General Electric Company
Albany, New York

Feasibility Study Report

Former Thomson Consumer Electronics/RCA Facility
Circleville, Ohio

March 2013, revised July 2013

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Former Thomson Consumer Electronics/RCA Facility
Circleville, Ohio

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Table of Contents

Tables

Figures

Appendices

Executive Summary

Introduction

This *Feasibility Study Report* (FS Report) presents an evaluation of remedial alternatives to address environmental impacts identified at the former Thomson Consumer Electronics/RCA Facility Site (the Site) located in the City of Circleville, Ohio (Ohio Environmental Protection Agency [Ohio EPA] Site No. 165-0655). This FS Report has been prepared by ARCADIS on behalf of the General Electric Company (GE) in accordance with the January 14, 1994 Administrative Order on Consent between GE and Thomson Consumer Electronics, Inc. (Thomson, now Technicolor USA, Inc. [Technicolor]), and the Ohio EPA (February 14, 1994).

The purpose of this FS Report is to identify and evaluate remedial alternatives that are:

- Appropriate for site-specific conditions;
- Protective of public health and the environment;
- Consistent with relevant sections of Ohio EPA guidance and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);

The overall objective of this FS Report is the development, screening and comparative analysis of site-specific remedial alternatives. Another objective of this FS Report is to recommend a reliable remedy that achieves the site-specific remedial action objectives (RAOs) and best balances the Ohio EPA/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) evaluation criteria.

Background

The 230-acre site is currently owned by Pickaway, LLC and is located in the City of Circleville, in Pickaway County, Ohio. The site is located along the east side of U.S. Route 23, approximately 0.5 miles south of developed areas of the City of Circleville. Open fields are located immediately east, south, and west of the site. A commercial property is located north of the site and a residential area is located approximately 1,000 feet south of the site. Site topography slopes gently westward towards the Scioto River Valley. The Scioto River is located approximately 0.75 miles west of the site and is approximately 30 to 40 feet lower in elevation than the terraced uplands that include the former plant site. The uplands of the Scioto River Valley contain small streams and unnamed ditches that drain to the Scioto River. The South Ditch flows from east to west along the south side of the former plant and discharges to the offsite creek area (OCA) and subsequently to the Scioto River.

The former plant was built in 1969 on a "greenfield land" and operated from 1970 to 2004. The current property owner, Pickaway, LLC, acquired the property in 2008. The former plant manufactured the face plate or panel (3 percent lead) and funnel (24 percent lead) components of television picture tubes from 1970 until 2004 when manufacturing operations ceased. During this time, the plant consisted primarily of interconnected administration, production, laboratory, batch house, and warehouse buildings. Batch house silos were used to contain raw and intermediate materials such as sand, litharge (lead oxide), and cullet (recycled glass).

After manufacturing operations ceased in 2004, a large portion of the glass manufacturing equipment was sold and removed from the site. Former manufacturing buildings and structures were demolished/dismantled between 2005 and 2006; specifically, those structures located within the former melting and forming operation areas. Currently, only the warehouse, former administrative offices, and associated paved parking areas remain at the Site.

Nature and Extent of Impacts

A Remedial Investigation (RI) and supplemental investigations performed at the Site between 1995 and 2012 identified several potential chemicals of interest (PCoIs, primarily inorganic constituents) primarily in Site soils at the following areas of interest (AoIs) at the Site:

- East Fenced Area (EFA)
- Adjacent Fields
- East Swale
- Former Oil Skimmer Pond
- South Ditch
- Offsite Creek Area
- Former Raw Materials Handling Area (RMHA)

A summary of the RI findings for each of these AoIs is provided below.

<u>East Fenced Area</u>

- The former sludge pits located at the EFA were covered with approximately 2 feet of soil in 1980. Based on the results of test pitting, the limits of sludge deposits appear to extend slightly beyond the current fence around the EFA to the south and east.

- Arsenic was detected in soil and sludge samples collected up to 8 feet below ground surface (bgs) at the EFA at concentrations up to 358 milligrams per kilogram (mg/kg).

- Lead was detected in soil and sludge samples collected up to 8 feet bgs at the EFA at concentrations up to 13,800 mg/kg.

- Lead was detected in soil samples collected from 0 to 3 feet around the perimeter of the EFA at concentrations up to 347 mg/kg.

- Metals were not detected in groundwater at concentrations above National Drinking Water Standards maximum contaminant levels (MCLs). Additionally, metals in the sludge are predominately in a vitrified state (i.e., within a glass matrix) and thereby, highly immobile, and the bottom elevation of sludge is above the highest observed groundwater level elevation in this area. Therefore, the site-related impacts at the EFA have minimal (if any) impact on shallow groundwater.

Adjacent Fields

In general, metals at this area were detected in soils at concentrations consistent with background levels.

East Swale

- Lead was detected in soil/sediment samples collected from the southern end of the East Swale at concentrations up to 23,500 mg/kg. from 0 to 6 inches bgs. Lead was detected in soil/sediment samples collected from the 2- to 3-foot depth interval in the bottom of the swale at concentrations up to 540 mg/kg. Lead was detected in soil samples collected from upper and lower banks of the East Swale from the 0- to 6-inch depth interval at concentrations up to 2,490 mg/kg and 937 mg/kg, respectively. The relative distribution of arsenic in soil/sediment was similar to the distribution for lead, with the highest arsenic concentrations (i.e., up to 530 mg/kg) detected in surface sediment samples collected from the southern end of the East Swale.

- The soil/sediment within the East Swale that contains the highest concentrations of arsenic and lead is located a minimum of 6 to 11 feet above the highest groundwater table elevations. Similar to the EFA, metals are apparently immobile and isolated from the groundwater; therefore site-related impacts are not expected to extend to groundwater.

Former Oil Skimmer Pond

- Soil samples collected from this area (from test pits excavated between 4 to 6 feet deep) contained total petroleum hydrocarbons (TPH) at concentrations up to 1,950 mg/kg.

- Volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) were not detected except for toluene and xylenes at concentrations up to 4.4 micrograms per kilogram (µg/kg) and 3.6 µg/kg, respectively.

- A thin sandy layer (0.5- to1-foot thick) containing hydraulic oil is located in a 50-square foot area at 4 to 6 feet below ground surface (bgs). However, the residual material does not contain CoIs at concentrations of concern and was expected to degrade over time, with no anticipated adverse impacts to groundwater.

South Ditch

- The highest concentrations of lead were generally observed in soil/sediment samples collected at the following locations:

  - Storm Sewer Outfall B (approximately 470 feet downstream of the former East Swale Outfall) – Up to 8,770 mg/kg (0- to 2-inch interval bgs) and up to 12,100 mg/kg (6- to 12-inch interval bgs).

  - The bend in the South Ditch (approximately 830 feet downstream of the former East Swale Outfall) – Up to 10,500 mg/kg (0 to 2 inches bgs).

  - Current Outfall 001 (former Oil Skimmer Pond outfall) located approximately 1,170 feet downstream of the former East Swale Outfall – Up to 4,680 mg/kg (0 to 2 inches bgs).

  - Western end of the South Ditch – up to 16,200 mg/kg (0- to 2-inch depth interval) and up to 4,350 mg/kg (6- to 12-inch interval bgs).

- Waters in contact with the soils/sediments within/along the South Ditch do not cause the dissolution and migration of the site-related impacts to any significant degree. This is corroborated by low CoI concentrations in surface water samples collected at the OCA, which is hydraulically downstream of the South Ditch.

Offsite Creek Area

- The highest concentrations of lead were generally detected in surface soil/sediment samples (i.e., up to 12 inches in depth) collected in the upper creek area (i.e., between Highway 23 and the railroad tracks) and the deltaic area.

- Up to 10,000 mg/kg (0- to 6-inch interval bgs) in the deltaic area. Up to 5,000 mg/kg in surrounding areas and up to 1,000 mg/kg in surface sediment samples (0- to 6-inch interval bgs) collected from a secondary channel that runs parallel to and east of the Farm Ditch.

- Lead was detected at a maximum concentration of 15,800 mg/kg (6- to 12-inch interval bgs) in a sample collected from the deltaic area.

- Elevated concentrations of lead were also observed in depositional areas such as the overbank areas and small channels that rework the overbank areas during high-flow conditions. Surface soil/sediment samples collected west of the railroad tracks contained TPH at up to 52 mg/kg. Dissolved lead was not detected in surface water

Former Raw Materials Handling Area

Arsenic and lead were detected in all the soil samples analyzed as follows:

- Arsenic was detected at concentrations up to 1,700 mg/kg (1.5- to 3-foot interval bgs).

- Lead was detected at concentrations up to 180,000 mg/kg (1.5- to 3-foot interval bgs).

- With the exception of one sampling location, detections of arsenic and lead above the RAO Report's future site worker Preliminary Remediation Goal (PRG) were co-located.

The human health and ecological risk assessments presented in the RI Report resulted in the identification of lead, arsenic, and antimony as CoIs requiring the development of PRGs and Remedial Action Objectives (RAOs) for the Site.

Remedial Action Objectives

Site-specific RAOs were developed to assist in developing preliminary remedial goals PRGs for cleanup of CoIs in each medium that may require remediation. If met, the RAOs would be protective of human health and the environment based on the environmental concerns identified at the Site. The following RAOs were developed for the Site:

- Implement/maintain measures to prevent future residential use of the "developed" portion of the former plant site (i.e., former manufacturing area [which includes the former RMHA], EFA, East Swale, and South Ditch) and the portions of the OCA owned by the Richard's entities.

- Implement/maintain measures to prevent Current and Potential Future Site Worker exposure to EFA sludge.

- Prevent Current/Future Site Worker direct exposure to soils/sediments within the Former Manufacturing Area (which includes the former RMHA), EFA, East Swale/South Ditch, and Upper Creek Area that contain: (1) exposure point concentrations (EPCs) of antimony, arsenic, or lead above the appropriate PRGs calculated using the 95% Upper Confidence Limit (UCL); or, (2) discrete concentrations of antimony, arsenic, or lead above the appropriate PRGs.

- Prevent Future Construction/Excavation Worker direct exposure to soils/sediments within the Former Manufacturing Area (which includes the former RMHA), East Swale/South Ditch, and Upper Creek Area that contain: (1) EPCs of antimony, arsenic, or lead above the appropriate PRGs calculated using the 95% UCL; or, (2) discrete concentrations of antimony, arsenic, or lead above the appropriate PRGs.

- Prevent Recreational User/Trespasser direct exposure to soils/sediments in the East Swale/South Ditch, Upper Creek Area, and Deltaic/Non-Deltaic portions of the OCA that contain: (1) EPCs of antimony, arsenic, or lead above the appropriate PRGs calculated using the 95% UCL; or, (2) discrete concentrations of antimony, arsenic, or lead above the appropriate PRGs.

- Prevent Future Resident direct exposure to soils/sediments within the Upper Creek Area and Deltaic/Non-Deltaic portions of the OCA that contain: (1) EPCs of antimony, arsenic, or lead above the appropriate PRGs calculated using the 95% UCL; or, (2) discrete concentrations of antimony, arsenic, or lead above the appropriate PRGs.

Identification and Screening of Technologies

The objective of technology screening is to identify general response actions (GRAs), associated remedial technology types and technology process options, and then narrow the universe of process options to those that have had documented success at achieving similar RAOs to identify options that are implementable and potentially effective at addressing impacts identified for the site. Based on this screening, remedial technology types and technology process options were eliminated or retained and subsequently combined into potential remedial alternatives for further, more detailed evaluation.

Development and Screening of Alternatives

Based on the results of the technology screening, the following potential remedial alternatives were developed:

- Alternative 1 – No Further Action
- Alternative 2 – 95% UCL Removal Scenario
- Alternative 3 – Discrete Removal Scenario

Detailed Evaluation of Alternatives

Following the development of the remedial alternatives, a detailed description of each alternative was prepared and each alternative was evaluated, consistent with the CERCLA guidance (USEPA, 1988) and Ohio EPA guidance (Ohio EPA, 2006), against the following criteria:

- Overall Protection of Human Health and the Environment
- Compliance with Applicable or Relevant and Appropriate Requirements
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, or Volume through Treatment
- Short-Term Effectiveness
- Implementability
- Cost

Comparative Analysis of Alternatives

Following the detailed evaluation of each alternative, a comparative analysis of the alternatives was completed using the evaluation criteria. The comparative analysis identified the advantages and disadvantages of each alternative relative to each other and with respect to the evaluation criteria. The results of the comparative analysis were used as a basis for recommending a preferred remedial alternative for the Site, as further described below.

Preferred Remedial Alternative

Based on the results of the comparative analysis presented in Section 5.3, Alternative 2 (95% UCL Removal Scenario) is recommended by the Respondents as the preferred remedial alternative for the Site. This conclusion is based on several considerations, including the following:

- As noted in the Revised Interim RAO Report, the 95% UCL approach is consistent with Ohio EPA's Voluntary Action Program (VAP) and United States Environmental Protection Agency (USEPA) guidance. Under the VAP, the 95% UCL on the arithmetic mean of a given data set can be used to determine which soils may potentially be subject to remedial action. Moreover, USEPA's recommended methodology for evaluating potential exposures to lead in soil specifies that the arithmetic mean concentration be used as the EPC; further indicating that use of a mean value is consistent with meeting the site risk goals.

- Alternative 2 would achieve the RAOs established in the Revised Interim RAO Report, through removal of soil/sediment containing CoIs until the calculated 95% UCL concentrations for the remaining data set are not greater than the applicable PRGs, and are therefore protective of human health and the environment.

- Alternative 2 is compliant with the chemical-, action-, and location-specific applicable or relevant and appropriate requirements (ARARs) identified as being applicable to the Site.

- The removal of soil/sediment containing the greatest concentrations of CoIs, combined with the environmental covenants (ECs) that have already been established for the formerly developed portions of the former plant area and the portions of the OCA owned by the Richard's entities, comprise an effective long-term, permanent solution that achieves the risk goals for the Site.

- Alternative 2 is as effective as Alternative 3 in the reduction of toxicity, mobility, or volume through treatment and results in post-remediation conditions that achieve the risk goals and RAOs for the Site as described above. While Alternative 3 would remove a greater volume of impacted material than Alternative 2, it should be noted that neither alternative includes treatment or recycling technologies.

- When compared to Alternative 3, Alternative 2 would be implemented in a significantly shorter (i.e., less than half) duration, with significantly less disruption to the natural environment and surrounding community, poses less risk to remedial construction workers, while achieving a similar level of risk reduction.

- Alternative 2 does not require highly specialized equipment (beyond the potential use of low ground pressure equipment, tundra mats, and/or other equipment designed for use in wetland environments) or personnel and could be easily implemented. Remedial contractors capable of conducting the anticipated remediation activities are readily available.

- Alternative 2 can be implemented for approximately half the cost of Alternative 3.

In summary, remediation under both Alternatives 2 (95% UCL removal scenario) and 3 (discrete removal scenario) would satisfy the baseline requirements of being protective of human health and the environment, complying with ARARs established for the Site, and achieving the site-specific RAOs. However, Alternative 2 can accomplish these same objectives and be implemented in less than half the time, is less disruptive to the natural environment and the community, poses less risk to remedial construction workers, and can be implemented at approximately half the cost of a discrete removal scenario. For these reasons the Respondents believe that Alternative 2 is the appropriate Remedial Alternative to be implemented at the Site.

The primary components of the preferred remedial alternative consist of the following:

- Conducting pre-design/pre-construction investigations to refine/verify the extent of soil/sediment removal and determine the waste characterization of those soils/sediments;

- Excavating an estimated 3,715 to 4,260 cubic yards (cy) of soil/sediment that contain CoIs at concentrations which result in calculated 95% UCL concentrations that are greater than the applicable PRGs, including:

    - Former RMHA (excluding removal in paved areas) – 40 cy
    - Former RMHA (including removal in paved areas) – 585 cy
    - East Swale – 130 cy
    - South Ditch – 270 cy
    - Upper Creek Area – 880 cy
    - OCA – 2,395 cy

- Transporting an estimated 6,000 to 6,800 tons of material offsite for disposal at appropriately permitted facilities;

- Transporting an estimated 110,000 to 130,000 gallons of construction-related waters offsite for treatment/disposal at appropriately permitted facilities;

- Restoring removal areas to match pre-construction levels and grades and vegetating disturbed areas to result in no loss of ecological habitat;

- Rehabilitating the EFA via clearing and grubbing, repair of the existing cover, placing an additional 1-foot soil cover to improve the cover, and repair/replacement/installation of EFA fencing; and

- Preparing an Operations and Maintenance Plan to document the following:

    - The institutional controls (ECs) that have been established and will be maintained for the site;

    - Known locations of soil containing CoIs greater than unrestricted access concentrations;

    - Protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during those activities; and

    - Protocols for conducting annual site inspections and maintenance activities.

As indicated above, institutional controls have already been established for the former plant area, including the former RMHA, EFA, South Ditch and East Swale, and the portion of the OCA owned by the Richard's entities. As part of this alternative, Institutional controls would be verified on an annual basis.

Acronyms and Abbreviations

AoIs	areas of interest
ARARs	applicable or relevant and appropriate requirements
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CTL	CTL Engineering, Inc.
CoI	chemical of interest
cy	cubic yard
DERR	Division of Environmental Response and Revitalization
EC	environmental covenant
EFA	East Fenced Area
EPCs	exposure point concentrations
ERA	Ecological Risk Assessment
ESA	Environmental Site Assessment
GDCS	generic direct-contact standards
GE	General Electric Company
GRA	General Response Actions
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
HASP	health and safety plan
HHRA	Human Health Risk Assessment
HI	Hazard Index
IRM	Interim Remedial Measure
LDRs	land disposal regulations
MCLs	maximum contaminant levels
mg/kg	milligrams per kilogram
NPDES	National Pollutant Discharge Elimination System
OAC	Ohio Administrative Code
OCA	Offsite Creek Area
Ohio EPA	Ohio Environmental Protection Agency
ORC	Ohio Reserved Code
O&M	operation and maintenance

O&M Plan	Operations and Maintenance Plan
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
POTW	publicly owned treatment works
PCoI	Potential chemical of interest
PDI	pre-design investigation
PRGs	preliminary remediation goals
PPE	personal protective equipment
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RMHA	raw materials handling area
RSLs	Regional Screening Levels
SVOCs	semi-volatile organic compounds
SMP	site management plan
TBC	to be considered
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
UCL	Upper Confidence Limit
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
VAP	Voluntary Action Program
VOCs	volatile organic compounds
WWTP	waste water treatment plant
µg/dL	micrograms per deciliter
µg/kg	micrograms per kilogram
µg/L	microgram per liter

ARCADIS

1. Introduction

1.1 General

On January 19, 1994, the Ohio Environmental Protection Agency (Ohio EPA) issued an Administrative Order on Consent (Consent Order, journalized on February 14, 1994) for the former Thomson Consumer Electronics/RCA facility located at 24200 U.S. Route 23 in Circleville, Ohio (the Site) (Ohio EPA Site No. 165-0655). That Consent Order was entered into between Ohio EPA, the General Electric Company (GE) and Thomson Consumer Electronics, Inc. (Thomson, now Technicolor USA, Inc. [Technicolor]) for the purpose of conducting a Remedial Investigation and Feasibility Study (RI/FS) at the Site. In accordance with Section VIII of that Consent Order, GE submitted a *Remedial Investigation/Feasibility Study Work Plan* (PTI Environmental Services [PTI], August 1995), as amended (GE 1997; Blasland, Bouck, & Lee [BBL, then ARCADIS BBL, now ARCADIS] 2002, 2003, 2005; Exponent [formerly PTI] 2007). Those submittals (collectively referred to as the RI/FS Work Plan) provided details regarding the proposed approach for various RI/FS activities at the Site.

To supplement the historic investigation activities performed at the Site between 1988 and 1995, extensive field investigation activities were performed at the Site in accordance with the RI/FS Work Plan, beginning in late 1995. An initial draft *Remedial Investigation Report* (RI Report; Exponent, April 1998) summarizing the results of the historic and initial RI activities was submitted to Ohio EPA in April 1998. Following that submittal, GE and Ohio EPA discussed and reached agreement on the procedure necessary for finalizing the RI. Subsequent to those discussions, GE coordinated with Ohio EPA to conduct an interim action in 2002, which involved limited soil/sediment removal along the west side of the railroad tracks at the Offsite Creek Area (OCA) to accommodate construction of an access road by an offsite property owner. Additional field investigations were performed in 2003 within the OCA and portions of the South Ditch to: (1) provide additional delineation of lead that was present in these areas; (2) support data analysis as part of the RI; and (3) facilitate remedial decision-making for areas affected by offsite transport of lead-bearing particulates from the South Ditch. Revised drafts of the RI Report, incorporating the results of the 2002 interim action and 2003 sediment investigations and certain comments from Ohio EPA, were provided to Ohio EPA in June and October 2004.

Subsequent to those revised draft RI Report submittals, GE performed supplemental sediment sampling activities within portions of the OCA and South Ditch in 2005 for analysis of total petroleum hydrocarbons (TPH). GE also conducted supplemental sediment sampling within portions of the OCA and South Ditch in 2007 to collect sediment samples for biotoxicity testing as a component of the ecological risk assessment conducted as part of the RI. Both supplemental investigations were performed in accordance with the RI/FS Work Plan, as amended. The results of the supplemental investigation activities were

incorporated into a revised draft RI Report submitted to Ohio EPA in November 2009, and a final RI Report was submitted to Ohio EPA in March 2010. The RI Report included both a Human Health Risk Assessment (HHRA) and a Phase 1 Ecological Risk Assessment (ERA). Ohio EPA provided final approval of the RI Report in a letter to GE dated March 23, 2010.

On May 27, 2010, an *Interim Remedial Action Objectives Report* (Interim RAO Report) presenting a summary of the remedial action objectives that had been developed for the Site on the basis of the RI results was submitted to Ohio EPA. Ohio EPA provided comments to that document in a letter dated November 10, 2010 and GE provided responses to those comments in a letter dated January 31, 2011. Ohio EPA issued another letter on June 14, 2011 requiring certain specific edits to the Interim RAO Report. In response to that letter, GE submitted a *Revised Interim Remedial Action Objectives Report* (Revised Interim RAO Report) to Ohio EPA on August 8, 2011. Ohio EPA submitted letters to GE related to that document on October 17 and 25, 2011. The October 17, 2011 letter requested that GE either: (1) provide additional information regarding data in the vicinity of the former Raw Materials Handling Area, or (2) if no such data existed, to conduct an additional investigation of the soil conditions in that area. The October 25, 2011 letter provided additional comments on the Revised Interim RAO Report. Representatives of GE and Ohio EPA discussed the proposed responses to Ohio EPA's October 2011 letters on December 2, 2011.

Concurrently with the discussions regarding further revision to the Revised Interim RAO Report, CTL Engineering, Inc. (CTL) prepared and submitted (on behalf of Technicolor) the *Supplemental Site Investigation Work Plan* (Supplemental Work Plan) to Ohio EPA on December 16, 2011. That document proposed supplemental investigation activities for the former Raw Materials Handling Area. Ohio EPA provided comments on the Supplemental Work Plan in a letter to Technicolor dated January 18, 2012 and revised pages of that document were submitted to Ohio EPA on January 30, 2012.

On February 7, 2012, Ohio EPA submitted a letter to GE that: (1) instructed GE to delay submittal of further revisions to the Revised Interim RAO Report so that a section on the supplemental investigations for the former Raw Materials Handling Area could be added to that report; and (2) provided additional comments on the proposed methodology for evaluating the potential need for remedial actions within the various Areas of Interest (AoIs) at the Site. GE submitted a letter to Ohio EPA on February 24, 2012 responding to Ohio EPA's February 7, 2012 comment letter and providing further justification for the evaluation methodology proposed in the Revised Interim RAO Report.

Following the performance of the supplemental investigations for the former Raw Materials Handling Area, CTL submitted the *Supplemental Site Investigation Report* (Supplemental Investigation Report) providing the results of those supplemental investigations to Ohio EPA

on May 10, 2012. Ohio EPA provided comments on that report in a letter to Technicolor dated June 13, 2012. In response to those comments, revised elements of the Supplemental Investigation Report were submitted by CTL to Ohio EPA on July 31, 2012 and Ohio EPA submitted a letter approving that document on August 2, 2012.

On June 15, 2012, Ohio EPA submitted a letter to GE indicating that, based on the results of the supplemental investigations, the Raw Materials Handling Area needed to be incorporated into a Revised Interim RAO Report. That letter also provided Ohio EPA's comments requesting certain revisions to the evaluation methodology proposed in the Revised Interim RAO Report. Representatives of Ohio EPA and GE discussed that letter and other related correspondence on July 20, 2012. Subsequent to that call, Ohio EPA provided further clarification regarding the requested edits to the Revised Interim RAO Report in a letter to GE dated August 29, 2012. Finally, representatives of Ohio EPA, GE, and Technicolor met on September 26, 2012 to discuss the various correspondence submitted by, or on behalf of, Ohio EPA, GE, and Technicolor since submittal of the August 2011 Revised Interim RAO Report and the appropriate revisions to be included herein.

A Revised Interim RAO Report, prepared in accordance with Task 8A (Remedial Action Objectives) of the RI/FS Work Plan and incorporating the revisions requested by Ohio EPA in their November 10, 2010 and June 14, 2011 comment letters, was submitted to Ohio EPA on November 13, 2012. The RAOs presented therein were developed to support the detailed analysis of remedial alternatives for the Site. Ohio EPA provided approval of the Revised Interim RAO Report in a letter to GE and Technicolor dated November 21, 2012.

As agreed by Ohio EPA, GE, and Technicolor during the aforementioned September 26, 2012 meeting, both the Alternatives Array Report (Tasks 8B & 8C) and the Treatability Studies (Task 9) tasks under the RI/FS Work Plan were eliminated. As a result, Ohio EPA's November 21, 2012 letter directed GE and Technicolor to submit a draft feasibility study to Ohio EPA by February 25, 2013. This *Feasibility Study Report* (FS Report) was prepared in accordance with Task 10 (FS Report) of the RI/FS Work Plan and presents an evaluation of remedial alternatives to address environmental impacts identified at the Site.

This FS Report has been prepared to evaluate remedial alternatives to address identified environmental impacts in a manner consistent with the Order and with Ohio EPA Division of Environmental Response and Revitalization (DERR) *Generic Statement of Work for Conducting Remedial Investigations and Feasibility Studies* (Ohio EPA, 2006). Additionally, this FS Report has been prepared in consideration of the United States Environmental Protection Agency (USEPA) *Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) (USEPA, 1998).

1.2 Site Description and History

A detailed description of the operational and regulatory history at the Site is presented in Section 1 of the RI Report. As indicated therein, the Site consists of approximately 230 acres along the east side of U.S. Route 23, located approximately 0.5 miles south of developed areas of the City of Circleville, Ohio (Figure 1). The Site is surrounded by open fields, with a small residential area located approximately 1,000 feet south-southwest of the former plant area. The Scioto River is located approximately 0.75 miles west of the Site. The uplands of the Scioto River Valley contain small streams and unnamed ditches that drain to the Scioto River. The South Ditch flows from east to west along the south side of the plant and discharges to the OCA and subsequently to the Scioto River.

The plant was built in 1969 on a “greenfield site” and began operation in 1970 under the Radio Corporation of America (RCA). The plant was operated by RCA until 1986, when it was acquired through a corporate merger with GE. GE maintained ownership of the Site for approximately 1 year before the Site was acquired by Thomson in 1987. Thomson maintained ownership of the Site from 1987 until it sold the property in 2008. From the time operations began in 1970 until shutdown in 2004, the plant manufactured the face plate or panel (3 percent lead) and funnel (24 percent lead) components of television picture tubes. During this time, the plant consisted primarily of interconnected administration, production, laboratory, batch house, and warehouse buildings. Batch house silos were used to contain raw and intermediate materials such as sand, litharge (lead oxide), and cullet (recycled glass).

Thomson ceased manufacturing operations on March 30, 2004 and subsequently sold a large portion of their glass manufacturing equipment, which was removed from the Site. The demolition of the structures (including building slabs) located within the melting and forming operations areas of the former plant were initiated in November 2005 and completed in 2006. Following demolition, only the warehouse, former administrative offices, and associated paved parking areas remain at the Site, as shown on Figure 2. The remainder of the Site consists of unpaved gravel and vegetated areas.

On April 3, 2008, Thomson sold the property to Circleville Pickaway, LLC. In accordance with the Consent Order, two copies of the journalized deed notice were provided to Ohio EPA on April 10, 2008. Technicolor and GE have worked with the current property owner to develop an Environmental Covenant (EC), which includes activity and use limitations restricting possible future uses of the ”developed portion” of the Site, including the East Fenced Area (EFA), the East Swale, and identified portions of the South Ditch. That EC, which was developed pursuant to the Ohio Uniform Environmental Covenants Act, Ohio Revised Code §5301.80-5301.92, was revised and resubmitted to the Ohio EPA on June 17, 2011. The EC was executed by all parties and then recorded on December 28, 2011 in the office of the Pickaway County Recorder. A copy of that EC is provided in Appendix A.

Technicolor and GE have worked with the current property owner of the deltaic and non-deltaic portions of the OCA (Richards Entities) to develop an EC, which includes activity and use limitations restricting possible future uses of the OCA, and prohibits the use of groundwater for any potable purposes. That EC, which was developed pursuant to the Ohio Uniform Environmental Covenants Act, Ohio Revised Code §5301.80-5301.92, was executed by all parties and then recorded on August 24, 2012 in the office of the Pickaway County Recorder. A copy of that EC is provided in Appendix B.

1.3 Purpose and Format of FS Report

The purpose of this FS Report is to identify and evaluate remedial alternatives that are:

- Appropriate for site-specific conditions;
- Protective of public health and the environment; and
- Consistent with relevant sections of Ohio EPA guidance and CERCLA.

The overall objective of this FS Report is the development, screening and comparative analysis of site-specific remedial alternatives. Another objective of this FS Report is to recommend a reliable remedy that achieves the site-specific RAOs and best balances the Ohio EPA/CERCLA evaluation criteria. The remainder of this FS Report is presented in six sections. The title and a brief overview of each section are provided below:

Section 2 – Summary of RI and Supplemental Investigation Results, provides a summary of the nature and extent of site impacts, as well as the human health and ecological risk assessments completed by Exponent as part of the RI, the results of which form the basis for the RAOs described in Section 3. This section also summarizes the supplemental site investigation activities performed for the former Raw Materials Handling Area.

Section 3 – Development of Remedial Action Objectives, provides a summary of the applicable or relevant and appropriate requirements (ARARs) identified for the Site as well as an overview of the development of the site-specific Preliminary Remediation Goals (PRGs) and RAOs for impacted site media that were provided in Section 3 of the Revised Interim RAO Report.

Section 4 – Identification/Screening of Technologies and Development of Remedial Alternatives, provides a listing of General Response Actions (GRAs), as well as the identification and screening of technology types and process options that are used to develop potential remedial alternatives for addressing impacted site media. This section also presents the rationale for combining individual technologies (and associated

technology processes) into site-wide remedial alternatives for the purpose of achieving the site-specific RAOs.

Section 5 – Detailed Analysis of Alternatives, provides detailed descriptions, along with individual and comparative analyses of the remedial alternatives using the evaluation criteria presented in the applicable guidance documents

Section 6 – Preferred Remedial Alternative, Identifies the preferred remedial alternative for the Site.

Section 7 – References, provides a listing of references utilized to prepare this FS Report.

The discussions in the above-referenced sections are supported by information provided in several tables, figures, and appendices to this FS Report, as described in subsequent sections of this document.

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2. Summary of RI and Supplemental Investigation Results

This section provides information regarding the results of: (1) the RI activities that were performed at the Site in accordance with the RI/FS Work Plan; and (2) the supplemental investigation activities performed at the former Raw Materials Handing Area in response to a letter from Ohio EPA dated October 17, 2011. Specifically, this section provides an overview of the PCoIs evaluated as part of the RI, the nature and extent of site impacts within certain AoIs identified in the RI Report and Ohio EPA's October 17, 2011 letter, and summarizes the results of the human health and ecological risk assessments for the AoIs identified in the RI Report.

2.1 Potential Chemicals of Interest Evaluated by RI

Several PCoIs were identified during the RI screening process by examining the known and assumed compositions of past raw materials and process chemicals, and by reviewing the results of the previous investigations. A complete description of the PCoI evaluation process was provided in the RI/FS Work Plan. As described in Section 1.5 of the RI Report, the following nine PCoIs were considered during the RI:

- Antimony;
- Arsenic;
- Barium;
- Chromium;
- Fluoride;
- Lead;
- Nickel;
- Polycyclic Aromatic Hydrocarbons (PAHs); and,
- Total Petroleum Hydrocarbons (TPH).

As further described in Section 2.3, lead was the only constituent for which the risk assessments provided in the RI Report identified unacceptable risk under certain potential exposure scenarios. However, Ohio EPA's June 14, 2011 comment letter directed the Respondents to incorporate certain PRGs developed by Ohio EPA for antimony, arsenic, and lead into the Revised Interim RAO Report. Therefore, as further discussed in Section 3, antimony, arsenic, and lead are the only constituents for which PRGs have been included herein.

