 1.0E-4 and/or total endpoint-specific HI results greater than 1.0 are shaded dark gray.

Equations:

**Lifetime Carcinogenic Endpoint**

Note: Only constituents considered to operate through a mutagenic mode of action will include an ADAF within the carcinogenic endpoint calculations.

$$ELCR_o = (EPC_s \times RBA \times FI \times CSF_o \times [IFS_{adj} \text{ or } IFSM_{adj}]) / (CF2 \times AT_c)$$

$$\text{where } IFS_{adj} = (EF_c \times ED_{0-2} \times IRS_c) / BW_c + (EF_c \times ED_{2-6} \times IRS_c) / BW_c + (EF_a \times ED_{6-16} \times IRS_a) / BW_a + (EF_a \times ED_{16-26} \times IRS_a) / BW_a$$

$$IFSM_{adj} = (EF_c \times ED_{0-2} \times IRS_c \times ADAF_{0-2}) / BW_c + (EF_c \times ED_{2-6} \times IRS_c \times ADAF_{2-6}) / BW_c + (EF_a \times ED_{6-16} \times IRS_a \times ADAF_{6-16}) / BW_a + (EF_a \times ED_{16-26} \times IRS_a \times ADAF_{16-26}) / BW_a$$

$$ELCR_d = (EPC_s \times ABS_d \times (CSF_o / GIABS)) \times [DFS_{adj} \text{ or } DSFM_{adj}] \times EV / (CF2 \times AT_c)$$

$$\text{where } DFS_{adj} = (EF_c \times ED_{0-2} \times AF_c \times SSA_c) / BW_c + (EF_c \times ED_{2-6} \times AF_c \times SSA_c) / BW_c + (EF_a \times ED_{6-16} \times AF_a \times SSA_a) / BW_a + (EF_a \times ED_{16-26} \times AF_a \times SSA_a) / BW_a$$

$$DSFM_{adj} = (EF_c \times ED_{0-2} \times AF_c \times SSA_c \times ADAF_{0-2}) / BW_c + (EF_c \times ED_{2-6} \times AF_c \times SSA_c \times ADAF_{2-6}) / BW_c + (EF_a \times ED_{6-16} \times AF_a \times SSA_a \times ADAF_{6-16}) / BW_a + (EF_a \times ED_{16-26} \times AF_a \times SSA_a \times ADAF_{16-26}) / BW_a$$

$$ELCR_i = (EPC_s \times [(ED_{res} \times EF_{res} \times ET_{res} \times CF1) \text{ or } INHM_{adj}]) \times IUR \times CF3 \times ((1/VF) + (1/PEF)) / (AT_c)$$

$$INHM_{adj} = (EF_c \times ED_{0-2} \times ET_c \times CF1 \times ADAF_{0-2}) + (EF_c \times ED_{2-6} \times ET_c \times CF1 \times ADAF_{2-6}) + (EF_a \times ED_{6-16} \times ET_a \times CF1 \times ADAF_{6-16}) + (EF_a \times ED_{16-26} \times ET_a \times CF1 \times ADAF_{16-26})$$

**Total Excess Cancer Lifetime Risk:**  $ELCR = ELCR_o + ELCR_d + ELCR_i$

**Child Receptor Noncarcinogenic Endpoint**

$$HQ_o \text{ child} = (EPC_s \times RBA \times FI \times IRS_c \times EF_c \times ED_c) / (CF2 \times BW_c \times AT_{nc} \times RfD_o)$$

$$HQ_d \text{ child} = (EPC_s \times SSA_c \times AF_c \times ABS_d \times EF_c \times ED_c \times EV) / (CF2 \times BW_c \times AT_{nc} \times (RfD_o \times GIABS))$$

$$HQ_i \text{ child} = (EPC_s \times EF_c \times ED_c \times ET_c \times CF1 \times ((1/VF) + (1/PEF))) / (AT_{nc} \times RfC)$$