2.2 Areas of Interest

Information regarding historical plant operations, waste management practices, site setting, and results of previous investigations were reviewed to identify AoIs that were subsequently evaluated during the RI. Based on that review, the following areas (shown on Figure 3) were identified for further investigation during the RI:

- East Fenced Area;
- Adjacent Fields;
- East Swale;
- Former Oil Skimmer Pond;
- South Ditch; and,
- OCA.

The RI/FS Work Plan also evaluated another area referred to as the Onsite Soils Area. As indicated therein, the review of the historic data indicated that the soils in this area had negligible concentrations of PCoIs. As a result, that area was excluded from further field investigations under the RI; however, the data for the Onsite Soils Area were incorporated into the screening analyses for the HHRA described in Section 6 of the RI Report and summarized in Section 2.3 of this report.

The current understanding of the nature and extent of Site impacts within these AoIs was developed based on the results of the RI. Detailed descriptions of the RI activities, the previous site investigations, and the interim remedial measures performed (where applicable) at each of these areas was presented in the RI Report. A summary of the nature and extent of Site impacts for each of the above-listed areas is presented in the Sections 2.2.1 through 2.2.6 below.

Separate from the RI, Ohio EPA's October 17, 2011 letter to GE indicated that the August 11, 2005 *Limited Phase II Environmental Site Assessment* (Phase II ESA) recommended additional sampling be performed to delineate lead and arsenic observed in samples collected in front of the former hazardous waste storage building at the former raw materials handling area (RMHA). As a result, that letter requested that GE either: (1) provide additional information regarding data in the vicinity of the former RMHA, or (2) if no such data existed, to conduct an additional investigation of the soil conditions in that area. In response to that letter, supplemental sampling activities were performed in the vicinity of the former Raw Materials Handling Area as further described in Section 2.2.7 below.

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2.2.1 East Fenced Area

The EFA is an approximately 5 acre area located east of the former plant (Figure 3) that is enclosed by security fencing. Glass polishing and grinding fines were pumped from site lagoons to three 8- to 10-foot deep "sludge pits" during plant operations in the 1970s. Based on historic site photography, the sludge within the pits may have overflowed, but the contents were contained within the general area by earthen berms that surrounded the pits. In October 1980, the sludge pits were covered with approximately 2 feet of soil.

Based on the results of the test pitting activities conducted during the RI, the limits of sludge deposits appear to extend slightly beyond the fenced portion of the EFA to the south and the east (but not to the South Ditch). During historic sampling, soil and sludge samples were collected and submitted for laboratory analysis. With the exception of lead and arsenic, other metals concentrations were generally detected at concentrations consistent with regional background levels. Arsenic concentrations in the EFA soil and sludge samples ranged from non-detect to 358 milligrams per kilogram (mg/kg) and lead was detected at concentrations ranging from 604 to 13,800 mg/kg. During the RI, soil samples were collected around the perimeter of the EFA at depths up to 3 feet below grade. Lead concentrations in these samples ranged from 16.2 to 347 mg/kg.

Quarterly groundwater sampling conducted during the RI indicated the sporadic presence of metals (i.e., not detected every quarter) at low concentrations in filtered and/or unfiltered samples collected in the vicinity of the EFA. No PCoI metals were detected at concentrations above National Drinking Water Standards maximum contaminant levels (MCLs). The RI concluded that the metals in the sludge were predominately in a vitrified state (i.e., within a glass matrix) and thereby, highly immobile. Additionally, as indicated in the RI Report, the bottom elevation of sludge in the EFA was above the highest observed groundwater level elevation in this area. Based on these findings, the RI Report concluded that the sludge in the EFA had a minimal (if any) impact on shallow groundwater in the vicinity of the EFA.

2.2.2 Adjacent Fields

The Adjacent Fields area was located immediately north of the former plant and was historically used for farming and grazing (Figure 3). This area was subsequently developed and a Wal-Mart is now located in this area.

Results from historic investigations conducted for the Adjacent Fields indicated that metals were detected in soils at concentrations consistent with background levels. However, elevated fluoride levels were noted (possibly from historic stack emissions) in vegetation and animal tissue samples. Analytical results for soil samples collected during the RI indicated the presence of lead at concentrations up to 112 mg/kg in the 0- to 6-inch depth

interval and up to 32 mg/kg in the 6- to 12-inch depth interval. Fluoride was detected at concentrations up to 430 mg/kg in the 0- to 6-inch depth interval and up to 650 mg/kg in the 6- to 12-inch depth interval. The RI Report concluded that the RI sampling activities confirmed the results of the historic investigations performed at the Site. Specifically, the results of the RI sampling indicated that the detected levels of PCoI metals in the soil samples collected from the Adjacent Fields are representative of background levels.

2.2.3 East Swale

The East Swale was a drainage ditch that was located east of the former plant (Figure 3). As noted in the RI Report, the swale is lined with perennial vegetation. Throughout the operational history of the former plant, the East Swale was typically dry, but during significant rain events it received some storm water runoff from fields northeast of the former plant and from the east end of the former plant where cullet was formerly stored. During the 1970s, batch plant and furnace waste materials were also stored in piles on the east side of the former plant in the vicinity of the East Swale prior to disposal. Prior to 1990, during heavy precipitation events, some portion the runoff from the East Swale discharged to the South Ditch. From 1990 to 2006, water that drained to the East Swale was captured at the southern end of the swale and was conveyed to the former onsite wastewater treatment plant (WWTP). As previously indicated, certain structures associated with the former plant (including the WWTP) were demolished in 2006.

Historic sampling conducted in the East Swale indicated the presence of lead and arsenic at elevated concentrations in surface soil/sediment only. Similarly, analytical results for RI soil/sediment samples collected from the 0- to 6-inch depth interval indicated that the most elevated concentrations of lead (i.e., up to 23,500 mg/kg), were present in surface sediment collected from the southern end of the East Swale. Soil/sediment samples collected from the 2- to 3-foot depth interval in the bottom of the swale contained lead at concentrations up to 540 mg/kg. Soil samples collected from upper and lower banks of the East Swale contained lead at concentrations up to 2,490 mg/kg and 937 mg/kg, respectively, with the highest concentrations generally detected in the 0- to 6-inch depth interval. At certain locations, lead concentrations detected in deeper soil/sediment were greater than concentrations detected in surface material (i.e., 0- to 6-inches), potentially as a result of historic filling and reworking of material within the swale. Analytical results for RI samples indicated that the relative distribution of arsenic in soil/sediment was similar to the distribution for lead, with the highest arsenic concentrations (i.e., up to 530 mg/kg) detected in surface sediment samples collected from the southern end of the East Swale. Similarly, the highest antimony concentrations (i.e., up to 604 mg/kg) were detected in surface sediment samples collected near the southern end of the East Swale.

The soil/sediment within the East Swale that contains the highest concentrations of arsenic and lead is located a minimum of 6 to 11 feet above the highest groundwater table elevations. Since those materials are believed to be immobile and isolated from the groundwater, the RI Report concluded that the soils/sediment within the East Swale is expected to have minimal (if any) impact on shallow groundwater in the vicinity of the East Swale.

2.2.4 Former Oil Skimmer Pond

The former Oil Skimmer Pond was located south of the former plant (Figure 3). The pond was used between 1970 and 1990 to remove oil from hot-end cooling water. Oil skimming equipment was used to remove floating oil within the pond. The recovered oil was transferred to a 500-gallon above-ground storage tank. The cooling water was then discharged to the South Ditch via Outfall 001 under a National Pollutant Discharge Elimination System (NPDES) permit. Beginning in 1990, the plant cooling water was diverted to the former WWTP. The pond was closed in 1992 and the material within the pond was excavated to a depth of 10 feet below grade. The area was then backfilled and vegetated.

Historic sampling indicated that surface sediment within the pond contained elevated concentrations of lead and TPH. Those surficial sediments were removed when the pond was excavated and backfilled. The RI soil samples collected from this area contained TPH at concentrations ranging from non-detect to 1,950 mg/kg. VOCs and SVOCs were not detected except for toluene and xylene at 4.4 ug/kg and 3.6 ug/kg, respectively. A thin sandy layer containing hydraulic oil was observed in an area measuring approximately 50 square feet located east of the former pond. The RI Report concluded that this residual material does not contain hazardous constituents at levels of concern and was expected to degrade over time, with no anticipated adverse impacts to groundwater.

2.2.5 South Ditch

The South Ditch is the onsite portion of an unnamed tributary to the Scioto River (Figure 3). The South Ditch is located south of the former plant and is a perennial grass-lined ditch, which is fed by a marsh located east of the Site. Multiple current and historical outfalls are located south of the former plant within the South Ditch. As previously indicated, the East Swale (during heavy precipitation events) and the former Oil Skimmer Pond both discharged to the South Ditch prior to 1990, at which point those flows were diverted to the former WWTP. From 1990 until 2006, the flow within the ditch was continuous as a result of the discharge from the former WWTP. Upon demolition of the former WWTP in 2006, the flow within the ditch was greatly reduced.

Soil/sediment samples collected from the South Ditch during historic and RI sampling contained elevated concentrations of lead (and other inorganics). The highest concentrations of lead were generally observed in samples collected from the top 12 inches of soil/sediment in the vicinity of current/former outfalls and samples collected from localized sediment accumulation areas downstream of the former outfall from the East Swale. The highest concentrations of lead in the South Ditch were detected at the following locations:

- Concentrations up to 8,770 mg/kg in samples collected from the 0- to 2-inch depth interval and up to 12,100 mg/kg from the 6- to 12-inch depth interval at Storm Sewer Outfall B located approximately 470 feet downstream of the former East Swale Outfall.

- Concentrations up to 10,500 mg/kg (0 to 2 inches) at the bend in the South Ditch, which is located approximately 830 feet downstream of the former East Swale Outfall.

- Concentrations up to 4,680 mg/kg (0 to 2 inches) at current Outfall 001 (former Oil Skimmer Pond outfall) located approximately 1,170 feet downstream of the former East Swale Outfall.

- Concentrations up to 16,200 mg/kg in samples collected from the 0- to 2-inch depth interval and up to 4,350 mg/kg from the 6- to 12-inch depth interval at the western end of the South Ditch.

The highest concentrations of arsenic (i.e., up to 239 mg/kg) were detected in soil/sediment samples collected at Storm Sewer Outfall B. Elevated TPH concentrations (i.e., up to 250,000 mg/kg) and PAHs were detected in soil/sediment samples collected during historic and RI sampling. However, the TPH concentrations observed during the supplemental RI sampling conducted in December 2005 were much lower (i.e., ranging from non-detect levels to 250 mg/kg). In addition, PAHs were not detected in the oily material collected from the former Oil Skimmer Pond. Therefore, the RI Report concluded that the TPH and PAH concentrations detected in the South Ditch were likely the result of the surface water discharge from Storm Sewer Outfall B.

Groundwater and surface water elevation data indicate that the South Ditch is a gaining stream (i.e., groundwater discharges to the ditch) from the EFA westward. The RI Report indicated that the geochemical and surface water sample data collected during the RI indicate that the waters in contact with the PCoI-bearing soils/sediments within/along the South Ditch do not cause the dissolution and migration of the PCoIs to any significant degree. This is further demonstrated by the fact that PCoIs have not been detected at elevated concentrations in surface water samples collected within the OCA, which is hydraulically downstream of the South Ditch, as further discussed in the next subsection.

2.2.6 Offsite Creek Area

The OCA is located downstream of the South Ditch and consists of the relatively narrow riparian corridor between Highway 23 and the Scioto River (Figure 3). The OCA measures approximately 12 acres and receives drainage from two principal areas: the offsite creek (which is a continuation of the South Ditch) and the Farm Ditch. The area between Highway 23 and the Chesapeake and Ohio Railroad is referred to as the upper creek, which drains into a triangular-shaped depositional area called the deltaic area located between the railroad tracks and the farm drainage ditch. The OCA also receives runoff from nearby residential/commercial areas, agricultural areas, and effluent from the Earnhart Hill Water District water treatment plant.

Lead-bearing particulates were observed only in certain portions of the OCA. Specifically, the highest concentrations of lead were generally detected in surface soil/sediment samples (i.e., up to 12 inches in depth) collected in the upper creek area (i.e., between Highway 23 and the railroad tracks) and the deltaic area. Elevated concentrations of lead were also observed in depositional areas such as the overbank areas and small channels that rework the overbank areas during high-flow conditions. During the initial sampling under the RI, the maximum lead concentrations (i.e., 5,000 to 10,000 mg/kg) were detected in soil/sediment samples collected from the 0- to 6-inch depth interval in the deltaic area. Lead concentrations generally ranged from 1,000 to 5,000 mg/kg in surrounding areas and ranged from 500 to 1,000 mg/kg in surface sediment samples collected from a secondary channel that runs parallel to and east of the Farm Ditch. During the supplemental investigation activities, lead was detected at a maximum concentration of 15,800 mg/kg (6- to 12-inch depth interval) in a sample collected from the deltaic area. Soil/sediment samples collected west of the railroad tracks during supplemental investigation activities contained TPH at concentrations ranging from 25 to 52 mg/kg). Finally, soil/sediment samples collected in the deltaic and non-deltaic areas contained arsenic concentrations ranging from non-detect to 222 mg/kg and antimony concentrations ranging from non-detect to 113 mg/kg.

Analytical results for surface water samples collected from the OCA indicated that dissolved lead was not detected in surface water. Although low levels of total lead were observed in certain surface water samples, indicating some particulate transport at very low concentrations, those concentrations were not greater than Thomson's NPDES permit number for discharge to the South Ditch and were well below both Ohio water quality standards for protection of aquatic organisms and drinking water quality standards (i.e., 15 microgram per liter [ug/L] for lead).

2.2.7 Former Raw Materials Handling Area

The former RMHA is a portion of the former industrialized portion of the Site that is located immediately west of the East Swale. During facility operations, this area consisted of open and covered concrete pads and a batch house used for the storage and handling of raw materials and a building for the temporary accumulation/storage of hazardous waste prior to transportation to an appropriately permitted offsite disposal facility (Figure 3). As noted in Section 1.4.2 of the RI, the building was clean closed in 1985 and EPA approved clean closure of the hazardous waste storage building on June 22, 1992. The structures present at the former Raw Materials Handling Area were subsequently removed as part of the demolition activities performed during 2005 and 2006.

As noted in Ohio EPA's October 17, 2011 letter, the June 1992 *Clean Closure Equivalency Demonstration Hazardous Waste Storage Building Unit* and August 11, 2005 Phase II ESA noted elevated concentrations of lead and arsenic in front of the former hazardous waste storage building. As a result, CTL performed supplemental investigations on behalf of Technicolor in March 2012. Those supplemental investigation activities included the performance of 33 soil borings in paved and unpaved areas located in the vicinity of the former Raw Materials Handling Area and the collection of 66 samples for total arsenic and lead analyses.

As noted in the Supplemental Investigation Report, arsenic and lead were detected in all the soil samples analyzed. Arsenic was detected above the RAO Report's future site worker PRG value in 17 of the 66 samples and four duplicate samples, with only seven such samples located in unpaved areas. The highest concentration of arsenic (i.e., 1,700 mg/kg) was detected in a paved area at the 1.5- to 3-foot interval. Lead was detected above the RAO Report's future site worker PRG in 12 of the 66 samples and three duplicate samples, with only four such samples located in unpaved areas. The highest concentration of lead (i.e., 180,000 mg/kg) was detected in the paved area at the 1.5- to 3-foot interval and was collocated with the highest concentration of arsenic described above. With the exception of one sampling location, each sample where lead was detected above the RAO Report's future site worker PRG was co-located with a sample where arsenic was also detected above the RAO Report's future site worker PRG.

2.3 Summary of Risk Assessments Included in RI Report

As part of the RI performed for the Site, Exponent conducted both an HHRA and a Phase I ERA. The detailed results of these assessments were previously presented in Sections 6 (HHRA) and 7 (ERA), respectively, of the RI Report and are summarized below.

2.3.1 Human Health Risk Assessment

The HHRA evaluated the potential for adverse human health effects from exposures to impacted media (i.e., soil, sediment, sludge, groundwater, and surface water). The first step in the HHRA involved a screening process through which available Site data for the PCoIs were compared to: (1) risk-based concentrations developed by USEPA for soils; and (2) maximum contaminant levels (for non-lead PCoIs) or national primary drinking water regulation concentration (for lead) for groundwater and surface water. As indicated in Section 6.2 of the RI Report, this screening process resulted in the elimination of the Former Oil Skimmer Pond and Adjacent Fields from further evaluation as AoIs in the HHRA based on the conclusion that the soils/sediment in those areas were unlikely to contribute significantly to Site-related risks. Similarly, the screening evaluation for the Onsite Soils confirmed the conclusions reached in the RI/FS Work Plan that the Onsite Soils have negligible concentrations of PCoIs and were not an AoI. Finally, the screening evaluation conducted as part of the HHRA for the groundwater and surface water data at the Site determined that neither groundwater nor surface water was likely to contribute significantly to Site-related risks. Therefore, both groundwater and surface water were eliminated from further evaluation in the HHRA as an exposure medium of interest.

The results of the screening evaluation for the remainder of the AoIs resulted in the following PCoIs being retained for further evaluation in the HHRA:

- EFA (sludge): antimony, arsenic, and lead;
- East Swale (soil/sediment): antimony, arsenic, and lead;
- South Ditch (soil/sediment): antimony, arsenic, lead, and certain carcinogenic PAHs (i.e., benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenzo[a,h] anthracene, and indeno[1,2,3-cd]pyrene); and,
- OCA (soil/sediment): antimony, arsenic, and lead.

The next step in the HHRA involved a review of the Site data, land-use information, and specific requests from Ohio EPA, to identify the populations that had potential exposure to Site-related PCoIs. That review considered both current and potential future site use/conditions in the absence of land use restrictions and remedial actions to eliminate or mitigate potential exposures. Based on that review, the potential receptors that were evaluated as part of the HHRA included the Onsite Worker, Recreational User/Trespasser, and Hypothetical Future Resident.

The results of the screening steps described above were combined to identify the following AoIs and scenarios that were retained and evaluated in the HHRA: EFA (Onsite Worker), the East Swale (Onsite Worker), the South Ditch (Onsite Worker and Recreational User/Trespasser) and the OCA (Recreational User/Trespasser and Hypothetical Future Resident). To evaluate the potential effects from exposure to soil/sediment or sludge containing lead, the HHRA utilized medium-specific lead concentrations and evaluated potential risks against the USEPA recommended blood lead concentration goal of 10 micrograms per deciliter (ug/dL). The results of the lead assessment included the following:

- When assuming weekly exposures to the Onsite Worker, Recreational User/Trespasser, and Hypothetical Future Resident, the predicted 95th percentile blood lead concentrations were generally below 10 ug/dL (i.e., when default parameter values were incorporated into USEPA's recommended approaches for assessing lead).

- Onsite Worker weekly exposure to lead in soil/sediment within the East Swale or South Ditch resulted in predicted 95th percentile blood lead concentrations less than 10 ug/dL when the default ingestion rate was used.

- Under the Hypothetical Future Resident scenario for the OCA requested by Ohio EPA for inclusion in the HHRA, the predicted 95th percentile blood lead concentrations for young children, who were assumed to have infrequent exposure in this area, were all below 10 ug/dL. When evaluating exposures to older children, using the default soil ingestion rate and higher exposure frequencies of 50 and 175 days/year, the predicted 95th percentile blood lead concentrations for the deltaic and upper creek areas were less than 10 ug/dL.

The HHRA also included an evaluation of calculated risks to exposures from carcinogenic CoIs at the retained AoIs. Arsenic was the only carcinogenic CoI identified in most AoIs and when other carcinogenic CoIs were identified, arsenic was the primary contributor to the estimated cancer risks. The risk estimates calculated for each AoI containing carcinogenic CoIs were compared to USEPA's acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$ and the Ohio EPA target level of $1x10^{-5}$. The results of the cancer risk estimate calculations indicated the following:

- The risk estimates calculated for each retained AoI containing carcinogenic CoIs (i.e., the EFA, East Swale, and South Ditch) were within USEPA's acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$ and below the Ohio EPA target level of $1x10^{-5}$, assuming monthly to weekly exposure.

- The risk estimates calculated for the Recreational User/Trespasser in the South Ditch and the OCA were $9x10^{-7}$ and $4x10^{-7}$, respectively, assuming monthly exposure, and $4x10^{-6}$ and $2x10^{-6}$, respectively, assuming weekly exposure.

The summary of the HHRA (Section 6.5.3.2 of the RI) stated that, even if an Onsite Worker was assumed to be present in all three areas of the Site on each day of exposure, the estimated potential risk would be $2x10^{-5}$. This risk estimate was above Ohio EPA's target risk level of $1x10^{-5}$. It is important to note, however, that this estimate was not representative of actual site conditions as it represented the sum of the estimated risks for the three onsite AoIs (i.e., the EFA, East Swale, and South Ditch). If Onsite Workers are present in all areas of the Site during their workdays, the total risk due to that exposure would be more appropriately represented by the average of the three risk estimates, rather than the sum. The arithmetic average of the estimated risks, assuming that individuals spend an equal portion of their workdays in the three AoIs, was $8x10^{-6}$, which was below the target risk level established by Ohio EPA.

Potential non-cancer health effects associated with non-lead CoIs were also evaluated as part of the HHRA. A Hazard Index (HI) was calculated for each of the evaluated exposure scenarios and compared to USEPA's target HI of 1.0. An HI below 1.0 indicates that no adverse non-cancer health effects are expected to occur.

The primary contributor to non-cancer health effects at the Site was arsenic. The results of the non-cancer assessment indicated the following:

- The HI for the Onsite Worker assuming monthly exposure ranged from 0.01 to 0.02 for the EFA, the East Swale, and the South Ditch. When weekly exposure was assumed, the HI ranged from 0.05 to 0.08. The HHRA summary reported that if the Onsite Worker contacted soil/sediment in all three AoIs combined during the workday, the calculated HI would be 0.05 when assuming monthly exposure, and 0.2 when weekly exposure was assumed. Although these HIs were well below USEPA's benchmark of 1.0, these values represented the sums of the individual HIs calculated for the three AoIs. As previously discussed, the more representative average HIs for these two scenarios, when assuming contact in all three areas during the workday, were 0.02 and 0.07, respectively.

- The HIs for the Recreational User/Trespasser were 0.02 in the South Ditch and 0.01 in the OCA when monthly exposure was assumed. When weekly exposures were assumed, the HIs for the South Ditch and the OCA were 0.07 and 0.04, respectively.

In summary, all of the calculated cancer risks fell within the USEPA's acceptable risk range when USEPA default parameter values were incorporated into the risk assessment. In addition, all of the calculated HIs were well below the USEPA benchmark of 1.0. Lead was the only constituent for which unacceptable health risks (i.e., some predicted 95th percentile blood lead concentrations greater 10 ug/dL) were calculated for some exposure scenarios.

2.3.2 Phase I Ecological Assessment

As part of the RI, a Phase I ERA was completed to evaluate the need for a Phase II Ecological Assessment. Key conclusions from the Phase I ERA consisted of the following:

- Only terrestrial environments are of concern.
- The EFA and the OCA are the only AoIs with habitats for consideration.
- Lead is the only PCoI for potential ecological receptors.
- The only relevant exposure routes for potential receptors are food ingestion and incidental soil ingestion.

The Phase I ERA ultimately concluded that lead concentrations present in soil/sediment do not pose a significant ecological risk to receptor populations. This conclusion was based on the overall habitat quality and distribution of lead in the EFA and the OCA, size of receptor home ranges relative to the size of the EFA and the OCA, proportion of receptor population potentially affected by exposure to lead, bioavailability of lead, toxicity of lead to receptors, and quantitative food-web exposure models. Based on these findings, it was concluded in the RI (and subsequently approved by Ohio EPA) that a Phase II Ecological Assessment was not required for the Site.

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3. Development of Remedial Action Objectives

This section provides a summary of the ARARs identified for the Site as well as an overview of the development of the site-specific PRGs and RAOs for impacted site media. Additional details regarding each of these activities are provided in Section 3 of the Revised Interim RAO Report.

3.1 Applicable or Relevant and Appropriate Requirements

ARARs are federal and state standards, requirements, criteria, or limitations that are either legally applicable, or relevant and appropriate for use at the site, and must be considered in the development and evaluation of the specific remedial actions. Compliance with ARARs is one of the eight criteria considered under CERCLA in the evaluation of potential remedial alternatives. State ARARs take precedence if they are more stringent than the associated Federal requirements (USEPA, 1988). In addition to ARARs, guidance materials that have not been promulgated or regulatory standards that are not applicable or relevant and appropriate may be considered (including local/county requirements); these are referred to as items "to be considered" (TBC). While TBCs may be considered along with ARARs, they are not legally binding and do not have the status of ARARs.

The ARARs and TBCs considered in this FS Report were categorized in the following classifications:

- *Chemical-Specific* – These ARARs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values for each CoI. These values establish the acceptable amount or concentration of chemical constituents that may be found in, or discharged to, the ambient environment.

- *Action-Specific* – These ARARs are technology- or activity-based requirements or limitations on actions taken with respect to hazardous waste management and remediation.

- *Location-Specific* – These ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur in specific locations.

The ARARs and TBCs identified for the evaluation of remedial alternatives are presented in the following subsections. These ARARs have been identified as potentially applicable; their actual applicability will be determined during the evaluation of a particular remedy, and further considered during development of the remedial design (i.e., after the final remedy

has been selected). Each potential remedy will comply with the identified ARARs, or indicate why compliance with an ARAR cannot or will not be obtained.

3.1.1 Chemical-Specific ARARs

Potentially applicable chemical-specific ARARs for the site are summarized in Table 1. Chemical-specific ARARs are the criteria that typically drive the remedial efforts at remedial sites because they are most directly associated with addressing potential human exposures. The primary chemical-specific ARARs that exist for impacted soil at the site are briefly summarized below.

As indicated in the Revised Interim RAO Report, antimony, arsenic, and lead are the only CoIs for which PRGs were calculated for the Site. The primary chemical-specific ARAR considered during the development of the site-specific PRGs/RAOs for these three constituents is Ohio EPA's Division of Emergency and Remedial Response (DERR) Voluntary Action Program (VAP) (Ohio EPA, 2009) generic numerical standards presented in Ohio Administrative Code (OAC) 3745-300-08.

The OAC presents generic direct-contact standards (GDCS) that are based on a single chemical exposure resulting from ingestion of soil, dermal contact with soil, and inhalation of volatile and particulate emissions from soil. The Ohio VAP soil GDCS for antimony, arsenic, and lead are presented in the following table. Note that the VAP also allows for the calculation of site-specific standards under OAC 3745-300-09. In addition, the VAP does not provide soil GDCS for either a Recreational or Trespassing scenario. For those scenarios, the Ohio VAP provides that applicable standards are to be derived in accordance with OAC 3745-300-09.

Table 3-1 – Chemical-Specific ARARs for Antimony, Arsenic, and Lead

Constituent	Residential Land Use (mg/kg)	Construction and Excavation Activities (mg/kg)	Commercial/Industrial Land Use (mg/kg)
Antimony	30	390	1,200
Arsenic	6.7[1]	420	82
Lead	400	750	1,800

Note:

1. Ohio EPA's June 14, 2011 comment letter on the Interim RAO Report directed that the site-specific background value of 33 mg/kg should be used as the PRG for arsenic when risk-based values are below this concentration, as is the case under a residential land use scenario.

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3.1.2 Action-Specific ARARs

Potentially applicable action-specific ARARs are summarized in Table 2. Action-specific ARARs include general health and safety requirements, and general requirements regarding handling and disposal of waste materials (including transportation and disposal, permitting, manifesting, disposal and treatment facilities, etc.), discharge of water generated during implementation of remedial alternatives, and air monitoring requirements (including permitting requirements for onsite treatment systems). Action-specific criteria would be identified for the selected remedy in a remedial design work plan; compliance with these criteria will be required. Several action-specific ARARs that may be applicable are briefly summarized below.

The United States Department of Transportation (USDOT) and Ohio State rules for the transport of hazardous materials are provided in the 49 code of federal regulations (CFR) Parts 107 and 171.1 through 172.558 and OAC 3745-52-11, 12, 14, 20, 22, 23, 30-34, 40, and 41. These rules include procedures for packaging, labeling, manifesting and transporting hazardous materials and are potentially applicable to the transport of hazardous materials under any potential remedial alternative. During site remedial activities, contractors transporting waste materials to appropriate offsite must be properly licensed and/or permitted.

Additionally, OAC 3745-32 provides requirements for obtaining 401 water quality certification and OAC 3745-39 regulates sources to protect water quality and to establish a comprehensive storm water management program. OAC 3745-15-07 and 08 prohibits the emission/discharge of substances that endanger the health, safety or welfare of the public, or cause unreasonable injury or damage to property and dictates air quality levels.

Remedial alternatives conducted within the site must comply with applicable requirements outlined under the Occupational Safety and Health Administration (OSHA). General industry standards are outlined under OSHA (29 CFR 1910) that specify time-weighted average concentrations for worker exposure to various compounds and training requirements for workers involved with hazardous waste operations. The types of safety equipment and procedures to be followed during site remediation are specified under 29 CFR 1926, and record keeping and reporting-related regulations are outlined under 29 CFR 1904.

In addition to OSHA requirements, the Resource Conservation and Recovery Act (RCRA) (40 CFR 264) preparedness and prevention procedures, contingency plan and emergency procedures are potentially relevant and appropriate to those remedial alternatives that include generation, treatment or storage of hazardous wastes.

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3.1.3 Location-Specific ARARs

Potentially applicable location-specific ARARs are summarized in Table 3. Examples of potential location-specific ARARs include regulations and federal acts concerning activities conducted in floodplains, wetlands and historical areas, and activities affecting navigable waters and endangered/threatened or rare species.

Based on the Federal Emergency Management Agency (FEMA) National Flood Insurance Program Map Number 39129C0325H (dated September 30), 1999 portions of the OCA (i.e., west of U.S. Route 23) are located within the limits of a 100-year floodplain. Location-specific ARARs may also include local requirements, such as local building permit conditions for permanent or semi-permanent facilities constructed during the remedial activities (if any), and influent/pre-treatment requirements for discharging water to the local Publicly Owned Treatment Works (POTW) (if water treatment is deemed necessary in support of remedial activities). Finally, OAC 3745-1-51 and -54 provides wetland protection requirements and requires no net loss of wetland acreage.

3.2 Preliminary Remedial Goals and Remedial Action Objectives

The primary purpose of the Revised Interim RAO Report was to provide details regarding the development of the site-specific PRGs and RAOs that would be used as the basis for developing potential remedial alternatives for the Site. This section presents an overview of the PRGs and RAOs for impacted media, as identified in the Revised Interim RAO Report.

3.2.1 Summary of Preliminary Remedial Goals

PRGs are media specific concentrations that are not expected to result in unacceptable risks to human health and the environment. PRGs for the site were developed based on both current and potential future site activities using ARARs provided under Ohio EPA's VAP (i.e., GDCS; where available), USEPA's Regional Screening Levels (RSLs), and calculated risk-based PRGs, as permitted under Ohio EPA's VAP. Note that Ohio EPA directed that when the scenario-specific, risk-based PRGs calculated for arsenic were greater than the site-specific background level of 33 mg/kg, the background concentration should be used as the PRG. Specific details regarding the development of PRGs were presented in Sections 3.3 and 3.4 of the Revised Interim RAO Report. The following table provides a summary of the PRGs applicable to each AoI on a risk- and exposure scenario-basis, as summarized in Section 3.5 of the Revised Interim RAO Report.

Table 3-2 – Summary of PRGs Potentially Applicable to the Site

Exposure Scenario	Constituent	Risk-Based PRG[1] (mg/kg)	USEPA RSL PRG[2] (mg/kg)	VAP PRG[3] (mg/kg)	Selected PRGs (mg/kg)
Current Site Worker	Antimony	---	---	---	---
	Arsenic	---	---	---	---
	Lead	9,810	---	---	9,810
Future Site Worker	Antimony	454	410	1,200	410
	Arsenic	1.77	1.6	82	33[5]
	Lead	2,240	800	1,800	800[6]
Current/Future Recreational User/Trespasser	Antimony	146	---	---	146
	Arsenic	1.82	---	---	33[5]
	Lead (GE) Lead (Ohio EPA)	4,905 1,505	---	---	1,505
Hypothetical Residential Land Use	Antimony	---	31	30	30
	Arsenic	---	0.39	6.7	33[5]
	Lead	---	400	400	400
Future Construction/ Excavation Worker	Antimony	1,550	---	390	390
	Arsenic	166	---	420	420
	Lead	---	---	750	750

Notes:

1. Risk-based PRGs developed by GE for the Interim RAO Report or Ohio EPA, as described in Sections 3.3 and 3.4 of that document.
2. EPA RSLs for constituents other than lead are based on either a 10^{-6} risk level or a hazard index of 1.
3. Generic chemical-specific GDCS contained in Ohio EPA's VAP.
4. --- Indicates that PRG is not available or has not been developed for the given scenario.
5. Per Ohio EPA's June 14, 2011 comment letter on an earlier version of the Revised Interim RAO Report, the site-specific background concentration of 33 mg/kg for arsenic is to be used as the PRG when the scenario-specific risk-based values are below this concentration.
6. Ohio EPA specified the use of EPA's lead RSL of 800 mg/kg for the future site worker exposure scenario.

3.2.2 Summary of Remedial Action Objectives

Consistent with the RI/FS Work Plan (as amended) site-specific RAOs were developed specific to CoIs, media of interest, potential exposure pathways, and remediation goals. As summarized in Section 3.6 of the Revised Interim RAO Report, achievement of the following RAOs (which were developed based on the results of the RI, HHRA, and Phase I ERA, and the PRGs) will be protective of human health and the environment:

1. Implement/maintain measures to prevent future residential use of the "developed" portion of the former plant site (i.e., former manufacturing area [which includes the former RMHA], EFA, East Swale, and South Ditch) and the portions of the OCA owned by the Richard's entities.

2. Implement/maintain measures to prevent Current and Potential Future Site Worker exposure to EFA sludge.

3. Prevent Current/Future Site Worker direct exposure to soils/sediments within the Former Manufacturing Area (which includes the former RMHA), EFA, East Swale/South Ditch, and Upper Creek Area that contain: (1) exposure point concentrations (EPCs) of antimony, arsenic, or lead above the appropriate PRGs calculated using the 95% Upper Confidence Limit (UCL); or, (2) discrete concentrations of antimony, arsenic, or lead above the appropriate PRGs.

4. Prevent Future Construction/Excavation Worker direct exposure to soils/sediments within the Former Manufacturing Area (which includes the former RMHA), East Swale/South Ditch, and Upper Creek Area that contain: (1) EPCs of antimony, arsenic, or lead above the appropriate PRGs calculated using the 95% UCL; or, (2) discrete concentrations of antimony, arsenic, or lead above the appropriate PRGs.

5. Prevent Recreational User/Trespasser direct exposure to soils/sediments in the East Swale/South Ditch, Upper Creek Area, and Deltaic/Non-Deltaic portions of the OCA that contain: (1) EPCs of antimony, arsenic, or lead above the appropriate PRGs calculated using the 95% Upper Confidence Limit (UCL); or, (2) discrete concentrations of antimony, arsenic, or lead above the appropriate PRGs.

6. Prevent Future Resident direct exposure to soils/sediments within the Upper Creek Area and Deltaic/Non-Deltaic portions of the OCA that contain: (1) EPCs of antimony, arsenic, or lead above the appropriate PRGs calculated using the 95% Upper Confidence Limit (UCL); or, (2) discrete concentrations of antimony, arsenic, or lead above the appropriate PRGs.

Section 5 of this FS Report presents an evaluation of potential remedial alternatives relative to their ability to meet the above-listed RAOs. As described therein, compliance with the PRGs was evaluated using the following two scenarios: (1) a 95% UCL removal scenario; and, (2) a discrete removal scenario.

In general, a 95% UCL removal scenario would involve the calculation of a 95% UCL concentration for each CoI within each AoI (or evaluation area, as further described in Section 5.2.2) for comparison to the applicable PRGs to determine the potential need for remedial action. To determine the potential volume of soil removal that would be required under this scenario, soils/sediments containing the highest concentrations of the CoIs would be removed until the revised 95% UCL concentration for each CoI is below the applicable PRGs for the AoI (or evaluation area). For a discrete removal scenario, the chemical-specific concentrations would be compared to the PRGs on a point-by-point (or discrete) basis and all soils/sediments containing discrete concentrations of CoIs at concentrations greater than the applicable PRGs would be removed. For the purposes of this FS Report, both removal scenarios focused solely on achievement of the specified lead PRGs, since: (1) a preliminary review of the arsenic and antimony data indicated that the elevated concentrations of those constituents were generally collocated with lead samples requiring remediation under either the 95% UCL or discrete removal scenarios; and (2) the data set for lead is significantly larger than the data sets for either antimony or arsenic.

Note that the 95% UCL approach is consistent with Ohio EPA's VAP. Under the VAP, the 95% UCL on the arithmetic mean of a given data set can be used to determine which soils may potentially be subject to remedial action. Moreover, USEPA's recommended methodology for evaluating potential exposures to lead in soil specifies that the arithmetic mean concentration can be used as the EPC; further indicating that use of a mean value was consistent with meeting the site risk goals.

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4. Identification/Screening of Technologies and Development of Alternatives

This section provides a listing of GRAs for use in the development of potential remedial actions at the Site. This section also presents the identification and screening of technology types and process options that are used to develop potential remedial alternatives for addressing impacted site media.

4.1 General Response Actions

GRAs represent general categories of the types of remedial actions that may be considered to achieve and comply with ARARs and the RAOs established for the Site. GRAs may be used individually or in combination to achieve the ARARs and RAOs. Based on the ARARs and RAOs identified in Section 3, the following GRAs have been established for soil/sediment in the East Swale, South Ditch, Upper Creek Area, deltaic and non-deltaic portions of the OCA, and the former RMHA.

- No Action
- Institutional Controls
- Monitoring and/or Adaptive Management
- Source Control/Natural Recovery
- Containment
- In-Situ Treatment
- Ex-Situ Treatment
- Removal
- Dewatering
- Disposal
- Residuals Management

4.2 Identification and Screening of Technology Types and Process Options

The term “technology type” refers to a general category of technologies appropriate to the site-specific conditions and impacts, such as chemical treatment, immobilization, biodegradation, capping, etc. The term “technology process option” refers to a specific process within a technology type. For each GRA identified, a number of technology types and associated technology process options were identified. In accordance with USEPA guidance (October 1988), potentially applicable technology types and process options were evaluated using the following process:

- An initial identification and screening process of a wide array of potentially applicable remedial technologies was performed based on technical implementability (i.e., considering site-specific issues and conditions).

- Once the technology types determined to be technically implementable were selected and the associated process options identified, they were further evaluated with respect to effectiveness, implementability, and relative costs.

The technology types and process options retained after the secondary screening process were then used to develop a set of potential remedial alternatives for the site-related impacts, which are presented in Section 5.

4.2.1 Initial Identification and Screening of Technology Types and Process Options

Potentially applicable remedial technology types and technology process options were identified for each GRA based on a variety of sources, including vendor information, engineering experience, and review of available literature.

The potentially applicable remedial technology types and technology process options were initially screened, as discussed above, on a technical implementability basis (i.e., implementability with respect to site conditions, chemical and/or physical characteristics of site materials, feasibility, and full-scale use) to select those remedial technology types and technology process options that can be potentially implemented at the site. Table 4 presents the results of the preliminary identification and screening of potential remedial technologies and process options.

Based on the preliminary screening, the following technology process options were not retained for further evaluation (as noted in Table 4):

- In-situ Stabilization/Solidification – This in-situ technology process option would not be appropriate for floodplain soil/sediment.

- In-situ Vitrification – This technology process option has not been demonstrated to be implementable in large scale operations, or in saturated media.

- Soil Washing – This technology process option would require the addition of water to sediment and saturated soils increasing the wastewater stream.

- Filtering Systems (plate & frame press, belt filter press, or centrifuge [solid-bowl]) – This technology process option is likely not applicable due to complexity of process and requirement to add water to sediment to create slurry, which creates an increased waste water treatment volume.

- Distillation – This technology process option is likely not applicable for heavy metals in an aqueous stream.

ARCADIS

4.2.2 Evaluation of Technology Types and Selection of Representative Process Options

Potentially applicable remedial technology types and technology process options retained during the initial identification and screening process were further screened on a medium- and area-specific basis to select the technology types and process options that could be implemented and would potentially be effective at achieving the site-specific RAOs. Technology process options were further evaluated relative to other technology process options of the same remedial technology type using the following criteria:

- *Effectiveness* – This criterion is focused on the ability of the process option to meet the site-specific RAOs, potential impacts to human health and the environment during remedial construction, and how proven and reliable the process is.

- *Implementability* – This criterion evaluates both the technical and administrative feasibility of implementing a technology process option.

- *Cost* – This criterion evaluates relative costs (i.e., high, moderate, or low) of process options under each technology type.

Note that the selection of a particular process option is intended to streamline the development of potential remedial alternatives and does not remove other initially retained process options in a technology type from potential use (i.e., a process option that is not selected in this evaluation could be considered during remedial design, if its technology type is part of the selected remedial alternative).

A summary of the soil/sediment remedial technology types, the technology process options and the basis for retaining the technology types and process options through the screening step is presented in Table 5 and is summarized below.

<u>No Action</u>

The remedial technology type screened under this GRA consists of No Further Action. As required by the CERCLA guidance, the “No Action” technology has been included and retained through the screening evaluation. By definition, there are no remediation technology types under such a scenario. The “No Action” alternative is readily implementable at no additional cost and was retained to serve as a baseline against which other alternatives will be compared.

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Institutional Controls

The remedial technology types identified under this GRA consist of non-intrusive controls focused on minimizing potential exposure to impacted media. The remedial technology types screened under this GRA consist of enforcement and permit controls, and government controls. Technology process options screened under these remedial technology types include access and deed restrictions. Institutional controls would be utilized to limit permissible future uses of the site, as well as establish health and safety requirements to be followed during subsurface activities that could result in future construction worker exposure to impacted soil/sediment.

Institutional controls will not achieve the site-specific RAOs as a stand-alone process, as these measures would not treat, contain or remove impacted soil/sediment. However, this process option was retained because institutional controls can be implemented in conjunction with other remedial technologies to reduce the potential for exposure to impacted soil. Moreover, institutional controls, in the form of ECs, have already been established for the following portions of the Site:

- An EC for a portion of the former plant area. The EC includes activity and use limitations restricting possible future uses of the industrialized portion of the site, including the EFA, the East Swale, and identified portions of the South Ditch. The EC was executed by all parties and recorded on January 9, 2012 in the office of the Pickaway County Recorder (Appendix A).

- An EC for the deltaic and non-deltaic portions of the OCA owned by Richards Entities (i.e., Richards Farms, Inc., Richards Land Company, William J. Richards, and Grace S. Richards). The EC includes activity and use limitations restricting possible future uses of the OCA, and prohibits the use of groundwater for any potable purposes. The EC was executed by all parties and recorded on August 24, 2012 in the office of the Pickaway County Recorder (Appendix B).

Monitoring and/or Adaptive Management

The remedial technology type associated with this GRA consists of measures to monitor natural recovery processes at the AoIs by means of collecting and analyzing soil/sediment samples and recording field observations. The remedial technology type evaluated under this GRA consists of monitoring and/or adaptive management.

Monitoring and/or adaptive management will not achieve the soil RAOs as a stand-alone process, as these measures would not treat, contain, or remove impacted soil/sediment. However, this process option was retained because monitoring and/or adaptive management are reliable means to document site conditions, and can be implemented in conjunction with other remedial technologies to evaluate the effectiveness of a remedial action.

Source Control/Natural Recovery

The remedial technology types associated with this GRA consist of measures and natural processes to address impacted media by reducing source mobility. The remedial technology types and process options evaluated under this GRA consist of source control and natural recovery.

Source control activities have been substantially completed at the Site. Several interim or emergency actions have been conducted at the Site to improve environmental conditions and/or facilitate more efficient operations (i.e., before the plant ceased operations). As summarized in the RI Report, no additional site-related sources have been identified since the cessation of plant operations and the completion of the associated source control activities. Natural recovery processes are ongoing at the site. These natural processes include physical (e.g., sedimentation, dilution), chemical (e.g., stabilization, degradation) and biological (e.g., stabilization, degradation, accumulation) processes. However, any reduction of risk through natural chemical and biological processes would be expected to require a long period of time to achieve the site-specific RAOs.

Neither source control nor natural recovery technology process options were retained for further evaluation. While each of these technology process options is readily implementable, implementation of source control and natural recovery would not provide any significant reduction to potential future exposures to impacts and would not achieve the majority of the site-specific RAOs in a reasonable timeframe.

Containment

The remedial technology types associated with this GRA consist of measures to address the impacted media by reducing mobility and/or the potential for exposure without removal or treatment. The remedial technology types evaluated under this GRA consist of in-place containment and engineering controls. Technology process options screened under these remedial technology types include:

- Engineered cap/cover (in-place containment)
- Hydraulic modification/rechannelization (engineering controls)

Installing an engineered cap/cover involves the placement of single or multiple layers of clean materials (e.g., topsoil, sand, gravel, cobbles, synthetic materials, etc.) over impacted soil/sediment to supplement the existing overburden and provide additional isolation from impacted materials. For aquatic systems, the addition of an armor layer (i.e., cobbles) could be added to enhance the cap's ability to resist erosional forces or to provide specific substrate for benthic invertebrates or other fauna. Geotextiles or Geomembranes could also be used as filtration and/or separation layers. This technology is readily implementable and should be effective in isolating COIs and achieving site-specific RAOs. This technology process option was retained for further evaluation. However, capping the flood plain/creek may alter storm water conveyance.

Hydraulic modification/rechannelization was not retained for further evaluation. While this technology process option is readily implementable, construction/installation of surface water control structures would not provide any significant reduction to potential exposures to impacts.

In-Situ Treatment

The remedial technology types associated with this GRA consist of those that treat impacted soil/sediment in-situ (i.e., without removal). These technologies would actively address site-related COIs in soil/sediment to achieve the site-specific RAOs. The remedial technology types evaluated under this GRA consist of physical, biological, and chemical treatment. Technology process options screened under these remedial technology types include:

- Soil flushing (physical treatment)
- Enhanced bioremediation and phytoremediation (biological treatment)
- Chemical reduction/oxidation (chemical treatment)

The above-listed treatment technologies have not been demonstrated to be effective for in-situ soil/sediment, and the overall effectiveness can be significantly reduced depending on the soil types, water content, and the presence of debris or other objects within the soil layers. In general, the availability of specialized equipment and personnel involved with these in-situ treatment technologies is limited and more costly than other technology types associated with other GRAs. Finally, these process options would likely not be efficient or effective in achieving the site-specific RAOs. Therefore, none of the process options were retained for further evaluation.

ARCADIS

Ex-Situ Treatment

The remedial technology types associated with this GRA consist of those that treat or stabilize impacted soil/sediment ex-situ (i.e., following removal, typically through excavation). These technologies, as well as in-situ soil/sediment treatment, would actively address site-related CoIs in soil/sediment to achieve the site-specific RAOs. The remedial technology types evaluated under this GRA consist of physical and chemical treatment. Technology process options screened under these remedial technology types include:

- Stabilization/solidification (physical treatment)
- Physical separation (physical treatment)
- Chemical reduction/oxidation (chemical treatment)

Stabilization/solidification would not achieve the site-specific RAOs as a stand-alone process. However, this process option can be implemented in conjunction with other technologies or process options to treat site-related impacts and potentially achieve the site-specific RAOs. Since, removed soil/sediment will need to be disposed of; treatment of soils/sediments to address free liquids and/or to stabilize potential leachable contaminants in the removed materials may become necessary to meet licensed disposal facility requirements. Therefore, in order to meet these potential requirements, ex-situ stabilization/solidification will be retained for further evaluation as the representative process option under treatment.

Physical separation, which separates contaminated and clean materials, could be effective in the physical treatment of impacted site media; however this technology type has limitations, particularly the requirement that soil/sediment entering the treatment system must meet certain moisture content and particle size requirements. Based on the potential high water content of the impacted site materials and the relative homogeneity of the impacted site media (i.e., lead-containing glass particles are not anticipated to be easily separated from excavated soils/sediments) this technology type was not retained for further evaluation.

Chemical reduction/oxidation was not retained for further evaluation due to general ineffectiveness at addressing site-related impacted soil/sediment, and because this process option would not achieve the majority of the site-specific RAOs.

Removal

The remedial technology type associated with this GRA consists of measures to remove impacted soil/sediment from the ground. The remedial technology type evaluated under this GRA consists of excavation. The technology process option screened under this remedial technology type includes mechanical excavation.

Excavation involves the use of an excavator (or similar equipment) to directly remove soil/sediment from targeted areas and place materials into trucks for transport to the processing or offsite disposal facilities. Measures can be taken to isolate excavation areas and to dewater these excavation areas to minimize/eliminate the need to treat excavation liquids. Berm or dam structures such as sheet piling or Jersey barriers and can be placed in the surface water channel to divert water flow. In addition, pumps can used to both pump water around the excavation and dewater an isolated section to allow for relatively dry removal activities.

Excavation is a proven technology to address impacted material and was retained for further evaluation. This process option was retained because it would be effective at minimizing potential future exposures and could be implemented (i.e., equipment and contractors needed to complete soil removal are readily available).

Dewatering

The remedial technology type associated with this GRA consists of measures to stockpile the soil/sediments, allowing excess water to drain via gravity flow into excavation areas or an area where it is collected and then removed for treatment. The remedial technology type evaluated for this GRA consists of gravity drainage, which requires a stockpile next to an active excavation area (lined if on soils/sediments not subject to future excavation) or a lined staging area elsewhere at the Site, with adequate room for stockpiling materials and collection of dewatered liquids.

This technology type was retained for further evaluation because dewatering may be necessary prior to disposal to stabilize excavated soil/sediment with high water content. However, the final decision regarding the most appropriate soil/sediment dewatering method will be made during the remedial design phase.

Disposal

Remedial technology types associated with this GRA consist of measures to dispose of impacted soil/sediment onsite or offsite after soil/sediment has been excavated or otherwise removed from the ground. The remedial technology types evaluated under this GRA consist of onsite consolidation and offsite disposal. Technology process options screened under these remedial technology types include:

- Confined disposal (onsite consolidation)
- Permitted landfill (offsite disposal)

None of the soil/sediment disposal technology types will achieve the site-specific RAOs as stand-alone processes. However, the process options under these technology types were retained because these process options can be implemented in conjunction with other remedial technologies (e.g., removal, dewatering, residuals management, institutional controls/access restrictions) to minimize potential future exposures to site-related impacts. Additionally, soil/sediment disposal is a proven technology and is considered practicable, technically implementable, and administratively feasible.

Note that, while offsite disposal was retained, the final offsite disposal means, methods and facilities will be evaluated as part of the remedial design for the selected remedy. This will allow for an evaluation of the costs associated with this potential offsite disposal process, which can fluctuate significantly based on season, market conditions, and disposal facility capacity.

Residuals Management

The remedial technology types associated with this GRA consist of measures to control residuals generated from soil/sediment removal activities. The remedial technology types evaluated for this GRA consist of both onsite and offsite water treatment. Technology process options screened under these remedial technology types include:

- Filtration and package treatment process (onsite water treatment)
- Discharge to sanitary sewer/ WWTP (offsite water treatment)
- Collect, store, and transport to a licensed treatment facility (offsite water treatment)

Residuals requiring management will likely be generated from soil/sediment removal activities. Therefore, all of the residual management technology types and corresponding process options were retained for further evaluation. The most appropriate technology process option for residuals management will be evaluated during the remedial design phase.

In summary, the results of the initial identification and detailed evaluation of the remedial technology screening process for soil/sediment are presented in Tables 4 and 5, respectively. Remedial technologies retained for soil/sediment are summarized in the following table.

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Table 4-1 – Summary of Retained Technology Types and Process Options

GRA	Technology Type	Technology Process Option
No Action	No Action	No Further Action
Institutional Controls	Enforcement and Permit Controls	Access Restrictions
	Government Controls	Deed Restrictions
Monitoring and Adaptive Management	Monitoring and Adaptive Management	Monitoring and Adaptive Management
Containment	In-Place Containment	Engineered Cap/Cover
Ex-Situ Treatment	Physical Treatment	Ex-Situ Stabilization Solidification
Removal	Excavation	Mechanical
Dewatering	Gravity Drainage	Gravity Drainage
Disposal	On-Site Disposal	Confined Disposal
	Off-Site Disposal	Permitted Facility
Residuals Management	On-Site Water Treatment	Filtration
		Package Treatment Process
	Off-Site Water Treatment	Discharge to Sanitary Sewer/WWTP
		Collect, Store, and Transport to Licensed Treatment Facility

4.3 Development of Remedial Alternatives

This section presents site-wide remedial alternatives that have been developed based on the remedial technology types and process options retained through the screening process presented in Section 4.2.

As requested by Ohio EPA, a screening evaluation for a removal scenario for the EFA was developed for inclusion in this FS Report. Section 1.A.4.5.1 of the RI/FS Work Plan indicates that the Ohio EPA had previously estimated that the three sludge pits comprising the EFA had an approximate surface area of 2 acres with estimated sludge thicknesses ranging from 8 to 10 feet. Using these figures, it can be estimated that between approximately 25,800 and 32,300 cubic yards (cy) of sludge are present within the EFA. Assuming 50% of the excavated sludge was RCRA characteristic waste (i.e., the same assumption used for Alternatives 2 and 3, as further described in Section 5.2), the excavation and off-site disposal costs alone for the EFA sludge would approach $10 million dollars. Under such a scenario, there would also be increased costs associated with the acquisition and placement of clean backfill. Finally, using the same excavation production rates and truck capacities used for Alternatives 2 and 3 (as described in Section 5.2 below), such a sludge removal scenario for the EFA would add 3,000 to 4,000 truck trips to transport all of the excavated sludge from the site and clean backfill material to the site and extend the project duration significantly.

Based on the screening evaluation presented above, it is obvious that implementation of an excavation and off-site disposal alternative for the EFA sludge would be cost-prohibitive. It should also be noted that the scope of the investigation activities proposed in the Ohio EPA-approved RI/FS Work Plan did not contemplate a removal scenario for the EFA. Rather, the investigation activities were designed to confirm the areal extent of the sludge and the presence or absence of impacts to groundwater associated with the sludge. The Ohio EPA-approved RI Report confirmed the assumption regarding the absence of impacts to groundwater from the sludge within the EFA and no further investigations were required by the Ohio EPA. Finally, the EC that was entered into by the Respondents, the current property owners, and the Ohio EPA for the formerly developed portion of the former Plant Site (inclusive of the EFA) explicitly prohibits the disturbance of the existing or future soil cover over the EFA. For these reasons, the requested excavation and off-site disposal alternative for the EFA sludge was not retained for further evaluation in this FS Report. The remainder of this section provides information regarding the remedial alternatives that have been developed for the Site.

4.3.1 Process for Development of Alternatives

Retained remedial technology types and technology process options were combined into remedial alternatives that have the potential to achieve or work toward achieving the site-specific RAOs. As required by CERCLA guidance the “No-Action” alternative will be included as a baseline for evaluation. Additional alternatives were developed based on current, intended, and reasonably anticipated future use of the site.

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4.3.2 Assembly of Alternatives

Remedial alternatives that have been assembled and developed for addressing impacted site media are presented below. Technical descriptions and detailed evaluations of the remedial alternatives are presented in Section 5.

Alternative 1 – No Further Action

This alternative was retained for evaluation as required by CERCLA guidance. Under this alternative, no remedial activities would be completed to address site-related impacts to sediment and/or soil. The "No Further Action" alternative serves as the baseline for comparison of the overall effectiveness of the other remedial alternatives.

As previously indicated in Section 4.2.2, institutional controls have been already implemented at the site to limit the potential for human exposures to site-related CoIs in soils/sediment and sludge. However, under the "No further Action Alternative" annual verification of those institutional controls is not included.

Alternative 2 – 95% UCL Removal Scenario

Under this alternative, soil/sediment containing lead, antimony, and arsenic at concentrations greater than PRGs would be removed until the constituent concentrations remaining in soil/sediment resulted in 95% UCL concentrations that are not greater than the applicable PRG. Under this scenario, the 95% UCL concentrations were calculated using USEPA's ProUCL software (Version 4.1). A total of approximately 3,715 cubic yards (cy) to 4,260 cy of material (depending on whether soil removal is performed beneath paved portions of the former RMHA) would be removed under this alternative to achieve the lead PRG applicable to each AoI (or evaluation area). All excavated materials would be subject to disposal at appropriately permitted off-site disposal facilities.

Additionally, Alternative 2 would include the rehabilitation of the EFA, involving the clearing and grubbing of the EFA, repair of the existing soil cover followed by installation of a soil cover one foot in thickness to improve the cover and repair/replacement/new installation of an estimated 25% of the existing fencing around the EFA. Alternative 2 would also include annual site inspection and maintenance activities (e.g., minor fence repairs, mowing/clearing of vegetation, and minor soil cover repairs), as required, of the EFA cover. In addition, Alternative 2 would include annual verification of institutional controls (i.e., environmental covenants), that have been established for the formerly developed portion of the plant site, as well as deltaic and non-deltaic portions of the OCA. In support of this alternative, an operations and maintenance plan (O&M Plan) would be prepared to document management protocols for inspections, maintenance, verification of institutional controls and potential future excavation activities that may be conducted at the Site.

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Alternative 3 – Discrete Removal Scenario

Alternative 3 is identical to Alternative 2, except the limits of removal would be based on the discrete removal of soil/sediment containing antimony, arsenic and lead at concentrations greater than the applicable PRGs. Under this alternative, a total of approximately 10,180 cy to 11,460 cy of material (depending on whether soil removal is performed beneath paved portions of the former RMHA) would be removed to achieve the lead PRG applicable to each AoI.

Similar to Alternative 2, Alternative 3 would include the rehabilitation of the EFA, involving the clearing and grubbing of the EFA, repair of the existing soil cover followed by installation of a soil cover one foot in thickness to improve the cover and repair/replacement/new installation of an estimated 25% of the existing fencing around the EFA. Alternative 3 would also include annual site inspection and maintenance activities (e.g., minor fence repairs, mowing/clearing of vegetation, and minor soil cover repairs), as required, of the EFA cover. In addition, Alternative 3 would include annual verification of institutional controls (i.e., environmental covenants), that have been established for the formerly developed portion of the plant site, as well as deltaic and non-deltaic portions of the OCA. In support of this alternative, an O&M Plan would be prepared to document management protocols for inspections, maintenance, verification of institutional controls and potential future excavation activities that may be conducted at the Site.

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5. Detailed Analysis of Alternatives

This section presents detailed descriptions of the remedial alternatives identified in Section 4 to achieve the site-specific RAOs. Each of the remedial alternatives is evaluated with respect to the evaluation criteria presented in CERCLA guidance (USEPA, 1988).

5.1 Description and Evaluation of Criteria

Consistent with the CERCLA guidance (USEPA, 1988) and Ohio EPA guidance (Ohio EPA, 2006), the detailed evaluation of remedial alternatives presented in this section consists of an evaluation of each assembled alternative against the following criteria:

- Overall Protection of Human Health and the Environment – Assesses the ability of each alternative to adequately protect human health and the environment from unacceptable risks posed by site impacts by eliminating, reducing or controlling exposures.

- Compliance with Applicable or Relevant and Appropriate Requirements – Assesses the ability of an alternative to meet the applicable or relevant and appropriate standards, criteria, and requirements of federal, state, and local laws. As indicated previously, for the purpose of this FS Report, ARARs are evaluated on a chemical-, action-, and location-specific basis.

- Long-Term Effectiveness and Permanence – Considers the nature and magnitude of residual risk remaining following remedial construction; the type, degree, and adequacy of long-term management required; the long-term reliability of engineering and institutional controls; and the need for repair/replacement to maintain the performance of the remedy.

- Reduction of Toxicity, Mobility, or Volume through Treatment – Assesses the treatment/recycling processes used by the alternative; the amount of impacts destroyed, treated, or recycled; the degree of reduction in toxicity, mobility, or volume; the degree to which treatment is irreversible; the type and quantity of residual that would remain; the degree to which treatment reduces the exposures; and the degree to which the transfer of impacts from one media to another media is reduced.

- Short-Term Effectiveness – Considers short-term risks to the community during remedial construction; the potential impacts to site workers and the environment during remedial construction and the reliability of protective measures; and the time required to meet remedial goals/site-specific RAOs.

- Implementability – Assesses the technical feasibility (i.e., difficulty and operational reliability of remedial construction, and ability to monitor the effectiveness), administrative feasibility (i.e., ability to coordinate with local, state, and federal agencies to obtain permits and approvals), and feasibility of obtaining services and materials (i.e., availability of the technology, services, materials, equipment, resources, and specialists).

- Cost – Considers the direct and indirect capital costs and annual O&M costs. For alternatives that are expected to last more than 2 years, a net present value of capital and O&M costs is determined assuming a 4% discount (i.e., interest) rate. For the purpose of this FS Report, a 20% contingency factor has been included to cover unforeseen costs incurred during implementation of the alternatives. The costs presented in this FS Report are estimated to an anticipated accuracy between -30% and +50%.

In accordance with the Ohio EPA guidance (Ohio EPA, 2006) community acceptance, will be addressed following submittal of this FS Report through a public comment period on the proposed remedy.

5.2 Individual Analysis of Alternatives

This subsection presents the detailed analysis of each of the alternatives previously identified in Section 3.

- Alternative 1 – No Action
- Alternative 2 – 95% UCL Removal Scenario
- Alternative 3 – Discrete Removal Scenario

Each alternative is generally described in the following section, then evaluated using the criteria described above (as indicated, public acceptance will be evaluated following submittal of this FS Report through a public comment period on the proposed remedy).

5.2.1 Alternative 1 – No Further Action

The “No Further Action” alternative was retained for evaluation as required by the CERCLA guidance. The “No Further Action” alternative serves as the baseline for comparison of the overall effectiveness of the other remedial alternatives. The “No Further Action” alternative would not involve implementation of any remedial activities to address site-related impacts. The site would be allowed to remain in its current condition and no effort would be made to change or monitor the current site conditions.

As indicated in Section 4.2.2, ECs preventing residential use have already been secured for the formerly developed portion of the former plant area and the deltaic and non-deltaic portions of the OCA. As part of the "No Further Action" alternative, no effort would be made to verify that the institutional controls are in place and remain effective.

Overall Protection of Human Health and the Environment

The "No Further Action" alternative does not include active remedial measures to address impacted media. However, institutional controls have already been established to reduce the potential for exposures to site-related CoIs in soil/sediment located at formerly developed portions of the former plant site (i.e., the Former Manufacturing Area [including the RMHA], EFA, East Swale, and South Ditch) and the deltaic and non-deltaic portions of the OCA.

The existing institutional controls prevent future residential use of the former plant area and portions of the OCA owned by Richard's Entities (RAO #1) and current and potential future site worker exposure to EFA sludge (RAO #2). In addition, the requirement for Site Management Plans (SMPs) in each EC (which will be satisfied through the preparation of O&M Plans) will manage safety practices and current/future site worker or construction/excavation worker exposure to material in the former manufacturing area, EFA, East Swale/South Ditch, and deltaic/non-deltaic portions of the OCA (RAOs #3 and #4), but would not prevent such exposures in the Upper Creek Area.

Finally, Alternative 1 would not prevent direct exposures to recreational users/trespassers to the East Swale/South Ditch, Upper Creek Area, and deltaic/non-deltaic portions of the OCA (RAO #5) or prevent residential exposures in the Upper Creek Area.

Compliance with ARARs

None of the chemical-, action-, or location-specific ARARs would be achieved, aside from those addressed through the implementation of existing ECs.

Long-Term Effectiveness and Permanence

Under the "No Further Action" alternative, soil/sediment containing CoIs at concentrations greater than PRGs would remain. Risks associated with exposure to remaining impacts would only be reduced by adhering to the institutional controls. As a result, this alternative is not considered effective on a long-term basis.

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Reduction of Toxicity, Mobility or Volume through Treatment

Under the "No Further Action" alternative, soil/sediment would not be treated, recycled, or destroyed (other than by natural processes). Therefore, the toxicity, mobility, and volume of environmental media containing site-related impacts would not be reduced.

Short-Term Effectiveness

No remedial actions would be implemented to address site impacts. Therefore, this alternative would not result in any short-term environmental impacts, or impacts to the surrounding community.

Implementability

The "No Further Action" alternative does not require implementation of any remedial activities, and therefore is technically and administratively implementable.

Cost

The "No Further Action" alternative does not involve implementation of any additional remedial activities or monitoring activities; therefore, there are no costs associated with this alternative.

5.2.2 Alternative 2 – 95% UCL Removal Scenario

Alternative 2 would include the removal of soil/sediment containing site-related impacts as necessary to achieve 95% UCL concentrations that are not greater than the specified PRGs. As noted in Section 3.2.2, for the purposes of developing the remedial alternatives and performing the comparative analyses of those alternatives in this FS Report, the 95% UCL removal scenario focused solely on achievement of the specified lead PRGs, since: (1) a preliminary review of the arsenic and antimony data indicated that the elevated concentrations of those constituents were generally collocated with lead samples requiring remediation under either the 95% UCL or discrete removal scenarios; and (2) the data set for lead is significantly larger than the data sets for either antimony or arsenic.

For the purposes of developing the volume and cost estimates provided in this FS Report, the data for the Site were evaluated using the following general procedures:

- Data sets were developed for each AoI for which PRGs were established in the Revised Interim RAO Report (i.e., the former RMHA; the East Swale; the South Ditch [west of the former outlet for the East Swale only (as there were no observed lead

concentrations greater than the unrestricted use PRG of 400 mg/kg east of the former outlet for the East Swale)]; the Upper Creek Area; and the OCA.

- As a conservative measure, the data sets for the South Ditch, Upper Creek Area, and OCA were further divided based on the following considerations: the relative size, topography, and/or the relative distribution of the observed lead concentrations. Specifically, areas of little or no observed impacts were evaluated separately from areas with elevated lead concentrations to avoid skewing the data set for those areas with higher concentrations. For example, the farm drainage ditch located along the western boundary of the OCA (designated as evaluation areas 5, 7, and 9) was evaluated separately from the areas to the east. Also, the areas south of transect 35 and north of transect 19 were evaluated separately from the other evaluations areas as the samples collected from these areas indicated very low levels of lead impacts. In summary, the South Ditch and Upper Creek Area were evaluated in two segments each and the OCA was split into 11 evaluation areas, as shown on Figures 4 through 7.