**Total Noncancer Child Hazard:**  $HI = HQ_o \text{ child} + HQ_d \text{ child} + HQ_i \text{ child}$

**Adult Receptor Noncarcinogenic Endpoint**

$$HQ_o \text{ adult} = (EPC_s \times RBA \times FI \times IRS_a \times EF_a \times ED_a) / (CF2 \times BW_a \times AT_{nc} \times RfD_o)$$

$$HQ_d \text{ adult} = (EPC_s \times SSA_a \times AF_a \times ABS_d \times EF_a \times ED_a \times EV) / (CF2 \times BW_a \times AT_{nc} \times (RfD_o \times GIABS))$$

$$HQ_i \text{ adult} = (EPC_s \times EF_a \times ED_a \times ET_a \times CF1 \times ((1/VF) + (1/PEF))) / (AT_{nc} \times RfC)$$

**Total Noncancer Adult Hazard:**  $HI = HQ_o \text{ adult} + HQ_d \text{ adult} + HQ_i \text{ adult}$

Table 3-2. Revised Final Summary of Risks and Hazards for Future Residential Receptors for All OU2 Parcels

Parcel	Total Excess Lifetime Cancer Risk	Total Noncancer HI (child)	Notes
CS-52	1.4x10 <sup>-5</sup>	0.39	
CS-53	3.1x10 <sup>-6</sup>	0.042	
CS-55	8.5x10 <sup>-6</sup>	0.069	
CS-56	7.5x10 <sup>-5</sup>	4.1	
CS-57	6.9x10 <sup>-7</sup>	0.033	
CS-58	2.7x10 <sup>-6</sup>	0.051	
CS-59	1.6x10 <sup>-6</sup>	0.025	
CS-60	3.6x10 <sup>-5</sup>	0.22	
CS-61	1.4x10 <sup>-6</sup>	0.023	
CS-62	6.5x10 <sup>-6</sup>	0.052	
CS-63	1.9x10 <sup>-6</sup>	0.046	
CS-64	1.4x10 <sup>-6</sup>	0.025	
CS-65	3.4x10 <sup>-6</sup>	0.049	
CS-66	6.1x10 <sup>-6</sup>	0.10	Parcel evaluated in OU2 HHRA Addendum
CS-67	8.8x10 <sup>-5</sup>	0.82	
CS-68	4.3x10 <sup>-5</sup>	1.1	Endpoint-specific HIs are less than 1.0
RISB05	1.8x10 <sup>-5</sup>	1.7	
RISB06	1.4x10 <sup>-6</sup>	0.042	
RISB07	5.3x10 <sup>-7</sup>	0.028	
RISB08	1.2x10 <sup>-5</sup>	0.087	
RISB09	2.2x10 <sup>-5</sup>	0.16	
RISB10	1.5x10 <sup>-5</sup>	0.16	
SB-127	1.9x10 <sup>-5</sup>	0.28	
SB-128	2.5x10 <sup>-6</sup>	0.028	
SB-129	6.5x10 <sup>-6</sup>	0.041	
SB-130	6.9x10 <sup>-6</sup>	0.17	
SB-131	8.5x10 <sup>-6</sup>	0.064	
SB-132	5.8x10 <sup>-5</sup>	0.40	
SB-133	1.1x10 <sup>-5</sup>	0.075	
SB-134	4.1x10 <sup>-6</sup>	0.062	
SB-135	1.2x10 <sup>-5</sup>	0.23	
SB-136	3.5x10 <sup>-5</sup>	2.6	
SB-148	1.8x10 <sup>-5</sup>	1.4	
SB-149	9.3x10 <sup>-6</sup>	0.35	
SB-150	2.8x10 <sup>-5</sup>	0.22	
SB-151	5.2x10 <sup>-6</sup>	0.15	
SB-152	1.1x10 <sup>-5</sup>	0.27	
SB-153	1.6x10 <sup>-5</sup>	0.35	
SD021	1.1x10 <sup>-5</sup>	0.14	
SS08	1.3x10 <sup>-5</sup>	0.16	
SS-108	1.5x10 <sup>-4</sup>	0.64	
SS-109	2.2x10 <sup>-5</sup>	0.14	

Table 3-2. Revised Final Summary of Risks and Hazards for Future Residential Receptors for All OU2 Parcels