- The 95% UCL concentration was calculated for each data set for each AoI or evaluation area under current conditions. This includes the former RMHA which consists of both paved and unpaved areas, even though exposure to soils located beneath existing pavement at the former RMHA is limited due to the presence of such pavement (thereby satisfying the RAOs applicable to the developed portion of the former plant site).

- For AoIs or evaluation areas where the current 95% UCL lead concentration is greater than the applicable PRG, soil removal was simulated by removing the sample with the highest constituent concentration (and any samples at shallower sample increments), followed by recalculation of the 95% UCL of the remaining data set. This process was repeated until the calculated 95% UCL concentration of the data set was no longer greater than the applicable PRG. As a conservative measure, the post-remediation 95% UCL was calculated without assuming the placement of clean backfill materials, even though the inclusion of such materials would clearly represent actual post-remediation conditions and result in lower calculated post-remediation 95% UCL concentrations. As a result, the post-remediation 95% UCL concentrations presented herein are based solely on the data set remaining following the completion of any proposed remediation. At the request of Ohio EPA, the soil removal at the former RMHA was simulated by assuming: 1) that the existing pavement would be maintained (i.e., by removing only the unpaved soils associated with the samples containing the highest constituent concentrations), thereby limiting access to the underlying soils; and 2) that the existing pavement materials and underlying soils would be removed as necessary to achieve the applicable PRG.

- As yet another conservative measure, the preliminary limits of soil removal were then developed by extending the limits of removal to the nearest adjacent sampling location with lower constituent concentrations. If such a sampling location was not available, the limits of soil removal were extended to a topographic boundary feature (e.g., steep embankment on sides of East Swale, South Ditch, Upper Creek Area, Offsite Creek Area; culvert; drainage ditch/creek channel, etc.). Also, if a sample at depth required excavation, it was assumed that all overlying materials would also be excavated and subject to off-site disposal, regardless of the lead concentration(s) associated with such soils. Finally, as requested by Ohio EPA, the preliminary limits of soil removal for the former RMHA were developed assuming both the presence and absence of the pavement materials currently located in that area (see Figures C-25 and C-26).

Supporting documentation regarding the 95% UCL scenarios for each evaluation area are provided in Appendix C. Specifically, Tables C-1 through C-3 summarize the following information for each evaluation area: the 95% UCL concentration under existing and post-remediation conditions; the samples that would be removed under Alternative 2; and the samples that would remain in each evaluation area. The data output sheets from USEPA's ProUCL software for the 95% UCL calculations performed for existing and, where necessary, post-remediation conditions are also included in Appendix C. Finally, Figures C-1 through C-16 present the data used in the evaluations, and Figures C-17 through C-26 present both the limits of soil removal associated with Alternative 2 and the data upon which those removal limits are based.

Based on the general procedures described above, implementation of a 95% UCL removal scenario would result in the excavation of between approximately 3,715 cy and 4,260 cy of soil/sediment (depending on whether soil removal is performed beneath paved portions of the former RMHA). The anticipated limits of soil removal limits associated with Alternative 2 are shown on Figures 4 through 7 and a summary of the excavation volumes associated with the former RMHA, South Ditch, East Swale, Upper Creek Area and deltaic/non-deltaic portions of the OCA is presented in the following table.

Table 5-1 – Estimated Soil Removal Volumes for 95% UCL Removal Scenario

Area	Lead PRG (mg/kg)	Excavation Volume (cy)
Former RMHA (Excluding Removal in Paved Areas)	750	40
Former RMHA (Including Removal in Paved Areas)	750	585

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Area	Lead PRG (mg/kg)	Excavation Volume (cy)
East Swale	750	130
South Ditch	750	270
Upper Creek Area	400	880
Offsite Creek Area	1,505	2,395

The major remedial components of Alternative 2 include the following:

- Removal through excavation of soil/sediment, as necessary until the calculated 95% UCL concentrations for the remaining data set are not greater than the applicable PRGs;

- Transporting excavated material to appropriate offsite disposal facilities;

- Rehabilitation of the EFA, including: clearing and grubbing of existing vegetation; repair of existing cover and placement of a soil cover one foot in thickness over the entire EFA to improve the cover; and repair/replacement/expansion of the existing fencing around the EFA.

- Annual verification of the executed institutional controls (ECs) for the formerly developed portion of the plant site, as well as the deltaic and non-deltaic portions of the OCA.

- Preparing O&M Plans to manage risks to current and future site workers in the Former Manufacturing Area [including the RMHA], EFA, East Swale, South Ditch and the deltaic and non-deltaic portions of the OCA

Additional details regarding the anticipated activities associated with this alternative are presented below.

Prior to remedial construction activities, supplemental pre-design sampling could be conducted to refine/verify the extent of soil/sediment removal (i.e., within the South Ditch, East Swale, Upper Creek and Offsite Creek areas) and/or to assist with waste characterization activities.

In support of the remedial construction activities, erosion and sedimentation controls (e.g., silt fence, hay bales) would be installed around work areas to minimize disturbance to the surrounding environment. Also, community air monitoring would be conducted to monitor dust levels. In the event that action levels were exceeded, additional protection measures

would be implemented (e.g., water sprays, covering of stockpiles and/or open excavations, cessation of excavation activities, etc.). Additionally, work space monitoring would be conducted to verify that the conditions do not pose a risk to site workers.

Excavation activities would be conducted using conventional construction equipment such as backhoes, excavators, front-end loaders, dump trucks, etc. Support areas (i.e., decontamination and material staging areas) could be constructed at the former plant area and near the OCA to support remedial construction activities. Access roads would be constructed to facilitate excavation and management of excavated soil/sediment from the South Ditch and OCA. Temporary dams (e.g., earthen berms, sand bags, etc.) and bypass pumping would likely be utilized to divert surface water around active excavation areas. Water generated during remedial construction activities (e.g., during material dewatering, decontamination, etc.) would be pumped from material staging and decontamination areas to temporary holding tanks and subsequently transported offsite for treatment/disposal. Further onsite and/or offsite treatment/disposal options would be assessed during the design of this remedial alternative.

Following completion of the material removal activities, excavation areas would be restored to the pre-construction lines and grades with general fill and top soil, then vegetated with native grass mixtures, shrubs, trees, and/or wetland mixes to restore pre-construction conditions. In addition, the EFA would be rehabilitated as part of Alternative 2. EFA rehabilitation activities would include clearing and grubbing the existing trees/shrubs in the approximately 5 acre area, repair of the existing cover and importation and placement of 1 foot of general fill to improve the soil cover, and repair/replacement of the existing fencing, as well as installation of additional fencing as necessary to address any sludge that is located outside the current limits of the EFA. Future O&M activities would include periodic inspection and maintenance (as necessary) of site fencing and the EFA soil cover.

As indicated in Alternative 1, institutional controls have already been established for the formerly developed portion of the plant site and the portions of the OCA owned by the Richard's entities. Under Alternative 2, verification that the institutional controls remain in place would be conducted annually, with documentation provided to the Ohio EPA.

Upon completion of the remediation activities associated with Alternative 2, an O&M Plan would be prepared to document the following:

- The institutional controls that have been established and will be maintained for the site.
- Known locations of soil containing COIs greater than unrestricted access concentrations.

- Protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted materials encountered during future excavation/construction activities.

- Protocols for conducting annual site inspections and maintenance activities.

The remainder of this section provides the evaluation of Alternative 2 using the CERCLA evaluation criteria.

Overall Protection of Human Health and the Environment

Under Alternative 2, soil/sediment would be removed until the calculated 95% UCL concentrations for the remaining data set are not greater than the applicable PRGs, resulting in conditions that are protective of human health and the environment. In addition, the EFA rehabilitation (including repair/replacement/installation of new fencing), institutional controls, and O&M Plan components of Alternative 2 would reduce the potential for exposures to remaining impacted materials. Therefore, Alternative 2 is considered protective of human health and the environment.

Alternative 2 prevents future residential use of the former plant area and portions of the OCA own by the Richard's Entities (RAO #1) through the established institutional controls. Institutional controls as well as the EFA rehabilitation activities would prevent direct exposure for current and potential future site worker exposure to EFA sludge (RAO #2). Alternative 2 would also prevent direct exposure to soils/sediments that contain EPCs of antimony, arsenic, or lead above the appropriate PRGs for: current/future site workers in the former manufacturing area (including the former RMHA), EFA, East Swale/South Ditch and Upper Creek Area (RAOs #3 and #4); recreational users/trespassers in the East Swale/South Ditch, Upper Creek Area, and Deltaic/Non-Deltaic portions of the OCA (RAO #5); and future residents in the Upper Creek Area and Deltaic/Non-Deltaic portions of the OCA (RAO #6).

Compliance with ARARs

- *Chemical-Specific ARARs* – Chemical-specific ARARs are presented in Table 1. Potentially applicable chemical-specific ARARs include the Ohio VAP, and generic numerical standards presented in OAC 3745-300-08. Additionally, OAC 3745-300-09 allows for the calculation of site-specific standards. The PRGs presented in Section 3.2.1 were developed based on the Ohio VAP standard and site-specific risk calculations. Removal of soil/sediment to achieve a 95% UCL concentration less than the applicable PRGs would achieve the ARARs through the removal of soil/sediment that result in EPCs of antimony, arsenic, or lead above the appropriate PRGs.

- *Action-Specific ARARs* – Action-specific ARARs are presented in Table 2. Potentially applicable action-specific ARARs include health and safety requirements and regulations associated with handling impacted media. Work activities would be conducted in accordance with OSHA requirements that specify general industry standards, safety equipment and procedures, and record keeping and reporting regulations (i.e., 40 CFR 264, 29 CFR 1910, 1926, and 1904). Compliance with these action-specific ARARs would be accomplished by following a site-specific health and safety plan (HASP).

  Excavated material would be subject to USDOT and any additional state of Ohio requirements for packaging, labeling, manifesting, and transporting hazardous or regulated materials (i.e., 49 CFR Parts 107 and 171.1 through 172.558, and OAC 3745-52-11, 12, 14, 20, 22, 23, 30-34, 40, and 41). Compliance with these requirements, as well as ARARs related to air and water quality management, would be achieved by following an Ohio EPA-approved remedial design and using licensed waste transporters and permitted disposal facilities. All excavated material would be disposed of in accordance with applicable state and federal land disposal regulations (LDRs) (e.g., OAC 3745-270 and -57).

- *Location-Specific ARARs* – Potentially applicable location-specific ARARs are presented in Table 3 and generally include regulations on conducting construction/remedial activities within floodplains and wetlands. Compliance with these ARARs would be achieved by obtaining necessary permits prior to conducting site activities, by following an Ohio EPA-approved remedial design, and applicable City of Circleville building/construction codes and ordinances.

Long-Term Effectiveness and Permanence

Under Alternative 2, soil/sediment would be excavated as necessary until the calculated 95% UCL concentrations for the remaining data set are not greater than the applicable PRGs. Based on the soil/sediment removal limits of Alternative 2, the potential for long-term exposures to soil/sediment that result in EPCs of antimony, arsenic, or lead above the appropriate PRGs would be eliminated. Institutional controls, EFA rehabilitation (including repair/replacement/installation of new fencing), and an O&M Plan would be utilized to manage potential exposure to remaining/residual impacted materials. Additionally, annual verification of institutional controls and an annual site inspection and maintenance of the EFA soil cover and security fencing would further reduce the potential for long-term exposures to any remaining impacted media at the former plant site.

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Reduction of Toxicity, Mobility or Volume Treatment

As previously indicated, the mobility of site-related impacts is limited to soil/sediment transport (i.e., particulate transport). Alternative 2 would include the excavation of between approximately 3,715 cy to 4,260 cy of soil/sediment (depending on whether soil removal is performed beneath paved portions of the former RMHA), thereby resulting in a reduction of both mobility and volume. Excavated material would be transported to an appropriate off-site disposal facility based on the results of waste characterization sampling. Additionally, all project-related remediation waters would be transported offsite for treatment/disposal, as necessary. Finally, Alternative 2 would also include the installation of additional soil cover material to further reduce the potential exposure to and mobility of EFA sludge.

Short-Term Effectiveness

Implementation of this alternative could result in short-term exposure of the surrounding community as a result of excavation, material handling, and/or offsite transportation activities associated with soil/sediment removal in the East Swale, South Ditch, Upper Creek Area, and/or Offsite Creek Area. Short-term exposure of the surrounding community during EFA rehabilitation and site restoration activities would generally be limited to the transportation of restoration materials to the Site. Potential community exposure mechanisms to soil containing CoIs would mostly include inhalation of dust containing CoIs during remedial construction. Community air monitoring would be conducted to monitor dust levels during invasive activities and corrective measures (e.g., water spray, stockpile/excavation covers, excavation cessation, etc.) would be implemented if action levels were exceeded.

Potential human (i.e., remediation worker) exposure mechanisms would include ingestion and dermal contact with impacted soil/sediment, and inhalation of dust containing CoIs during remedial construction. Potential exposure of remedial workers during soil/sediment removal, EFA rehabilitation, and/or site restoration activities would be reduced through the use of appropriately trained field personnel, personal protective equipment (PPE), and work space air monitoring, as specified in a site-specific HASP that would be developed as part of the remedial design. Also, potential impacts to the environment during soil/sediment removal, EFA rehabilitation, and/or site restoration activities would be minimized through the use of erosion and sediment controls (e.g., silt fence, hay bales, silt curtains, etc.) and by implementing certain operational control measures (e.g., inspection of erosion and sediment controls, excavation survey, berms and covers around material stockpiles, flow diversion/bypass pumping, turbidity monitoring, etc.).

Additional worker and community safety concerns include working with and around large construction equipment, noise generated from operating construction equipment, and increased vehicle traffic associated with transportation of excavated material from the site and delivery of fill materials. These concerns would be reduced by using engineering controls and appropriate health and safety practices. Offsite transportation of excavated material and importation of clean fill materials would result in approximately 370 to 420 tractor trailer truck round trips (depending on whether soil removal is performed beneath paved portions of the former RMHA and assuming 35 tons per dump truck and 5,000 gallons per tank truck). Traffic control measures (e.g., flagmen, temporary barriers, and signs) would be used to direct vehicle traffic into and exiting the Site, as well as around the excavation areas.

Finally, assuming an excavation and backfilling production rate of 100 cy per day, it is estimated that Alternative 2 could be completed in approximately 3.5 to 4 months (again, depending on whether soil removal is performed beneath paved portions of the former RMHA and assuming 5 work days per week and 4.5 weeks per month), with post-construction annual verification of institutional controls, site inspections and maintenance conducted over an assumed 30-year period.

Implementability

Alternative 2 would be technically and administratively implementable. Excavation of soil/sediment, offsite transportation and disposal of excavated material and installation of a soil over the EFA cover does not require specialized equipment (beyond the potential use of low ground pressure equipment, tundra mats, and/or other equipment designed for use in wetland environments) and remedial contractors capable of performing these activities are readily available. Potential implementation challenges associated with this alternative include accessing the soil/sediment removal areas. Temporary construction roads would be constructed to facilitate access to the South Ditch, Upper Creek Area, and OCA. Remedial support areas would also likely be constructed in the vicinity of the Upper Creek Area and OCA. Additionally, bypass pumping will likely be required to divert surface water flow around certain soil/sediment removal areas.

Administratively, institutional controls in the form of ECs governing the future use and performance of invasive activities are already established for the formerly developed portion of the former plant area and the portions of the OCA owned by the Richard's entities. Further, access to sludge remaining in the EFA will be further restricted through the installation of an additional one foot of soil to improve the cover and repair/replacement of existing fencing and/or installation of new fencing around the EFA. Finally, access agreements and permits would be required for future excavation activities in the Upper Creek Area.

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Cost

The estimated costs associated with Alternative 2 are presented in Tables 6 through 11 and 18. The total estimated 30-year present worth cost for this alternative is approximately $4,010,000 to $4,390,000 (depending on whether soil removal is performed beneath paved portions of the former RMHA). The estimated capital cost, for conducting soil/sediment removal and backfilling activities, is $3,510,000 to $3,890,000 (again, depending on whether soil removal is performed beneath paved portions of the former RMHA). The estimated 30-year present worth cost of O&M activities associated with this alternative, including site inspection and maintenance, is approximately $500,000 (regardless of how much material is removed from the former RMHA).

5.2.3 Alternative 3 – Discrete Removal Scenario

The remedial actions associated with Alternative 3 are essentially the same as Alternative 2, with the only significant difference being the methodology utilized to determine the volume of soil/sediment subject to remediation. Therefore, the following description and evaluation of Alternative 3 is largely focused on information that differs from that provided previously for Alternative 2.

Alternative 3 would include removal activities to address soil/sediment containing site-related CoIs at discrete concentrations greater than applicable PRGs. The limits of soil removal for Alternative 3 were developed using the same procedures utilized to develop the limits of soil removal for Alternative 2, as described in Section 5.2.2. Figures C-27 through C-38 show the sample data within each evaluation area and present the limits of soil removal associated with Alternative 3. Based on the information provided on these figures, Alternative 3 would include the excavation of between approximately 10,180 cy and 11,460 cy of soil/sediment (depending on whether soil removal is performed beneath paved portions of the former RMHA). The anticipated soil removal limits are shown on Figures 8 through 11 and a summary of the excavation volumes associated with the former RMHA, South Ditch, East Swale, Upper Creek Area and deltaic/non-deltaic portions of the OCA is presented in the following table.

Table 5-2 – Estimated Soil Removal Volumes for Discrete Removal Scenario

Area	Lead PRG (mg/kg)	Excavation Volume (cy)
Former RMHA (Excluding Removal in Paved Areas)	750	245
Former RMHA (Including Removal in Paved Areas)	750	1,525

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Area	Lead PRG (mg/kg)	Excavation Volume (cy)
East Swale	750	1,200
South Ditch	750	1,210
Upper Creek Area	400	1,470
Offsite Creek Area	1,505	6,055

As previously indicated, the major components of Alternative 3 are essentially the same as Alternative 2, and would include: removing soil/sediment containing lead, arsenic, and antimony at discrete concentrations greater than applicable PRGs; transporting excavated material offsite for disposal; rehabilitation of the EFA (clearing and grubbing of existing vegetation, repair of the existing cover and placement of an additional one foot of soil cover to improve the cover, and repair/replacement/expansion of the existing fencing); and preparing an O&M Plan to manage risks to current and future site workers in the Former Manufacturing Area [including the RMHA], EFA, East Swale, South Ditch and the deltaic and non-deltaic portions of the OCA.

Overall Protectiveness of Human and the Environment

Alternative 3 would remove all the soils/sediments containing CoIs at discrete concentrations greater then applicable PRGs. The EFA rehabilitation (including repair/replacement/installation of new fencing) and O&M Plan components of Alternative 3 (which are similar to Alternative 2) would reduce the potential for exposures to remaining residual impacts. Therefore, Alternative 3 is considered protective of human health and the environment.

Alternative 3 satisfies RAO #1 and RAO #2 of the Revised Interim RAO Report in a similar manner as Alternative 2. With regard to RAOs #3 through #6, Alternative 3 would also accomplish those objectives by preventing direct exposure to soils/sediments that contain discrete concentrations of antimony, arsenic, or lead above the applicable PRGs with the excavation and removal of soil associated with those concentrations.

Compliance with ARARs

Similar to Alternative 2, Alternative 3 would also be compliant with the chemical-, action-, and location-specific ARARs identified in Tables 1 through 3, with the only difference being removal based on discrete concentrations for Alternative 3 as compared to removal based on EPCs calculated using a 95% UCL methodology (as is the case for Alternative 2).

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Long-Term Effectiveness and Permanence

Under Alternative 3, soil/sediment containing site-related CoIs at discrete concentrations greater than applicable PRGs would be excavated and transported offsite for disposal. Based on the soil removal limits of Alternative 3 and anticipated use of the AoIs, the potential for long-term exposures to site-related CoIs in soil/sediment at levels above the PRGs would be eliminated through the implementation of this alternative. The institutional controls, EFA rehabilitation, and requirements for O&M Plans under Alternative 3 are identical to those under Alternative 2.

Reduction of Toxicity, Mobility or Volume through Treatment

Similar to Alternative 2, Alternative 3 would result in reductions in the toxicity, mobility, and volume of impacted soil/sediment remaining at the Site by the excavation of 10,180 cy to 11,460 cy of soil/sediment (depending on whether soil removal is performed beneath paved portions of the former RMHA). Excavated material would be transported to an appropriate off-site disposal facility based on the results of waste characterization sampling. Additionally, all project-related remediation waters would be transported offsite for treatment/disposal, as necessary. Finally, Alternative 3 would also include the installation of additional soil cover material to further reduce the potential exposure to EFA sludge.

Short-Term Effectiveness

Implementation of Alternative 3 would be anticipated to result in similar short-term exposures of surrounding community, the environment, and site workers to site-related CoIs resulting from the excavation, material handling, and offsite transportation activities, as those associated with implementation of Alternative 2. Offsite transportation of excavated material and importation of clean fill materials would result in approximately 990 and 1,110 tractor trailer truck round trips (depending on whether soil removal is performed beneath paved portions of the former RMHA and assuming 35 tons per dump truck and 5,000 gallons per tank truck). Transportation activities would be managed in a manner similar to Alternative 2. Assuming an excavation and backfilling production rate of 100 cy per day, it is estimated that Alternative 3 could be completed in approximately 9.25 to 10.25 months (again, depending on whether soil removal is performed beneath paved portions of the former RMHA and assuming 5 work days per week and 4.5 weeks per month), with post-construction annual verification of institutional controls, site inspections and maintenance conducted over an assumed 30-year period.

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Implementability

Alternative 3 could be implemented using the same remedial contractors and equipment (albeit, more equipment might be necessary), as Alternative 2. Administratively, the institutional controls for Alternative 3 would be the same as Alternative 2 (with ECs already established for the formerly developed portion of the former plant area and the portions of the OCA owned by the Richard's entities). Finally, the access restrictions for Alternative 3 will be identical to those for Alternative 2.

Cost

The estimated costs associated with Alternative 3 are presented in Tables 12 through 18. The total estimated 30-year present worth cost for this alternative is approximately $7,570,000 to $8,300,000 (depending on whether soil removal is performed beneath paved portions of the former RMHA). The estimated capital cost, for conducting soil/sediment removal and backfilling activities, is $7,070,000 to $7,800,000 (again, depending on whether soil removal is performed beneath paved portions of the former RMHA). The estimated 30-year present worth cost of O&M activities associated with this alternative, including site inspection and maintenance is approximately $500,000 (regardless of how much material is removed from the former RMHA).

5.3 Comparative Analysis of Alternatives

This section presents the comparative analysis of each remedial alternative using the evaluation criteria identified in Section 5.1. The comparative analysis assesses the advantages and disadvantages of each alternative relative to each other and with respect to the evaluation criteria.

The alternatives evaluated in this Section consist of the following:

- Alternative 1 – No Action
- Alternative 2 – 95% UCL Removal Scenario
- Alternative 3 – Discrete Removal Scenario

The comparative analysis of these alternatives is presented in the following subsections. In addition, Table 19 summarized the following comparative analysis for these three remedial alternatives to evaluation criteria.

5.3.1 Overall Protection of Human Health and the Environment

Alternative 1 does not include any remedial measures. However, institutional controls in the form of ECs have been established for the formerly developed portion of the former plant site and the portions of the OCA owned by the Richard's entities, which prevent future residential use in these areas (RAO #1) and work toward preventing current and potential future site worker exposure to EFA sludge (RAO #2). Alternative 1 would not prevent site worker, construction/excavation worker, recreational user/trespasser, or future resident exposures to CoIs at concentrations above the PRGs in other AoIs (RAOs #3, #4, #5 and #6). Alternatives 2 and 3 both include the same institutional controls, but also include soil removal, EFA rehabilitation (including repair/replacement/installation of new fencing), and O&M Plan components. Therefore, all three alternatives would limit the potential for exposure to impacted media in the former plant area and the portions of the OCA owned by the Richard's entities (RAO #1) as well as current and potential future site worker exposures to EFA sludge (RAO #2).

Alternative 2 includes the removal of soil/sediment from select locations until the calculated 95% UCL concentrations for the remaining data set are not greater than the applicable PRGs, while Alternative 3 includes the removal of all the discrete soil/sediment locations containing CoIs at concentrations greater than PRGs. Both alternatives are protective of human health and the environment and achieve the established RAOs through the removal of soil/sediment with the highest concentrations of CoIs. However, Alternative 3 removes all of the soil/sediment containing discrete constituent concentrations at levels above the PRGs, excavating 6,465 cy to 7,200 cy more material than Alternative 2 (depending on whether soil removal is performed beneath paved portions of the former RMHA). As previously indicated, both USEPA and Ohio EPA recognize that the use of average concentrations (including 95% UCL on the arithmetic mean) to meet the established PRGs is protective of human health and the environment. Therefore, Alternatives 2 and 3 would prevent current/future site worker and future construction/excavation worker exposure to soil/sediment in the former plant area, EFA, East Swale/South Ditch, and Upper Creek Area (RAOs #3 and #4); prevent recreational user/trespasser exposure to soil/sediment in the East Swale/South Ditch, Upper Creek Area, and OCA (RAO #5); and prevent future resident exposure to soil/sediment in the Upper Creek Area and OCA (RAO #6).

5.3.2 Compliance with ARARs

- *Chemical-Specific ARARs* – Chemical-specific ARARs are presented in Table 1. Potentially applicable chemical-specific ARARs include the Ohio VAP, and generic numerical standards presented in OAC 3745-300-08. Additionally, OAC 3745-300-09 allows for the calculation of site-specific standards. The PRGs presented in Section 3.2.1 were developed based on the Ohio VAP standard and site-specific risk calculations.

Alternative 1 does not include intrusive remedial construction activities and therefore, would not achieve chemical-specific ARARs for soil/sediment. Alternatives 2 and 3 would include the removal of soil/sediment containing the highest concentration of CoIs. Alternative 2 would require removal of soil/sediment containing the highest concentrations of CoIs, until the calculated 95% UCL concentrations for the remaining data set are not greater than the applicable PRGs. Alternative 3 would address soil containing CoIs at discrete concentrations greater than the respective PRGs at each AoI. Both Alternative 2 and Alternative 3 would achieve the chemical-specific ARARs.

- *Action-Specific ARARs* – Action-specific ARARs are presented in Table 2. Potentially applicable action-specific ARARs include health and safety requirements and regulations associated with handling impacted media. Alternatives 2 and 3 would be equally effective at achieving the action-specific ARARs. Work activities would be conducted in accordance with OSHA requirements that specify general industry standards, safety equipment and procedures, and record keeping and reporting regulations (i.e., 40 CFR 264, 29 CFR 1910, 1926, and 1904). Compliance with these action-specific ARARs would be accomplished by following a site-specific HASP.

  Excavated material would be subject to USDOT and additional state of Ohio requirements for packaging, labeling, manifesting, and transporting hazardous or regulated materials (i.e., 49 CFR Parts 107 and 171.1 through 172.558, and ORC 3745-52-11, 12, 14, 20, 22, 23, 30-34, 40, and 41). Compliance with these requirements, as well as ARARs related to air and water quality management, would be achieved by following an Ohio EPA-approved remedial design and using licensed waste transporters and permitted disposal facilities. All excavated material subject to offsite disposal would be disposed of in accordance with applicable state and federal LDRs (e.g., OAC 3745-270 and -57).

- *Location-Specific ARARs* – Potentially applicable location-specific ARARs are specified in Table 3 and generally include regulations on conducting construction/remedial activities on flood plains/wetlands. Compliance with these ARARs would be achieved by obtaining necessary permits prior to conducting site activities. Alternatives 2 and 3 would be equally effective at achieving the location-specific ARARs. Additionally, remedial activities would be conducted in accordance with the City of Circleville building/construction codes and ordinances, as applicable.

Additional information regarding how the remediation activities associated with Alternatives 2 and 3 would address the ARARs are provided in Tables 1-3.

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5.3.3 Long-Term Effectiveness and Permanence

Alternative 1 would not include the implementation of any remedial activities and therefore, would not reduce the potential for long-term exposures to soil/sediment containing site-related impacts. However, the institutional controls (in the form of ECs) that have been established for the formerly developed portion of the former plant site and the portions of the OCA owned by the Richard's entities will prevent future residential use in these areas and work toward preventing current and potential future site worker exposure to EFA sludge.

Alternatives 2 and 3 would include the same institutional control component as Alternative 1. In addition, both Alternatives 2 and 3 are protective of human health and the environment and achieve the established RAOs through the removal of soil/sediment with the highest concentrations of CoIs in Alternative 2 and through the removal of all soil/sediment containing discrete concentrations of CoIs at levels above the PRGs in Alternative 3. Therefore, Alternatives 2 and 3 would address the soils/sediments containing the highest concentrations of CoIs, thereby mitigating the potential for future exposures to: current/future site workers at the former manufacturing area, EFA, East Swale/South Ditch and Upper Creek Area; future construction/excavation workers at the former manufacturing area, East Swale/South Ditch and Upper Creek Area; recreational users/trespassers at the East Swale/South Ditch, Upper Creek Area, and deltaic/non-deltaic portions of the OCA; and future residents at the Upper Creek Area and deltaic/non-deltaic portions of the OCA.

Alternatives 2 and 3 both include annual verification of the institutional controls, rehabilitation of the EFA (including repair/replacement/installation of new fencing), and preparation of an O&M Plan. Potential future exposures to EFA sludge would be mitigated through repair of the existing EFA cover and installation of additional soil cover on the EFA, repair/replacement/installation of new fencing, and through periodic inspection/maintenance activities to monitor the effectiveness of the soil cover. Under Alternatives 2 and 3, potential exposures to remaining/residual site impacts would be mitigated by following the procedures established in the O&M Plan. Finally, Alternatives 2 and 3 are not anticipated to have negative long-term impacts to the environment as a result of remedial construction activities. Following removal of soil/sediment, disturbed areas would be restored to pre-construction levels and grades and vegetated, as appropriate. As a result, none of these alternatives will result in a loss of ecological habitats.

5.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 1 would not actively treat, remove, recycle, or destroy impacted media and therefore, is considered the least effective for this criterion.

Through excavation, Alternatives 2 and 3 would both address soil/sediment containing site-related impacts. As previously indicated, Alternative 2 would include excavation of 3,715 cy to 4,260 cy of the most impacted soils/sediments (depending on whether soil removal is performed beneath paved portions of the former RMHA), as required until the calculated 95% UCL concentrations for the remaining data set are not greater than the applicable PRGs, while Alternative 3 would include the excavation of approximately 10,180 cy to 11,460 cy of soil/sediment containing site-related impacts at discrete concentrations greater than the applicable PRGs (again, depending on whether soil removal is performed beneath paved portions of the former RMHA). Under both alternatives, excavated material would be permanently transported offsite for disposal at either a non-hazardous solid waste landfill or hazardous landfill (i.e., depending on the results of waste characterization sampling).

While Alternative 3 would remove a greater volume (approximately 6,465 cy to 7,200 cy more than Alternative 2 [depending on whether soil removal is performed beneath paved portions of the former RMHA]) of soil containing site-related impacts, as compared to Alternative 2, it should be noted that neither alternative includes treatment or recycling technologies. Therefore, because both alternatives result in post-remediation conditions that achieve the same level of risk reduction and make each AoI safe for its intended future use, Alternatives 2 and 3 are both considered effective at reducing the toxicity, mobility, and volume of site-related impacts.

5.3.5 Short-Term Effectiveness

Alternative 1 would not include any active remediation and would not present potential short-term impacts to remedial workers, the public, or the environment.

Alternatives 2 and 3 both involve intrusive soil excavation to address soil/sediment containing site-related impacts. As previously indicated, Alternative 2 would include excavation of 3,715 cy to 4,260 cy of soil/sediment (depending on whether soil removal is performed beneath paved portions of the former RMHA), while Alternative 3 would include the excavation of approximately 10,180 cy to 11,460 cy of soil/sediment (again, depending on whether soil removal is performed beneath paved portions of the former RMHA). As a result, Alternatives 2 and 3 would pose potential short-term risks to remedial workers, the environment and the public from potential exposure to impacted soil/sediment during excavation, offsite transportation of excavated material, and backfilling activities. Additionally, the excavation activities conducted under these alternatives would pose short-term risks from the operation of construction equipment and generation of noise and dust.

Alternative 3 would cause greater disruption to the natural environment and surrounding community than Alternative 2. Specifically, Alternative 3 would require excavation and/or restoration activities within an area measuring approximately 270,000 to 284,000 square feet (approximately 6.2 to 6.5 acres), while Alternative 2 would require excavation and/or

restoration activities within an area measuring approximately 102,000 to 107,000 square feet (approximately 2.3 to 2.5 acres) depending on whether soil removal is performed beneath paved portions of the former RMHA. Therefore, Alternative 2 would require less than 40% of the excavation and/or restoration footprint required to implement Alternative 3, while achieving the same level of risk reduction.

In addition, nuisances to the surrounding community would include noise from the operation of construction equipment and an increase in local truck traffic from offsite transportation of excavated materials and the importation of fill materials. Estimated duration of remedial construction activities for each of the alternatives and number of truck trips required for each alternative are presented below.

- Alternative 1 – no time required and no truck trips
- Alternative 2 – 3.5 to 4 months and 370 to 420 truck trips (depending on whether soil removal is performed beneath paved portions of the former RMHA)
- Alternative 3 – 9.25 to 10.25 months and 990 to 1,110 truck trips (again, depending on whether soil removal is performed beneath paved portions of the former RMHA)

Potential exposures during implementation of these alternatives would be mitigated, to the extent practicable, by using appropriate PPE, conducting community air and work space monitoring, implementation of dust control (e.g., water sprays) and noise mitigation measures (as appropriate, and if necessary based on monitoring results), and proper planning and training of remedial workers. Additionally, erosion and sediment controls would be used to minimize impacts to the environment. Health and safety practices and protective measures would be developed/included as part of the remedial design and HASP that would be prepared for Alternatives 2 and 3.

The potential for short-term impacts to the public, the environment and remedial workers inherently increases as the volume of excavated material and number of truck trips increases. Alternative 2 would be the least disruptive to the natural environment and the surrounding community, provides a smaller potential for exposures to remedial workers and the public, and would require the shortest time to implement. Therefore, Alternative 2 has the greatest short-term effectiveness (i.e., the smallest potential for exposure during implementation), while achieving the same level of risk reduction as Alternative 3.

5.3.6 Implementability

No remedial activities would be conducted as part of Alternative 1 and therefore, Alternative 1 is considered the most implementable. Alternatives 2 and 3 would include excavation of impacted soil/sediments, rehabilitation of the EFA (including repair/replacement/installation of new fencing), and preparation of an O&M Plan. From a technical implementability standpoint, these activities do not require highly specialized equipment (beyond the

potential use of low ground pressure equipment, tundra mats, and/or other equipment designed for use in wetland environments) or personnel and could be easily implemented. Remedial contractors capable of conducting these activities are readily available.

Alternatives 2 and 3 have similar implementation challenges. The foremost implementation challenge associated with these alternatives involves accessing the soil/sediment removal areas. Temporary construction roads would be constructed to facilitate access to the South Ditch, Upper Creek Area, and OCA. In addition, support areas would likely be constructed in the vicinity of the Upper Creek Area and OCA during the excavation of material beyond the former plant area due to the relative lack of working space in those areas. Finally, water management will present a challenge for Alternatives 2 and 3. As a result, bypass pumping will likely be required to divert surface water flow around soil/sediment removal areas and material dewatering/solidification may be required to condition the excavated materials prior to transportation to the applicable offsite disposal facilities. Finally, from an administrative standpoint, institutional controls in the form of ECs were already established for the developed portion of the former plant area and the portion of the OCA owned by the Richard's entities.

5.3.7 Cost

The following table summarizes the estimated costs associated with implementing each of the remedial alternatives.

Table 5-3 – Estimated Cost to Implement Remedial Alternatives

Alternative	Estimated Capital Cost	Estimated Present Worth Cost of O&M[1]	Total Estimated Cost
Alternative 1 (No Further Action)	$0	$0	$0
Alternative 2 (95% UCL Scenario)	$3,510,000 to $3,890,000	$500,000	$4,010,000 to $4,390,000
Alternative 3 (Discrete Removal Scenario)	$7,070,000 to $7,800,000	$500,000	$7,570,000 to $8,300,000

Notes:
1. Estimated present worth of O&M cost is over an assumed 30-year period.

As shown in the table above, the capital cost to implement Alternative 3 is approximately twice the cost required to implement Alternative 2.

Although Alternative 3 corresponds to the greatest removal volume (more than two and half times the volume of soil/sediment that would be removed under Alternative 2(regardless of whether soil removal is performed beneath paved portions of the former RMHA), it also involves the greatest disruption to the natural environment and the surrounding community, has the greatest potential for exposures to workers during implementation of the alternative, is approximately twice as expensive and would take more than twice as long to implement. Alternatives 2 and 3 would include the same EFA rehabilitation (including fencing repair/replacement/installation) and O&M Plan components. Finally, Alternatives 2 and 3 would include the same verification of institutional controls and site inspection/maintenance components to limit potential future exposures to remaining/residual impacts at the Site. Therefore, Alternative 2 is considered the most cost-effective.

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6. Preferred Remedial Alternative

The results of the comparative analysis (presented in Section 5.3) were used as a basis for identifying a preferred remedial alternative for the Site. The rationale for selecting the preferred remedial alternative, as well as the components of the preferred remedial alternative, is presented in the following subsections.

6.1 Remedy Selection Rationale

Based on the information provided in Section 5.3, Alternative 2 (95% UCL Removal Scenario) is the preferred remedial alternative for the Site. This conclusion is based on several considerations described below.

- As noted in the Revised Interim RAO Report, the 95% UCL approach is consistent with Ohio EPA's VAP and USEPA guidance. Under the VAP, the 95% UCL on the arithmetic mean of a given data set can be used to determine which soils may potentially be subject to remedial action. Moreover, USEPA's recommended methodology for evaluating potential exposures to lead in soil specifies that the arithmetic mean concentration be used as the EPC; further indicating that use of a mean value is consistent with meeting the site risk goals.

- Alternative 2 would achieve the RAOs established in the Revised Interim RAO Report, through removal of soil/sediment containing CoIs until the calculated 95% UCL concentrations for the remaining data set are not greater than the applicable PRGs, and is therefore protective of human health and the environment.

- Alternative 2 is compliant with the chemical-, action-, and location-specific ARARs identified as being applicable to the Site.

- The removal of soil/sediment containing the greatest concentrations of CoIs, combined with the ECs that have already been established for the formerly developed portions of the former plant area and the portions of the OCA owned by the Richard's entities, comprise an effective long-term, permanent solution that achieves the risk goals for the Site.

- Alternative 2 is as effective as Alternative 3 in the reduction of toxicity, mobility, or volume through treatment and results in post remediation conditions that achieve the risk goals and RAOs for the Site as described above. While Alternative 3 would remove a greater volume of impacted material than Alternative 2, it should be noted that neither alternative includes treatment or recycling technologies.

- When compared to Alternative 3, Alternative 2 would be implemented in a significantly shorter (i.e., less than half) duration, with significantly less disruption to the natural environment and surrounding community, poses less risk to remedial construction workers, while achieving a similar level of risk reduction.

- Alternative 2 does not require highly specialized equipment (beyond the potential use of low ground pressure equipment, tundra mats, and/or other equipment designed for use in wetland environments) or personnel and could be easily implemented. Remedial contractors capable of conducting the anticipated remediation activities are readily available.

- Alternative 2 can be implemented for approximately half the cost of Alternative 3.

In summary, remediation under both Alternatives 2 (95% UCL removal scenario) and 3 (discrete removal scenario) would satisfy the baseline requirements of being protective of human health and the environment, complying with ARARs established for the Site, and achieving the site-specific RAOs. However, Alternative 2 can accomplish these same objectives and be implemented in less than half the time, is less disruptive to the natural environment and the community, poses less risk to remedial construction workers, and can be implemented at approximately half the cost of a discrete removal scenario. For these reasons the Respondents believe that Alternative 2 is the appropriate Remedial Alternative to be implemented at the Site.

6.2 Summary of Preferred Remedial Alternative

As described in Section 5 and Table 7, the primary components of the preferred remedial alternative would consist of the following:

- Conducting pre-design/pre-construction investigations to refine/verify the extent of soil/sediment removal and determine the waste characterization of those soils/sediments;

- Excavating an estimated 3,715 to 4,260 cy of soil/sediment that contain CoIs at concentrations which result in calculated 95% UCL concentrations that are greater than the applicable PRGs, including:

    - Former RMHA (excluding removal in paved areas) – 40 cy
    - Former RMHA (including removal in paved areas) – 585 cy
    - East Swale – 130 cy
    - South Ditch – 270 cy
    - Upper Creek Area – 880 cy
    - OCA – 2,395 cy

- Transporting an estimated 6,000 to 6,800 tons of material offsite for disposal at appropriately permitted facilities;

- Transporting an estimated 110,000 to 130,000 gallons of construction-related waters offsite for treatment/disposal at appropriately permitted facilities;

- Restoring removal areas to match pre-construction levels and grades and vegetating disturbed areas to result in no loss of ecological habitat;

- Rehabilitating the EFA via clearing and grubbing, repair of the existing cover, placing an additional 1-foot of soil cover to improve the cover, and repair/replacement/installation of EFA fencing; and

- Preparing an O&M Plan to document the following:

    - The institutional controls (ECs) that have been established and will be maintained for the site;

    - Known locations of soil containing CoIs greater than unrestricted access concentrations;

    - Protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during those activities; and

    - Protocols for conducting annual site inspection and maintenance activities;

As previously described, institutional controls have already been established for the formerly developed portion of the former plant area and the portion of the OCA owned by the Richard's entities. As part of this remedial alternative, the institutional controls will be verified on an annual basis.

7. References

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Tables

Table 1
Summary of Chemical-Specific ARARs

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Medium	Status	Potential Requirement	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal				
Soil	Applicable	RCRA-Regulated Levels for Toxic Characteristics Leaching Procedure (TCLP) Constituents 40 CFR Part 261	These regulations specify the TCLP constituent levels for identification of hazardous wastes that exhibit the characteristic of toxicity.	Waste characterization samples will be collected prior to/during implementation of Alternative 2 or 3 to determine whether any material to be excavated is a hazardous waste by characteristic. All excavated material generated during the implementation of Alternative 2 or 3 would be disposed of at an appropriate/approved off-site disposal facility in accordance with these regulations.
Soil	Applicable	Universal Treatment Standards/Land Disposal Restrictions (UTS/LDRs) 40 CFR Part 268	Identifies hazardous wastes for which land disposal is restricted and provides a set of numerical constituent concentration criteria at which hazardous waste is restricted from land disposal (without treatment).	Wastes exhibiting a hazardous characteristic would need to be treated to meet the UTS for all hazardous constituents present in the residuals prior to disposal, in accordance with these regulations.
Soil	To be considered	U.S. EPA Regional Soil Screening Levels	Provides risk-based screening values used in baseline human health risk assessments to focus efforts on contaminants of concern (COCs) by eliminating compounds that are below levels considered to adversely impact human health.	This guidance was considered when developing the Preliminary Remedial Goals (PRGs) for contaminated media.
Soil	To be considered	U.S. EPA Risk Assessment Guidance for Superfund (RAGS)	Provides guidance for developing health risk information at Superfund sites and provides guidance for environmental assessment at Superfund sites. Guidance in both human health evaluation and environmental assessment is needed so that USEPA can fulfill CERCLA's requirement to protect human health and the environment.	This guidance was considered when developing the PRGs for contaminated media.
Surface Water	Relevant and appropriate	Clean Water Act (CWA) s. 304(a), Ambient Water Quality Criteria (AWQC) for Protection of Human Health and Aquatic Life, 40 CFR 131	AWQCs are developed under the CWA as guidelines from which states develop water quality standards for protection of human health and aquatic organisms.	AWQCs would be attained by Alternative 2 or 3 in adjacent surface waters via source control (i.e., soil/sediment removal), erosion and sedimentation controls, and water column monitoring during remediation and annual verification of the executed institutional controls following remediation.
Surface Water	Relevant and appropriate	Clean Water Act (CWA) Ambient Water Quality Criteria (WQC) for Protection of Human Health and Aquatic Life. Env-ws 430.	Establishes water quality standards for protection of human health and aquatic organisms. Standards include dissolved oxygen, pH, bacteria, toxic substances, etc.	AWQCs would be attained by Alternative 2 or 3 in adjacent surface waters via source control (i.e., soil/sediment removal), erosion and sedimentation controls, and water column monitoring during remediation and annual verification of the executed institutional controls following remediation.
State				
Waste Material	Relevant and appropriat	Ohio Administrative Code (OAC) 3745-207-48 Paragraph A Universal Treatment Standards	Provides chemical specific standards for land disposal.	All excavated material generated during the implementation of Alternative 2 or 3 would be disposed of in accordance with applicable state and federal land disposal regulations.
Waste Material	Relevant and appropriat	OAC 3745-54-13 General Analysis of Hazardous Waste	Prior to any treatment, storage, or disposal of hazardous wastes, a representative sample of the waste must be chemically and physically analyzed.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific waste management plan.
Soil and Groundwater	Applicable	OAC 3745-300-08	Ohio EPA's Division of Emergency and Remedial Response (DERR) Voluntary Action Program (VAP, 2009) generic numerical standards for soil and groundwater.	This guidance was considered when developing the soil/sediment PRGs.
Soil and Groundwater	Applicable	OAC 3745-300-09	Ohio EPA's Division of Emergency and Remedial Response (DERR) Voluntary Action Program (VAP, 2009) provisions for calculating site-specific standards for soil and groundwater.	The guidance was considered when developing the soil/sediment PRGs. This guidance would be achieved by Remedial Alternative 2 or 3 through the removal of soil/sediment that result in exposure point concentrations of antimony, arsenic, or lead above the appropriate PRGs.

Table 2
Summary of Action-Specific ARARs

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Medium	Status	Potential Requirement	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal				
Soil	To be considered	Land Disposal Facility Notice in Deed 40 CFR Parts 264 and 265 Sections 116-119(b)(1)	Establishes provisions for a deed notation for closed hazardous waste disposal units, to prevent land disturbance by future owners.	These provisions would be attained by Alternative 1, 2, or 3 via source control (i.e., soil removal) and annual verification of the executed institutional controls (environmental covenant).
Soil	Applicable	40 CFR 122.26(C)(1)(ii)(C); 40 CFR 122.44(i); NPDES General Permit for Construction Stormwater Management	Discharges of stormwater associated with construction activities must implement best management practices and other measures, to control pollutants in stormwater discharges during and after construction activities.	Erosion and sedimentation controls will be installed and maintained around the perimeter of the exclusion zones during the implementation of Alternative 2 or 3. Additionally, waters from impacted equipment/material staging/handling areas will be contained and routed to a temporary water treatment facility for treatment prior to discharge, or disposed of at an appropriate/approved off-site disposal facility in accordance with applicable regulations.
Soil	Applicable	RCRA - 40 CFR 261.24	Testing procedure (TCLP) to assess materials for potential hazardous characteristics including toxicity.	Waste characterization samples will be collected prior to/during implementation of Alternative 2 or 3 to determine whether any material to be excavated is a hazardous waste.
Surface Water	Applicable	Clean Water Act (CWA), Section 402, National Pollutant Discharge Elimination System (NPDES), 33 USC 1342; 40 CFR 122-125, 129, 131	Standards for the discharge of pollutants into surface waters. Remediation General Permit imposes effluent limitations, standards, prohibitions and best management practices for discharges from construction dewatering of contaminated sites.	Discharges associated with dewatering of soil/sediment will meet requirements through onsite treatment, or treatment at an appropriate/approved off-site plant. Discharge activities shall meet the substantive requirements of these regulations.
Surface Water	To be considered	CWA, Section 404, Permits to Discharge Dredged or Fill Material	Requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation (e.g. certain farming and forestry activities).	Discharge activities shall meet the substantive requirements of these regulations. However, remediation activities would not discharge sludge/fill to waterways.
Site Worker	Applicable	Occupational Safety and Health Act (OSHA) - General Industry Standards 29 CFR Part 1910	These regulations specify the 8-hour time-weighted average concentration for worker exposure to various compounds. Training requirements for workers at hazardous waste operations are specified in 29 CFR 1910.120.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific health and safety plan.
Site Worker	Applicable	OSHA - Safety and Health Standards 29 CFR Part 1926	These regulations specify the type of safety equipment and procedures to be followed during site remediation.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific health and safety plan.
Site Worker	Applicable	OSHA - Record-keeping, Reporting and Related Regulations 29 CFR Part 1904	These regulations outline record-keeping and reporting requirements for an employer under OSHA.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific health and safety plan.
Site Worker	Applicable	RCRA - Preparedness and Prevention 40 CFR Part 264.30 - 264.31	These regulations outline requirements for safety equipment and spill control when treating, handling and/or storing hazardous wastes.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific health and safety plan and/or a contingency plan.
Site Worker	Applicable	RCRA - Contingency Plan and Emergency Procedures 40 CFR Part 264.50 - 264.56	Provides requirements for outlining emergency procedures to be used following explosions, fires, etc. when storing hazardous wastes.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific health and safety plan and/or a contingency plan.
Air	Applicable	Clean Air Act-National Ambient Air Quality Standards 40 CFR Part 60	Establishes ambient air quality standards for protection of public health.	Air emissions monitoring will be conducted as required during remediation to verify compliance with these requirements.
Air	Applicable	RCRA (40 CFR 264, Subpart AA)	Air emission standards for process vents and closed-vent systems and control devices associated with air or steam stripping operations that manage hazardous wastes with organic concentrations of at least 10 ppmw.	Should air stripping operations manage hazardous wastes with organic concentrations of at least 10 ppm by weight, vents operated as part of the air stripper system will comply with Sections 1032 through 1036 of this Subpart.
Air	Applicable	RCRA (40 CFR 264, Subpart BB)	Air emission standards for equipment that contains or contacts hazardous wastes with organic concentrations of at least 10 percent by weight.	Should equipment come into contact with hazardous wastes containing organic concentrations of at least 10 percent by weight, the equipment will be equipped and monitored for leaks as specified in Sections 1052 through 1065 of this Subpart.
Waste Material	Applicable	90 Day Accumulation Rule for Hazardous Waste 40 CFR Part 262.34	Allows generators of hazardous waste to store and treat hazardous waste at the generation site for up to 90 days in tanks, containers and containment buildings without having to obtain a RCRA hazardous waste permit.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific waste management plan (WMP).
Waste Material	Applicable	RCRA - General Standards 40 CFR Part 264.111	General performance standards requiring minimization of need for further maintenance and control; minimization or elimination of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products. Also requires decontamination or disposal of contaminated equipment, structures and soils.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific WMP.
Waste Material	Applicable	Standards Applicable to Transporters of Applicable Hazardous Waste - RCRA Section 3003 40 CFR Parts 170-179, 262, and 263	Establishes the responsibility of off-site transporters of hazardous waste in the handling, transportation and management of the waste. Requires manifesting, recordkeeping and immediate action in the event of a discharge.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific WMP.

Table 2
Summary of Action-Specific ARARs

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Medium	Status	Potential Requirement	Requirement Synopsis	Action to be Taken to Attain ARAR
Waste Material	Applicable	United States Department of Transportation (USDOT) Rules for Transportation of Hazardous Materials 49 CFR Parts 107 and 171.1 - 172.558	Outlines procedures for the packaging, labeling, manifesting and transporting of hazardous materials.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific WMP.
Waste Material	Relevant and appropriate	USEPA-Administered Permit Program: The Hazardous Waste Permit Program RCRA Section 3005; 40 CFR Part 270.124	Covers the basic permitting, application, monitoring and reporting requirements for off-site hazardous waste management facilities.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by shipping wastes to appropriately licensed, permitted facilities.
Waste Material	Applicable	Land Disposal Restrictions 40 CFR Part 368	Restricts land disposal of hazardous wastes that exceed specific criteria. Establishes Universal Treatment Standards (UTSs) to which hazardous waste must be treated prior to land disposal.	Wastes exhibiting a hazardous characteristic would need to be treated to meet the UTS for all hazardous constituents present in the residuals prior to disposal, in accordance with these regulations.
Waste Material	Applicable	RCRA Subtitle C 40 U.S.C. Section 6901 et seq.; 40 CFR Part 268	Restricts land disposal of hazardous wastes that exceed specific criteria. Establishes UTSs to which hazardous wastes must be treated prior to land disposal.	Wastes exhibiting a hazardous characteristic would need to be treated to meet the UTS for all hazardous constituents present in the residuals prior to disposal, in accordance with these regulations.
State				
Soil	Applicable	Ohio Administrative Code (OAC) 3745-270-49 Paragraphs A - E Land Disposal Restriction for Contaminated Soils	Specifies standards for soil treatment.	Wastes exhibiting a hazardous characteristic would need to be treated to meet these standards for all hazardous constituents present in the residuals prior to disposal, in accordance with these regulations.
Surface Water	To be considered	Ohio Revised Code (ORC) 1517.16 Channel Modification Requirements	No governmental body may modify the channel of any watercourse within a wild, scenic, or recreational river area outside the limits of a municipal corporation without approval from the director of the Ohio Department of National Resources.	The Ohio Department of National Resources will be contacted, as necessary, to discuss any modification to any watercourse during the implementation of the remedial alternative. However, no modification to any watercourse is anticipated for Alternative 2 or 3.
Surface Water	Applicable	OAC 3745-1-04 Paragraphs A - E The "Five Freedoms" for Surface Water	All surface waters of the state shall be fee from a) objectionable suspended solids, b) floating debris, oil, and scum, c)materials that create a nuisance, d) toxic, harmful, or lethal substances, e) nutrients that create nuisance growth. Pertains to both discharges to surface waters as a result of remediation and any onsite surface waters affected by site conditions.	Discharges associated with dewatering of soil/sediment will meet requirements through onsite treatment, or treatment at an appropriate/approved off-site plant. Discharge activities shall meet the substantive requirements of these regulations.
Surface Water	Applicable	OAC 3745-1-05 Paragraphs A - C Antidegradation Policy for Surface Water	Requires that best available technology be used to treat surface water discharges. Prevents degradation of surface water quality below designated use or existing water quality.	Discharges associated with dewatering of soil/sediment will meet requirements through onsite treatment, or treatment at an appropriate/approved off-site plant. Discharge activities shall meet the substantive requirements of these regulations.
Surface Water	To be considered	Ohio Administrative Code (OAC) 3745-32, Section 401 - Water Quality Certification	Provides requirements for obtaining 401 water quality certification.	An application for obtaining 401 water quality certification will be submitted to the OEPA, as required. However, remedial activities under Alternative 2 or 3 will be conducted only within South Ditch and Offsite Creek (i.e., no work proposed in the
Surface Water	Applicable	OAC 3745-39, Storm Water Program	Regulates sources to protect water quality and to establish a comprehensive storm water management program.	Compliance with this ARAR would be accomplished during the implementation of Alternatives 2 and 3 by diverting storm water around work areas and, if necessary, collecting storm water in work areas for treatment, as necessary.
Air	To be considered	OAC 3745-15-07, Emission Restrictions on Fugitive Dust	Prohibits the emission/discharge of substances that endanger the health, safety or welfare of the public, or cause unreasonable injury or damage to property.	Air emissions monitoring will be conducted as required during remediation to verify compliance with these requirements. However, no air handling/treatment process requirement is anticipated for Alternatives 2 and 3.
Air	To be considered	OAC 3745-15-08, Air Pollution Nuisances	Provides requirements to secure and maintain those levels of air quality which are consistent with the protection of health and the prevention of injury to plant, animal life, and property in the state of Ohio.	Air emissions monitoring will be conducted as required during remediation to verify compliance with these requirements. However, no air handling/treatment process requirement is anticipated for Alternatives 2 and 3.
Waste Material	Relevant and appropriate	ORC 15301.00, Uniform Environmental Covenants Act	Provides standards for environmental covenants.	These provisions would be attained by Alternatives 1, 2, or 3 via annual verification of the executed institutional controls.
Waste Material	Applicable	OAC 3745-52-11, 12, 14, 20, 22, 23, 30-34, 40, and 41	Presents requirements for hazardous waste identification, manifest, packaging, labeling, marking, placarding, accumulation, record keeping.	Compliance with these ARARs would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific WMP.
Waste Material	Applicable	OAC 3745-55-14 Disposal/Decontamination of Equipment, Structures, and Soils	Requires that all contaminated equipment, structures, and soils be properly disposed of or decontaminated. Removal of hazardous wastes or constituents from a unit may constitute generation of hazardous wastes.	Compliance with these ARARs would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific WMP.

Table 3
Summary of Location-Specific ARARs

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Medium	Status	Potential Requirement	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal				
Sediment	Applicable	Clean Water Act (CWA) Section 404(b) and Rivers and Harbors Act Section 10 (33 U.S.C. 403).	No discharge of dredged or fill material shall be permitted if there is a practicable alternative that has less adverse impact on aquatic ecosystem provided the alternative does not have other significant adverse environmental consequences.	Soil erosion/sedimentation control measures will be installed and maintained during remediation to minimize impacts. There is no practical alternative to conducting work in the wetlands.
Wetlands	Applicable	Protection of Wetlands (Executive Order No. 11990) 40 CFR 6, Appendix A (Policy on Implementing E.O. 11990) CWA Section 404(b) (40 CFR 230; 33 CFR 323) and Rivers and Harbors Act Section 10 (33 U.S.C. 403)	Requires that federal agencies' activities avoid, to the extent possible, adverse impacts on wetlands if there is a practicable alternative, and minimize adverse impacts on wetlands if no practicable alternative exists. See preceding item for CWA provisions.	Alternative 2 or 3 will be implemented with control of wetlands excavation to the greatest extent possible. Excavation in wetlands will meet the requirements of this Executive Order and applicable regulatory requirements. Restoration and, if required, mitigation will follow any such excavations. There is no practical alternative to conducting work in the wetlands.
Floodplains	Applicable	Floodplain Management (Executive Order No. 11988) 40 CFR 6.302(b) and 40 CFR 6, Appendix A (Policy on Implementing E.O. 11988)	Requires that federal agencies evaluate the effects of their actions (including actions undertaken by other entities pursuant to Federal permit or license) on floodplain to avoid or minimize adverse effects on floodplain.	Alternative 2 or 3 will be designed to restore current grades. As such, Alternative 2 or 3 will be implemented in such a manner as to minimize the impacts to the risk of flood loss to the greatest extent possible. Because portions of the site that are subject to remediation are located in the floodplain, there is no practical alternative to conducting work within the floodplain.
Surface Water	Applicable	Rivers and Harbors Act (Section 10 [33 U.S.C. 401]) and CWA (Section 404 [33 U.S.C. 1344]), 33 CFR 323	Regulates the discharge of dredged or fill material into waters of the United States. No discharge shall be permitted if there is a practicable alternative that has less adverse impact on resource area. See prior synopsis regarding wetlands medium.	Erosion and sedimentation controls will be installed and maintained during the implementation of Alternative 2 or 3 to mitigate potential discharges of dredged or fill materials.
Surface Water	Applicable	Fish and Wildlife Coordination Act (16 USC 661-666)	Federal agencies, or public or private entities under Federal permit or license, proposing to undertake an action that will control or modify a water body must consult U.S. Fish and Wildlife Service regarding measures to prevent loss of or damage to fish and wildlife resources and to provide for the development and improvement of such resources.	The U.S. Fish and Wildlife Service will be consulted, as required, during the implementation of Alternative 2 or 3 to comply with this regulation.
Habitat	Applicable	Endangered Species Act - 16 USC 1536(a)-(d); 40 CFR 6.302(h); 50 CFR Part 402, Subparts A & B	Requires Federal agencies to take into account the effects of their actions (including actions undertaken by other entities pursuant to Federal permit or license) on federally-listed threatened and endangered species and their habitats. Involves issuance of a biological assessment and a biological opinion if a listed species or critical habitat may be present in the action area. If determined likely to adversely affect a listed species or critical habitat, requires identification of reasonable and prudent alternatives and measures to avoid such effects.	The appropriate federal agencies will be consulted prior to implementation of Alternative 2 or 3. If endangered/threatened species/habitat exists, the applicable requirements will be met.
Historic Places	Applicable	National Historic Preservation Act, Protection of Historic Properties (16 USC 470(f); 36 CFR 800)	Requires Federal agencies to take into account the effects of their actions on properties (site, building, structure, or objects) included or eligible for inclusion in the National Register of Historic Places. If, in consultation with the State and/or Tribal Historic Preservation Office, it is determined that the project would have an adverse impact on a listed or eligible historic property within an area of potential effects, then it requires (a) evaluation of alternatives to avoid, minimize or mitigate the adverse impacts, and (b) agreement on such measures or, failing agreement, implementation of such measures identified by the authorizing agency.	The appropriate federal agencies will be consulted prior to implementation of Alternative 2 or 3. If properties included or eligible for inclusion in the National Register of Historic Places exists within or adjacent to areas subject to remediation, the applicable requirements will be met.

Table 3
Summary of Location-Specific ARARs

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Medium	Status	Potential Requirement	Requirement Synopsis	Action to be Taken to Attain ARAR
State				
Wetlands	Applicable	Ohio Administrative Code (OAC) 3745-1-51 Paragraphs A - C Wetland Narrative Criteria	Lists criteria to be protected in wetland environments.	Remedial activities in wetlands located in the limits of Alternative 2 or 3 will avoid or minimize impacts to the greatest extent possible. Any excavation in wetlands will meet the applicable substantive requirements.
Wetlands	Applicable	OAC 3745-1-54, Wetland Antidegradation	Requires that the degradation of surface waters through direct, indirect, or cumulative impacts does not result in the net loss of wetland acreage.	Remedial activities in wetlands located in the limits of Alternative 2 or 3 will avoid or minimize impacts to the greatest extent possible. Any excavation in wetlands will meet the applicable substantive requirements.
Surface Water	To be considered	OAC 3734.03, Prohibition of Open Dumping or Burning	Prohibits disposal of solid wastes by open burning or open dumping.	Compliance with these ARARs would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific waste management plan. Open dumping or burning is not an element of Alternative 2 or 3.
Surface Water	To be considered	OAC 3767.13, Prohibition of Nuisances in Waterways	Prohibits obstruction or impeding the passage of a navigable river, harbor, or collection of water, or corrupt or render unwholesome or impure, a watercourse, stream, or water, or unlawfully divert such watercourse from its natural course or state to the injury or prejudice of others.	Alternative 2 or 3 will be implemented in accordance with these requirements. However, remedial activities under Alternative 2 or 3 will be conducted only within South Ditch and Offsite Creek (i.e., no work proposed in the Scioto River).
Waste Material	To be considered	OAC 3745-57-47, Monitoring and Inspections	Provides requirements for monitoring while incinerating hazardous waste.	Compliance with this ARAR would be accomplished during the implementation of Alternative 2 or 3 by following a site-specific air monitoring plan. However, no incineration of hazardous waste is anticipated under Alternative 2 or 3.
Waste Material	To be considered	OAC 3745-54-52, Establishment of a Contingency Plan	Provides the content requirements for contingency plans for waste disposal facilities.	Compliance with this ARAR would be accomplished by following a site-specific health and safety plan and contingency plan.
Waste Material	To be considered	OAC 3745-55-19, Notification to Local Land Authority	Provides notification requirements regarding the closure of hazardous waste disposal units.	Compliance with this ARAR would be accomplished by following the site-specific Operations and Management Plan and the annual verification of institutional controls.
Endangered Species	Applicable	Ohio Revised Code (ORC) 1518.02 Endangered Plant Species	Prohibits removal or destruction of endangered plant species. Applies to sites where chemicals may harm endangered species.	State agencies will be consulted prior to implementation of Alternative 2 or 3. If endangered/threatened animal species exists, applicable requirements will be met.
Endangered Species	Applicable	ORC 1531.25 Endangered Animal Species	Prohibits removal or destruction of endangered animal species. Applies to sites where chemicals may harm endangered species.	State agencies will be consulted prior to implementation of Alternative 2 or 3. If endangered/threatened animal species exists, applicable requirements will be met.
Surface Water	Applicable	OAC 3745-1-09 Water Use for Scioto River	Establishes water use designations for stream segments within the Scioto River Basin.	The Ohio Environmental Protection Agency will be consulted prior to implementation of Alternative 2 or 3 to meet any applicable requirements.
Local				
Site Structures	Applicable	Local Building Codes	Local authorities may require a building permit for any permanent or semi-permanent structure, such as an on-site water treatment system building or a retaining wall.	An application for obtaining a building permit will be submitted to the local agencies, as required, under Alternative 2 or 3.

Table 4
Initial Screening of Potential Remedial Technologies

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

General Response Action/ Technology Type	Remedial Technology Type	Process Option	Description	Preliminary Assessment
No Action	No Action	No Further Action	No further remedial activities. Ongoing natural processes would continue.	Implementable
Institutional Controls	Enforcement and Permit Controls	Access Restrictions	Constraints, such as fencing and signs, would be placed throughout the Sites to limit access to AoIs.	Implementable
	Government Controls	Deed Restrictions	Constraints would be placed on future land/creek use.	Implementable
Monitoring and/or Adaptive Management	Monitoring and/or Adaptive Management	Monitoring and/or Adaptive Management	Periodic monitoring (e.g., site inspections) and adaptive management (e.g., management decisions adapted based on site conditions can include periodic collection of field samples (e.g., surface water), performing visual reconnaissance to monitor site conditions and any associated response action, and performing maintenance activities to ensure the integrity and effectiveness of any response action that may be implemented.	Implementable
Source Control/Natural Recovery	Source Control	Source Control	Constraints/controls placed on point sources to reduce discharge of CoIs to the AoIs.	Implementable; source control activities performed as interim remedial measures at portions of the site.
	Natural Recovery	Natural Processes	Naturally occurring physical (e.g., sedimentation, dilution), and chemical processes (e.g., stabilization, sorption) that reduce CoIs exposure, toxicity, and mobility.	Implementable.
Containment	In-Place Containment	Engineered Cap/Cover	Placement of a cap typically comprised of layered materials (e.g., topsoil, sand, gravel, cobbles, geotextile) over in-situ soil/sediment to isolate CoIs from biota/overlying water column and mitigate erosion.	Implementable.
	Engineering Controls	Hydraulic Modification/ Rechannelization	Hydraulic modification includes construction/demolition of impoundments or modifications to fluvial geomorphic processes to alter the rate of sedimentation in portions of the AoIs. Rechannelization involves re-routing the AoIs from their existing flow paths and placing a cap/cover over in-situ soil/sediment to reduce exposure to and erosion of lead-impacted media.	Implementable for sediment within surface water conveyances; not applicable for upland soils.
In-Situ Treatment	Physical Treatment	Stabilization/ Solidification	Chemically immobilize materials by injecting and mixing a stabilization/solidification agent into the in-situ soil/sediment.	In-situ process not appropriate for floodplain soil/sediment. Not retained.
		Soil Flushing	Water along with solvents introduced in soil, extraction wells recover solvent and extracted CoIs.	Implementable for soil; not applicable for sediment. Limited effectiveness.