Parcel	Total Excess Lifetime Cancer Risk	Total Noncancer HI (child)	Notes
SS-110	3.2x10 <sup>-5</sup>	0.69	Parcel evaluated in OU2 HHRA Addendum
SS-111	1.3x10 <sup>-6</sup>	0.031	
SS-112	7.7x10 <sup>-6</sup>	0.088	
SS-113	6.3x10 <sup>-5</sup>	0.37	
SS-114	1.0x10 <sup>-4</sup>	0.46	
SS-115	1.3x10 <sup>-4</sup>	5.7	
SS-116	1.1x10 <sup>-5</sup>	0.11	
SS-117	2.9x10 <sup>-4</sup>	1.4	
SS-118	1.2x10 <sup>-5</sup>	0.11	
SS-119	4.4x10 <sup>-5</sup>	0.71	Parcel evaluated in OU2 HHRA Addendum
SS-120	5.5x10 <sup>-6</sup>	0.11	
SS-121	3.0x10 <sup>-5</sup>	0.19	
SS-122	9.5x10 <sup>-6</sup>	0.12	
SS-123	3.9x10 <sup>-6</sup>	0.27	
SS-124	5.0x10 <sup>-5</sup>	0.46	
SS-125	4.7x10 <sup>-5</sup>	0.41	
SS-126	6.4x10 <sup>-5</sup>	0.54	
TB-05	2.5x10 <sup>-4</sup>	1.2	Parcel evaluated in OU2 HHRA Addendum; endpoint-specific HIs are less than 1.0
TB-07	6.6x10 <sup>-5</sup>	0.43	
TB-08	5.5x10 <sup>-5</sup>	0.73	Parcel evaluated in OU2 HHRA Addendum
TB-09	2.3x10 <sup>-5</sup>	0.32	
TB-10	1.1x10 <sup>-6</sup>	0.023	
TB-11	1.4x10 <sup>-5</sup>	0.22	Parcel evaluated in OU2 HHRA Addendum
TB-12	5.3x10 <sup>-5</sup>	0.28	Parcel evaluated in OU2 HHRA Addendum
TB-13	2.9x10 <sup>-6</sup>	0.090	
TB-14	2.1x10 <sup>-5</sup>	0.18	
TB-15	3.9x10 <sup>-6</sup>	0.032	
TB-16	9.5x10 <sup>-4</sup>	4.7	
TB-16A	4.0x10 <sup>-5</sup>	0.19	
TB-16B	4.6x10 <sup>-5</sup>	0.27	
TB-16C	1.7x10 <sup>-4</sup>	1.0	
TB-16D	4.5x10 <sup>-5</sup>	0.23	
TB-16E	6.1x10 <sup>-6</sup>	0.056	
TB-16F	1.3x10 <sup>-4</sup>	0.88	
TB-16G	5.1x10 <sup>-5</sup>	0.49	
TB-16H	1.1x10 <sup>-5</sup>	0.083	
TB-17	1.6x10 <sup>-4</sup>	0.77	Parcel evaluated in OU2 HHRA Addendum
TB-18	9.9x10 <sup>-5</sup>	0.47	Parcel evaluated in OU2 HHRA Addendum
TB-19	7.9x10 <sup>-6</sup>	0.058	
TB-20	7.1x10 <sup>-6</sup>	0.12	
TB-21	1.4x10 <sup>-5</sup>	0.13	

Table 3-2. Revised Final Summary of Risks and Hazards for Future Residential Receptors for All OU2 Parcels

Parcel	Total Excess Lifetime Cancer Risk	Total Noncancer HI (child)	Notes
TB-22	1.5x10 <sup>-5</sup>	0.33	
TB-23	4.2x10 <sup>-5</sup>	0.37	
TB-24	3.0x10 <sup>-5</sup>	0.50	
TB-25	2.4x10 <sup>-6</sup>	0.12	
TB-26	6.7x10 <sup>-6</sup>	0.41	
TWSB23	6.6x10 <sup>-6</sup>	0.10	
TWSB24	8.5x10 <sup>-6</sup>	0.16	
TWSB27	2.3x10 <sup>-5</sup>	0.14	

## Notes:

ELCR = excess lifetime cancer risk

HI = hazard index

NCDEQ = North Carolina Department of Environmental Quality

Total ELCR greater than 1.0x10<sup>-4</sup> and/or total HI greater than 1.0 are shaded.

At the direction of NCDEQ, ELCRs and HIs are presented to two significant figures.

Risk calculations for parcels evaluated as part of this OU2 HHRA Addendum are presented in Table 3-1. Table 3-10 of the 2021 OU2 HHRA presents the risk calculations for those parcels not evaluated as part of the OU2 HHRA Addendum.