Table 4
Initial Screening of Potential Remedial Technologies

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

General Response Action/ Technology Type	Remedial Technology Type	Process Option	Description	Preliminary Assessment
In-Situ Treatment (Cont.)	Biological Treatment	Enhanced Biodegradation	Enhanced biodegradation involves adding certain microorganisms to the impacted media to facilitate biological oxidation/reduction. In-situ biological treatments (e.g., composting, slurry-phase treatment) can be used to treat soil/sediment with a range of lead-impacted media, including pesticides.	Implementable
		Phytoremediation	The use of plants to extract and accumulate heavy metals, and/or convert then to less toxic forms. Plants can also enhance bioremediation within the root zone (e.g., increased biological degradation) as well as stabilize metals in soil.	Implementable
	Chemical Treatment	Reduction/Oxygenation	Chemical agents are added to the in-situ soil/sediment to promote lead removal or to limit migration of lead-impacted media.	Implementable
	Thermal Treatment	Vitrification	Vitrification uses heat, generated by the application of electricity, to transform the impacted soils such that the lead-impacted media are effectively immobilized in a vitrified mass.	Not demonstrated to be implementable in large scale operations. Not retained.
Ex-Situ Treatment	Physical Treatment	Stabilization/ Solidification	Removed materials are mixed ex-situ with Portland cement, fly ash, or some other stabilization agent. May be used for dewatering only, or to reduce the mobility of CoIs.	Implementable
		Soil Washing	Soil washing process is accomplished by treatment of whole soil to liberate whole soil particles, by hydroclassification and wet screening, and collection of the product streams. Processes take advantage of differences in effective particle size of the CoI impacted and non-impacted media.	Process would require adding water to sediment and saturated soils, creating an increased wastewater stream. Not retained.
	Chemical Treatment	Reduction/Oxygenation (Chemical)	Removed materials are mixed ex-situ with certain chemical agents to promote lead removal or to limit migration of lead-impacted media.	Implementable
	Thermal Treatment	Vitrification	Uses electric power to melt soil at extremely high temperatures; melted material cools to form glassy solid.	Process has not been demonstrated at large scale. Not retained.
Removal	Excavation (in-the-dry)	Mechanical	Use of standard excavation equipment for soil/sediment removal.	Implementable.
Dewatering	Slurry Dewatering Process	Filtering Systems (plate & frame press, belt filter press, or centrifuge[solid-bowl])	Processing of soil/sediment using filter equipment requires addition of water to the sediment to create slurry, which is fed by pump to the filtering equipment. Multi-step process to prepare sediment for filtration is required to protect filter equipment; use trommel screen to remove large debris and course material down to 5/8-inch (water added), then pump slurry to the hydrocyclone for further particle removal down to 50-micron. Slurry from hydrocyclone pumped to filtering system (percent solids achieved varies with filtering process selected), filtrate requires treatment.	Likely not applicable due to complexity of process and requirement to add water to sediment to create slurry, which creates an increased wastewater treatment volume. Not retained.

Table 4
Initial Screening of Potential Remedial Technologies

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

General Response Action/ Technology Type	Remedial Technology Type	Process Option	Description	Preliminary Assessment
Dewatering (Cont.)	Gravity Drainage	Gravity Drainage	Soil/sediment is stockpiled and protected form precipitation and water drains via gravity, drainage requires treatment. Additives may be mixed into excavated material to improve dewatering and/or to reduce the mobility of COIs.	Implementable.
Disposal	On-Site Consolidation	Confined Disposal Facility	Removed soil/sediment or residuals consolidated on-site in a constructed disposal facility consisting of containment features (e.g., earthen dikes and liners).	Implementable
	Off-Site Disposal	Landfill	Disposal of solids or residuals in licensed/permitted landfill that accepts waste materials.	Implementable.
Residuals Management	On-Site Water Treatment	Distillation	COIs separated from aqueous stream by vaporization and condensation. Accumulated scale material collected and disposed of at landfill.	Likely not applicable for heavy metals in aqueous stream. Not retained.
		Filtration	COIs filtered from the residuals using various media alternatives, reusable media (i.e., sand, activated carbon, etc.) or disposable media (i.e., bag, cartridge, etc.). Back wash water from reusable media system or spent filters from disposable media filter system collected for disposal at permitted facility.	Implementable.
		Package Treatment Process	Remove lead and other heavy metals from residuals using a multi-step treatment process, such as; pH adjustment, coagulation, and flocculation. The use of proprietary sludge conditioning emulsion and co-precipitant solutions affect maximum lead removal. Process wastes and dewatered sludge require disposal at a permitted facility.	Implementable.
	Off-Site Water Treatment	Discharge to Sanitary Sewer/WWTP	Collect residuals and convey to nearby sanitary sewer system for treatment by a municipal WWTP. Requires approval for discharge and treatment.	Implementable.
		Collect, Store and Transport to Permitted Treatment Facility	Collect drainage or filtrate and store in a tanker or portable containers to be transported to a permitted facility for treatment.	Implementable.

Notes:
1. This screening analysis is based on technical implementability without consideration of cost. Remedial technologies that have not been demonstrated at full-scale were not retained for further analysis; although this does not preclude their potential use during remedial design. A process option that is implementable for soil/sediment was retained for further analysis, but would need to be selected in combination with another process option to address other media. Shaded process options have not been retained for further analysis.

Table 5
Evaluation of Process Options

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

General Response Action/Remedial Technology	Remedial Technology Type	Technology Process Option	Effectiveness			Implementability		Relative Cost[1]
			Ability to Meet RAOs	Impacts to Human Health and the Environment	How Proven and Reliable is the Technology?	Technical Feasibility	Administrative Feasibility	
No Action	No Action	No Further Action	RAOs may eventually be met through ongoing naturally occurring processes, however would occur over a long time period. Not Expected to meet RAOs.	None.	Reliable.	Implementable.	Implementable with no permits/equipment required.	No additional cost.
Institutional Controls	Enforcement and Permit Controls	Access Restrictions	Would achieve RAOs related to preventing exposures to site workers, recreational users and trespassers. Can be used in conjunction with other technologies to form remedial actions (e.g., removal, dewatering, residuals management) that eventually would be expected to meet RAOs.	None.	Somewhat reliable, varies on extent of notification program, enforcement, and compliance by public.	Implementable. Routine maintenance may be necessary.	Implementable, but may present maintenance difficulties over long periods of time and off-site creek area. Also, likely difficult to implement in on land areas as these are located on residential property and commercial property.	Low to moderate.
	Government Controls	Deed Restrictions	Informs property owners of potential risks associated with properties. Would not achieve RAOs related to construction/excavation workers. Can be used in conjunction with other technologies to form remedial actions that eventually would be expected to meet RAOs.	None.	Reliable; applied at numerous other sites.	Implementable.	Implementable.	Low to moderate.
Monitoring and/or Adaptive Management	Monitoring and/or Adaptive Management	Monitoring and/or Adaptive Management	Periodic visual observations and/or field sampling to monitor the site conditions. Not anticipated to meet RAOs as a stand-alone process. Can be used in conjunction with other technologies to evaluate the effectiveness of a remedial action, such as achieving the RAOs.	Minimal.	Reliable means to track site conditions; applied at numerous other sites.	Implementable.	Implementable, with specialized services required and available. Permits not required under CERCLA, although substantive requirements should be met.	Low to moderate.
Source Control/Natural Recovery	Source Control	Source Control	Reduces CoI influx to areas of interest. Not anticipated to achieve RAOs.	Source control activities have been completed and there are no additional identified sources.	Activities have been reliable in reducing/eliminating releases to areas of interest.	Technically feasible based on results of already completed activities.	Implementable since on-site activities complete; future permits, if necessary, are expected to be obtainable.	Specific to source under evaluation.
	Natural Recovery	Natural Processes	Includes physical, biological and chemical processes that would provide for natural recovery of the Site. Not anticipated to achieve RAOs.	None.	Reliable; applied at numerous other sites.	Implementable.	Natural process; no permits, specialized equipment, or personnel are necessary.	Very low.
Containment	In-Place Containment	Engineered Cap/Cover	Includes placement of clean materials over existing cover or impacted soil/sediment. Should be effective in isolating CoIs and achieving RAOs.	Would disturb existing habitats. Potential effects could be reduced by use of engineering controls to mitigate release of sediment/cap material during cap construction. Addition of a cap on top of existing floodplain/creek grade would alter conveyance. May require soil/sediment removal to accommodate cap/cover.	Capping has been demonstrated at a number of sites nationwide (and under a variety of aquatic sites conditions) to isolate soil/sediment.	Implementable.	Expected to be implementable. Permits not required under CERCLA, although substantive requirements should be met. Equipment, materials and personnel are commercially available.	Moderate.
	Engineering Controls	Hydraulic Modification/Rechannelization	Includes installation of surface water control structures to increase sedimentation and/or creation of a new channel(s) for water flow. Will provide isolation of CoI impacted soil/sediment.	Would disturb existing habitats. Potential effects could be reduced by use of engineering controls to mitigate release of sediment/cap material resuspended during cap construction.	Reliable; has been selected as part of remedial actions for other sites.	Only applicable in limited portions of areas of interest where physical configuration exist. Only suitable for sediment remediation.	Expected to be implementable. Permits not required under CERCLA, although substantive requirements should be met. Equipment, materials and personnel are commercially available.	Moderate to high.
In-Situ Treatment	Physical Treatment	Soil Flushing	Does not meet RAOs alone, but may be considered in conjunction with other technologies to form potential remedial actions (e.g., removal, dewatering, and residuals management) that eventually may meet RAOs.	Potential impacts could be mitigated through use of engineering controls. Extraction residuals may have limited disposal options. Technology limited by subsurface obstructions and dense soil layers.	Has been used full-scale for soil. A site-specific study would be required to assess treatment effectiveness.	Implementable for soil, but not sediment. Used to separate fine materials from coarse materials.	Expected to be implementable. Limited number of full-scale units available.	Moderate to high.
	Biological Treatment	Enhanced Bioremediation	Does not meet RAOs alone, but may be considered for specific areas to address shallow, low concentrations of lead. May be considered in conjunction with other technologies to form potential remedial actions (e.g., removal, dewatering, and residuals management, institutional controls) that eventually may meet RAOs.	Would not disturb existing habitat. Biological treatment is not effective in addressing the presence of heavy metals in subsurface soil, and requires greater time periods than other response actions presented.	Has been used full-scale for soil. A site-specific study would be required to assess treatment effectiveness.	Sometimes the current conditions are not suitable for bioremediation, therefore may have to remove soil/add fertilizers to adjust the conditions.	Implementable. May need to alter the natural environment to assist in the application.	Low to moderate
		Phytoremediation	Does not meet RAOs alone, but may be considered for specific areas to address shallow, low concentrations of lead. May be considered in conjunction with other technologies to form potential remedial actions (e.g., removal, dewatering, and residuals management, institutional controls) that eventually may meet RAOs.	Would disturb existing habitat in planting certain species to perform the phytoremediation. Plants will also have to be maintained/harvested so that it does not affect the food chain.	Has been used full-scale for soil. A site-specific study would be required to assess treatment effectiveness.	Implementable for soil. However, requires greater time periods than other response actions presented. Phytoremediation, in conjunction with other response actions, can help achieve RAOs in surface soil.	Expected to be implementable. Limited number of full-scale units available.	Low to moderate
	Chemical Treatment	Reduction/Oxidation	Does not meet RAOs alone, but may be considered in conjunction with other technologies to form potential remedial actions (e.g., removal, dewatering, disposal, residuals management) that eventually would be expected to meet RAOs.	Would need to disturb existing habitat to install wells. Effectiveness depends on the groundwater flow and depth of impacted areas. Possible risk of potential heavy metal mobilization.	Has been used full-scale for soil. A site-specific study would be required to assess treatment effectiveness.	Reduction/oxidation reactions in the presence of organics would likely be incomplete and necessitate additional treatment. Therefore, reduction/oxidation is cost prohibitive relative to other response actions considered. In-situ chemical treatments will not be retained for further consideration.	Implementable. Equipment, materials, and technical support available.	Moderate to high (considering additional treatment will be required if using reduction/ oxidation process alternative).

Table 5
Evaluation of Process Options

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

General Response Action/Remedial Technology	Remedial Technology Type	Technology Process Option	Effectiveness			Implementability		Relative Cost[1]
			Ability to Meet RAOs	Impacts to Human Health and the Environment	How Proven and Reliable is the Technology?	Technical Feasibility	Administrative Feasibility	
Ex-Situ Treatment	Physical Treatment	Stabilization/Solidification	Does not meet RAOs alone, but may be considered in conjunction with other technologies to form potential remedial actions (e.g., removal, dewatering, disposal, residuals management) that eventually would be expected to meet RAOs.	Reduces mobility of COIs but increases disposal volume. Potential effects (i.e., potential safety concerns during material transport, handling, and processing) could be reduced through engineering controls.	Process option has been shown to be effective ex-situ and demonstrated full-scale at several sites. Commonly used to reduce free moisture for disposal purposes.	Implementable.	Implementable. Equipment, materials, and technical support available.	Moderate.
		Physical Separation	Does not meet RAOs alone, but may be considered in conjunction with other technologies to form potential remedial actions (e.g., removal, dewatering, disposal, residuals management) that eventually would be expected to meet RAOs.	Can segregate impacted media/source materials from non-impacted media	Process option can be effective, but can also be limited by characteristics of media such as water content and homogeneity of material.	Implementable	Implementable. Equipment, materials, and technical support available.	Moderate.
	Chemical Treatment	Reduction/Oxygenation	Does not meet RAOs alone, but may be considered in conjunction with other technologies to form potential remedial actions (e.g., removal, dewatering, disposal, residuals management) that eventually would be expected to meet RAOs.	Allows sufficient time for oxidation to occur in a controlled environment.	Has been used full-scale for soil. A site-specific study would be required to assess treatment effectiveness.	Implementable.	Implementable. Equipment, materials, and technical support available.	Moderate to high (considering additional treatment will be required if using reduction/ oxidation process option).
Removal	Excavation	Mechanical	Does not meet RAOs alone, but may be considered in conjunction with other technologies to form potential remedial actions (e.g., excavation in-the-dry, dewatering, residuals management) that eventually meet RAOs.	Would remove existing habitat, may result in increased residual activity levels at locations where greater activities exist at depth and/or as a result of COI release during implementation. Effects could be mitigated through the use of engineering controls. Increased potential for localized flooding exist. Potential risk of release and exposure also exists during material transport, handling, and processing.	Has been applied at other sites.	Implementable based on understanding of groundwater and surface water depths in areas of interest.	Permits not required under CERCLA, although substantive requirements should be met.	Moderate.
Dewatering	Gravity Drainage	Gravity Drainage	Does not meet RAOs on its own, but may be necessary for removed soil/sediment that are high in water content prior to disposal.	Minimal, assuming waste streams are properly managed. Possible worker exposure to impacted soil/sediment and water. Treated water likely would be discharged back to surface water conveyance.	Reliable. A site-specific study would be required to assess treatment effectiveness.	Implementable.	Implementable.	Low.
Disposal	On-Site Consolidation	Confined disposal	Does not meet RAOs alone, but can be used in conjunction with other technologies to form remedial actions (e.g., removal, dewatering, residuals management) that eventually would be expected to meet RAOs.	Minimal, assuming waste streams are properly managed.	Reliable. Applied at numerous other sites.	Implementable.	Implementable.	Moderate to high.
	Off-Site Disposal	Permitted Landfill	Does not meet RAOs alone, but can be used in conjunction with other technologies to form remedial actions (e.g., removal, dewatering, residuals management) that eventually would be expected to meet RAOs.	Effects could be reduced through use of proper engineering controls. Risks of exposure and transportation accidents increase with significantly increased haul distances of materials.	Widely used.	Implementable. Depends on landfill location, availability, and capacity.	Implementable.	Moderate to high.
Residuals Management	On-Site Water Treatment	Filtration	Does not meet RAOs alone, but can be used in conjunction with other technologies to form remedial actions (e.g., removal, dewatering, disposal) that eventually would be expected to meet RAOs.	Minimal, assuming waste streams are properly managed. Possible worker exposure to impacted soil/sediment and water.	Reliable.	Implementable.	Implementable.	Low to moderate.
		Package Treatment process	Does not meet RAOs alone, but can be used in conjunction with other technologies to form remedial actions (e.g., removal, dewatering, disposal) that eventually would be expected to meet RAOs.	Minimal, assuming waste streams are properly managed. Possible worker exposure to impacted soil/sediment and water.	Reliable.	Implementable.	Implementable.	Low to moderate.
	Off-Site Water Treatment	Discharge to Sanitary Sewer/ WWTP	Does not meet RAOs alone, but can be used in conjunction with other technologies to form remedial actions (e.g., removal, dewatering, disposal) that eventually would be expected to meet RAOs.	Minimal, assuming waste streams are properly managed. Possible worker exposure to impacted soil/sediment and water.	Reliable.	Implementable.	Implementable.	Low to moderate.
		Collect, Store, and Transport to Licensed Treatment Facility	Does not meet RAOs alone, but can be used in conjunction with other technologies to form remedial actions (e.g., removal, dewatering, disposal) that eventually would be expected to meet RAOs.	Minimal, assuming waste streams are properly managed. Risks of exposure and transportation accidents increase with significantly increased haul distances of materials.	Reliable.	Implementable.	Implementable.	Low to moderate.

Notes:
1. Cost are relative to other process options within each general response action.
2. Shaded process options have not been retained for further analysis.

Table 6
Cost Estimate for Former RMHA (Excluding Removal in Paved Areas) - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$750	$750
2	Permitting/Access Agreements	1	LS	$250	$250
3	Mobilization/Demobilization	1	LS	3%	$800
4	Utility Markout, Protection, and Relocation	1	LS	$100	$100
5	Clearing and Grubbing	0.01	ACRE	$5,000	$50
6	Construct and Maintain Material Staging Areas	2	EACH	$750	$1,500
7	Construct and Maintain Decontamination Pads	2	EACH	$75	$150
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$2,130	$2,130
9	Sedimentation and Erosion Control	70	LF	$3	$210
10	Water Handling/Management	1	WEEK	$2,000	$2,000
11	Excavation and Handling	40	CY	$30	$1,200
12	Stabilization Admixture (Water Content)	10	TON	$115	$1,150
13	Community Air Monitoring	1	WEEK	$2,000	$2,000
14	Backfill	30	CY	$25	$750
15	Surface Restoration	600	SF	$2	$1,200
16	Liquid Waste Characterization	1	EACH	$1,000	$1,000
17	Solid Waste Characterization	1	EACH	$1,000	$1,000
18	Liquid Waste Transportation and Disposal	1,200	GALLONS	$1	$1,200
19	Transportation and Disposal - non-RCRA materials	40	TON	$55	$2,200
20	Transportation and Disposal - RCRA characteristic materials	40	TON	$250	$10,000
21	Construction Completion Report and Site Management Plan	1	LS	$750	$750
				Subtotal Capital Cost	$30,390
22				Administration & Engineering (15%)	$2,286
				Construction Management (15%)	$2,286
				Contingency (20%)	$6,078
				Total Capital Cost	$41,040
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$20	$20
24	Site Inspection and Maintenance	1	LS	$30	$30
				Subtotal O&M Cost	$50
				Contingency (20%)	$10
				Total Annual O&M Cost	$60
25				30-Year Total Present Worth Cost of O&M	$1,038
				Total Estimated Cost:	**$42,078**
				Rounded To:	**$40,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 6
Cost Estimate for Former RMHA (Excluding Removal in Paved Areas) - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

Table 6
Cost Estimate for Former RMHA (Excluding Removal in Paved Areas) - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 7
Cost Estimate for Former RMHA (Including Removal in Paved Areas) - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$10,500	$10,500
2	Permitting/Access Agreements	1	LS	$3,500	$3,500
3	Mobilization/Demobilization	1	LS	3%	$8,500
4	Utility Markout, Protection, and Relocation	1	LS	$1,400	$1,400
5	Clearing and Grubbing	0.15	ACRE	$5,000	$750
6	Construct and Maintain Material Staging Areas	2	EACH	$10,500	$21,000
7	Construct and Maintain Decontamination Pads	2	EACH	$1,050	$2,100
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$29,800	$29,800
9	Sedimentation and Erosion Control	980	LF	$3	$2,940
10	Water Handling/Management	3	WEEK	$2,000	$6,000
11	Excavation and Handling	585	CY	$30	$17,550
12	Stabilization Admixture (Water Content)	50	TON	$115	$5,750
13	Community Air Monitoring	3	WEEK	$2,000	$6,000
14	Backfill	470	CY	$25	$11,750
15	Surface Restoration	6,400	SF	$2	$12,800
16	Liquid Waste Characterization	1	EACH	$1,000	$1,000
17	Solid Waste Characterization	2	EACH	$1,000	$2,000
18	Liquid Waste Transportation and Disposal	17,550	GALLONS	$1	$17,550
19	Transportation and Disposal - non-RCRA materials	470	TON	$55	$25,850
20	Transportation and Disposal - RCRA characteristic materials	470	TON	$250	$117,500
21	Construction Completion Report and Site Management Plan	1	LS	$10,500	$10,500
				Subtotal Capital Cost	$314,740
22				Administration & Engineering (15%)	$19,401
				Construction Management (15%)	$19,401
				Contingency (20%)	$62,948
				Total Capital Cost	$416,490
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$20	$20
24	Site Inspection and Maintenance	1	LS	$30	$30
				Subtotal O&M Cost	$50
				Contingency (20%)	$10
				Total Annual O&M Cost	$60
25				30-Year Total Present Worth Cost of O&M	$1,038
				Total Estimated Cost:	**$417,528**
				Rounded To:	**$420,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 7
Cost Estimate for Former RMHA (Including Removal in Paved Areas) - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 7
Cost Estimate for Former RMHA (Including Removal in Paved Areas) - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 8
Cost Estimate for East Swale - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$3,000	$3,000
2	Permitting/Access Agreements	1	LS	$1,000	$1,000
3	Mobilization/Demobilization	1	LS	3%	$2,400
4	Utility Markout, Protection, and Relocation	1	LS	$400	$400
5	Clearing and Grubbing	0.16	ACRE	$5,000	$800
6	Construct and Maintain Material Staging Areas	2	EACH	$3,000	$6,000
7	Construct and Maintain Decontamination Pads	2	EACH	$300	$600
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$8,510	$8,510
9	Sedimentation and Erosion Control	280	LF	$3	$840
10	Water Handling/Management	1	WEEK	$2,000	$2,000
11	Excavation and Handling	130	CY	$30	$3,900
12	Stabilization Admixture (Water Content)	10	TON	$115	$1,150
13	Community Air Monitoring	1	WEEK	$2,000	$2,000
14	Backfill	0	CY	$25	$0
15	Surface Restoration	7,000	SF	$2	$14,000
16	Liquid Waste Characterization	1	EACH	$1,000	$1,000
17	Solid Waste Characterization	1	EACH	$1,000	$1,000
18	Liquid Waste Transportation and Disposal	3,900	GALLONS	$1	$3,900
19	Transportation and Disposal - non-RCRA materials	110	TON	$55	$6,050
20	Transportation and Disposal - RCRA characteristic materials	110	TON	$250	$27,500
21	Construction Completion Report and Site Management Plan	1	LS	$3,000	$3,000
				Subtotal Capital Cost	$89,050
22				Administration & Engineering (15%)	$6,690
				Construction Management (15%)	$6,690
				Contingency (20%)	$17,810
				Total Capital Cost	$120,240
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$220	$220
24	Site Inspection and Maintenance	1	LS	$330	$330
				Subtotal O&M Cost	$550
				Contingency (20%)	$110
				Total Annual O&M Cost	$660
25				30-Year Total Present Worth Cost of O&M	$11,413
				Total Estimated Cost:	**$131,653**
				Rounded To:	**$130,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 8
Cost Estimate for East Swale - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization)

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 8
Cost Estimate for East Swale - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 9
Cost Estimate for South Ditch - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$5,250	$5,250
2	Permitting/Access Agreements	1	LS	$1,750	$1,750
3	Mobilization/Demobilization	1	LS	3%	$4,400
4	Utility Markout, Protection, and Relocation	1	LS	$700	$700
5	Clearing and Grubbing	0.20	ACRE	$5,000	$1,000
6	Construct and Maintain Material Staging Areas	2	EACH	$5,250	$10,500
7	Construct and Maintain Decontamination Pads	2	EACH	$525	$1,050
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$14,890	$14,890
9	Sedimentation and Erosion Control	490	LF	$3	$1,470
10	Water Handling/Management	2	WEEK	$2,000	$4,000
11	Excavation and Handling	270	CY	$30	$8,100
12	Stabilization Admixture (Water Content)	30	TON	$115	$3,450
13	Community Air Monitoring	2	WEEK	$2,000	$4,000
14	Backfill	110	CY	$25	$2,750
15	Surface Restoration	8,800	SF	$2	$17,600
16	Liquid Waste Characterization	1	EACH	$1,000	$1,000
17	Solid Waste Characterization	1	EACH	$1,000	$1,000
18	Liquid Waste Transportation and Disposal	8,100	GALLONS	$1	$8,100
19	Transportation and Disposal - non-RCRA materials	220	TON	$55	$12,100
20	Transportation and Disposal - RCRA characteristic materials	220	TON	$250	$55,000
21	Construction Completion Report and Site Management Plan	1	LS	$5,250	$5,250
				Subtotal Capital Cost	$163,360
22				Administration & Engineering (15%)	$11,387
				Construction Management (15%)	$11,387
				Contingency (20%)	$32,672
				Total Capital Cost	$218,805
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$270	$270
24	Site Inspection and Maintenance	1	LS	$410	$410
				Subtotal O&M Cost	$680
				Contingency (20%)	$136
				Total Annual O&M Cost	$816
25				30-Year Total Present Worth Cost of O&M	$14,110
				Total Estimated Cost:	**$232,915**
				Rounded To:	**$230,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 9
Cost Estimate for South Ditch - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

Table 9
Cost Estimate for South Ditch - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 9
Cost Estimate for South Ditch - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 10
Cost Estimate for Upper Creek Area - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$18,000	$18,000
2	Permitting/Access Agreements	1	LS	$6,000	$6,000
3	Mobilization/Demobilization	1	LS	3%	$13,700
4	Utility Markout, Protection, and Relocation	1	LS	$2,400	$2,400
5	Clearing and Grubbing	0.57	ACRE	$5,000	$2,850
6	Construct and Maintain Material Staging Areas	2	EACH	$18,000	$36,000
7	Construct and Maintain Decontamination Pads	2	EACH	$1,800	$3,600
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$51,030	$51,030
9	Sedimentation and Erosion Control	1,680	LF	$3	$5,040
10	Water Handling/Management	4	WEEK	$2,000	$8,000
11	Excavation and Handling	880	CY	$30	$26,400
12	Stabilization Admixture (Water Content)	70	TON	$115	$8,050
13	Community Air Monitoring	4	WEEK	$2,000	$8,000
14	Backfill	420	CY	$25	$10,500
15	Surface Restoration	24,700	SF	$2	$49,400
16	Liquid Waste Characterization	2	EACH	$1,000	$2,000
17	Solid Waste Characterization	2	EACH	$1,000	$2,000
18	Liquid Waste Transportation and Disposal	26,400	GALLONS	$1	$26,400
19	Transportation and Disposal - non-RCRA materials	700	TON	$55	$38,500
20	Transportation and Disposal - RCRA characteristic materials	700	TON	$250	$175,000
21	Construction Completion Report and Site Management Plan	1	LS	$18,000	$18,000
				Subtotal Capital Cost	$510,870
22				Administration & Engineering (15%)	$34,346
				Construction Management (15%)	$34,346
				Contingency (20%)	$102,174
				Total Capital Cost	$681,735
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$760	$760
24	Site Inspection and Maintenance	1	LS	$1,140	$1,140
				Subtotal O&M Cost	$1,900
				Contingency (20%)	$380
				Total Annual O&M Cost	$2,280
25				30-Year Total Present Worth Cost of O&M	$39,426
				Total Estimated Cost:	**$721,161**
				Rounded To:	**$720,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 10
Cost Estimate for Upper Creek Area - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

Table 10
Cost Estimate for Upper Creek Area - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 10
Cost Estimate for Upper Creek Area - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 11
Cost Estimate for Offsite Creek Area - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$48,000	$48,000
2	Permitting/Access Agreements	1	LS	$16,000	$16,000
3	Mobilization/Demobilization	1	LS	3%	$36,300
4	Utility Markout, Protection, and Relocation	1	LS	$6,400	$6,400
5	Clearing and Grubbing	1.39	ACRE	$5,000	$6,950
6	Construct and Maintain Material Staging Areas	2	EACH	$48,000	$96,000
7	Construct and Maintain Decontamination Pads	2	EACH	$4,800	$9,600
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$136,060	$136,060
9	Sedimentation and Erosion Control	4,480	LF	$3	$13,440
10	Water Handling/Management	10	WEEK	$2,000	$20,000
11	Excavation and Handling	2,395	CY	$30	$71,850
12	Stabilization Admixture (Water Content)	180	TON	$115	$20,700
13	Community Air Monitoring	10	WEEK	$2,000	$20,000
14	Backfill	1,280	CY	$25	$32,000
15	Surface Restoration	60,500	SF	$2	$121,000
16	Liquid Waste Characterization	4	EACH	$1,000	$4,000
17	Solid Waste Characterization	5	EACH	$1,000	$5,000
18	Liquid Waste Transportation and Disposal	71,850	GALLONS	$1	$71,850
19	Transportation and Disposal - non-RCRA materials	1,890	TON	$55	$103,950
20	Transportation and Disposal - RCRA characteristic materials	1,890	TON	$250	$472,500
21	Construction Completion Report and Site Management Plan	1	LS	$48,000	$48,000
				Subtotal Capital Cost	$1,359,600
22				Administration & Engineering (15%)	$89,895
				Construction Management (15%)	$89,895
				Contingency (20%)	$271,920
				Total Capital Cost	$1,811,310
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$1,870	$1,870
24	Site Inspection and Maintenance	1	LS	$2,810	$2,810
				Subtotal O&M Cost	$4,680
				Contingency (20%)	$936
				Total Annual O&M Cost	$5,616
25				30-Year Total Present Worth Cost of O&M	$97,112
				Total Estimated Cost:	**$1,908,422**
				Rounded To:	**$1,910,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 11
Cost Estimate for Offsite Creek Area - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

Table 11
Cost Estimate for Offsite Creek Area - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 11
Cost Estimate for Offsite Creek Area - Alternative 2 (95% UCL Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 12
Cost Estimate for Former RMHA (Excluding Removal in Paved Areas) - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$1,500	$1,500
2	Permitting/Access Agreements	1	LS	$500	$500
3	Mobilization/Demobilization	1	LS	3%	$3,200
4	Utility Markout, Protection, and Relocation	1	LS	$200	$200
5	Clearing and Grubbing	0.14	ACRE	$5,000	$700
6	Construct and Maintain Material Staging Areas	2	EACH	$1,500	$3,000
7	Construct and Maintain Decontamination Pads	2	EACH	$150	$300
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$4,260	$4,260
9	Sedimentation and Erosion Control	140	LF	$3	$420
10	Water Handling/Management	1	WEEK	$2,000	$2,000
11	Excavation and Handling	245	CY	$30	$7,350
12	Stabilization Admixture (Water Content)	20	TON	$115	$2,300
13	Community Air Monitoring	1	WEEK	$2,000	$2,000
14	Backfill	130	CY	$25	$3,250
15	Surface Restoration	6,100	SF	$2	$12,200
16	Liquid Waste Characterization	1	EACH	$1,000	$1,000
17	Solid Waste Characterization	1	EACH	$1,000	$1,000
18	Liquid Waste Transportation and Disposal	7,350	GALLONS	$1	$7,350
19	Transportation and Disposal - non-RCRA materials	200	TON	$55	$11,000
20	Transportation and Disposal - RCRA characteristic materials	200	TON	$250	$50,000
21	Construction Completion Report and Site Management Plan	1	LS	$1,500	$1,500
				Subtotal Capital Cost	$115,030
22				Administration & Engineering (15%)	$6,477
				Construction Management (15%)	$6,477
				Contingency (20%)	$23,006
				Total Capital Cost	$150,990
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$120	$120
24	Site Inspection and Maintenance	1	LS	$180	$180
				Subtotal O&M Cost	$300
				Contingency (20%)	$60
				Total Annual O&M Cost	$360
25				30-Year Total Present Worth Cost of O&M	$6,225
				Total Estimated Cost:	**$157,215**
				Rounded To:	**$160,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 12
Cost Estimate for Former RMHA (Excluding Removal in Paved Areas) - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 12
Cost Estimate for Former RMHA (Excluding Removal in Paved Areas) - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 13
Cost Estimate for Former RMHA (Including Removal in Paved Areas) - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$9,750	$9,750
2	Permitting/Access Agreements	1	LS	$3,000	$3,000
3	Mobilization/Demobilization	1	LS	3%	$19,000
4	Utility Markout, Protection, and Relocation	1	LS	$1,300	$1,300
5	Clearing and Grubbing	0.45	ACRE	$5,000	$2,250
6	Construct and Maintain Material Staging Areas	2	EACH	$9,750	$19,500
7	Construct and Maintain Decontamination Pads	2	EACH	$980	$1,960
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$27,700	$27,700
9	Sedimentation and Erosion Control	910	LF	$3	$2,730
10	Water Handling/Management	7	WEEK	$2,000	$14,000
11	Excavation and Handling	1,525	CY	$30	$45,750
12	Stabilization Admixture (Water Content)	120	TON	$115	$13,800
13	Community Air Monitoring	7	WEEK	$2,000	$14,000
14	Backfill	1,160	CY	$25	$29,000
15	Surface Restoration	19,800	SF	$2	$39,600
16	Liquid Waste Characterization	3	EACH	$1,000	$3,000
17	Solid Waste Characterization	4	EACH	$1,000	$4,000
18	Liquid Waste Transportation and Disposal	45,750	GALLONS	$1	$45,750
19	Transportation and Disposal - non-RCRA materials	1,210	TON	$55	$66,550
20	Transportation and Disposal - RCRA characteristic materials	1,210	TON	$250	$302,500
21	Construction Completion Report and Site Management Plan	1	LS	$9,750	$9,750
				Subtotal Capital Cost	$674,890
22				Administration & Engineering (15%)	$35,639
				Construction Management (15%)	$35,639
				Contingency (20%)	$134,978
				Total Capital Cost	$881,145
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$120	$120
24	Site Inspection and Maintenance	1	LS	$180	$180
				Subtotal O&M Cost	$300
				Contingency (20%)	$60
				Total Annual O&M Cost	$360
25				30-Year Total Present Worth Cost of O&M	$6,225
				Total Estimated Cost:	**$887,370**
				Rounded To:	**$890,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 13
Cost Estimate for Former RMHA (Including Removal in Paved Areas) - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 13
Cost Estimate for Former RMHA (Including Removal in Paved Areas) - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 14
Cost Estimate for East Swale - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$9,000	$9,000
2	Permitting/Access Agreements	1	LS	$3,000	$3,000
3	Mobilization/Demobilization	1	LS	3%	$15,600
4	Utility Markout, Protection, and Relocation	1	LS	$1,200	$1,200
5	Clearing and Grubbing	0.61	ACRE	$5,000	$3,050
6	Construct and Maintain Material Staging Areas	2	EACH	$9,000	$18,000
7	Construct and Maintain Decontamination Pads	2	EACH	$900	$1,800
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$25,520	$25,520
9	Sedimentation and Erosion Control	840	LF	$3	$2,520
10	Water Handling/Management	5	WEEK	$2,000	$10,000
11	Excavation and Handling	1,200	CY	$30	$36,000
12	Stabilization Admixture (Water Content)	90	TON	$115	$10,350
13	Community Air Monitoring	5	WEEK	$2,000	$10,000
14	Backfill	710	CY	$25	$17,750
15	Surface Restoration	26,500	SF	$2	$53,000
16	Liquid Waste Characterization	2	EACH	$1,000	$2,000
17	Solid Waste Characterization	3	EACH	$1,000	$3,000
18	Liquid Waste Transportation and Disposal	36,000	GALLONS	$1	$36,000
19	Transportation and Disposal - non-RCRA materials	950	TON	$55	$52,250
20	Transportation and Disposal - RCRA characteristic materials	950	TON	$250	$237,500
21	Construction Completion Report and Site Management Plan	1	LS	$9,000	$9,000
				Subtotal Capital Cost	$556,540
22				Administration & Engineering (15%)	$31,469
				Construction Management (15%)	$31,469
				Contingency (20%)	$111,308
				Total Capital Cost	$730,785
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$540	$540
24	Site Inspection and Maintenance	1	LS	$810	$810
				Subtotal O&M Cost	$1,350
				Contingency (20%)	$270
				Total Annual O&M Cost	$1,620
25				30-Year Total Present Worth Cost of O&M	$28,013
				Total Estimated Cost:	**$758,798**
				Rounded To:	**$760,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 14
Cost Estimate for East Swale - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 14
Cost Estimate for East Swale - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 15
Cost Estimate for South Ditch - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$9,000	$9,000
2	Permitting/Access Agreements	1	LS	$3,000	$3,000
3	Mobilization/Demobilization	1	LS	3%	$16,900
4	Utility Markout, Protection, and Relocation	1	LS	$1,200	$1,200
5	Clearing and Grubbing	1.15	ACRE	$5,000	$5,750
6	Construct and Maintain Material Staging Areas	2	EACH	$9,000	$18,000
7	Construct and Maintain Decontamination Pads	2	EACH	$900	$1,800
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$25,520	$25,520
9	Sedimentation and Erosion Control	840	LF	$3	$2,520
10	Water Handling/Management	5	WEEK	$2,000	$10,000
11	Excavation and Handling	1,210	CY	$30	$36,300
12	Stabilization Admixture (Water Content)	100	TON	$115	$11,500
13	Community Air Monitoring	5	WEEK	$2,000	$10,000
14	Backfill	280	CY	$25	$7,000
15	Surface Restoration	50,100	SF	$2	$100,200
16	Liquid Waste Characterization	2	EACH	$1,000	$2,000
17	Solid Waste Characterization	3	EACH	$1,000	$3,000
18	Liquid Waste Transportation and Disposal	36,300	GALLONS	$1	$36,300
19	Transportation and Disposal - non-RCRA materials	960	TON	$55	$52,800
20	Transportation and Disposal - RCRA characteristic materials	960	TON	$250	$240,000
21	Construction Completion Report and Site Management Plan	1	LS	$9,000	$9,000
				Subtotal Capital Cost	$601,790
22				Administration & Engineering (15%)	$37,754
				Construction Management (15%)	$37,754
				Contingency (20%)	$120,358
				Total Capital Cost	$797,655
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$1,020	$1,020
24	Site Inspection and Maintenance	1	LS	$1,530	$1,530
				Subtotal O&M Cost	$2,550
				Contingency (20%)	$510
				Total Annual O&M Cost	$3,060
25				30-Year Total Present Worth Cost of O&M	$52,914
				Total Estimated Cost:	**$850,569**
				Rounded To:	**$850,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 15
Cost Estimate for South Ditch - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

Table 15
Cost Estimate for South Ditch - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing COIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 15
Cost Estimate for South Ditch - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 16
Cost Estimate for Upper Creek Area - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$10,500	$10,500
2	Permitting/Access Agreements	1	LS	$3,500	$3,500
3	Mobilization/Demobilization	1	LS	3%	$19,300
4	Utility Markout, Protection, and Relocation	1	LS	$1,400	$1,400
5	Clearing and Grubbing	0.84	ACRE	$5,000	$4,200
6	Construct and Maintain Material Staging Areas	2	EACH	$10,500	$21,000
7	Construct and Maintain Decontamination Pads	2	EACH	$1,050	$2,100
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$29,770	$29,770
9	Sedimentation and Erosion Control	980	LF	$3	$2,940
10	Water Handling/Management	6	WEEK	$2,000	$12,000
11	Excavation and Handling	1,470	CY	$30	$44,100
12	Stabilization Admixture (Water Content)	120	TON	$115	$13,800
13	Community Air Monitoring	6	WEEK	$2,000	$12,000
14	Backfill	790	CY	$25	$19,750
15	Surface Restoration	36,800	SF	$2	$73,600
16	Liquid Waste Characterization	3	EACH	$1,000	$3,000
17	Solid Waste Characterization	3	EACH	$1,000	$3,000
18	Liquid Waste Transportation and Disposal	44,100	GALLONS	$1	$44,100
19	Transportation and Disposal - non-RCRA materials	1,170	TON	$55	$64,350
20	Transportation and Disposal - RCRA characteristic materials	1,170	TON	$250	$292,500
21	Construction Completion Report and Site Management Plan	1	LS	$10,500	$10,500
				Subtotal Capital Cost	$687,410
22				Administration & Engineering (15%)	$39,294
				Construction Management (15%)	$39,294
				Contingency (20%)	$137,482
				Total Capital Cost	$903,480
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$750	$750
24	Site Inspection and Maintenance	1	LS	$1,130	$1,130
				Subtotal O&M Cost	$1,880
				Contingency (20%)	$376
				Total Annual O&M Cost	$2,256
25				30-Year Total Present Worth Cost of O&M	$39,011
				Total Estimated Cost:	**$942,491**
				Rounded To:	**$940,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 16
Cost Estimate for Upper Creek Area - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 16
Cost Estimate for Upper Creek Area - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 17
Cost Estimate for Offsite Creek Area - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Pre-Design/Pre-Construction Investigations	1	LS	$45,000	$45,000
2	Permitting/Access Agreements	1	LS	$15,000	$15,000
3	Mobilization/Demobilization	1	LS	3%	$79,300
4	Utility Markout, Protection, and Relocation	1	LS	$6,000	$6,000
5	Clearing and Grubbing	3.45	ACRE	$5,000	$17,250
6	Construct and Maintain Material Staging Areas	2	EACH	$45,000	$90,000
7	Construct and Maintain Decontamination Pads	2	EACH	$4,500	$9,000
8	Construct and Maintain Access Roads and Laydown Area	1	LS	$127,560	$127,560
9	Sedimentation and Erosion Control	4,200	LF	$3	$12,600
10	Water Handling/Management	25	WEEK	$2,000	$50,000
11	Excavation and Handling	6,055	CY	$30	$181,650
12	Stabilization Admixture (Water Content)	460	TON	$115	$52,900
13	Community Air Monitoring	25	WEEK	$2,000	$50,000
14	Backfill	3,270	CY	$25	$81,750
15	Surface Restoration	150,500	SF	$2	$301,000
16	Liquid Waste Characterization	10	EACH	$1,000	$10,000
17	Solid Waste Characterization	13	EACH	$1,000	$13,000
18	Liquid Waste Transportation and Disposal	181,650	GALLONS	$1	$181,650
19	Transportation and Disposal - non-RCRA materials	4,780	TON	$55	$262,900
20	Transportation and Disposal - RCRA characteristic materials	4,780	TON	$250	$1,195,000
21	Construction Completion Report and Site Management Plan	1	LS	$45,000	$45,000
				Subtotal Capital Cost	$2,826,560
22				Administration & Engineering (15%)	$162,302
				Construction Management (15%)	$162,302
				Contingency (20%)	$565,312
				Total Capital Cost	$3,716,475
Operation and Maintenance Costs					
23	Annual Verification of Institutional Controls	1	LS	$3,060	$3,060
24	Site Inspection and Maintenance	1	LS	$4,590	$4,590
				Subtotal O&M Cost	$7,650
				Contingency (20%)	$1,530
				Total Annual O&M Cost	$9,180
25				30-Year Total Present Worth Cost of O&M	$158,741
				Total Estimated Cost:	**$3,875,216**
				Rounded To:	**$3,880,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. All costs assume construction field work to be conducted by non-unionized labor.

Table 17
Cost Estimate for Offsite Creek Area - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Pre-design/pre-construction investigation cost estimate includes labor, equipment, and materials necessary to conduct investigation activities in support of the remedial design and implementation of this alternative. Such investigations may include, but are not limited to, collection of delineation and/or preconstruction waste characterization samples and site survey.

2. Permitting/access agreements cost estimate includes estimated costs necessary to obtain any necessary permits and access agreements to complete the remedial construction activities associated with this alternative.

3. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

4. Utility markout, protection, and relocation cost estimate includes labor, equipment, and materials necessary to markout, clear, protect, and/or temporarily relocate utilities within the proposed removal areas.

5. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

6. Construct and maintain material staging areas cost estimate includes labor, equipment, and materials to construct two 100-foot by 100-foot material staging areas, constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer for staging excavated material and to facilitate material handling/stabilization. It is estimated that the staging areas will be located on existing surfaces and that maintenance activities will include inspections and repair area as necessary. Estimate assumes a cost of approximately $7.50 per square foot for construction.

7. Construct and maintain decontamination pads cost estimate includes labor, equipment, and materials necessary to construct and maintain two 20-foot by 50-foot decontamination pads and appurtenances. The decontamination pads would consist of constructed with a 12-inch berm, a 40-mil HDPE liner, collection sump, and 12-inch gravel layer. Estimate assumes a cost of approximately $7.50 per square foot of pad for construction.

8. Construct and maintain access roads and laydown areas cost estimate includes labor, equipment, and materials necessary to construct support areas and access points to facilitate removal activities. Estimate includes costs for a equipment laydown area in the Offsite Creek Area and access roads in the Offsite Creek Area, Upper Creek Area, and South Ditch. Estimate includes costs for construction of an approximately 100-foot by 100-foot equipment laydown area and approximately 8,000 linear feet of access roads (25 feet wide). Cost estimate assumes access roads and equipment laydown area will consist of geotextile fabric ($1 per square yard) and 1 foot of gravel ($25 per cubic yard [cy]).

9. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage pathways.

10. Water handling/management cost estimate includes labor, equipment, and materials necessary to: 1) remove and containerize water from material dewatering/staging areas; and 2) provide bypass pumping around work/excavation area. Cost estimate includes the rental of up to two 20,000 gallon holding tanks and associated pumps and piping/hoses for management of water, and pumps, sandbags, and piping/hoses for temporary bypass pumping. Project duration estimated using an average excavation production rate of 100 cy per day for project duration (mobilization through demobilization).

11. Excavation and handling cost estimate includes labor, equipment, and materials necessary to excavate material containing CoIs at concentrations resulting in 95% UCL concentrations greater than the applicable lead PRGs. Cost estimate assumes excavation activities would be completed to depths up to 3 feet below grade using conventional construction equipment. Cost estimate is based on in-place soil volume and includes survey control and transfer of excavated material to staging area for processing.

12. Stabilization admixture (water content) cost estimate includes the purchase and import of stabilizing agents for an assumed 50% of excavated material. Cost estimate assumes stabilization admixture (e.g., Portland cement) will be added at ratio of 10% of the weight of material to be stabilized.

13. Community air monitoring cost estimate includes equipment and materials necessary to monitor particulate matter during intrusive or material handling activities and applying dust suppression measures (e.g. water spray), if required, to work areas. See Assumption #9 for information regarding estimated project duration.

14. Backfill cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on in-place soil volume of materials requiring excavation. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing.

15. Surface restoration cost estimate includes labor, equipment, and material necessary to restore surfaces disturbed during remedial activities. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture, shrubs, trees, and wetland mix. Estimate based on an assumed area of twice the removal footprint (to account for support/staging

16. Liquid waste characterization cost estimate includes the collection and analysis (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals) of water containerized during remedial construction. Cost estimate assumes one sample collected and analyzed per every 20,000 gallons water requiring transportation and off-site disposal.

17. Solid waste characterization cost estimate includes the collection and analysis of soil samples (including, but not limited to, PCBs, VOCs, SVOCs, and RCRA Metals). Cost estimate assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal.

18. Liquid waste transportation and disposal cost estimate includes the transportation and off-site treatment/disposal of water collected during remedial construction activities. Volume estimate includes decontamination water and water removed from soil staging areas only. Volume estimate based on one saturated pore volume of 50% of excavated material. Cost estimate assumes water would be removed from on-site holding tanks and transported for off-site treatment/disposal via 5,000-gallon tanker trucks.

19. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

20. Transportation and disposal - RCRA characteristic materials cost estimate includes labor, equipment, and materials necessary to transport and dispose excavated material at an appropriately permitted disposal facility. Estimate assumes disposal of approximately 50% of excavated material (including stabilizing admixture for dewatering [see line item 11]) at an estimated density of 1.5 tons per cy.

Table 17
Cost Estimate for Offsite Creek Area - Alternative 3 (Discrete Removal Scenario)

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

21. Construction completion report and site management plan cost estimate includes labor necessary to prepare final construction completion documentation for the performance of the remediation activities. Estimate also includes preparation of a site management plan for the post-construction phase of the project to document: the institutional controls that have been established and will be maintained for the site; protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities; and requirements for periodic site inspections and maintenance.

22. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

23. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

24. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

25. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 18
Cost Estimate for Rehabilitation of the Eastern Fenced Area

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Item #	Description	Estimated Quantity	Unit	Unit Price	Estimated Cost
Capital Costs					
1	Mobilization/Demobilization	1	LS	3%	$12,400
2	Sedimentation and Erosion Control	2,050	LF	$3	$6,150
3	Clearing and Grubbing	5	ACRE	$5,000	$25,000
4	Transportation and Disposal - non-RCRA materials	100	TON	$55	$5,500
5	Clean Fill Materials	4,110	CY	$25	$102,750
6	Surface Vegetative Restoration	24,680	SY	$10	$246,800
7	Fence Repair/Replacement/New Fence	510	LF	$50	$25,500
				Subtotal Capital Cost	$424,100
8				Administration & Engineering (15%)	$59,790
				Construction Management (15%)	$59,790
				Contingency (20%)	$84,820
				Total Capital Cost	$628,500
Operation and Maintenance Costs					
9	Annual Verification of Institutional Controls	1	LS	$6,870	$6,870
10	Site Inspection and Maintenance	1	LS	$10,310	$10,310
				Subtotal O&M Cost	$17,180
				Contingency (20%)	$3,436
				Total Annual O&M Cost	$20,616
11				30-Year Total Present Worth Cost of O&M	$356,493
				Total Estimated Cost:	**$984,993**
				Rounded To:	**$980,000**

General Notes:

1. Cost estimate is based on ARCADIS of U.S., Inc.'s (ARCADIS') past experience and vendor estimates using 2013 dollars.

2. Costs for certain lump sum site preparation activities (e.g. pre-design investigations, permitting/access agreements, utility markout, construction of staging areas/decontamination areas/equipment laydown pads, etc.) are accounted for in the cost estimates for the other AoIs and were not included herein.

3. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

4. All costs assume construction field work to be conducted by non-unionized labor.

Table 18
Cost Estimate for Rehabilitation of the Eastern Fenced Area

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Assumptions:

1. Mobilization/demobilization cost estimate includes contractor planning/permitting and mobilization/demobilization of labor, equipment, and materials necessary to conduct the remedial construction activities associated with this alternative. Estimated cost assumed to be 3% of contractor capital costs (Line Items 4 through 21).

2. Sedimentation and erosion control cost estimate includes labor, equipment, and materials necessary for the placement/maintenance of staked hay bales or silt fence removal limits and temporary dams within/along drainage

3. Clearing and grubbing includes all labor and equipment associated with the removal of all vegetation within the EFA in preparation for the installation of a 1-foot soil cover. Above-grade portions of vegetation will be chipped and left onsite (outside the areas subject to remediation). Below grade portions of trees/shrubs will be removed and disposed of off-site as non-RCRA material.

4. Transportation and disposal - non-RCRA materials cost estimate includes labor, equipment, and materials necessary to transport and dispose of excavated material at an appropriate solid waste landfill. Estimate assumes disposal of approximately 100 cy of grubbed tree/shrub root structures at an estimated density of 1.5 tons per cy.

5. Clean fill materials cost estimate includes labor, equipment, and materials necessary to import, place, grade and compact imported fill (e.g., general fill) in removal areas to match previously existing lines and grades. Cost estimate is based on installation of a 6-inch layer of clean backfill as the base layer for the soil cover over the EFA. Cost estimate assumes 95% compaction based on standard proctor testing and includes survey verification and compaction testing. Estimate based on providing a one-foot soil cover over the entire 5 acre EFA.

6. Surface restoration cost estimate includes labor, equipment, and material necessary to provide vegetative restoration of the EFA. Final surface restoration includes up to 6 inches of topsoil vegetated with seed mixture. Estimate based on providing a one foot soil cover over the entire 5 acre EFA.

7. Fence repair/replacement/new fence is based on the assumption that a total equal to 25% of the existing fencing around the EFA will require replacement or new fencing to enclose sludge deposits.

8. Administration and engineering and construction management costs are based on an assumed 15% of the total capital costs (i.e., Line Items 3 to 18), excluding costs for the pre-design investigation, permitting and access agreements, off-site transportation and treatment/disposal of liquids and excavated material, preparation of construction completion reporting or a site management plan.

9. Annual verification of institutional controls cost estimate includes administrative costs for confirming that the established institutional controls remain in place and that no restricted activities have occurred. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to OEPA to demonstrate that the institutional controls are being maintained and remain effective.

10. Site inspection and maintenance cost estimate includes labor, equipment, and materials necessary to conduct periodic inspections of the Eastern Fenced Area and South Ditch and maintenance/repair (e.g., mowing) of the East Fenced Area cover, South Ditch, perimeter fencing, etc.

11. Present worth is estimated based on a 4% beginning-of-year discount rate. It is assumed that "year zero" is 2013.

Table 19
Comparative Analysis of Alternatives 2 and 3 Against Evaluation Criteria

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Criterion	Degree to Which Each Scenario Satisfies Criterion		
	Alternative 1 (No Action Scenario)	**Alternative 2 (95% UCL Removal Scenario**	**Alternative 3 (Discrete Removal Scenario)**
Overall Protection of Human Health and the Environment – Assesses the ability of each alternative to adequately protect human health and the environment from unacceptable risks posed by site impacts by eliminating, reducing or controlling exposures	**Partially Meets Criterion -** Alternative 1 achieves Remedial Action Objectives (RAOs) #1 and #2. Alternative 1 requires no remediation activities, but does establish and maintain Institutional Controls (ICs) in the form of Environmental Covenants (ECs) for the former plant site (including former Raw Materials Handling Area [RMHA], East Swale, South Ditch, and Eastern Fenced Area [EFA]) and the portion of the Offsite Creek Area (OCA) owned by the Richards entities.	**Fully Meets Criterion -** Alternative 2 achieves all six RAOs established for the Site. Alternative 2 achieves the risk-based Preliminary Remediation Goals (PRGs) established for each Area of Interest (AOI) through the removal of soils until the 95% Upper Confidence Limit on the arithmetic mean of the data set (95% UCL, the Exposure Point Concentration [EPC]) is less than the applicable PRG. Alternative 2 features the same ICs as Alternative 1.	**Fully Meets Criterion -** Alternative 3 achieves all six RAOs established for the Site. Alternative 3 achieves the risk-based PRGs established for each AOI through the removal of all soils containing discrete concentrations greater than the applicable PRG. Alternative 3 features the same ICs as Alternative 1.
Compliance with Applicable or Relevant and Appropriate Requirements – Assesses the ability of an alternative to meet the applicable or relevant and appropriate standards, criteria, and requirements of federal, state, and local laws.	**Does Not Meet Criterion -** Alternative 1 does not requires remediation activities and therefore does not include actions to comply with the chemical-, action-, or location-specific ARARs identified for the Site.	**Fully Meets Criterion -** Alternative 2 will comply with the chemical-specific ARARs through the removal of soils until the 95% UCL concentration is less than the applicable PRG. Alternative 2 will comply with the action-specific ARARs through the performance of the remediation activities in accordance with Ohio-EPA approved design documents and through the use of a site-specific Health & Safety Plan. Alternative 2 will comply with the location-specific ARARs by obtaining the required permits/applications or through the satisfaction of the substantive requirements of any such ARAR.	**Fully Meets Criterion -** Alternative 3 will be implemented using the same procedures/methodologies and equipment as Alternative 2 and will therefore also be performed in compliance with the chemical-, action-, and location-specific ARARs identified for the Site.
Long-Term Effectiveness and Permanence – Considers the nature and magnitude of residual risk remaining following remedial construction; the type, degree, and adequacy of long-term management required; the long-term reliability of engineering and institutional controls; and the need for repair/replacement to maintain the performance of the remedy.	**Partially Meets Criterion -** Alternative 1 would not include the implementation of any remedial activities and therefore, would not reduce the potential for long-term exposures to soil/sediment containing site-related impacts. However, the ECs that have been established for the formerly developed portion of the former plant site and the portions of the OCA owned by the Richard's entities will prevent future residential use in these areas and work toward preventing current and potential future site worker exposure to EFA sludge.	**Fully Meets Criterion -** Alternative 2 includes the same ICs as Alternative 1. Alternative 2 will also lower the potential for future exposures in each AoI based upon the designated future uses of those areas through the removal of soil containing the highest constituent concentrations until the 95% UCL is less than the applicable PRG. Under Alternative 2, potential exposures to remaining/residual impacts for certain portions of the Site would be mitigated by following the procedures established in an O&M Plan. Finally, all work areas under Alternative 2 will be restored at the end of the job, so this alternative is not anticipated to have negative long-term impacts to the environment as a result of remedial construction activities.	**Fully Meets Criterion -** Alternative 3 involves the same remediation activities as Alternative 2; however, Alternative 3 involves the removal of all soils with constituent concentrations above the applicable PRGs. Therefore, Alternative 3 also satisfies the long-term effectiveness and permanence criteria.
Reduction of Toxicity, Mobility, or Volume through Treatment – Assesses the treatment/recycling processes used by the alternative; the amount of impacts destroyed, treated, or recycled; the degree of reduction in toxicity, mobility, or volume; the degree to which treatment is irreversible; the type and quantity of residual that would remain; the degree to which treatment reduces the exposures; and the degree to which the transfer of impacts from one media to another media is reduced.	**Does Not Meet Criterion -** Alternative 1 would not actively treat, remove, recycle, or destroy impacted media and therefore, is considered the least effective for this criterion.	**Partially Meets Criterion -** Alternative 2 will not employ treatment/recycling; however, Alternative 2 will reduce the volume of impacted materials through the excavation and off-site disposal of between 3,715 cy and 4,260 cy (depending on whether soil removal is performed under the paved portions of the former RMHA).	**Partially Meets Criterion -** Alternative 3 will not employ treatment/recycling; however, Alternative 3 will reduce the volume of impacted materials through the excavation and off-site disposal of between 10,180 cy and 11,460 cy (depending on whether soil removal is performed under the paved portions of the former RMHA).

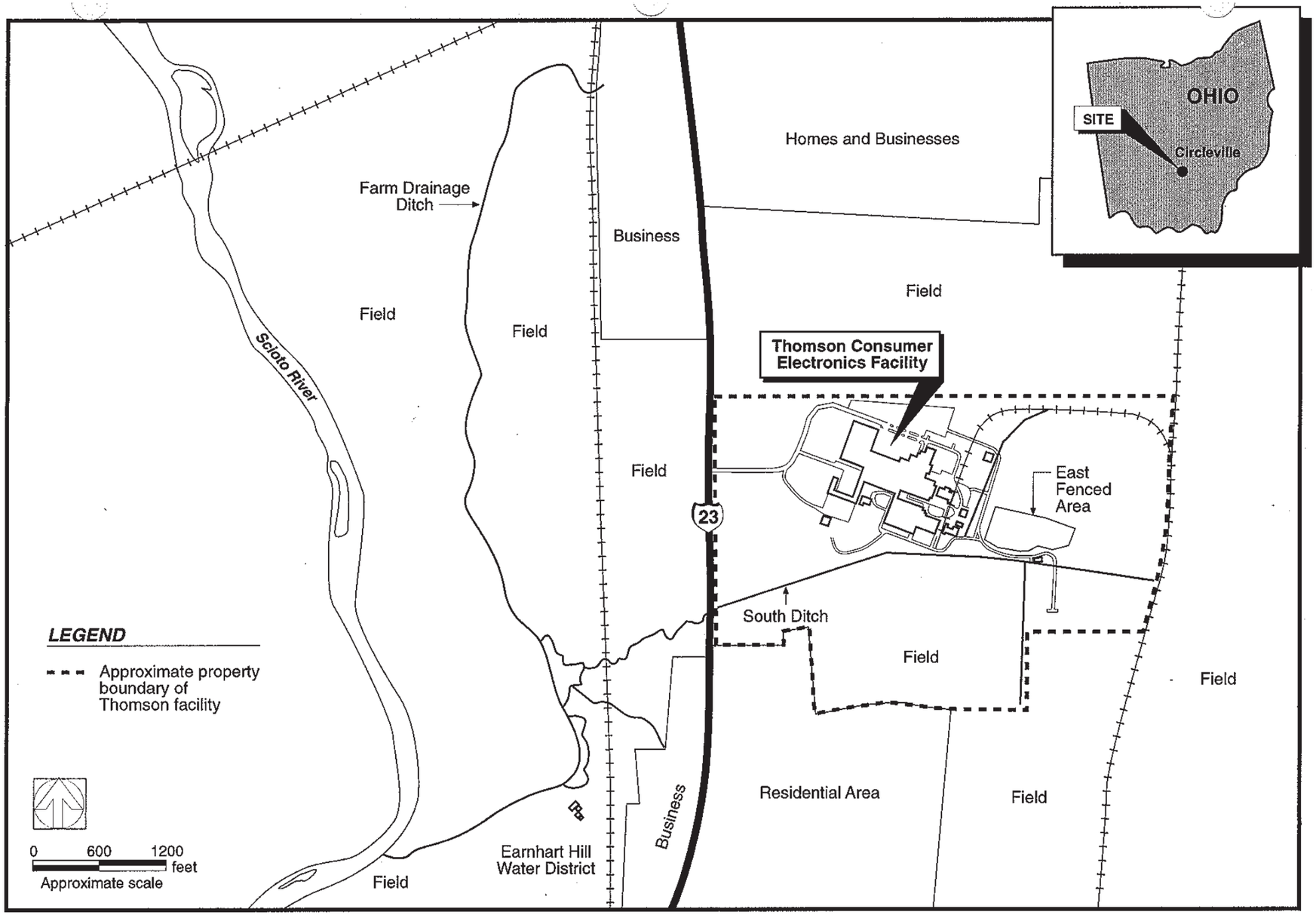
Table 19
Comparative Analysis of Alternatives 2 and 3 Against Evaluation Criteria

Feasibility Study Report
General Electric Company - Former Thomson/RCA Facility - Circleville, Ohio

Criterion	Degree to Which Each Scenario Satisfies Criterion		
	Alternative 1 (No Action Scenario)	**Alternative 2 (95% UCL Removal Scenario**	**Alternative 3 (Discrete Removal Scenario)**
Short-Term Effectiveness – Considers short-term risks to the community during remedial construction; the potential impacts to site workers and the environment during remedial construction and the reliability of protective measures; and the time required to meet remedial goals/site-specific RAOs.	**Does Not Meet Criterion -** Alternative 1 would not include any active remediation and would not present potential short-term impacts to remedial workers, the public, or the environment.	**Fully Meets Criterion -** Alternative 2 achieves the RAOs identified for the Site, requiring less than half the total removal and off-site disposal and would disturb less than half of the surface area as Alternative 3. As a result, Alternative 2 can be performed in less than half the time required to perform Alternative 3. As a result Alternative 2 is considered to pose the least disruption to the community and fewer potential impacts to workers and the environment. Potential exposures to the community and workers will be managed through the use of a site-specific Health & Safety Plan and an Air Monitoring Plan.	**Partially Meets Criterion -** Alternative 3 achieves the RAOs identified for the Site, but requires significantly more removal and off-site disposal and would require the disturbance of more surface area than Alternative 2. Also, Alternative 3 will take more than twice the time required to perform Alternative 2. As a result Alternative 3 is considered to pose the greatest potential disruption to the community and impacts to workers and the environment and therefore is only considered to partially meet criteria. Potential exposures to the community and workers will be managed through the use of a site-specific Health & Safety Plan and an Air Monitoring Plan.
Implementability – Assesses the technical feasibility (i.e., difficulty and operational reliability of remedial construction, and ability to monitor the effectiveness), administrative feasibility (i.e., ability to coordinate with local, state, and federal agencies to obtain permits and approvals), and feasibility of obtaining services and materials (i.e., availability of the technology, services, materials, equipment, resources, and specialists).	**Fully Meets Criterion -** No remedial activities would be conducted as part of Alternative 1 and therefore, Alternative 1 is considered the most implementable.	**Fully Meets Criterion -** Alternative 2 does not require highly specialized equipment or personnel to implement. The greatest implementation challenges are associated with access to the areas requiring remediation and water management. Access to the areas will require the installation of access roads and equipment staging areas. Water management will be performed through flow diversion and bypass pumping.	**Fully Meets Criterion -** Alternative 3 does not require highly specialized equipment or personnel to implement. The greatest implementation challenges are associated with access to the areas requiring remediation and water management. Access to the areas will require the installation of access roads and equipment staging areas. Water management will be performed through flow diversion and bypass pumping.
Cost – Considers the direct and indirect capital costs and annual operation and maintenance (O&M) costs.	**Low -** Alternative 1 requires no remediation activities. The only costs are associated with the execution of the ICs (ECs) and the and annual verification that those ICs remain in place.	**Medium -** Alternative 2 achieves the RAOs established for the Site at approximately half the cost of Alternative 3.	**High -** Alternative 3 achieves the RAOs established for the Site, but will cost approximately double cost of Alternative 2.