Table 3-3. Revised Final OU2 Parcels Identified as Having Unacceptable Risk to Future Residential Receptors

Parcel	Total Excess Lifetime Cancer Risk	Total Noncancer HI (child)	Notes
CS-56	7.5x10 <sup>-5</sup>	4.1	
RISB05	1.8x10 <sup>-5</sup>	1.7	
SB-136	3.5x10 <sup>-5</sup>	2.6	
SB-148	1.8x10 <sup>-5</sup>	1.4	
SS-108	1.5x10 <sup>-4</sup>	0.64	
SS-115	1.3x10 <sup>-4</sup>	5.7	
SS-117	2.9x10 <sup>-4</sup>	1.4	
TB-05	2.5x10 <sup>-4</sup>	1.2	Parcel evaluated in OU2 HHRA Addendum; endpoint-specific HIs are less than 1.0
TB-16	9.5x10 <sup>-4</sup>	4.7	
TB-16C	1.7x10 <sup>-4</sup>	1.0	
TB-16F	1.3x10 <sup>-4</sup>	0.88	
TB-17	1.6x10 <sup>-4</sup>	0.77	Parcel evaluated in OU2 HHRA Addendum

## Notes:

ELCR = excess lifetime cancer risk

HI = hazard index

NCDEQ = North Carolina Department of Environmental Quality

At the direction of NCDEQ, ELCRs and HIs are presented to two significant figures. Total ELCR greater than 1.0x10<sup>-4</sup> and/or total HI greater than 1.0 are shaded.

Risk calculations for parcels evaluated as part of this OU2 HHRA addendum are presented in Table 3-1. Table 3-10 of the 2021 OU2 HHRA presents the risk calculations for those parcels not evaluated as part of the OU2 HHRA Addendum.

Table 3-4. Revised Final Constituents of Concern by OU2 Residential Parcel

Parcel	Endpoint		COPC ("X" if Identified as COC)								Notes
	ELCR > 1.0x10 <sup>-4</sup>	Endpoint-Specific Noncancer HI > 1.0	BaP TEQ	BaP	Fluoranthene	Naphthalene	PCP	Phenanthrene	Pyrene	TCDD TEQ	
CS-56		X								X	
RISB05		X								X	
SB-136		X								X	
SB-148		X								X	
SS-108	X		X								
SS-115	X	X	X							X	
SS-117	X	X	X	X						X	
TB-05	X		X							X	Parcel with OU2 PDI data and evaluated in OU2 HHRA Addendum
TB-16	X	X	X	X		X	X			X	
TB-16C	X		X							X	
TB-16F	X		X			X				X	
TB-17	X		X							X	Parcel with OU2 PDI data and evaluated in OU2 HHRA Addendum

Notes:

- BaP = benzo[a]pyrene
- COC = constituent of concern
- COPC = constituent of potential concern
- ELCR = excess lifetime cancer risk
- HI = hazard index
- PCP = pentachlorophenol
- TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
- TEQ = toxic equivalency

COCs for parcels with OU2 PDI data and evaluated in this OU2 HHRA Addendum are based on the risks presented in Table 3-1. For all other parcels, COCs were originally presented in Table 3-17 of the 2021 OU2 HHRA, and are unchanged.



Table 3-5. Range of Site-Specific Remediation Goals for Residential COCs

COC	Cancer Basis (mg/kg)			Child Noncancer Basis (mg/kg)			Adult Noncancer Basis (mg/kg)		
	1.0x10 <sup>-6</sup>	1.0x10 <sup>-5</sup>	1.0x10 <sup>-4</sup>	0.10	1.0	3.0	0.10	1.0	3.0
BaP TEQ	0.11	1.1	11	NA	NA	NA	NA	NA	NA
BaP	NA	NA	NA	1.8	18	54	16	160	480
Naphthalene	1.7	17	170	9.5	95	290	10	100	310
Pentachlorophenol	1.0	10	100	25	250	740	200	2000	6100
TCDD TEQ	0.000047	0.00047	0.0047	0.000051	0.00051	0.0015	0.00051	0.0051	0.015

Notes:

BaP = benzo[a]pyrene

COC = constituent of concern

NA = not applicable; endpoint not relevant for COC

TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin

TEQ = toxic equivalency

Site-Specific Remediation Goals are presented to two significant figures.