ARCADIS

Figures



NOTE:
1. DRAWING CREATED FROM FIGURE 1-1 OF REMEDIAL INVESTIGATION REPORT (EXPONENT, MARCH 2010)

GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

SITE LOCATION MAP

ARCADIS

FIGURE
1

07/17/2013 SYRACUSE, NY-ENV/CAD-DJHOWES
N:\B001\0003\0004\00001\CDR\10003G03.CDR

07/17/2013 SYRACUSE, NY-ENV/CAD-DJHOWES
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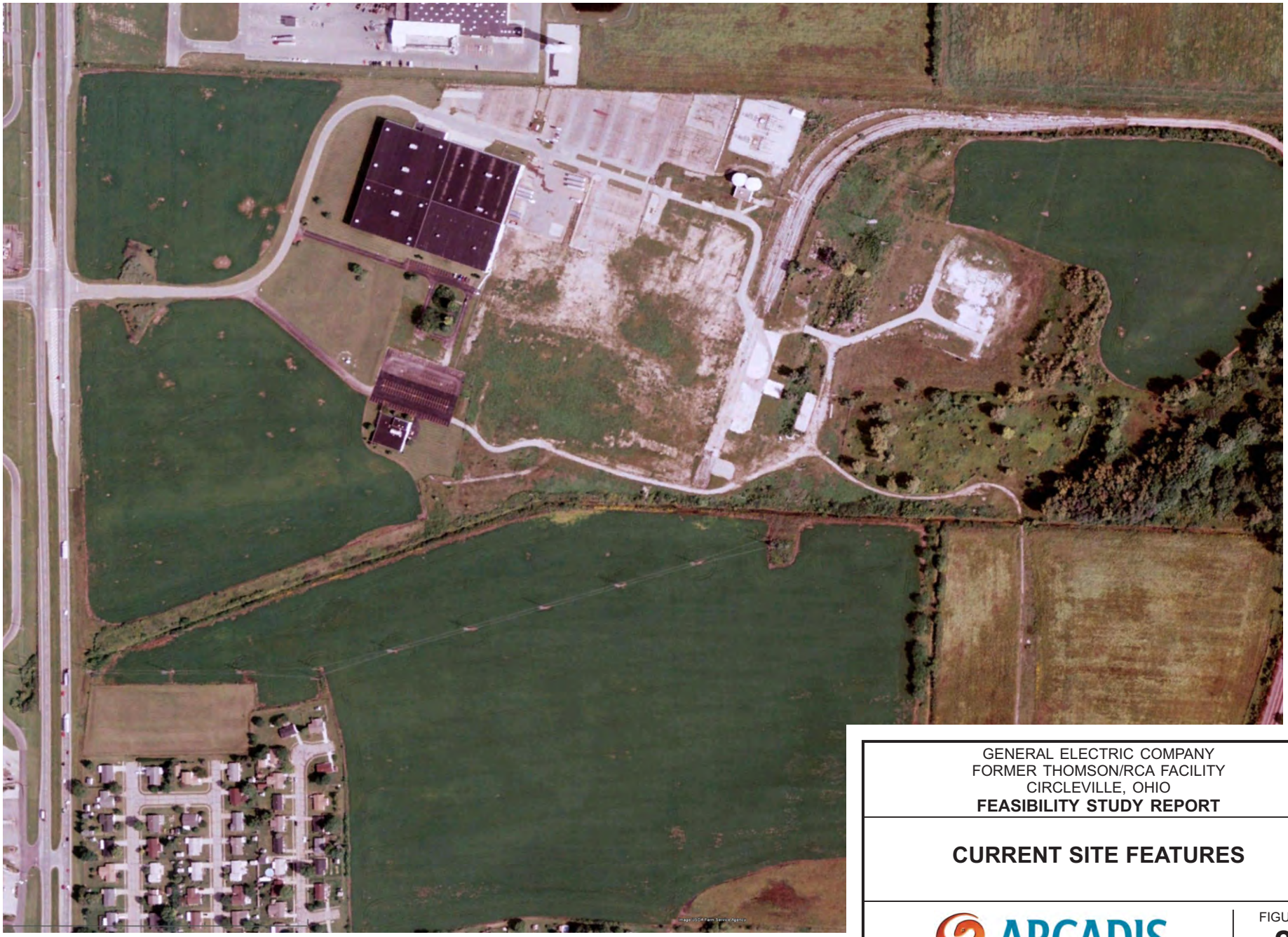


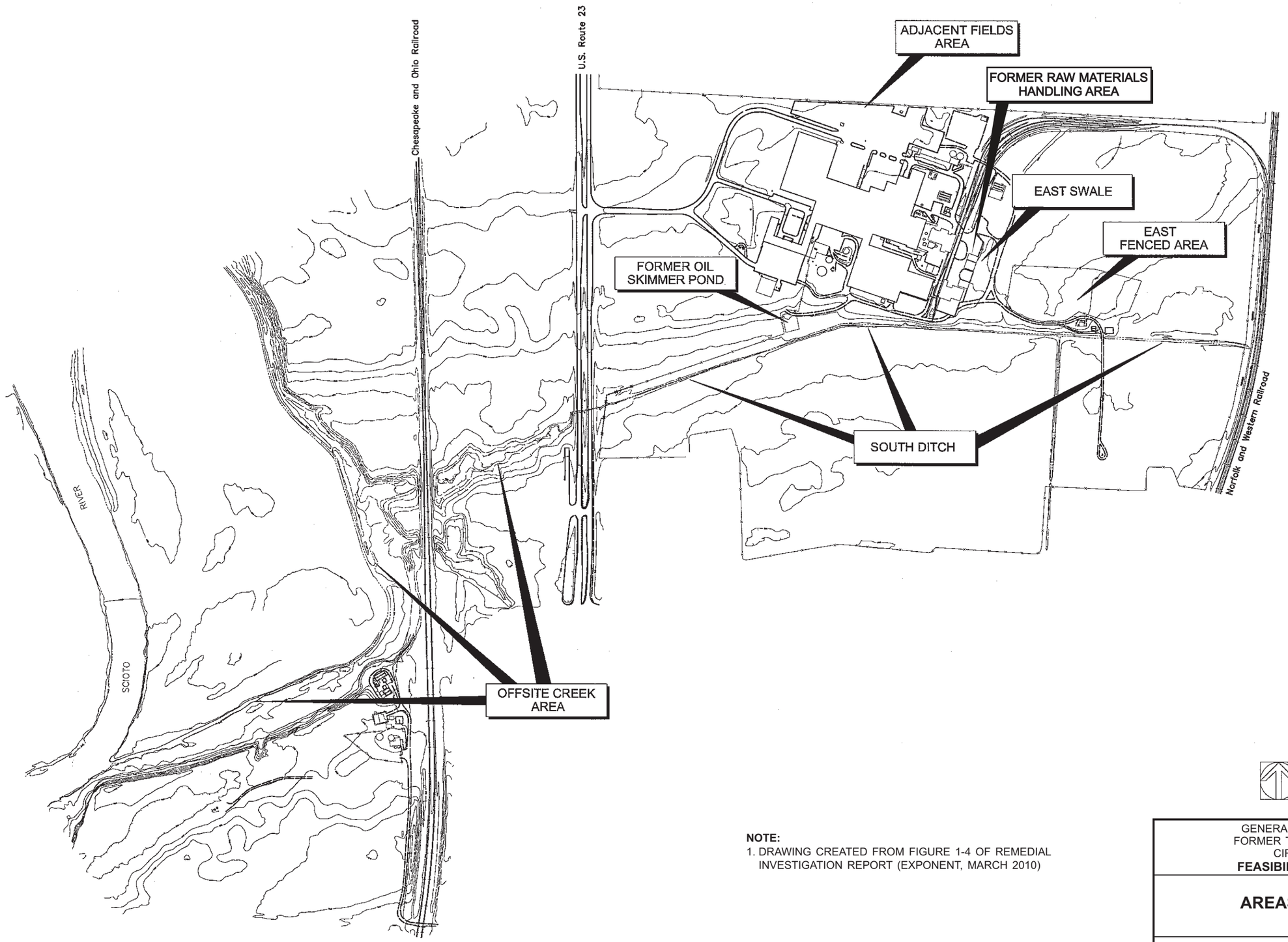
REFERENCE: AERIAL PHOTO GOOGLE EARTH © 2009.

GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

CURRENT SITE FEATURES

ARCADIS

FIGURE
2



NOTE:
1. DRAWING CREATED FROM FIGURE 1-4 OF REMEDIAL INVESTIGATION REPORT (EXPONENT, MARCH 2010)

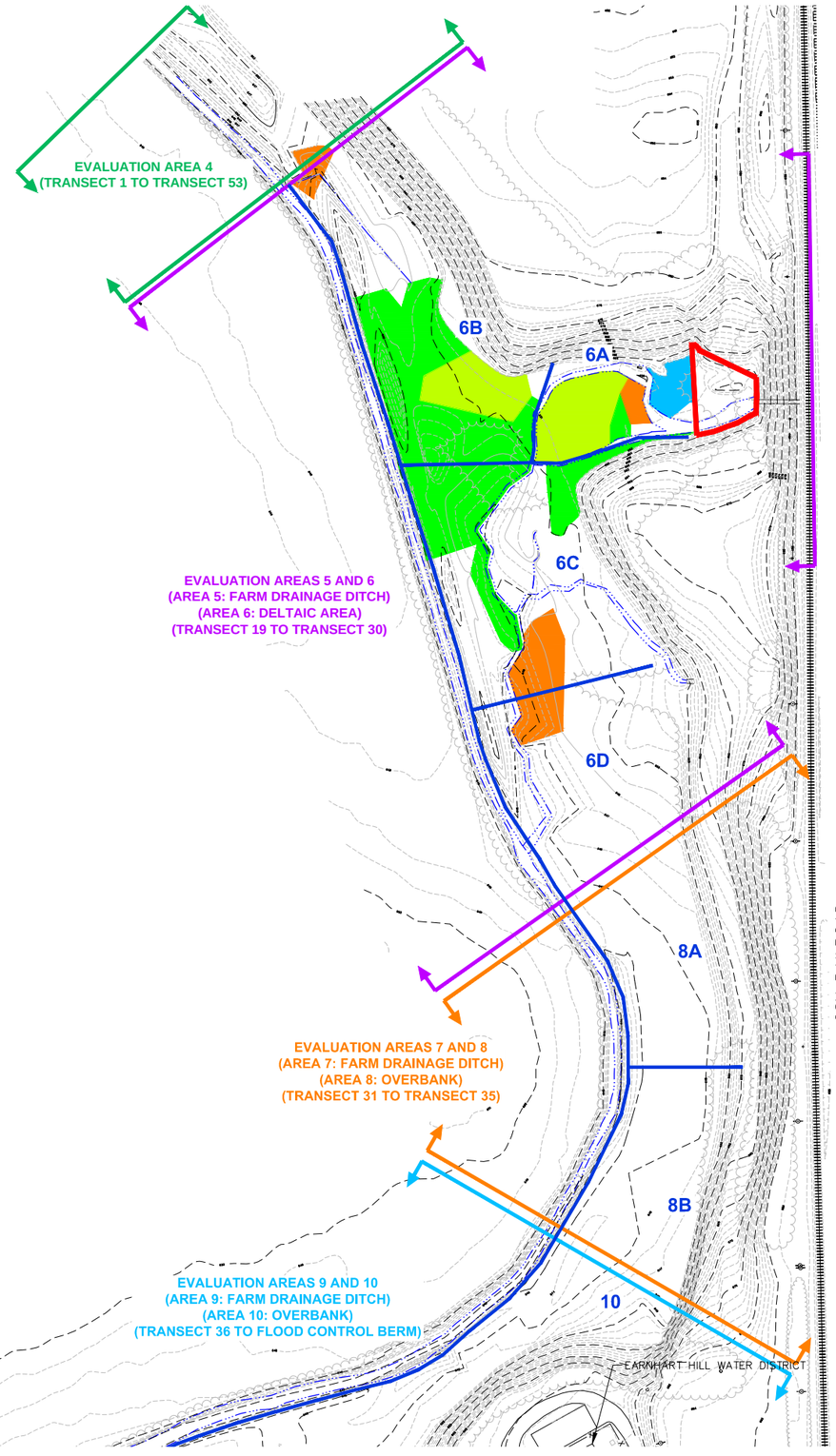
GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

AREAS OF INTEREST

ARCADIS

FIGURE
3

07/17/2013 SYRACUSE, NY-ENV/CAD-DJHOWES
N:\B0010003\0004\00001\CDR/10003G02.CDR



LEGEND:

- EXISTING CONTOUR
- EDGE OF WATER
- TREELINE
- EXISTING GUARD RAIL
- EXISTING FENCE
- EXISTING UTILITY POLE

APPROXIMATE LIMITS OF EXCAVATION

- 6" REMOVAL
- 12" REMOVAL
- 18" REMOVAL
- 24" REMOVAL
- AREA OF 2002 IRM

NOTE:

1. BASE MAP PROVIDED BY M.A.N. MAPPING SERVICES, INC. ENTITLED "03–62 THOMSON FACILITY," DATED SEPTEMBER 5, 2003 (FILE NO. THOMSON.DWG) AS REVISED BY BLASLAND, BOUCK & LEE, INC. ON JANUARY 12, 2004.

0 80' 160'
APPROXIMATE GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

APPROXIMATE REMOVAL LIMITS DELTAIC & NON-DELTAIC PORTIONS OF OCA - ALTERNATIVE 2

ARCADIS

FIGURE
4

CITY:SYRACUSE DIV/GROUP:ENV DB:KDM DMW G.STOWELL PM:C.AVERILL LYR:ON=*OFF=*REF
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XREFS: IMAGES: PROJECTNAME: ----
100003X01
100003X00
100003X42

EVALUATION AREA 3
(TRANSECT 10 TO CSX RAILROAD)

EVALUATION AREA 2
(US HIGHWAY 23 SOUTH TO TRANSECT 9)

US 23 SOUTH

CSX RAILROAD

RNRG, INC.

UPPER CREEK AREA

SSK ASSOCIATES, INC.

LEGEND:

- EXISTING CONTOUR
- EDGE OF WATER
- TREELINE
- EXISTING GUARD RAIL
- EXISTING FENCE
- EXISTING UTILITY POLE

APPROXIMATE LIMITS OF EXCAVATION

- 6" REMOVAL
- 12" REMOVAL
- 30" REMOVAL

NOTE:

1. BASE MAP PROVIDED BY M.A.N. MAPPING SERVICES, INC. ENTITLED "03–62 THOMSON FACILITY," DATED SEPTEMBER 5, 2003 (FILE NO. THOMSON.DWG) AS REVISED BY BLASLAND, BOUCK & LEE, INC. ON JANUARY 12, 2004.

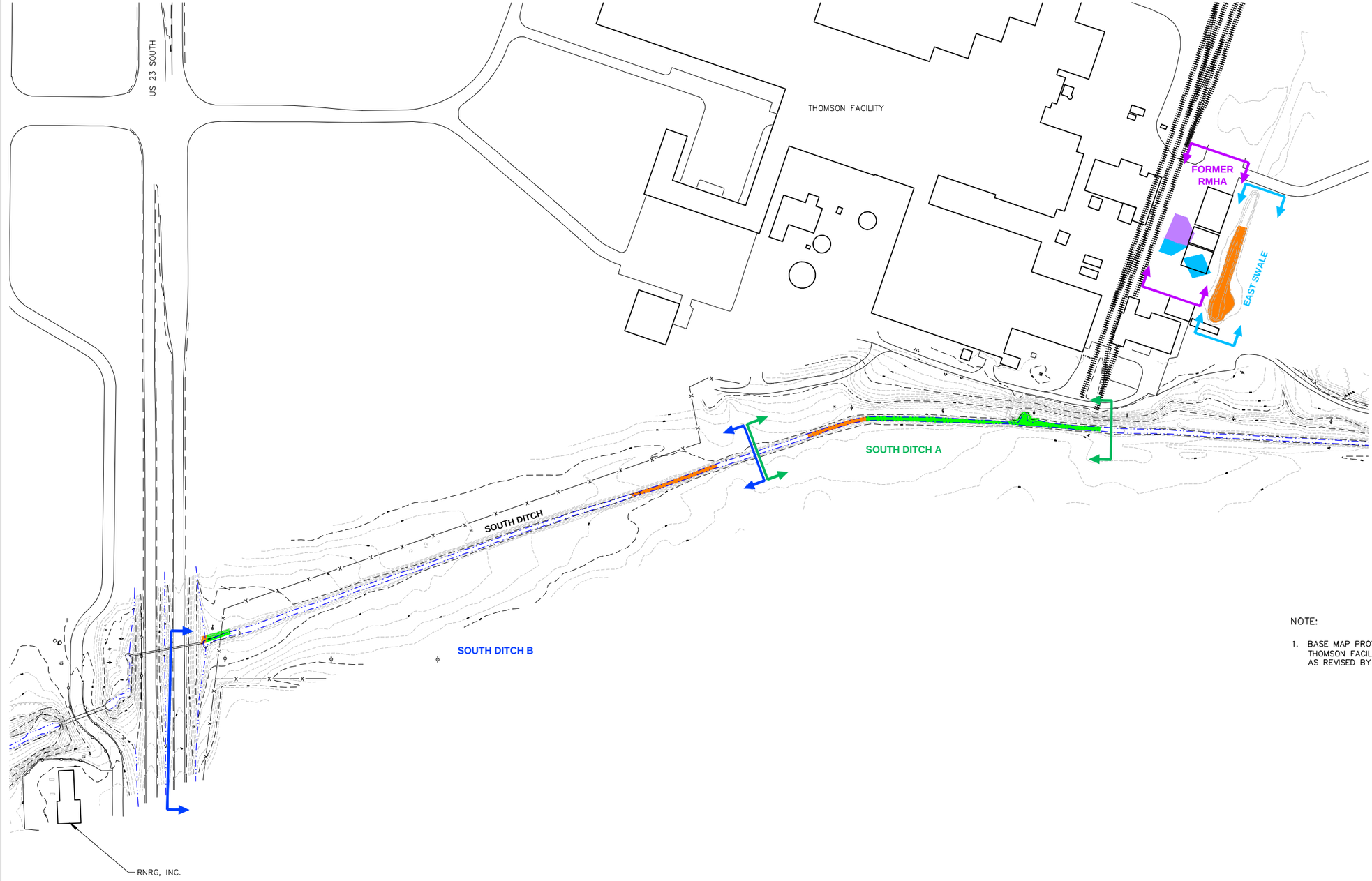
0 40' 80'
APPROXIMATE GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

APPROXIMATE REMOVAL LIMITS UPPER CREEK AREA - ALTERNATIVE 2

ARCADIS

FIGURE
5



LEGEND:

- EXISTING CONTOUR
- EDGE OF WATER
- TREELINE
- EXISTING GUARD RAIL
- EXISTING FENCE
- EXISTING UTILITY POLE

APPROXIMATE LIMITS OF EXCAVATION

- 6" REMOVAL
- 12" REMOVAL
- 24" REMOVAL
- 36" REMOVAL

NOTE:

1. BASE MAP PROVIDED BY M.A.N. MAPPING SERVICES, INC. ENTITLED "03–62 THOMSON FACILITY," DATED SEPTEMBER 5, 2003 (FILE NO. THOMSON.DWG) AS REVISED BY BLASLAND, BOUCK & LEE, INC. ON JANUARY 12, 2004.

0 120' 240'
APPROXIMATE GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

APPROXIMATE REMOVAL LIMITS SOUTH DITCH, EAST SWALE AND FORMER RMHA (INCLUDING PAVED AREAS) - ALTERNATIVE 2

ARCADIS

FIGURE
6

CITY:SYRACUSE DIV/GROUP:ENV DB:KDM DMW G.STOWELL PM:C.AVERILL LYR:ON=*;OFF=*REF
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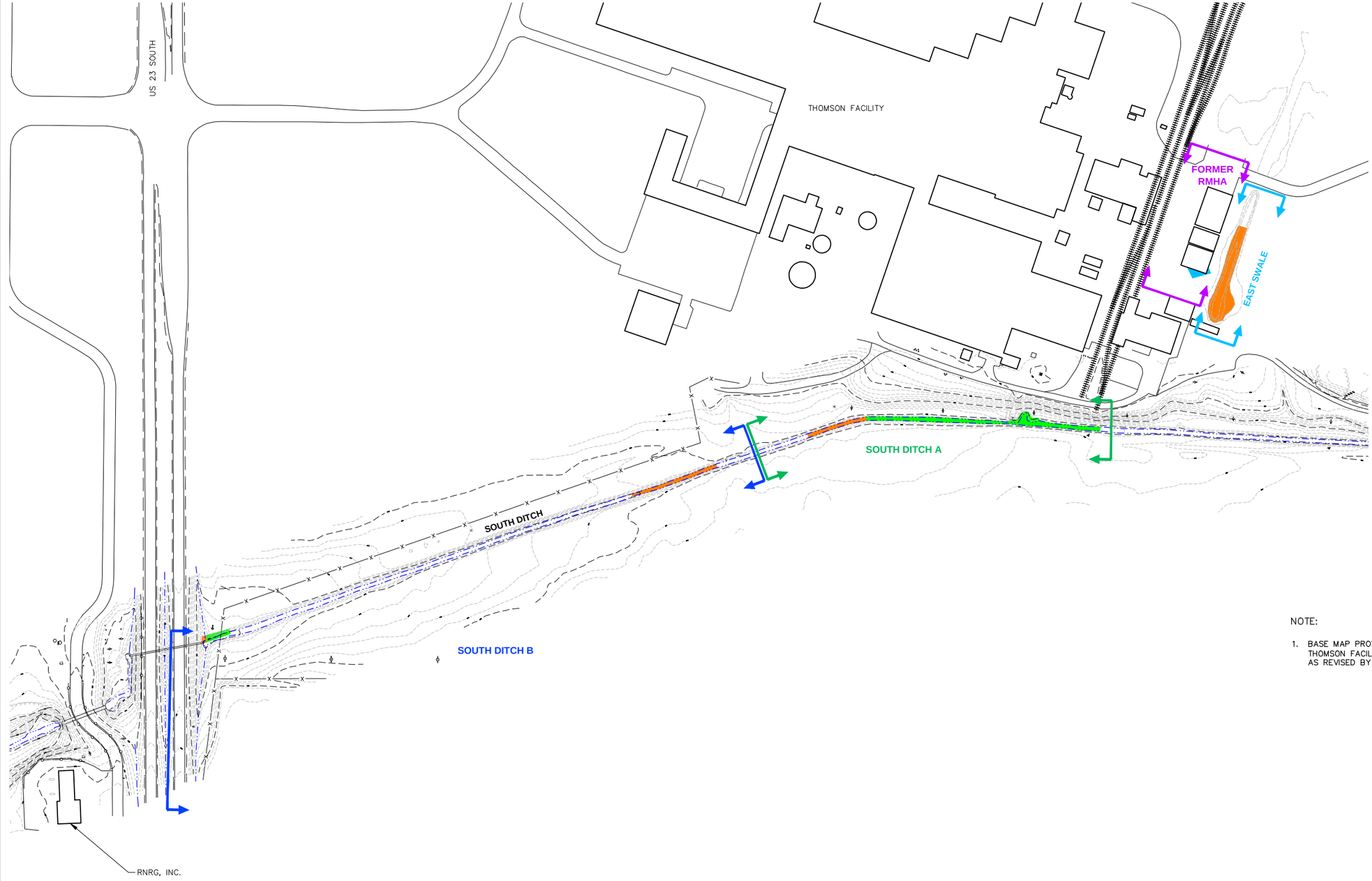
100030X00
100030X42



LEGEND:

- EXISTING CONTOUR
- EDGE OF WATER
- TREELINE
- EXISTING GUARD RAIL
- EXISTING FENCE
- EXISTING UTILITY POLE

APPROXIMATE LIMITS OF EXCAVATION

- 6" REMOVAL
- 12" REMOVAL
- 24" REMOVAL
- 36" REMOVAL

NOTE:

1. BASE MAP PROVIDED BY M.A.N. MAPPING SERVICES, INC. ENTITLED "03–62 THOMSON FACILITY," DATED SEPTEMBER 5, 2003 (FILE NO. THOMSON.DWG) AS REVISED BY BLASLAND, BOUCK & LEE, INC. ON JANUARY 12, 2004.

0 120' 240'
APPROXIMATE GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

APPROXIMATE REMOVAL LIMITS SOUTH DITCH, EAST SWALE AND FORMER RMHA (EXCLUDING PAVED AREAS) - ALTERNATIVE 2

ARCADIS

FIGURE
7

CITY:SYRACUSE DIV/GROUP:ENV DB:KDM DMW G.STOWELL PM:C.AVERILL LYR:ON=*;OFF=*REF
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XREFS: IMAGES: PROJECTNAME: ---
100030X01
100030X00
100030X42

LEGEND:

- EXISTING CONTOUR
- EDGE OF WATER
- TREELINE
- EXISTING GUARD RAIL
- EXISTING FENCE
- EXISTING UTILITY POLE

APPROXIMATE LIMITS OF EXCAVATION

- 6" REMOVAL
- 12" REMOVAL
- 18" REMOVAL
- 24" REMOVAL
- AREA OF 2002 IRM

NOTE:

1. BASE MAP PROVIDED BY M.A.N. MAPPING SERVICES, INC. ENTITLED "03-62 THOMSON FACILITY," DATED SEPTEMBER 5, 2003 (FILE NO. THOMSON.DWG) AS REVISED BY BLASLAND, BOUCK & LEE, INC. ON JANUARY 12, 2004.

0 80' 160'
APPROXIMATE GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

APPROXIMATE REMOVAL LIMITS DELTAIC & NON-DELTAIC PORTIONS OF OCA - ALTERNATIVE 3

ARCADIS

FIGURE
8

CITY:SYRACUSE DIV/GROUP:ENV DB:KDM DMW G.STOWELL PM:C.AVERILL LYR:ON=*;OFF=*REF
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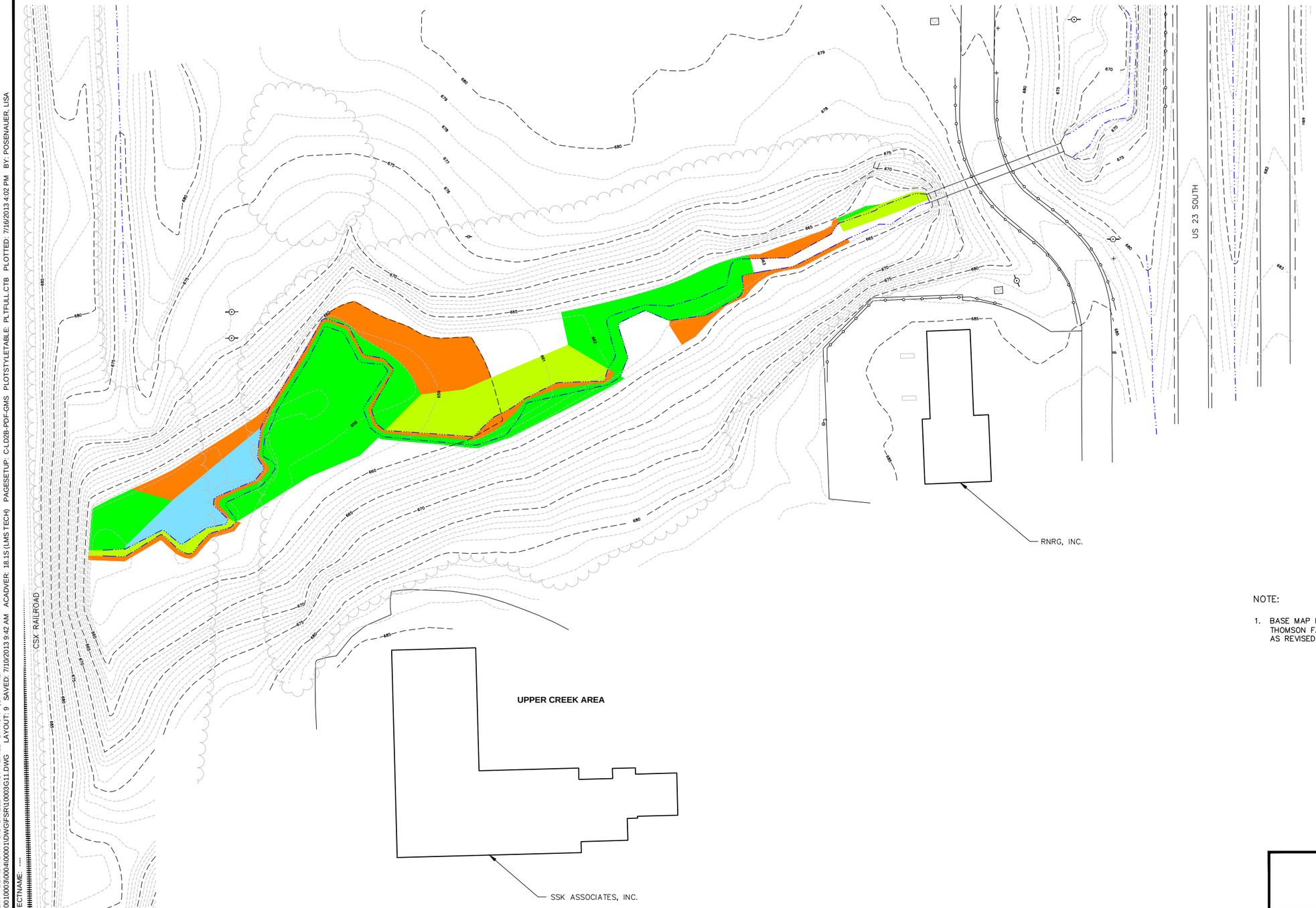
10003X00
10003X02



LEGEND:

- EXISTING CONTOUR
- EDGE OF WATER
- TREELINE
- EXISTING GUARD RAIL
- EXISTING FENCE
- EXISTING UTILITY POLE

APPROXIMATE LIMITS OF EXCAVATION

- 6" REMOVAL
- 12" REMOVAL
- 18" REMOVAL
- 30" REMOVAL

NOTE:

1. BASE MAP PROVIDED BY M.A.N. MAPPING SERVICES, INC. ENTITLED "03-62 THOMSON FACILITY," DATED SEPTEMBER 5, 2003 (FILE NO. THOMSON.DWG) AS REVISED BY BLASLAND, BOUCK & LEE, INC. ON JANUARY 12, 2004.

0 40' 80'
APPROXIMATE GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

APPROXIMATE REMOVAL LIMITS UPPER CREEK AREA - ALTERNATIVE 3

ARCADIS

FIGURE
9

CITY:SYRACUSE DIV/GROUP:ENV DB:KDM DMW:G.STOWELL PM:C.AVERILL LYR:ON=*;OFF=*REF
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XREFS: IMAGES: PROJECTNAME: ----
10003X01
10003X00
10003X02

LEGEND:

- EXISTING CONTOUR
- EDGE OF WATER
- TREELINE
- EXISTING GUARD RAIL
- EXISTING FENCE
- EXISTING UTILITY POLE

APPROXIMATE LIMITS OF EXCAVATION

- 6" REMOVAL
- 12" REMOVAL
- 24" REMOVAL
- 36" REMOVAL

NOTE:

1. BASE MAP PROVIDED BY M.A.N. MAPPING SERVICES, INC. ENTITLED "03–62 THOMSON FACILITY," DATED SEPTEMBER 5, 2003 (FILE NO. THOMSON.DWG) AS REVISED BY BLASLAND, BOUCK & LEE, INC. ON JANUARY 12, 2004.

0 120' 240'
APPROXIMATE GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

APPROXIMATE REMOVAL LIMITS SOUTH DITCH, EAST SWALE AND FORMER RMHA (INCLUDING PAVED AREAS) - ALTERNATIVE 3

ARCADIS

FIGURE
10

CITY:SYRACUSE DIV/GROUP:ENV DB:KDM DMW G.STOWELL PM:C.AVERILL LYR:ON=*;OFF=*REF
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XREFS: IMAGES: PROJECTNAME: ---
10003X01
10003X00
10003X02

LEGEND:

- EXISTING CONTOUR
- EDGE OF WATER
- TREELINE
- EXISTING GUARD RAIL
- EXISTING FENCE
- EXISTING UTILITY POLE

APPROXIMATE LIMITS OF EXCAVATION

- 6" REMOVAL
- 12" REMOVAL
- 24" REMOVAL
- 36" REMOVAL

NOTE:

1. BASE MAP PROVIDED BY M.A.N. MAPPING SERVICES, INC. ENTITLED "03–62 THOMSON FACILITY," DATED SEPTEMBER 5, 2003 (FILE NO. THOMSON.DWG) AS REVISED BY BLASLAND, BOUCK & LEE, INC. ON JANUARY 12, 2004.

0 120' 240'
APPROXIMATE GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
FORMER THOMSON/RCA FACILITY
CIRCLEVILLE, OHIO
FEASIBILITY STUDY REPORT

APPROXIMATE REMOVAL LIMITS SOUTH DITCH, EAST SWALE AND FORMER RMHA (EXCLUDING PAVED AREAS) - ALTERNATIVE 3

ARCADIS

FIGURE
11

CITY:SYRACUSE DIV/GROUP:ENV DB:KDM DMW G.STOWELL PM:C.AVERILL LYR:ON=*;OFF=*REF
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XREFS: IMAGES: PROJECTNAME: ---
10003X01
10003X00
10003X02